

## 1. Acceleration of the Primary Axis

- **Definition:** This sensor measures the acceleration along the **primary axis** of the vehicle, which is typically the **longitudinal axis (front to rear)**. It's useful for **traction control, stability control, and crash detection**.
  - **Example Usage:** If you suddenly accelerate or decelerate, this sensor records how fast the speed changes.
  - **Impact if Faulty:** If this sensor fails, systems like **traction control (DSC), adaptive cruise control, and emergency braking** might not work correctly.
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## 2. Acceleration of the Secondary Axis

- **Definition:** This sensor measures acceleration along the **secondary axis**, which is usually **side-to-side (lateral movement)**.
  - **Example Usage:** When making a sharp turn, the car's **Dynamic Stability Control (DSC)** uses this data to **prevent skidding**.
  - **Impact if Faulty:** If this sensor fails, the **DSC, ABS (Anti-lock Braking System), and cornering assist** might not function properly, increasing the risk of **oversteer or understeer in high-speed turns**.
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## 3. Actual Damper Value in Degrees

- **Definition:** Measures the actual **position of the shock absorbers** (dampers) in degrees.
  - **Example Usage:** If the car has **adaptive suspension**, the system adjusts the damping force based on road conditions.
  - **Impact if Faulty:** If this sensor fails, the suspension **might not adjust correctly**, leading to **a rougher ride, poor handling, or excessive bouncing over bumps**.
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## 4. Actual Gear

- **Definition:** Reports the currently selected **gear** in the transmission.
- **Example Usage:** The **automatic transmission control unit (TCU)** relies on this sensor to **adjust shift timing, power output, and throttle response**.

- **Impact if Faulty:** The transmission may **misinterpret gear selection, causing jerky shifts, incorrect gear display, or even failure to shift gears.**
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## 5. Actual Gear in the Monitoring Function from Gear Sensor

- **Definition:** A backup monitoring system that **cross-checks the actual gear position** using a separate sensor.
  - **Example Usage:** If the **primary gear sensor fails**, this secondary monitoring function can detect inconsistencies and activate **emergency shifting modes**.
  - **Impact if Faulty:** If both primary and monitoring gear sensors fail, the **car might enter "limp mode"**, restricting acceleration and preventing high-speed driving.
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## 6. Actual Gear Information from the Gear Sensor

- **Definition:** The primary **gear position sensor** that informs the car's ECU of the **real-time gear selection**.
  - **Example Usage:** Works together with **engine mapping** to adjust the **torque output** and ensure smooth gear changes.
  - **Impact if Faulty:** If the sensor provides incorrect data, the **car might think it's in a different gear**, leading to **delayed or rough gear shifts**.
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## 7. Actual Ignition Angle

- **Definition:** Measures the **angle of the crankshaft** when the spark plug fires.
  - **Example Usage:** The ECU uses this data to **adjust ignition timing for optimal fuel combustion, power output, and emissions control**.
  - **Impact if Faulty:** If the ignition angle sensor fails, the **engine may misfire, lose power, or consume more fuel** due to incorrect spark timing.
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## 8. Actual Lambda from Probe

- **Definition:** Measures the **air-fuel ratio (AFR)** using the **oxygen sensor (lambda probe)**.

- **Example Usage:** The ECU adjusts the **fuel mixture** based on **lambda readings** to ensure **optimal combustion efficiency**.
  - **Impact if Faulty:** If the lambda sensor is inaccurate, the car may run **too rich** (**excess fuel, poor mileage, more emissions**) or **too lean** (**overheating, engine knocking, power loss**).
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## 9. Actual Oil Pressure Value (Absolute Pressure)

- **Definition:** Measures **engine oil pressure** in **absolute pressure** (**compensated for altitude changes**).
  - **Example Usage:** This sensor ensures that **enough oil is circulating** through the engine to prevent **wear and overheating**.
  - **Impact if Faulty:** A faulty oil pressure sensor may **trigger false warning lights** or **fail to warn about actual low oil pressure**, leading to **engine damage or failure**.
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## 10. Actual Operating Mode

- **Definition:** Detects the current **driving mode** the ECU is in, such as **Eco, Sport, Normal, or Adaptive**.
  - **Example Usage:** If the driver switches to **Sport mode**, the system **adjusts throttle response, suspension stiffness, and gear shifting behavior**.
  - **Impact if Faulty:** The car might get stuck in the wrong mode, leading to **unresponsive throttle, incorrect transmission behavior, or failure to optimize fuel economy**.
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## 11. Actual Oil Pressure Value Offset-Corrected (Based on Ambient Pressure)

- **Definition:** This sensor measures **oil pressure**, but applies a correction based on the **ambient pressure** to improve accuracy.
- **Example Usage:** At **higher altitudes**, atmospheric pressure is lower, so the sensor compensates for this change to ensure the correct **oil circulation** pressure.

- **Impact if Faulty:** If the correction factor is incorrect, the ECU may think the **oil pressure is too high or too low**, leading to **false alarms or failure to detect real pressure issues**.
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## 12. Actual Operating Mode Oil Pressure Control

- **Definition:** Monitors the **engine's current operating mode** (such as idle, acceleration, or high-load) and adjusts the **oil pressure accordingly**.
  - **Example Usage:** When driving at **high speeds**, the ECU increases oil pressure to **lubricate** faster-moving engine parts.
  - **Impact if Faulty:** The engine may **not receive enough oil pressure**, leading to **increased wear and tear on moving components**, especially under **high loads**.
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## 13. Actual Speed of Electric Water Pump

- **Definition:** Measures the **rotational speed** of the **electric water pump**, which controls **coolant circulation**.
  - **Example Usage:** The pump adjusts its speed depending on **engine load** and **coolant temperature** to **prevent overheating**.
  - **Impact if Faulty:** If this sensor fails, the ECU might **not regulate cooling correctly**, potentially leading to **engine overheating**.
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## 14. Actual Speed

- **Definition:** Measures the **vehicle's actual speed**, using inputs from the **wheel speed sensors** and **transmission sensors**.
  - **Example Usage:** The speed sensor helps systems like **cruise control, ABS, and traction control** operate correctly.
  - **Impact if Faulty:** The speedometer might show incorrect speeds, and systems like **ABS, traction control, and adaptive cruise control** might malfunction.
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## 15. Actual Value Inlet Spread

- **Definition:** Measures how much the **intake camshaft timing** has been adjusted (also called **VANOS** in BMW systems).
  - **Example Usage:** Adjusting the **intake valve timing** improves **engine efficiency** at different RPMs.
  - **Impact if Faulty:** A failure may cause **reduced power, rough idling, or increased emissions.**
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## 16. Actual Value of Electric Fan

- **Definition:** Measures the actual **speed or power** of the **electric cooling fan**.
  - **Example Usage:** When the engine gets hot, the fan kicks in at a specific speed to **help with cooling**.
  - **Impact if Faulty:** A malfunction could lead to **insufficient cooling**, which may cause **engine overheating**.
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## 17. Actual Value Inlet Spread Bank 2

- **Definition:** The same as **sensor #15**, but specifically for **Bank 2** (the second set of cylinders in **V8 or V6 engines**).
  - **Example Usage:** Ensures that **both sides of the engine** have synchronized **variable valve timing adjustments**.
  - **Impact if Faulty:** If this sensor fails, the engine might have **uneven performance** between the two banks.
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## 18. Actual Value of Oil Pressure

- **Definition:** Directly measures the **real-time oil pressure** inside the engine.
  - **Example Usage:** Used to prevent **low oil pressure conditions** that could lead to **engine damage**.
  - **Impact if Faulty:** Incorrect oil pressure readings might **cause unnecessary warnings** or fail to alert the driver about **critical engine lubrication issues**.
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## **19. Actual Value of Stroke Adjustment**

- **Definition:** Measures the movement range of **variable valve lift (Valvetronic system)**.
  - **Example Usage:** In BMW's **Valvetronic engines**, this system adjusts valve lift to improve **fuel efficiency and power output**.
  - **Impact if Faulty:** If incorrect, the engine may **lose power, consume more fuel, or even stall**.
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## **20. Actual Value of the Eccentric Angle VVT**

- **Definition:** Measures the angle of the **Valvetronic camshaft** (eccentric shaft), which controls **valve lift**.
  - **Example Usage:** Adjusting this angle allows the ECU to optimize **air intake without using a throttle valve**.
  - **Impact if Faulty:** A bad reading may cause **misfires, poor acceleration, or failure to adjust engine power**.
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## **21. Actual Value of the Outlet Spread**

- **Definition:** Measures the **actual timing adjustment** of the **exhaust camshaft (outlet VANOS)**.
  - **Example Usage:** In BMW engines with **VANOS (Variable Valve Timing)**, this sensor helps optimize **exhaust gas flow** for better **performance and emissions**.
  - **Impact if Faulty:** A faulty sensor may cause **delayed exhaust timing**, leading to **loss of power, increased emissions, or rough idling**.
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## **22. Actual Value of the Outlet Spread Bank 2**

- **Definition:** Same as **sensor #21**, but for **Bank 2** (in V6/V8 engines).
- **Example Usage:** Ensures that the **exhaust camshaft timing** is correctly adjusted on the **second bank of cylinders**.

- **Impact if Faulty:** If incorrect, the car may suffer from **uneven engine performance, poor emissions, or higher fuel consumption.**
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### 23. Adapted Ash Mass in OPF Bank 1

- **Definition:** Measures the amount of **ash buildup in the OPF (Otto Particulate Filter) for Bank 1.**
  - **Example Usage:** The OPF is a **gasoline particulate filter (GPF)** that reduces emissions. This sensor helps monitor **filter clogging.**
  - **Impact if Faulty:** If the reading is inaccurate, the ECU might **fail to trigger a regeneration cycle**, leading to **clogging, increased backpressure, and potential engine damage.**
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### 24. Actual Voltage Generator

- **Definition:** Measures the **output voltage of the alternator (generator).**
  - **Example Usage:** The ECU monitors this to ensure the **battery and electrical systems** receive the correct power.
  - **Impact if Faulty:** If incorrect, the **battery may not charge properly**, leading to **electrical failures and potential stalling.**
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### 25. Adapted Ash Mass in OPF Bank 2

- **Definition:** Same as **sensor #23**, but for **Bank 2.**
  - **Example Usage:** Ensures that the **gasoline particulate filter (GPF)** on the **second bank of cylinders** is working correctly.
  - **Impact if Faulty:** If inaccurate, it can **cause regeneration to fail, leading to clogged filters and reduced engine efficiency.**
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### 26. Adapted Ash Mass in the Particle Filter

- **Definition:** Measures the amount of **ash accumulation in the Diesel/Gasoline Particulate Filter (DPF/GPF).**

- **Example Usage:** Helps the ECU determine **when a filter regeneration cycle** (burning off soot) is needed.
  - **Impact if Faulty:** A clogged filter can cause **high backpressure, poor fuel economy, or engine limp mode.**
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## 27. Adapted Ash Mass in the Particulate Filter Bank 2

- **Definition:** Same as **sensor #26**, but specifically for **Bank 2**.
  - **Example Usage:** Helps in monitoring the particulate filter's condition on the **second set of cylinders**.
  - **Impact if Faulty:** If incorrect, **clogging and emissions control issues** may arise, leading to **check engine lights and reduced power.**
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## 28. Adapted Crankcase Ventilation Pressure

- **Definition:** Measures the **pressure inside the crankcase**, helping to monitor the **PCV (Positive Crankcase Ventilation) system.**
  - **Example Usage:** The PCV system removes **excess gases from the crankcase**, preventing oil contamination.
  - **Impact if Faulty:** A faulty reading can cause **excessive crankcase pressure**, leading to **oil leaks, poor engine efficiency, or misfires.**
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## 29. Adapted Total Loading of the OPF Bank 1

- **Definition:** Measures the **total soot and ash loading in the gasoline particulate filter** for Bank 1.
  - **Example Usage:** Helps trigger **regeneration cycles** to keep the exhaust system clean.
  - **Impact if Faulty:** If the sensor misreads, the filter may become **clogged, reducing power and fuel efficiency.**
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## 30. Adapted Total Loading of the OPF Bank 2

- **Definition:** Same as **sensor #29**, but for **Bank 2**.
  - **Example Usage:** Ensures proper **filter regeneration** for the second set of cylinders.
  - **Impact if Faulty:** Incorrect readings can lead to **clogged filters, poor performance, and higher emissions**.
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### 31. Adapted Total Loading of the Particulate Filter Bank 2

- **Definition:** Measures the **total accumulation of soot and ash** in the **particulate filter (OPF/DPF) for Bank 2**.
  - **Example Usage:** The ECU uses this data to **optimize regeneration cycles** and maintain proper **exhaust performance**.
  - **Impact if Faulty:** If the sensor gives incorrect readings, the **filter might not regenerate properly**, leading to **clogging, reduced power, and increased backpressure**.
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### 32. Adapted Total Loading of the Particle Filter

- **Definition:** Measures the **total soot and ash** across the **entire particulate filter** (both banks).
  - **Example Usage:** This value helps the ECU determine **when to perform a filter regeneration cycle**.
  - **Impact if Faulty:** If the value is too high or too low, **filter clogging** may cause **increased fuel consumption, reduced engine power, and excessive emissions**.
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### 33. Adjustment Range of the Eccentric Angle

- **Definition:** Measures how far the **Valvetronic eccentric shaft** can adjust the **intake valve lift**.
- **Example Usage:** In **BMW Valvetronic systems**, this sensor helps fine-tune the **air intake** without a traditional throttle body.
- **Impact if Faulty:** If the range is incorrect, the car may **struggle to regulate airflow**, leading to **rough idling, power loss, and increased fuel consumption**.

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#### **34. Air Damper - Actual Position in Steps**

- **Definition:** Measures the **current position** of the **air intake damper**, which controls airflow to the engine.
  - **Example Usage:** The ECU adjusts this damper to **optimize engine breathing** based on **speed, load, and temperature**.
  - **Impact if Faulty:** If stuck open or closed, the engine may experience **poor throttle response, reduced efficiency, or excessive turbo lag**.
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#### **35. Air Damper - Target Position in Steps**

- **Definition:** The **desired** position of the **air intake damper**, which the ECU commands based on **driving conditions**.
  - **Example Usage:** The system continuously adjusts this target position to **maximize airflow for performance or efficiency**.
  - **Impact if Faulty:** If this target position is not achieved, **engine efficiency may drop, and power delivery may become inconsistent**.
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#### **36. Air Flap - Lower Air Flap Status**

- **Definition:** Monitors the position of the **lower air intake flap**, which helps regulate **cold vs. warm air intake**.
  - **Example Usage:** In cold weather, the ECU may **close the lower air flap** to allow for **faster engine warm-up**.
  - **Impact if Faulty:** A stuck or malfunctioning flap may cause **longer warm-up times, poor fuel economy, or performance loss**.
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#### **37. Air Mass Flow**

- **Definition:** Measures the **total amount of air entering the engine**, usually via a **Mass Air Flow (MAF) sensor**.

- **Example Usage:** The ECU uses this data to adjust **fuel injection** for optimal combustion.
  - **Impact if Faulty:** A faulty sensor can cause **rough idling, stalling, poor acceleration, and excessive fuel consumption.**
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### 38. Air Flap - Upper Air Flap Status

- **Definition:** Monitors the position of the **upper air intake flap**, which regulates **airflow for different driving conditions.**
  - **Example Usage:** The upper flap may **close at lower speeds for better efficiency** and **open at high speeds for more power.**
  - **Impact if Faulty:** If stuck, the engine may **run too lean or too rich**, affecting **throttle response and emissions.**
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### 39. Air Mass Flow Filtered

- **Definition:** Provides a **smoothed, more accurate version** of the **raw air mass flow sensor reading.**
  - **Example Usage:** Used in real-time engine calculations to **prevent misfires, incorrect fuel trims, or laggy throttle response.**
  - **Impact if Faulty:** If incorrect, the engine may experience **inconsistent fuel delivery, increased emissions, or power loss.**
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### 40. Air Mass Flow Filtered Bank 2

- **Definition:** Same as **sensor #39**, but for **Bank 2.**
  - **Example Usage:** Ensures that the **airflow into both cylinder banks** is balanced for **smooth power delivery.**
  - **Impact if Faulty:** If this sensor fails, **one bank may run richer or leaner than the other**, leading to **misfires, rough idle, or check engine lights.**
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### 41. Air Mass Flow Participating in Combustion

- **Definition:** Measures the **actual portion of the air mass** that is being used in the **combustion process**.
  - **Example Usage:** The ECU uses this value to adjust **fuel injection** and **optimize the air-fuel mixture**.
  - **Impact if Faulty:** If incorrect, the engine may run **too rich (excess fuel, higher emissions, loss of power)** or **too lean (overheating, misfires, knock detection issues)**.
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## 42. Ambient Pressure

- **Definition:** Measures the **outside air pressure** to help the ECU adjust **engine parameters**.
  - **Example Usage:** At **higher altitudes**, where air pressure is lower, the ECU compensates by adjusting **fuel mixture and turbo boost levels**.
  - **Impact if Faulty:** A malfunctioning sensor could cause **incorrect fuel mapping, turbo boost errors, or power loss at different elevations**.
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## 43. Ambient Pressure from Sensor Raw Value

- **Definition:** The **unfiltered** raw data from the **ambient pressure sensor** before any ECU correction is applied.
  - **Example Usage:** Used as a baseline for pressure compensation in **fuel injection and turbocharging systems**.
  - **Impact if Faulty:** The system might **misinterpret altitude changes**, leading to **wrong fuel-air ratios, turbo under-boost, or over-boost conditions**.
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## 44. Ambient Temperature

- **Definition:** Measures the **outside air temperature** to adjust **engine and transmission behavior**.
- **Example Usage:** In cold weather, the engine may **idle higher** at startup for quicker warm-up.

- **Impact if Faulty:** Incorrect temperature readings can affect **fuel economy, emissions, or even climate control functions.**
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#### 45. Ambient Temperature Between 20°C and 29°C

- **Definition:** A pre-calibrated sensor reading that categorizes ambient temperature within this **specific range.**
  - **Example Usage:** Some systems, like **start-stop technology or air conditioning efficiency**, rely on this range for operation.
  - **Impact if Faulty:** If incorrect, the ECU may **disable fuel-saving features or incorrectly adjust engine cooling systems.**
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#### 46. Ambient Temperature Between 3°C and 19°C

- **Definition:** Same as **sensor #45**, but for **colder temperatures.**
  - **Example Usage:** If the temperature is in this range, the ECU may **modify fuel injection and ignition timing for better cold starts.**
  - **Impact if Faulty:** Could cause **difficult cold starts, improper fuel mixture, or unnecessary system restrictions.**
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#### 47. Ambient Temperature Between 30°C and 39°C

- **Definition:** Same as **sensor #45**, but for **warmer conditions.**
  - **Example Usage:** The ECU may **activate additional cooling systems** in this temperature range to prevent overheating.
  - **Impact if Faulty:** If the ECU thinks it's cooler than it actually is, the **engine may overheat or air conditioning performance may drop.**
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#### 48. Ambient Temperature Greater Than 39°C

- **Definition:** Indicates when **extreme hot conditions** are detected.
- **Example Usage:** At very high temperatures, the ECU **adjusts cooling strategies, fuel mapping, and possibly reduces engine power** to prevent damage.

- **Impact if Faulty:** If the reading is wrong, the ECU may **fail to engage additional cooling**, leading to **engine overheating**.
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#### 49. Ambient Temperature Less Than 3°C

- **Definition:** Indicates when **extremely cold conditions** are detected.
  - **Example Usage:** Triggers **cold start enrichment**, activates **heated components (mirrors, windshield)**, and changes **transmission shift points**.
  - **Impact if Faulty:** The ECU may **fail to enrich the fuel mixture**, causing **hard starts, misfires, or reduced performance in cold weather**.
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#### 50. Ambient Temperature Unfiltered

- **Definition:** The **raw** temperature reading before any ECU processing or filtering.
  - **Example Usage:** This data is used internally for **diagnostics and real-time adjustments**.
  - **Impact if Faulty:** Incorrect data may lead to **wrong climate control behavior, fuel mixture issues, and delayed fan activation**.
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#### 51. Analogue Absolute Pressure Raw Value Fuel Low Pressure Sensor

- **Definition:** Measures the **fuel pressure** in the **low-pressure fuel system** before it enters the **high-pressure pump**.
  - **Example Usage:** Ensures that **enough fuel is supplied** to the **high-pressure pump**, which then delivers fuel to the injectors.
  - **Impact if Faulty:** If the sensor provides incorrect readings, it could cause **fuel starvation, engine hesitation, or difficulty starting**.
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#### 52. Angle Exhaust Valve Closes Based on LWOT

- **Definition:** Measures the **closing angle of the exhaust valves**, which is a function of **Load With Open Throttle (LWOT)**.

- **Example Usage:** Used for **valve timing optimization** in **VANOS (variable camshaft timing)** systems to improve **power and emissions**.
  - **Impact if Faulty:** A bad reading may cause **loss of power, rough idling, or increased emissions**.
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### 53. Angle Inlet Valve Opens Based on LWOT

- **Definition:** Measures the **opening angle of the intake valves**, also based on **Load With Open Throttle (LWOT)**.
  - **Example Usage:** Helps the ECU **adjust intake timing dynamically**, improving **airflow efficiency and combustion**.
  - **Impact if Faulty:** Incorrect intake timing can lead to **poor fuel efficiency, knocking, or power loss**.
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### 54. Angle of the Inlet NW Flanks Relative to the Crankshaft

- **Definition:** Measures the **intake camshaft position** relative to the **crankshaft**.
  - **Example Usage:** In **VANOS-equipped engines**, this data helps the ECU determine the **correct camshaft phase adjustment**.
  - **Impact if Faulty:** If incorrect, the engine may have **reduced power, misfires, or increased fuel consumption**.
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### 55. Angle of the Outlet NW Flanks Relative to the Crankshaft

- **Definition:** Measures the **exhaust camshaft position** relative to the **crankshaft**.
  - **Example Usage:** Works together with the **intake camshaft** to ensure proper **cam phasing for power and emissions**.
  - **Impact if Faulty:** A malfunction may cause **poor exhaust scavenging, loss of efficiency, or increased emissions**.
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### 56. Ash Influence

- **Definition:** Measures the effect of **ash buildup in the exhaust system**, particularly in the **OPF/DPF (particulate filter)**.
  - **Example Usage:** Used to determine when a **regeneration cycle** is needed to burn off excess particulates.
  - **Impact if Faulty:** If miscalculated, the filter may clog **prematurely**, leading to **restricted exhaust flow and loss of power**.
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## 57. Ash Influence Bank 2

- **Definition:** Same as **sensor #56**, but for **Bank 2** in V6/V8 engines.
  - **Example Usage:** Ensures **balanced exhaust cleaning** across both cylinder banks.
  - **Impact if Faulty:** If incorrect, **one side of the engine may experience higher backpressure**, leading to **uneven performance**.
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## 58. Assembly Mode Currently Active

- **Definition:** Indicates whether the vehicle is in **factory assembly mode**, which enables **diagnostic and testing procedures**.
  - **Example Usage:** In this mode, certain **safety checks and electronic system verifications** are performed before the car leaves the factory.
  - **Impact if Faulty:** If mistakenly left in assembly mode, some **safety systems** (e.g., **traction control**) may **not function properly**.
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## 59. Automatic Start Condition

- **Definition:** Detects whether the **engine should start automatically**, such as in **auto start-stop systems**.
  - **Example Usage:** If the car is stopped at a traffic light, this sensor determines whether the engine should restart when you **release the brake**.
  - **Impact if Faulty:** If incorrect, the **auto start-stop feature may fail**, leading to **unnecessary idling and higher fuel consumption**.
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## 60. Average Distance Between Critical DMF Faults

- **Definition:** Tracks the **average distance driven** between **Dual Mass Flywheel (DMF) issues**.
  - **Example Usage:** Helps monitor the **condition of the flywheel** in manual and automatic transmissions.
  - **Impact if Faulty:** If misreported, the **system might fail to warn about a worn flywheel**, leading to **shaking, misalignment, or drivetrain damage**.
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## 61. Average of the Pressure Sensor Values of All Existing Pressure Sensors

- **Definition:** Calculates the **average pressure readings** from multiple **pressure sensors** in the system (e.g., fuel pressure, oil pressure, boost pressure).
  - **Example Usage:** Used for **engine diagnostics** and to **verify the consistency** of pressure readings across different components.
  - **Impact if Faulty:** If miscalculated, the ECU might **misinterpret system pressure**, leading to **incorrect adjustments in fuel injection, turbo boost, or lubrication**.
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## 62. Average Value of the Time Interval Between Critical ZMS Faults

- **Definition:** Measures the **average time** between detected **critical Dual Mass Flywheel (ZMS) issues**.
  - **Example Usage:** Helps **predict flywheel wear** and **detect drivetrain vibrations**.
  - **Impact if Faulty:** If incorrect, it may **fail to warn of an impending flywheel failure**, which can cause **excessive vibration, clutch issues, or drivetrain damage**.
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## 63. Basic Electrical System Converter Current

- **Definition:** Measures the **current flowing** through the **electrical system's DC-DC converter**.
- **Example Usage:** Ensures **stable power delivery** for **low-voltage and high-voltage systems** in the car.

- **Impact if Faulty:** If incorrect, it can lead to **low-voltage battery charging issues, malfunctioning electronics, or dimming lights.**
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#### 64. Basic Electrical System Deep Discharge IBS

- **Definition:** Detects whether the **Intelligent Battery Sensor (IBS)** has identified a **deep discharge event** (when battery voltage drops too low).
  - **Example Usage:** Helps prevent **battery damage** and **activates power-saving measures.**
  - **Impact if Faulty:** If this reading is incorrect, the **car may disable unnecessary power consumers** (e.g., heated seats, infotainment) unnecessarily, or fail to warn about an **actual battery failure.**
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#### 65. Basic Electrical System Generator Power

- **Definition:** Measures the **output power** of the **alternator (generator)** supplying electricity to the car.
  - **Example Usage:** Ensures that the alternator is **producing enough power** to charge the battery and run electrical systems.
  - **Impact if Faulty:** If the reading is incorrect, the battery may **not charge properly**, causing **electrical failures or engine shutdowns.**
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#### 66. Basic Electrical System Generator Voltage

- **Definition:** Measures the **voltage output** of the **alternator.**
  - **Example Usage:** Helps regulate **charging voltage** and prevents **overcharging or undercharging** the battery.
  - **Impact if Faulty:** If incorrect, it could lead to **battery damage, electrical failures, or sudden engine shutdowns.**
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#### 67. Basic On-Board Network Storage State of Charge Quality Value

- **Definition:** Assesses the **quality and accuracy** of the **battery's state of charge (SOC) readings**.
  - **Example Usage:** Ensures that the **battery charge level displayed on the dashboard** is reliable.
  - **Impact if Faulty:** If incorrect, the **car may misjudge battery levels**, leading to **unexpected battery drain or premature system shutdowns**.
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## 68. Basic Electrical System Producer Status

- **Definition:** Indicates whether the **alternator (generator)** is **actively charging** the battery.
  - **Example Usage:** If the car is running, this should indicate that the **alternator is supplying power**.
  - **Impact if Faulty:** A failure can cause **misdiagnosis of charging system issues**, leading to **unexpected battery depletion or electrical failures**.
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## 69. Basic On-Board Network, Storage Charge Status

- **Definition:** Monitors the **overall charge status** of the **on-board electrical system**.
  - **Example Usage:** Helps the ECU manage **power distribution** between the battery and various electrical consumers.
  - **Impact if Faulty:** If incorrect, the **car might shut down unnecessary power-consuming components (e.g., climate control, audio system) even if the battery is fine**.
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## 70. Battery Temperature

- **Definition:** Measures the **temperature of the battery**, which affects **charging and power output**.
- **Example Usage:** In cold weather, the ECU may **adjust charging rates or disable start-stop functionality** to protect the battery.
- **Impact if Faulty:** If misread, the car may **overcharge or undercharge the battery**, leading to **shortened battery life or electrical system malfunctions**.

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## 71. Battery Voltage Value Recorded by the AD Converter

- **Definition:** Measures the **battery voltage** as detected by the **Analog-to-Digital (AD) Converter** inside the ECU.
  - **Example Usage:** The ECU uses this value to determine **charging status, power availability, and alternator efficiency**.
  - **Impact if Faulty:** If incorrect, the system might **misinterpret battery health**, leading to **premature battery failure warnings or improper charging behavior**.
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## 72. Bit Heating Sufficient, HEGO Sensor 3 Bank 1

- **Definition:** Indicates whether the **oxygen sensor (HEGO - Heated Exhaust Gas Oxygen sensor)** in **Bank 1** has reached the **required operating temperature**.
  - **Example Usage:** The ECU waits for the **O2 sensor to heat up** before adjusting the air-fuel mixture.
  - **Impact if Faulty:** If the system **thinks the sensor is not heated when it actually is**, the ECU may **ignore O2 readings, leading to poor fuel economy and higher emissions**.
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## 73. Bit Mask for Invalid Signal in Message (IdentGenLinPdu)

- **Definition:** A diagnostic **bitmask** that flags **invalid signals** received from the **IdentGenLinPdu communication module**.
  - **Example Usage:** Used in **vehicle diagnostics** to detect faulty **communication between ECUs**.
  - **Impact if Faulty:** If this flag is raised incorrectly, the car might **trigger a false warning or fail to recognize actual communication failures between modules**.
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## 74. Bit Mask for Invalid Signal in Message (StAoasLinPdu)

- **Definition:** Similar to sensor #73 but specific to the **StAoasLinPdu communication module**.

- **Example Usage:** Used in **onboard diagnostics** to detect data **corruption in sensor signals**.
  - **Impact if Faulty:** False readings can **disable certain ECU functions** or cause the **check engine light (CEL) to illuminate unnecessarily**.
- 

## 75. Bit Mask for Invalid Signal in Message (StAoasLinSig)

- **Definition:** Flags **invalid data** in the **StAoasLinSig communication protocol**.
  - **Example Usage:** Helps the ECU determine if **sensor signals are reliable** or need to be ignored.
  - **Impact if Faulty:** Can cause **faulty engine behavior, incorrect error messages, or intermittent sensor failures**.
- 

## 76. Bit Mask for Invalid Signal in Message (StGenLinPdu)

- **Definition:** Another **bitmask-based diagnostic flag**, specific to **StGenLinPdu communication**.
  - **Example Usage:** Used to detect **malfunctions in sensor networks**, particularly in **power management systems**.
  - **Impact if Faulty:** May cause **unnecessary system resets** or incorrect **battery charging behavior**.
- 

## 77. Bit Signal Valid, HEGO Sensor 3 Bank 1

- **Definition:** Confirms whether the **oxygen sensor in Bank 1** is **providing valid data**.
  - **Example Usage:** The ECU uses this to **verify lambda sensor reliability** before making fuel adjustments.
  - **Impact if Faulty:** If the ECU assumes the signal is **invalid when it's actually working**, the car may **default to a rich fuel mixture, increasing fuel consumption**.
- 

## 78. Boost Pressure

- **Definition:** Measures the **air pressure inside the intake manifold**, which is critical for **turbocharged engines**.
  - **Example Usage:** The ECU adjusts **boost pressure** dynamically based on engine load and altitude.
  - **Impact if Faulty:** If misread, the car might experience **turbo lag, loss of power, overboost (causing engine knock), or underboost (causing sluggish acceleration)**.
- 

## 79. Boost Pressure Raw Value

- **Definition:** The **unfiltered** boost pressure reading before ECU compensation.
  - **Example Usage:** Used as a **reference point** to calculate actual boost levels.
  - **Impact if Faulty:** Incorrect raw values may result in **wrong turbo adjustments, inefficient fuel burning, or higher emissions**.
- 

## 80. Boost Pressure Setpoint

- **Definition:** The **desired boost pressure level** as set by the ECU.
  - **Example Usage:** The ECU ensures that the **actual boost pressure matches this setpoint** by adjusting **wastegate or turbocharger settings**.
  - **Impact if Faulty:** If incorrect, the car might **over-boost (causing detonation) or under-boost (causing power loss and hesitation)**.
- 

## 81. Brake Booster Pressure Sensor Voltage

- **Definition:** Measures the **voltage output** of the **brake booster pressure sensor**, which detects the vacuum level in the **brake booster**.
  - **Example Usage:** Ensures that the **brake booster has enough vacuum assist** for proper braking force.
  - **Impact if Faulty:** If incorrect, the brake pedal may become **hard to press**, leading to **reduced braking efficiency** and possible **brake system warnings**.
-

## 82. Cell Voltage Cell 1

- **Definition:** Measures the **voltage** of **cell 1** in the **lithium-ion or lead-acid battery pack**.
  - **Example Usage:** Helps monitor battery **health and balance** in vehicles with **multiple battery cells**.
  - **Impact if Faulty:** If misread, the battery management system (BMS) may **fail to balance the cells properly**, reducing **battery lifespan**.
- 

## 83. Cell Voltage Cell 2

- **Definition:** Same as **sensor #82**, but for **cell 2** in the battery pack.
  - **Example Usage:** Used in **battery management systems** (BMS) to monitor and **equalize cell voltages**.
  - **Impact if Faulty:** Uneven voltage distribution can cause **premature battery wear** and **potential overcharging issues**.
- 

## 84. Cell Voltage Cell 3

- **Definition:** Measures the voltage of **cell 3** in a **multi-cell battery pack**.
  - **Example Usage:** Ensures proper **charging and discharging** in hybrid or **start-stop systems**.
  - **Impact if Faulty:** Incorrect readings may result in **charging imbalance**, leading to **reduced battery efficiency**.
- 

## 85. Cell Voltage Cell 4

- **Definition:** Monitors the **voltage level** of **cell 4** in a **vehicle battery pack**.
  - **Example Usage:** Used to **optimize battery charging cycles** and prevent **over-discharge**.
  - **Impact if Faulty:** Misreading could **cause cell failure** and **limit battery performance**.
-

## 86. Cell Voltage Cell 5

- **Definition:** Measures the **voltage of cell 5** within the **battery management system**.
  - **Example Usage:** Helps to **monitor battery pack health** in **electric and hybrid vehicles**.
  - **Impact if Faulty:** If incorrect, it may cause **early battery degradation and reduced range**.
- 

## 87. Cell Voltage Cell 6

- **Definition:** Measures the **voltage of the sixth cell** in the **battery system**.
  - **Example Usage:** Used to **identify potential weak cells** within the **battery pack**.
  - **Impact if Faulty:** If one cell fails, it can **lower the overall battery efficiency**, affecting **engine start or hybrid mode**.
- 

## 88. Ceramic Temperature of LSU Bank 2

- **Definition:** Measures the **temperature of the LSU (Lambda Sensor Unit) oxygen sensor** for **Bank 2**.
  - **Example Usage:** Helps regulate **sensor heating** to ensure **accurate oxygen level readings**.
  - **Impact if Faulty:** If the sensor overheats or stays too cold, it may **provide inaccurate air-fuel mixture readings**, causing **higher emissions and poor fuel economy**.
- 

## 89. Ceramic Temperature of the LSU

- **Definition:** Measures the **temperature of the LSU oxygen sensor** for **Bank 1** or general use.
- **Example Usage:** Ensures that the **oxygen sensor remains within the correct operating temperature**.
- **Impact if Faulty:** A misreading can cause the sensor to **fail prematurely**, leading to **incorrect engine tuning and increased emissions**.

---

## 90. Charge Status of Additional Power Storage

- **Definition:** Measures the **charging status** of **extra battery storage**, such as a **48V mild-hybrid system** or **backup power module**.
  - **Example Usage:** Helps the vehicle manage **additional power loads**, like **start-stop systems, active suspension, or hybrid drive assist**.
  - **Impact if Faulty:** If incorrect, the car may fail to utilize **auxiliary power**, leading to **higher fuel consumption or electrical malfunctions**.
- 

## 91. Chip Temperature of the Machine

- **Definition:** Measures the **temperature of the electronic chips** in critical engine control modules, such as the **ECU (Engine Control Unit), alternator, or power inverters**.
  - **Example Usage:** Prevents **overheating of engine electronics**, ensuring stable performance.
  - **Impact if Faulty:** If the temperature is too high, the system may enter **protection mode**, reducing power or shutting down components. If misread, it may cause **unnecessary thermal throttling** or fail to protect components from heat damage.
- 

## 92. Clutch Motor Torque Actual Value

- **Definition:** Measures the **actual torque** applied by the **clutch actuator motor** in **automated or dual-clutch transmissions (DCT/DSG)**.
  - **Example Usage:** Helps the ECU determine **clutch engagement force** for smooth gear shifts.
  - **Impact if Faulty:** If incorrect, the transmission may **jerk, slip, or struggle to engage gears**, leading to **harsh or delayed shifting**.
- 

## 93. Clutch Temperature

- **Definition:** Monitors the **temperature of the clutch plates and clutch fluid** in the **transmission system**.

- **Example Usage:** Used to prevent **clutch overheating**, which can cause **slipping or damage**.
  - **Impact if Faulty:** If the reading is too high, the car may **reduce engine power** or prevent aggressive driving. If misread, it may allow **overheating, leading to transmission failure**.
- 

#### 94. Clutch Torque

- **Definition:** Measures the **amount of torque transferred** through the **clutch**.
  - **Example Usage:** Ensures the **clutch is engaging correctly** under different driving conditions.
  - **Impact if Faulty:** If miscalculated, it may cause **gear slipping, delayed acceleration, or excessive wear on the clutch components**.
- 

#### 95. Component Temperature Raw Value

- **Definition:** Provides the **raw, unfiltered temperature reading** from various sensors monitoring **engine components**.
  - **Example Usage:** Used as a reference before applying **temperature corrections** in ECU calculations.
  - **Impact if Faulty:** If incorrect, the ECU might **overcompensate**, leading to **unnecessary cooling fan activation or incorrect fuel-air mixture adjustments**.
- 

#### 96. Condition: The Probe Behind the Catalyst is Sufficiently Heated

- **Definition:** Determines if the **oxygen sensor (O2 sensor)** behind the **catalytic converter** has reached its **optimum operating temperature**.
  - **Example Usage:** The ECU relies on this condition before using O2 sensor data to adjust **fuel injection and emissions**.
  - **Impact if Faulty:** If misreported, the ECU may **delay emissions adjustments**, leading to **increased pollution and poor fuel economy**.
-

## **97. Condition: VVT Position Controller Monitoring Has Recognized a Permanent Control Deviation**

- **Definition:** Detects if the **Variable Valve Timing (VVT) controller** has a **permanent misalignment or deviation**.
  - **Example Usage:** Ensures that the **camshaft timing remains accurate** for fuel efficiency and power output.
  - **Impact if Faulty:** A faulty reading could cause **rough idling, power loss, or increased emissions** due to incorrect valve timing.
- 

## **98. Condition: VVT Position Controller Oscillates**

- **Definition:** Monitors if the **VVT controller is oscillating too much**, indicating an **unstable valve timing adjustment**.
  - **Example Usage:** Helps diagnose **worn VVT actuators, solenoids, or timing chain issues**.
  - **Impact if Faulty:** Excessive oscillation can cause **misfires, poor throttle response, and check engine lights**.
- 

## **99. Condition: Vanos Entrance at the Ready**

- **Definition:** Checks if the **VANOS (BMW's variable valve timing system) is prepared** to make timing adjustments.
  - **Example Usage:** Before advancing or retarding the camshaft, the ECU confirms if the **VANOS mechanism is ready**.
  - **Impact if Faulty:** If the system falsely detects VANOS as not ready, it may **disable variable valve timing**, leading to **poor acceleration and high fuel consumption**.
- 

## **100. Condition: Brake Light Switch Actuated**

- **Definition:** Detects whether the **brake pedal has been pressed**, using the **brake light switch sensor**.
- **Example Usage:** Helps activate systems like **cruise control disengagement, brake force distribution, and auto-hold braking**.

- **Impact if Faulty:** A malfunction may cause **brake lights to stay on/off**, **cruise control failure**, or even **transmission issues** (some cars require a brake input to shift gears).
- 

#### 101. Condition: Brake Test Switch Actuated

- **Definition:** Detects if the **brake test switch** has been pressed, typically used in **diagnostic procedures or service mode**.
  - **Example Usage:** Used by technicians during **brake system tests** to verify proper brake function.
  - **Impact if Faulty:** If the system falsely detects the switch as **pressed or not pressed**, it could interfere with **diagnostics, ABS tests, or brake system warnings**.
- 

#### 102. Condition: Clutch Pedal Pressed

- **Definition:** Identifies whether the **clutch pedal is fully depressed**, which is critical for **manual transmissions and engine start conditions**.
  - **Example Usage:** In manual cars, the engine will only **start if the clutch is pressed**. Also used for **smooth gear shifts in automated transmissions**.
  - **Impact if Faulty:** If misread, the car may **fail to start, stall unexpectedly, or prevent proper gear engagement**.
- 

#### 103. Condition: Engine Oil Temperature Valid

- **Definition:** Checks if the **engine oil temperature reading** is within a **valid range** and **usable by the ECU**.
  - **Example Usage:** Ensures the oil is at the **correct temperature** before enabling **high RPM operation or start-stop functions**.
  - **Impact if Faulty:** If the sensor falsely detects an invalid reading, the ECU may **limit engine power, disable start-stop, or trigger warning lights unnecessarily**.
- 

#### 104. Condition: Exhaust Flap with Resonator

- **Definition:** Detects whether the **exhaust flap** (which controls exhaust sound and backpressure) is properly **open or closed**.
  - **Example Usage:** Adjusts **exhaust tone** in **Sport or Comfort mode**, and optimizes backpressure for **better fuel efficiency**.
  - **Impact if Faulty:** A stuck flap could cause **excess noise, poor exhaust flow, or even a check engine light**.
- 

#### 105. Condition: Detected Knockers

- **Definition:** Determines whether **engine knock (pre-detonation)** has been detected by the knock sensors.
  - **Example Usage:** If knock is detected, the ECU **retards ignition timing** to prevent **engine damage**.
  - **Impact if Faulty:** If the knock sensor is faulty, the ECU may **not detect actual knocking**, leading to **engine knocking damage**. Alternatively, false detections could lead to **reduced power and efficiency**.
- 

#### 106. Condition: Compressor to Switch On

- **Definition:** Determines if the **A/C compressor is allowed to engage**, based on **temperature, engine load, and electrical conditions**.
  - **Example Usage:** Prevents the compressor from switching on during **high acceleration** or when the **battery is low**.
  - **Impact if Faulty:** If incorrect, the **air conditioning may not work**, or it could **turn on at the wrong time, straining the engine unnecessarily**.
- 

#### 107. Condition: Impermissibly High Motor Current Detected in the Event of a Short Circuit

- **Definition:** Monitors for **excessive current flow** in the **electric motor system**, which may indicate a **short circuit or overload condition**.
- **Example Usage:** Protects electric drive motors (e.g., **electric power steering or hybrid systems**) from **damage due to overheating or excessive power draw**.

- **Impact if Faulty:** If misread, the system may **shutdown the affected component unnecessarily or fail to detect actual short circuits**, leading to **potential electrical fires or motor failures**.
- 

#### 108. Condition: Oil Sensor Failure

- **Definition:** Detects whether the **engine oil level or pressure sensor** has **malfunctioned**.
  - **Example Usage:** If the oil sensor fails, the ECU **uses estimated values** instead of actual measurements.
  - **Impact if Faulty:** A false failure detection could **trigger unnecessary warnings**, while an **undetected failure** may lead to **engine oil starvation and damage**.
- 

#### 109. Condition: Probe Behind Catalyst Sufficiently Heated (Bank 2)

- **Definition:** Confirms whether the **oxygen sensor behind the catalytic converter** on **Bank 2** has reached **operating temperature**.
  - **Example Usage:** Once heated, this sensor provides feedback for **catalyst efficiency and emissions control**.
  - **Impact if Faulty:** If the sensor doesn't heat up properly, the ECU may **fail emissions tests** or trigger a **check engine light**.
- 

#### 110. Condition: Probe Ready for Operation Before Catalyst (Bank 1 & 2)

- **Definition:** Checks if the **pre-catalyst oxygen sensors (upstream O<sub>2</sub> sensors)** are **warmed up and operational** for both **Bank 1 & Bank 2**.
  - **Example Usage:** These sensors help the ECU determine the **air-fuel mixture**, adjusting fuel injection accordingly.
  - **Impact if Faulty:** If the ECU fails to detect readiness, the car may **run in open-loop mode**, leading to **poor fuel economy and higher emissions**.
- 

#### 111. Condition: Probe Ready for Operation Before Catalyst Bank 2

- **Definition:** Determines if the **pre-catalyst oxygen sensor** (before the catalytic converter) in **Bank 2** has reached its **operating temperature**.
  - **Example Usage:** Ensures the sensor is providing **accurate air-fuel ratio data** to the ECU for **optimal fuel combustion and emissions control**.
  - **Impact if Faulty:** If the probe doesn't reach operating temperature, the ECU may **stay in open-loop mode**, leading to **higher fuel consumption and increased emissions**.
- 

#### 112. Condition: Probe Ready for Operation Behind Catalyst

- **Definition:** Checks if the **post-catalyst oxygen sensor** (after the catalytic converter) is properly heated and operational.
  - **Example Usage:** The ECU uses this sensor to **monitor catalyst efficiency** and detect **catalyst degradation**.
  - **Impact if Faulty:** If misread, the ECU may **incorrectly trigger a catalytic converter fault code (P0420/P0430)**, even if the catalyst is fine.
- 

#### 113. Condition: Probe Ready for Operation Behind Catalyst Bank 2

- **Definition:** Same as **sensor #112**, but specifically for **Bank 2** in a V6/V8 engine.
  - **Example Usage:** Ensures that **both banks of the engine** are running efficiently and meeting emissions standards.
  - **Impact if Faulty:** An incorrect reading may result in **misdiagnosed emissions failures**, potentially leading to **unnecessary catalytic converter replacement**.
- 

#### 114. Condition: Throttled

- **Definition:** Indicates whether the engine has been **intentionally throttled down**, typically due to **power management, limp mode, or overheating protection**.
- **Example Usage:** If the car is overheating or **experiencing drivetrain issues**, the ECU may **throttle engine output** to prevent damage.

- **Impact if Faulty:** If this condition is triggered falsely, the engine may **lose power unnecessarily**. If not triggered when needed, it could cause **engine overheating or damage**.
- 

#### 115. Condition: Zero Gear Signal in the Learning Window

- **Definition:** Confirms if the **zero gear position (neutral)** has been detected within the **transmission learning phase**.
  - **Example Usage:** Used in **automatic and dual-clutch transmissions (DCTs)** to calibrate **gear engagement timing**.
  - **Impact if Faulty:** If the transmission cannot correctly detect neutral, the car may **fail to shift properly or remain stuck in gear**.
- 

#### 116. Condition: VVT Motor Overload Warning Threshold

- **Definition:** Detects if the **Variable Valve Timing (VVT) motor** is **drawing too much current**, indicating **possible mechanical resistance or failure**.
  - **Example Usage:** Helps prevent **VVT actuator failure**, which could lead to **incorrect valve timing and reduced engine efficiency**.
  - **Impact if Faulty:** A bad sensor reading may cause **false warnings** or **fail to detect actual actuator problems**, leading to **rough idling and power loss**.
- 

#### 117. Condition: Heater Status A is Present, Probe is Sufficiently Heated Status LS Heater in Front of Catalyst Bank 2

- **Definition:** Determines if the **front oxygen sensor's heater** is active and has reached its **required operating temperature** in **Bank 2**.
  - **Example Usage:** Heated O<sub>2</sub> sensors reach **optimal performance faster**, improving **fuel control and emissions reduction**.
  - **Impact if Faulty:** If misread, the sensor may **not provide reliable data**, affecting **air-fuel mixture control**.
- 

#### 118. Condition: Heater Status A is Present, The Probe is Sufficiently Heated

- **Definition:** Confirms that the **front oxygen sensor (Bank 1 or single-bank engine) is sufficiently heated** and operational.
  - **Example Usage:** Allows the ECU to **transition from open-loop to closed-loop fuel control** for better efficiency.
  - **Impact if Faulty:** Incorrect readings can cause **poor fuel economy, higher emissions, or check engine lights.**
- 

#### 119. Confirmed Target Speed Electric Water Pump

- **Definition:** Measures the **actual confirmed speed** of the **electric water pump**, which cools the engine.
  - **Example Usage:** The ECU ensures the **water pump is running at the required speed** to maintain **optimal engine temperature.**
  - **Impact if Faulty:** If misread, the **engine may overheat**, leading to **engine damage or limp mode activation.**
- 

#### 120. Control Difference Boost Pressure - Bank-Specific Bank 1

- **Definition:** Compares the **actual vs. target boost pressure** in **Bank 1** of a **turbocharged engine** to detect inconsistencies.
  - **Example Usage:** Helps regulate **turbo boost levels** to prevent **over-boost or under-boost conditions.**
  - **Impact if Faulty:** Incorrect readings could cause **turbo lag, excessive turbo strain, or detonation due to too much boost.**
- 

#### 121. Control Difference Boost Pressure - Bank-Specific Bank 2

- **Definition:** Measures the **difference between the actual and target boost pressure** in **Bank 2** of a twin-turbocharged engine.
- **Example Usage:** Ensures that the **turbochargers** in Bank 2 are providing the **correct amount of boost** for optimal performance.
- **Impact if Faulty:** If incorrect, it can lead to **turbo inefficiency, under-boost (loss of power), or over-boost (engine knock and damage).**

---

## 122. Control Duty Cycle of the Fuel Pump

- **Definition:** Monitors and adjusts the **duty cycle (on-off ratio) of the fuel pump** to regulate fuel pressure.
  - **Example Usage:** Ensures that **fuel pressure remains stable** under different driving conditions (idle, acceleration, full throttle).
  - **Impact if Faulty:** If misread, the fuel pump might **overwork, causing premature failure, or underperform, leading to fuel starvation and misfires.**
- 

## 123. Control of Stand Consumers

- **Definition:** Regulates the **electrical power consumption of non-essential systems** when the vehicle is stationary.
  - **Example Usage:** Controls **radio, infotainment, climate control, and lighting** when the engine is off to prevent **battery drain**.
  - **Impact if Faulty:** A malfunction may **shut down critical components too soon or fail to deactivate non-essential power drains, leading to battery depletion.**
- 

## 124. Control Value DKG Shut-Off Valve

- **Definition:** Measures the **shut-off valve operation in Dual Clutch Gearbox (DKG/DSG)** transmissions.
  - **Example Usage:** Ensures that the shut-off valve engages correctly to **control hydraulic pressure for smooth gear shifts.**
  - **Impact if Faulty:** If malfunctioning, the **transmission might not shift properly, causing jerky movements or gear engagement failure.**
- 

## 125. Control Unit Temperature

- **Definition:** Monitors the **temperature of the ECU (Engine Control Unit) or other electronic control units** in the vehicle.

- **Example Usage:** Prevents overheating by **adjusting cooling fan speed or reducing processing load** if the control unit gets too hot.
  - **Impact if Faulty:** If the temperature is too high, the ECU may enter **protection mode**, leading to **reduced performance or system shutdowns**.
- 

## 126. Control Value Electric Water Pump for 48V Component Cooling

- **Definition:** Monitors and adjusts the **cooling rate of the electric water pump for 48V electrical components**.
  - **Example Usage:** Helps maintain **optimal temperatures for hybrid systems, turbo intercoolers, and electronic power modules**.
  - **Impact if Faulty:** If cooling is inadequate, **48V electrical systems may overheat**, leading to **reduced performance or potential failure**.
- 

## 127. Control Value for Electric Water Pump for LLK Cooling Bank 2

- **Definition:** Regulates the **electric water pump operation** for cooling the **low-temperature charge air cooler (LLK)** in **Bank 2**.
  - **Example Usage:** Ensures the **intercooler remains cool**, which improves turbo efficiency and **prevents heat soak**.
  - **Impact if Faulty:** A malfunction can cause **high intake temperatures, reducing engine power and increasing detonation risk**.
- 

## 128. Coolant Temperature

- **Definition:** Measures the **temperature of the engine coolant**, critical for **engine thermal management**.
  - **Example Usage:** The ECU adjusts **fan speed, ignition timing, and fuel mixture** based on coolant temperature.
  - **Impact if Faulty:** A bad sensor reading can cause **overheating, poor fuel economy, or unnecessary cooling fan activation**.
-

## **129. Coolant Temperature (Sensor Value) After Low-Pass Filtering**

- **Definition:** Provides a **filtered and stabilized coolant temperature reading** to the ECU.
  - **Example Usage:** Helps in **more accurate thermal regulation** by eliminating sudden fluctuations in temperature readings.
  - **Impact if Faulty:** If misread, it could lead to **erratic cooling system behavior, unnecessary fan activation, or overheating**.
- 

## **130. Coolant Temperature Sensor After High-Pressure EGR Cooler - Detected Temperature**

- **Definition:** Monitors the **temperature of the coolant after it passes through the High-Pressure Exhaust Gas Recirculation (HP-EGR) cooler**.
  - **Example Usage:** Ensures the **EGR system is working efficiently**, preventing excessive combustion temperatures and NOx emissions.
  - **Impact if Faulty:** A faulty reading could cause **improper EGR function**, leading to engine knock, increased emissions, or check engine lights.
- 

## **131. Coordinated Moment for Filling**

- **Definition:** Measures the **calculated torque value** based on air-fuel mixture filling in the combustion chamber.
  - **Example Usage:** Helps regulate **fuel injection and ignition timing** for optimal performance and efficiency.
  - **Impact if Faulty:** If incorrect, it can cause **misfires, rough idling, or power loss due to incorrect torque predictions**.
- 

## **132. Coordinated Target Torque on the Wheel**

- **Definition:** Determines the **amount of torque applied to the wheels**, considering engine power, transmission, and traction control settings.
- **Example Usage:** Helps optimize **acceleration, traction, and stability control**.

- **Impact if Faulty:** If miscalculated, the vehicle may experience **traction loss, unresponsive throttle, or excessive wheel spin.**
- 

### 133. Correction Factor for the Amount of Fuel

- **Definition:** Adjusts the **fuel injection quantity** based on **real-time engine conditions and sensor readings.**
  - **Example Usage:** Used to maintain an **optimal air-fuel ratio**, compensating for **temperature, pressure, and altitude changes.**
  - **Impact if Faulty:** A bad correction factor can lead to **poor fuel efficiency, rich/lean conditions, increased emissions, or rough engine performance.**
- 

### 134. Correction Value Shutdown

- **Definition:** A **calibration factor** that helps determine the **proper fuel and ignition settings during engine shutdown.**
  - **Example Usage:** Helps the ECU manage **stop-start systems** or smooth engine shutdown when the ignition is turned off.
  - **Impact if Faulty:** If incorrect, it may cause **harsh shutdowns, excessive fuel waste, or restart issues.**
- 

### 135. Counter Angle Correction in the Event of VVT Temperature Overload

- **Definition:** Adjusts **Variable Valve Timing (VVT) angles** when the **system detects excessive heat.**
  - **Example Usage:** Ensures that the **camshaft timing remains stable**, even under extreme conditions.
  - **Impact if Faulty:** If the correction fails, the **engine might lose efficiency, cause knocking, or reduce power to prevent damage.**
- 

### 136. Counter Estimated Burn-Free Processes of the Spark Plug Soot

- **Definition:** Estimates how many **self-cleaning cycles (burn-off events)** the spark plugs have gone through to remove **carbon buildup**.
  - **Example Usage:** Helps predict **spark plug life expectancy and performance degradation**.
  - **Impact if Faulty:** A miscalculation may cause **premature spark plug failure or misfires due to excessive carbon buildup**.
- 

### 137. Crankcase Differential Pressure Sensor Voltage

- **Definition:** Measures the **pressure difference inside the crankcase**, helping monitor **blow-by gases and ventilation efficiency**.
  - **Example Usage:** Used by the **Positive Crankcase Ventilation (PCV) system** to prevent **oil contamination and excessive pressure buildup**.
  - **Impact if Faulty:** Incorrect readings may cause **oil leaks, excessive pressure buildup, or inefficient PCV operation, leading to carbon buildup in the intake**.
- 

### 138. Crankshaft Position at the Start Command

- **Definition:** Detects the **exact position of the crankshaft** when the **engine start process begins**.
  - **Example Usage:** Helps the ECU determine **ignition timing and fuel injection timing** for smooth startup.
  - **Impact if Faulty:** If incorrect, the car may **fail to start, experience long crank times, or trigger a check engine light**.
- 

### 139. Current DC-DC Converter

- **Definition:** Measures the **current flow in the DC-DC converter**, which regulates voltage between **high-voltage and low-voltage electrical systems**.
- **Example Usage:** Ensures **proper battery charging and power distribution in hybrid or 48V electrical systems**.
- **Impact if Faulty:** If misread, it can cause **charging failures, electrical malfunctions, or 12V system instability**.

---

#### **140. Current Battery Current**

- **Definition:** Measures the **actual current (amperage)** going in or out of the battery.
  - **Example Usage:** Helps the ECU determine **battery charging efficiency, alternator performance, and power usage**.
  - **Impact if Faulty:** If incorrect, it can cause **battery drain, overcharging, or inaccurate power management**.
- 

#### **141. Current Battery Current 48V Battery**

- **Definition:** Measures the **current flow in and out of the 48V battery system**, typically used in **mild-hybrid systems or electric power assist features**.
  - **Example Usage:** Helps the ECU manage **48V power distribution for regenerative braking, electric turbos, or start-stop systems**.
  - **Impact if Faulty:** If incorrect, it can cause **incorrect power management, system shutdowns, or premature battery wear**.
- 

#### **142. Current Battery Voltage**

- **Definition:** Measures the **real-time voltage of the battery**, ensuring that **charging and discharging are within safe limits**.
  - **Example Usage:** Helps control **alternator output, battery charge state, and power management strategies**.
  - **Impact if Faulty:** A misread voltage may cause **overcharging (leading to battery damage) or undercharging (causing starting issues or electrical failures)**.
- 

#### **143. Current Battery Voltage 48V Battery**

- **Definition:** Monitors the **voltage of the 48V system**, ensuring proper functionality for **mild-hybrid and electric-assist components**.
- **Example Usage:** Regulates power delivery to **electric turbos, active suspension, or advanced braking systems**.

- **Impact if Faulty:** If misread, electrical systems may malfunction, power assist features may be disabled, or hybrid efficiency may drop.
- 

#### 144. Current Brake Pressure

- **Definition:** Measures the **hydraulic pressure in the braking system**, which is critical for **ABS, ESP, and brake-by-wire systems**.
  - **Example Usage:** Helps optimize **braking force distribution, emergency braking assist, and stability control functions**.
  - **Impact if Faulty:** If incorrect, the vehicle may experience **braking inconsistencies, false ABS activation, or poor braking performance**.
- 

#### 145. Current Consumption Electric Water Pump

- **Definition:** Measures the **power consumption of the electric water pump**, ensuring it is running efficiently.
  - **Example Usage:** The ECU adjusts pump speed based on **coolant temperature and engine load**.
  - **Impact if Faulty:** If misread, the engine may **overheat due to insufficient cooling**, or the pump may overwork and **fail prematurely**.
- 

#### 146. Current Fuel Viscosity

- **Definition:** Monitors the **thickness (viscosity) of fuel**, which affects **fuel injection and combustion efficiency**.
  - **Example Usage:** Adjusts **fuel injection pressure and timing** based on **temperature and fuel quality**.
  - **Impact if Faulty:** Incorrect readings can cause **fuel injector clogging, poor combustion, increased emissions, or starting difficulties in cold weather**.
- 

#### 147. Current Injection Counter Reading Since the Very Beginning

- **Definition:** Tracks the **total number of fuel injections** performed by the engine since the vehicle's first start.
  - **Example Usage:** Used for **fuel system diagnostics, injector lifespan tracking, and maintenance planning**.
  - **Impact if Faulty:** If miscalculated, it could lead to **incorrect injector maintenance schedules or failure to detect worn-out injectors**.
- 

#### 148. Current of Memory

- **Definition:** Measures the **current flow in volatile and non-volatile memory chips** inside the ECU and other control units.
  - **Example Usage:** Ensures **stable power delivery** to prevent **data corruption in ECU memory**.
  - **Impact if Faulty:** If memory power supply fluctuates, it could cause **random ECU resets, system crashes, or loss of stored vehicle data**.
- 

#### 149. Current Oil Pressure Control Operating Mode

- **Definition:** Identifies the **current state of the oil pressure control system**, which adjusts oil pressure dynamically based on **engine conditions**.
  - **Example Usage:** Regulates **oil pressure to optimize lubrication at different RPMs and loads**.
  - **Impact if Faulty:** If the system fails, the engine may **not receive adequate lubrication, leading to premature wear or overheating**.
- 

#### 150. Current Output Ignition Angles

- **Definition:** Measures the **current ignition timing** for each cylinder, crucial for **engine performance and efficiency**.
- **Example Usage:** Adjusts **spark timing** based on **engine load, RPM, and fuel quality** to prevent **knocking and improve power delivery**.
- **Impact if Faulty:** If incorrect, it can cause **knocking, power loss, rough idling, or even engine damage due to misfires**.

---

## 151. Current Status of Electric Machine

- **Definition:** Indicates the **current operational status of the electric motor** in a **hybrid or mild-hybrid system**.
  - **Example Usage:** Helps regulate **electric drive assistance, regenerative braking, and energy recovery**.
  - **Impact if Faulty:** If misread, the electric motor may **fail to assist properly, cause poor fuel efficiency, or disable regenerative braking**.
- 

## 152. Current Temperature Memory

- **Definition:** Stores and tracks the **last recorded temperature readings** of various vehicle components.
  - **Example Usage:** Helps in **diagnostics and learning adaptive values** for better **cold starts and warm-up cycles**.
  - **Impact if Faulty:** If corrupted, the ECU may **use incorrect temperature baselines, affecting fuel mixture, ignition timing, and engine performance**.
- 

## 153. Current Value Stoichiometric Ratio

- **Definition:** Measures the **current air-fuel ratio** and compares it to the **ideal stoichiometric ratio (14.7:1 for gasoline)**.
  - **Example Usage:** Ensures optimal **combustion for fuel efficiency and emissions compliance**.
  - **Impact if Faulty:** Incorrect readings can cause **rich or lean conditions**, leading to **higher emissions, poor fuel economy, or knocking**.
- 

## 154. Cylinder-Specific Angular Acceleration Cylinder 1

- **Definition:** Measures the **angular acceleration of the crankshaft** specific to **cylinder 1**.

- **Example Usage:** Used to detect **misfires, combustion quality, and cylinder balancing issues**.
  - **Impact if Faulty:** If incorrect, the system may **fail to detect misfires, leading to engine damage or poor performance**.
- 

#### **155. Cylinder-Specific Angular Acceleration Cylinder 2**

- **Definition:** Similar to **sensor #154**, but for **cylinder 2**.
  - **Example Usage:** Helps in **dynamic engine balancing and misfire detection**.
  - **Impact if Faulty:** If incorrect, it may lead to **imbalance in power delivery, rough idling, or vibration issues**.
- 

#### **156. Cylinder-Specific Angular Acceleration Cylinder 3**

- **Definition:** Same as **sensor #154**, but for **cylinder 3**.
  - **Example Usage:** Ensures that **each cylinder is contributing equally** to engine power output.
  - **Impact if Faulty:** An incorrect value can cause **misfire detection errors or improper cylinder deactivation strategies**.
- 

#### **157. Cylinder-Specific Angular Acceleration Cylinder 4**

- **Definition:** Same as **sensor #154**, but for **cylinder 4**.
  - **Example Usage:** Helps detect **power imbalances between cylinders**, improving engine smoothness and longevity.
  - **Impact if Faulty:** If inaccurate, it can cause **engine hesitation, rough idling, or misfire-related fault codes**.
- 

#### **158. Cylinder-Specific Angular Acceleration Cylinder 5**

- **Definition:** Same as **sensor #154**, but for **cylinder 5**.

- **Example Usage:** Used in **real-time fuel and ignition adjustments** to maintain smooth operation.
  - **Impact if Faulty:** If incorrect, it can lead to **vibration, knocking, or inconsistent power output**.
- 

## 159. Cylinder-Specific Angular Acceleration Cylinder 6

- **Definition:** Same as **sensor #154**, but for **cylinder 6**.
  - **Example Usage:** Ensures that **all cylinders contribute evenly** to the power output.
  - **Impact if Faulty:** Incorrect values may cause the **ECU to incorrectly adjust fuel injection timing or deactivate the wrong cylinder in fault mode**.
- 

## 160. DC-DC Converter Status

- **Definition:** Monitors the **operational state of the DC-DC converter**, which manages power conversion between **high-voltage and low-voltage systems**.
  - **Example Usage:** Ensures stable **12V power supply for onboard electronics**, even in **hybrid or electric vehicles**.
  - **Impact if Faulty:** If misread, the vehicle may **experience power loss, battery drain, or electronic system failures**.
- 

## 161. Damper Setpoint in Degrees

- **Definition:** Determines the **target position of the suspension dampers** in degrees, adjusting the **stiffness of the shock absorbers**.
  - **Example Usage:** Used in **adaptive suspension systems** to optimize ride comfort and handling.
  - **Impact if Faulty:** If incorrect, the car may experience **uneven ride quality, excessive body roll, or poor cornering stability**.
- 

## 162. Day of the Last Battery Change

- **Definition:** Stores the **date when the last battery replacement** was recorded in the ECU.
  - **Example Usage:** Helps **track battery age** and determine **charging efficiency adjustments** over time.
  - **Impact if Faulty:** If outdated, the vehicle may **incorrectly estimate battery life**, potentially triggering **premature battery replacement warnings**.
- 

#### 163. Decreased Moment of the Electric Machine

- **Definition:** Monitors the **reduction in torque output from an electric motor in hybrid or fully electric vehicles**.
  - **Example Usage:** Used for **torque vectoring, regenerative braking, and energy efficiency adjustments**.
  - **Impact if Faulty:** If incorrect, it may cause **loss of electric power assist, reduced acceleration, or improper regenerative braking behavior**.
- 

#### 164. Default Generator Setpoint Voltage (Output Value)

- **Definition:** Specifies the **target voltage output** for the **alternator (generator)** under normal conditions.
  - **Example Usage:** Helps maintain **stable battery charging** and **consistent power supply to electrical systems**.
  - **Impact if Faulty:** A bad setpoint can lead to **undercharging (battery drain)** or **overcharging (battery damage)**.
- 

#### 165. Default Machine Target Voltage

- **Definition:** Defines the **baseline voltage output** for electrical machines such as **DC-DC converters or hybrid inverters**.
- **Example Usage:** Ensures proper power delivery for **high-voltage components in hybrid or electric vehicles**.
- **Impact if Faulty:** Incorrect values can lead to **power loss, inefficient energy transfer, or system shutdowns**.

---

## **166. Desired Torque Transmission Input Main Drive Axle Without Driving Dynamics Filtering**

- **Definition:** Measures the **raw torque value delivered to the main drive axle**, before **traction control adjustments**.
  - **Example Usage:** Helps determine **how much power should be sent to the wheels** before applying electronic stability adjustments.
  - **Impact if Faulty:** If misread, the car may **deliver too much or too little power**, leading to **traction loss, wheel spin, or sluggish acceleration**.
- 

## **167. Delta Probe Offset Master Control**

- **Definition:** Adjusts the **offset correction** for oxygen (lambda) sensors to ensure **accurate air-fuel ratio measurements**.
  - **Example Usage:** Compensates for **sensor aging and drift**, improving **fuel mixture accuracy**.
  - **Impact if Faulty:** If incorrect, the ECU may **miscalculate fuel injection**, leading to **poor fuel economy or higher emissions**.
- 

## **168. Difference Between Ambient Pressure and Brake Booster Pressure from Pressure Sensor (Raw Value)**

- **Definition:** Measures the **pressure difference** between the **atmospheric pressure** and the **brake booster vacuum pressure**.
  - **Example Usage:** Used in **brake-by-wire and vacuum-assisted braking systems** to determine brake force efficiency.
  - **Impact if Faulty:** Incorrect readings can cause **reduced braking performance, delayed brake response, or ABS system malfunctions**.
- 

## **169. Difference Between Pressure Value Sensor and Model**

- **Definition:** Compares the **actual sensor reading** with an **estimated model value** to detect inconsistencies.

- **Example Usage:** Ensures pressure sensors in **fuel, oil, or turbo systems** are functioning correctly.
  - **Impact if Faulty:** If incorrect, it may cause **incorrect pressure adjustments, leading to fuel starvation, turbo lag, or oil pressure failures.**
- 

## 170. Differential Pressure Ejector Pump - Environment

- **Definition:** Measures the **pressure difference across the ejector pump**, which assists in **fuel vapor recovery or vacuum generation**.
  - **Example Usage:** Helps ensure proper operation of **evaporative emissions systems (EVAP)** and **turbo wastegate control**.
  - **Impact if Faulty:** A bad sensor can lead to **fuel vapor leaks, check engine lights, or inefficient turbo boost control**.
- 

## 171. Differential Pressure in Front of the Throttle Valve Between the Start and the End of the Dynamic Test SSP

- **Definition:** Measures the **pressure difference before and after the throttle valve** during a **Self-Start Procedure (SSP) test**.
  - **Example Usage:** Ensures the **throttle body operates smoothly** and detects **any air leaks or restrictions** in the intake system.
  - **Impact if Faulty:** If incorrect, it may cause **poor throttle response, erratic idling, or incorrect air-fuel mixture adjustments**.
- 

## 172. Differential Temperature of the Respective Cooling Requirement

- **Definition:** Measures the **temperature difference between coolant before and after passing through a cooling component** (e.g., radiator, intercooler).
  - **Example Usage:** Helps the ECU **adjust cooling fan speeds** and **manage heat dissipation** more effectively.
  - **Impact if Faulty:** Incorrect readings may cause **overcooling (wasted energy)** or **overheating (engine damage or limp mode activation)**.
-

### **173. Differential Temperature of the Respective Cooling Requirement When Switching Off**

- **Definition:** Records the **cooling system's temperature difference** just before the **engine is turned off**.
  - **Example Usage:** Helps determine whether additional cooling (e.g., **electric water pump operation after shutdown**) is required.
  - **Impact if Faulty:** If misread, the system may **fail to cool down critical components properly**, leading to **thermal stress and shorter engine lifespan**.
- 

### **174. Discharge During Quiescent Current Violation**

- **Definition:** Detects **excessive battery discharge** when the vehicle is in **sleep mode (parked and not in use)**.
  - **Example Usage:** Prevents battery drain by **identifying parasitic power draws from electrical components**.
  - **Impact if Faulty:** If misread, it could **fail to detect a power drain**, leading to **a dead battery**, or **falsely trigger power-saving measures unnecessarily**.
- 

### **175. Distance to Starting Ability**

- **Definition:** Estimates the **remaining range or battery charge level** before the vehicle can **no longer start**.
  - **Example Usage:** Used in **start-stop systems and hybrid vehicles** to ensure **sufficient power is available** for restarting the engine.
  - **Impact if Faulty:** A misreading could lead to **unexpected no-start conditions** or **unnecessary warnings about low battery power**.
- 

### **176. Duty Cycle Electric Fan**

- **Definition:** Measures the **percentage of time the electric cooling fan is running** within a given period.
- **Example Usage:** Helps regulate **engine temperature and optimize cooling efficiency** by adjusting **fan speed dynamically**.

- **Impact if Faulty:** If the duty cycle is too high or too low, the engine may **overheat** (**fan not running enough**) or **waste energy** (**fan running unnecessarily**).
- 

## 177. Duty Cycle for Lambda Probe Heating

- **Definition:** Measures the **on/off ratio of the heating element in the oxygen (lambda) sensor** to ensure it reaches **operating temperature quickly**.
  - **Example Usage:** Ensures accurate **air-fuel ratio monitoring** even in **cold starts** or low-temperature conditions.
  - **Impact if Faulty:** If incorrect, the **lambda sensor may not work correctly**, causing **increased emissions, poor fuel economy, and rough engine performance**.
- 

## 178. Duty Cycle Lambda Probe Heating Bank 2

- **Definition:** Same as **sensor #177**, but specifically for **Bank 2 in V6/V8 engines**.
  - **Example Usage:** Ensures that the **oxygen sensors on both banks** reach operating temperature at the same rate.
  - **Impact if Faulty:** If misread, **one side of the engine may run richer or leaner than the other**, leading to **imbalance in fuel economy and emissions**.
- 

## 179. Duty Cycle Oil Pressure Control Valve

- **Definition:** Measures the **duty cycle of the oil pressure control valve**, which regulates **engine lubrication**.
  - **Example Usage:** Helps the ECU optimize **oil flow and pressure** based on engine speed and load.
  - **Impact if Faulty:** If incorrect, the engine may **experience low oil pressure (risk of internal damage)** or **excessive oil pressure (wasted energy and oil leaks)**.
- 

## 180. Duty Cycle Phaser Inlet Camshaft Bank 1

- **Definition:** Measures the **duty cycle of the camshaft phaser actuator** for the **intake camshaft in Bank 1**.

- **Example Usage:** Helps adjust **variable valve timing (VANOS system in BMW engines)** for optimal performance and emissions control.
  - **Impact if Faulty:** If misread, the system may **fail to advance or retard valve timing properly, leading to power loss, rough idling, or poor fuel efficiency.**
- 

#### 181. Duty Cycle Zero Gear Sensor

- **Definition:** Measures the **duty cycle** of the **zero gear sensor**, which detects when the transmission is in **neutral (zero gear position)**.
  - **Example Usage:** Used in **automatic and manual transmissions** to enable **engine start, gear selection, and stop-start functions**.
  - **Impact if Faulty:** If incorrect, the system may **fail to recognize neutral, preventing the engine from starting or shifting gears properly.**
- 

#### 182. Dynamic Value of LSU Bank 2

- **Definition:** Measures the **real-time response rate** of the **LSU oxygen sensor** in **Bank 2**.
  - **Example Usage:** Used in **fuel control strategies** to ensure **accurate air-fuel mixture regulation**.
  - **Impact if Faulty:** If misread, the ECU may **fail to adjust fuel injection correctly**, leading to **poor fuel economy, increased emissions, and power loss.**
- 

#### 183. Dynamic Value of the LSU

- **Definition:** Same as **sensor #182**, but applies to **all banks or a single-bank engine**.
  - **Example Usage:** Helps ensure the **oxygen sensor responds quickly** to air-fuel ratio changes for optimal combustion.
  - **Impact if Faulty:** Incorrect values can cause **delayed fuel adjustments, rich/lean conditions, or check engine lights (CELs).**
- 

#### 184. E-Fan Target Speed from WMK

- **Definition:** Determines the **desired speed of the electric cooling fan**, based on inputs from the **water management controller (WMK)**.
  - **Example Usage:** Helps regulate **coolant temperature** dynamically to maintain **optimal engine operating conditions**.
  - **Impact if Faulty:** If misread, the **fan may not run when needed, leading to overheating**, or it may run **excessively, reducing efficiency**.
- 

#### 185. E-Machine Time Counter Limitation Due to High Temperature

- **Definition:** Limits the **operating time** of the **electric motor (in hybrids or EVs)** if **temperature thresholds are exceeded**.
  - **Example Usage:** Prevents **overheating and damage to the electric drive system** by managing **operating cycles**.
  - **Impact if Faulty:** If incorrect, it may **shut down electric propulsion prematurely** or **fail to protect components from heat damage**.
- 

#### 186. Effective Engine Power

- **Definition:** Measures the **actual power output** of the engine at a given moment, considering **fuel input, combustion efficiency, and load conditions**.
  - **Example Usage:** Used to optimize **torque delivery, transmission shifts, and driving dynamics**.
  - **Impact if Faulty:** If misread, the system may **underestimate or overestimate power output**, leading to **poor performance and fuel efficiency**.
- 

#### 187. Electricity Additional Storage

- **Definition:** Monitors the **energy level** in an **auxiliary battery or capacitor** that provides backup power for electrical systems.
- **Example Usage:** Ensures stable power delivery for **start-stop systems, emergency power needs, or hybrid electric drive assist**.
- **Impact if Faulty:** If misread, it may cause **unexpected electrical failures, hybrid system shutdowns, or inefficient power distribution**.

---

## 188. Electricity for VVT Motor

- **Definition:** Measures the **power consumption of the Variable Valve Timing (VVT) actuator motor.**
  - **Example Usage:** Ensures the VVT system receives enough power to adjust camshaft timing effectively.
  - **Impact if Faulty:** If incorrect, the VVT system may **fail to adjust valve timing**, leading to **reduced power, increased emissions, and rough engine operation.**
- 

## 189. Electronics Temperature Electric Water Pump

- **Definition:** Measures the **temperature of the electronic components inside the electric water pump.**
  - **Example Usage:** Prevents **overheating-related failures** in the **cooling system's electric water pump.**
  - **Impact if Faulty:** If the pump gets too hot, it may **reduce cooling efficiency**, leading to **engine overheating or cooling system failure.**
- 

## 190. Energy Status for Terminal Control

- **Definition:** Monitors the **power supply status for terminal-controlled electronic components**, such as ignition and infotainment systems.
  - **Example Usage:** Ensures that **systems are powered on/off correctly based on key position or power-saving modes.**
  - **Impact if Faulty:** If misread, certain electrical functions **may not turn on or off correctly**, leading to **battery drain or startup issues.**
- 

## 191. Engine Oil Temperature from Sensor Stuck in Oil Circuit Diagnosis Pointer Difference

- **Definition:** Measures the **difference between the expected and actual oil temperature readings** from the sensor inside the oil circuit.

- **Example Usage:** Used to **detect sensor failures or incorrect oil temperature readings**, ensuring proper **lubrication and thermal management**.
  - **Impact if Faulty:** If incorrect, the ECU may **fail to adjust oil pressure correctly**, leading to **overheating, excessive wear, or unnecessary warning lights**.
- 

## 192. Engine Oil Temperature Measured

- **Definition:** Measures the **actual temperature of the engine oil**, which affects **lubrication, engine efficiency, and wear protection**.
  - **Example Usage:** Used to regulate **variable oil pressure systems, VANOS timing adjustments, and thermal management**.
  - **Impact if Faulty:** Incorrect readings can lead to **poor lubrication, overheating, or unnecessary oil pressure changes**.
- 

## 193. Engine Radiator Outlet Temperature (Coolant)

- **Definition:** Measures the **coolant temperature after it exits the radiator**, indicating **cooling system efficiency**.
  - **Example Usage:** Helps the ECU **adjust cooling fan speed and thermostat operation** based on engine load.
  - **Impact if Faulty:** A faulty sensor can cause **overcooling (wasting energy) or overheating (engine damage)**.
- 

## 194. Engine Shut-Off Angle

- **Definition:** Measures the **crankshaft angle at which the engine is shut off**, ensuring the correct **restart position in stop-start systems**.
  - **Example Usage:** Helps hybrid and **start-stop engines** achieve smoother restarts.
  - **Impact if Faulty:** If incorrect, it may lead to **hard starting, engine misalignment, or excessive vibrations when restarting**.
- 

## 195. Engine Shutdown Time

- **Definition:** Tracks the **elapsed time since the engine was turned off**, used for **thermal and diagnostic purposes**.
  - **Example Usage:** Helps optimize **fuel injection strategies, emissions controls, and engine cooling cycles**.
  - **Impact if Faulty:** Incorrect values may lead to **cold start miscalculations, poor idle control, or unnecessary fuel enrichment**.
- 

#### 196. Engine Speed

- **Definition:** Measures the **real-time engine RPM (revolutions per minute)**, essential for **power management and fuel injection control**.
  - **Example Usage:** Used for **fuel injection timing, ignition timing, and automatic transmission shifting**.
  - **Impact if Faulty:** If misread, the vehicle may experience **erratic engine behavior, rough idling, misfires, or incorrect gear shifts**.
- 

#### 197. Engine Starting Temperature

- **Definition:** Records the **coolant or oil temperature at the moment of engine start**, used for **fuel mixture adjustments and emissions control**.
  - **Example Usage:** Helps adjust **fuel injection, spark timing, and idle speed based on temperature conditions**.
  - **Impact if Faulty:** A faulty reading can cause **cold start issues, excessive emissions, or poor fuel economy**.
- 

#### 198. Engine Temperature When Switched Off

- **Definition:** Captures the **coolant or oil temperature at the time the engine was last shut down**.
- **Example Usage:** Used to determine **cooling system behavior after shutdown, such as running electric water pumps or cooling fans**.
- **Impact if Faulty:** If incorrect, the ECU may **fail to activate post-shutdown cooling, leading to thermal stress on engine components**.

---

## 199. Environmental Condition BNS Error

- **Definition:** Detects environmental conditions that may cause **errors in the battery network system (BNS)**, such as **extreme temperatures or humidity**.
  - **Example Usage:** Helps prevent **battery overcharging, premature degradation, or electrical failures in extreme conditions**.
  - **Impact if Faulty:** If misread, it may cause **incorrect battery charging rates, power delivery issues, or unnecessary system warnings**.
- 

## 200. Estimation of the Distance Until the OPF is Fully Loaded with Ash

- **Definition:** Estimates the **remaining distance the vehicle can travel before the Otto Particulate Filter (OPF) reaches full ash load**.
  - **Example Usage:** Used to trigger **regeneration cycles or maintenance alerts** for cleaning or replacing the OPF.
  - **Impact if Faulty:** A miscalculated reading may cause **early or late filter regeneration, leading to excessive backpressure and power loss**.
- 

## 201. Ethanol Content - Raw Value from the Sensor

- **Definition:** Measures the **ethanol percentage** in the fuel, crucial for **flex-fuel vehicles (FFVs)** that can run on different ethanol blends.
  - **Example Usage:** Adjusts **fuel injection timing and air-fuel ratio** based on ethanol content to optimize performance.
  - **Impact if Faulty:** If misread, the engine may **run too lean or too rich**, leading to **poor fuel economy, power loss, or increased emissions**.
- 

## 202. Ethanol Go Ev

- **Definition:** Detects the **transition from gasoline to ethanol blend usage** in a flex-fuel vehicle.

- **Example Usage:** Helps in **smooth adaptation to ethanol fuel blends**, preventing engine knocking or misfires.
  - **Impact if Faulty:** If incorrect, the vehicle may **hesitate, stall, or misfire when switching between fuel types**.
- 

#### **203. Exhaust Gas Recirculation Controller High Pressure - Actual Position**

- **Definition:** Monitors the **actual position of the high-pressure EGR valve**, which recirculates exhaust gases to reduce NOx emissions.
  - **Example Usage:** Ensures **proper exhaust gas flow into the intake manifold** for emissions control.
  - **Impact if Faulty:** A bad reading may cause **excess emissions, rough idling, or poor fuel economy**.
- 

#### **204. Exhaust Gas Temperature After Catalytic Converter from Model**

- **Definition:** Estimates the **temperature of exhaust gases after passing through the catalytic converter**, based on ECU calculations.
  - **Example Usage:** Used to determine **catalyst efficiency and detect potential overheating issues**.
  - **Impact if Faulty:** Incorrect readings can cause **false emissions warnings, inefficient catalytic converter operation, or excessive thermal stress**.
- 

#### **205. Exhaust Gas Temperature Behind Main Catalyst from Model**

- **Definition:** Similar to **sensor #204**, but measures the temperature **directly behind the main catalytic converter**.
  - **Example Usage:** Helps optimize **catalytic efficiency and detect possible malfunctions**.
  - **Impact if Faulty:** If incorrect, it can lead to **misfires, increased emissions, or damage to the catalyst due to overheating**.
-

## **206. Exhaust Gas Temperature Behind Main Catalyst from Model Bank 2**

- **Definition:** Same as **sensor #205**, but specifically for **Bank 2** in a **V6/V8 engine**.
  - **Example Usage:** Ensures that **both catalytic converters function equally** and emissions are properly controlled.
  - **Impact if Faulty:** Incorrect values may cause **asymmetrical emissions control**, leading to **check engine lights (CELs) or performance issues**.
- 

## **207. Exhaust Gas Temperature Sensor Before SCRF - Detected Temperature**

- **Definition:** Measures the **exhaust temperature before the Selective Catalytic Reduction Filter (SCRF)**, used in diesel engines.
  - **Example Usage:** Helps optimize **DEF (Diesel Exhaust Fluid) injection timing** to reduce NOx emissions.
  - **Impact if Faulty:** If misread, it can lead to **poor SCR efficiency, increased emissions, or excessive DEF consumption**.
- 

## **208. Exhaust Gas Temperature Sensor in Front of Oxidation Catalyst - Detected Temperature**

- **Definition:** Measures the **exhaust gas temperature before entering the oxidation catalyst**, ensuring proper catalyst operation.
  - **Example Usage:** Helps control **catalyst warm-up, emissions reduction, and post-injection strategies**.
  - **Impact if Faulty:** Incorrect values can cause **catalyst inefficiency, higher emissions, or failed emissions tests**.
- 

## **209. Exhaust Gas Temperature Sensor in Front of the Underbody SCR Kat - Recorded Temperature**

- **Definition:** Measures the **temperature before the underbody-mounted SCR (Selective Catalytic Reduction) catalyst** in diesel vehicles.
- **Example Usage:** Ensures that the **SCR system operates within the optimal temperature range** for reducing NOx emissions.

- **Impact if Faulty:** A bad reading may lead to inefficient NOx reduction, higher emissions, or excessive DEF consumption.
- 

## 210. External Charge Detected During Sleep Phase

- **Definition:** Detects whether an **external power source (such as a charger or jump-start) is connected while the vehicle is in sleep mode.**
  - **Example Usage:** Used to **monitor battery charging behavior** and ensure that the vehicle correctly handles external power sources.
  - **Impact if Faulty:** If misread, it may **fail to recognize external charging**, causing **battery drain or unnecessary power draw.**
- 

## 211. External Charging Active

- **Definition:** Indicates whether the vehicle is **actively being charged** by an **external power source**, such as a wall charger or generator.
  - **Example Usage:** Used in **hybrid and electric vehicles** to manage **charging cycles, battery conditioning, and power distribution.**
  - **Impact if Faulty:** If incorrect, it may cause **charging failures, inaccurate battery status, or unexpected system shutdowns.**
- 

## 212. Extrapolation of the Remaining Distance of the Spark Plug Set

- **Definition:** Estimates the **remaining lifespan of the spark plugs** based on **usage, combustion conditions, and wear data.**
  - **Example Usage:** Helps schedule **spark plug replacement** for optimal performance.
  - **Impact if Faulty:** Incorrect readings may cause **early or late spark plug changes, leading to misfires, reduced power, or increased fuel consumption.**
- 

## 213. Factor from Lambda Control Adaptation for Bank 1

- **Definition:** Measures the **adjustment factor applied to the lambda (O2) sensor** readings for **Bank 1** to maintain the **correct air-fuel ratio**.
  - **Example Usage:** Helps fine-tune **fuel injection** based on **real-time sensor feedback**.
  - **Impact if Faulty:** Incorrect adaptation may cause **rich or lean conditions**, leading to **poor fuel economy, emissions issues, or engine knocking**.
- 

#### 214. Factor Estimated ZK Sooting

- **Definition:** Estimates the **amount of soot buildup in the combustion chamber** to adjust **engine timing and fuel injection** accordingly.
  - **Example Usage:** Helps in **combustion efficiency optimization** and prevents **excessive carbon buildup**.
  - **Impact if Faulty:** If incorrect, the ECU may **fail to prevent carbon buildup**, leading to **reduced power, misfires, or higher emissions**.
- 

#### 215. Fast Average of the Lambda Control Factor Bank 2

- **Definition:** Calculates the **fast-responding average** of the lambda control adjustments for **Bank 2**.
  - **Example Usage:** Provides **real-time fuel mixture correction** for accurate **combustion efficiency**.
  - **Impact if Faulty:** If misread, it can cause **incorrect fuel trims, leading to poor fuel efficiency and increased emissions**.
- 

#### 216. Fast Mean Value of the Lambda Control Factor

- **Definition:** Similar to **sensor #215**, but applies to **all cylinders or a single-bank engine**.
- **Example Usage:** Ensures **fast adaptation of the air-fuel ratio**, preventing **delayed fuel corrections**.
- **Impact if Faulty:** If inaccurate, it may cause **unstable fuel control, power loss, or check engine lights (CELs)**.

---

## 217. Filtered Actual Rail Pressure Value from CAN (Absolute Pressure)

- **Definition:** Measures the **fuel rail pressure** after **CAN bus filtering**, providing a stable reading.
  - **Example Usage:** Ensures **smooth fuel delivery to injectors** and prevents **pressure fluctuations**.
  - **Impact if Faulty:** If incorrect, it may cause **fuel starvation, injector failures, or incorrect fuel pressure regulation**.
- 

## 218. Filtered Fuel Flow

- **Definition:** Measures the **amount of fuel flowing into the engine** after applying **data smoothing techniques**.
  - **Example Usage:** Helps regulate **fuel injection timing and consumption calculations**.
  - **Impact if Faulty:** Incorrect readings may cause **fuel mixture imbalance, reduced power, or inefficient fuel use**.
- 

## 219. Filtered Rail Pressure Actual Value (Absolute Pressure)

- **Definition:** Provides a **smoothed version of the actual rail pressure**, eliminating noise or sudden fluctuations.
  - **Example Usage:** Helps prevent **fuel system oscillations**, ensuring consistent injector performance.
  - **Impact if Faulty:** If misread, it may cause **poor fuel atomization, engine hesitation, or fuel injector damage**.
- 

## 220. Filtered Spark Burning Time Cylinder 1

- **Definition:** Measures the **actual burn duration of the spark in cylinder 1**, after filtering out data noise.

- **Example Usage:** Helps in **combustion efficiency monitoring** and **misfire detection**.
  - **Impact if Faulty:** Incorrect readings may lead to **false misfire detections**, **inefficient fuel burning**, or **ignition system failures**.
- 

## 221. Filtered Spark Burning Time Cylinder 5

- **Definition:** Measures the **actual burn duration of the spark in cylinder 5**, after applying filtering to remove data noise.
  - **Example Usage:** Helps optimize **ignition timing** and detect **combustion irregularities**.
  - **Impact if Faulty:** If incorrect, it may lead to **misfires**, **reduced engine power**, or **inefficient combustion**.
- 

## 222. Filtered Spark Burning Time Cylinder 6

- **Definition:** Similar to **sensor #221**, but for **cylinder 6**.
  - **Example Usage:** Ensures the **spark plug is firing correctly**, contributing to **smooth engine operation**.
  - **Impact if Faulty:** A misread value may result in **delayed ignition**, **knocking**, or **rough idling**.
- 

## 223. Filtering Pressure Difference Ambient Pressure - Intake Manifold Pressure

- **Definition:** Measures the **pressure difference between ambient air and the intake manifold**, with applied filtering to reduce fluctuations.
  - **Example Usage:** Helps in **turbo boost control**, **EGR operation**, and **engine load calculations**.
  - **Impact if Faulty:** If incorrect, the ECU may **miscalculate turbo boost**, leading to **power loss** or **excessive turbo wear**.
- 

## 224. Firing Angle Cylinder 1

- **Definition:** Measures the **exact crankshaft angle at which the spark plug fires in cylinder 1**.
  - **Example Usage:** Helps optimize **combustion timing for power efficiency and emissions control**.
  - **Impact if Faulty:** If incorrect, it may cause **knocking, poor fuel economy, or misfires**.
- 

## 225. Firing Angle Cylinder 2

- **Definition:** Same as **sensor #224**, but for **cylinder 2**.
  - **Example Usage:** Ensures **synchronized ignition timing across multiple cylinders**.
  - **Impact if Faulty:** A bad reading can lead to **uneven engine performance or detonation**.
- 

## 226. Firing Angle Cylinder 3

- **Definition:** Measures the **ignition timing of cylinder 3** in relation to the crankshaft.
  - **Example Usage:** Helps maintain **smooth power delivery and combustion efficiency**.
  - **Impact if Faulty:** If misread, it could cause **pre-detonation, rough idling, or power loss**.
- 

## 227. Firing Angle Cylinder 4

- **Definition:** Tracks the **spark timing for cylinder 4**, ensuring proper combustion cycle operation.
  - **Example Usage:** Assists in **knock control and adaptive ignition timing adjustments**.
  - **Impact if Faulty:** Incorrect values may cause **engine misfires, knocking, or poor acceleration**.
- 

## 228. Firing Angle Cylinder 5

- **Definition:** Same as **sensor #224**, but for **cylinder 5**.
  - **Example Usage:** Ensures **optimal spark timing**, reducing wear on engine components.
  - **Impact if Faulty:** Incorrect timing may lead to **incomplete combustion, excess fuel consumption, or high emissions**.
- 

## 229. Firing Angle Cylinder 6

- **Definition:** Tracks the **ignition timing for cylinder 6** in multi-cylinder engines.
  - **Example Usage:** Used for **smoother engine operation and better fuel efficiency**.
  - **Impact if Faulty:** A misread value can result in **delayed combustion, loss of power, or check engine lights**.
- 

## 230. Frequency Counter Actuation of Dosing Valve 1

- **Definition:** Counts how many times the **dosing valve** (for fuel, DEF, or another fluid) has been activated.
  - **Example Usage:** Used in **fuel injection or selective catalytic reduction (SCR) systems** to monitor dosing valve health.
  - **Impact if Faulty:** If misread, it may cause **incorrect fuel or DEF injection**, leading to **inefficient combustion or emissions control failures**.
- 

## 231. Frequency Counter Actuation of Dosing Valve 2

- **Definition:** Counts the number of times **dosing valve 2** has been activated, typically for **fuel injection, DEF (Diesel Exhaust Fluid) injection, or secondary fuel circuits**.
  - **Example Usage:** Helps track **valve wear and injection cycle efficiency**.
  - **Impact if Faulty:** If misread, it may cause **over- or under-dosing**, leading to **poor fuel efficiency or emissions system failure**.
- 

## 232. Frequency Counter Actuation of Engine Shut-Off Valve

- **Definition:** Counts how many times the **engine shut-off valve** has been activated.
  - **Example Usage:** Used in **fuel cut-off strategies, emergency shutdowns, and hybrid engine management**.
  - **Impact if Faulty:** Incorrect values may cause **delayed shutdowns, fuel waste, or failure to cut power in an emergency**.
- 

### 233. Frequency Counter Actuation of Ventilation Valve

- **Definition:** Tracks the number of times the **ventilation valve in the fuel system or crankcase ventilation system** has been activated.
  - **Example Usage:** Helps ensure **proper fuel vapor management and crankcase pressure regulation**.
  - **Impact if Faulty:** If misread, it may cause **excessive fuel vapor buildup, check engine lights (CELs), or emissions failures**.
- 

### 234. Fuel Temperature Sensor - Detected Temperature

- **Definition:** Measures the **temperature of the fuel**, which affects **fuel density, injection timing, and combustion efficiency**.
  - **Example Usage:** Helps adjust **fuel delivery in different temperature conditions** for optimal performance.
  - **Impact if Faulty:** Incorrect readings can lead to **poor fuel atomization, incorrect air-fuel ratios, and inefficient combustion**.
- 

### 235. Fuel Consumption Since the Last Oil Change

- **Definition:** Tracks the **total fuel consumed since the last engine oil change**, helping with **maintenance planning**.
- **Example Usage:** Used to determine **oil degradation rates and suggest optimal oil change intervals**.
- **Impact if Faulty:** If incorrect, it may cause **delayed or premature oil changes, affecting engine lubrication and efficiency**.

---

## **236. Fuel Mass Flow**

- **Definition:** Measures the **mass of fuel flowing into the engine per unit time**, critical for **fuel injection calculations**.
  - **Example Usage:** Helps in **fuel economy monitoring and performance adjustments**.
  - **Impact if Faulty:** Incorrect readings may result in **fuel starvation, over-fueling, poor fuel economy, or increased emissions**.
- 

## **237. Fuel Mass Homogeneous as Target Value, Cylinder 1**

- **Definition:** Sets the **target fuel mass for homogeneous combustion mode in cylinder 1**.
  - **Example Usage:** Helps maintain **uniform fuel distribution across all cylinders**.
  - **Impact if Faulty:** If miscalculated, it can cause **misfires, rough idling, or power loss**.
- 

## **238. Fuel Mass Homogeneous as Target Value, Cylinder 2**

- **Definition:** Same as **sensor #237**, but for **cylinder 2**.
  - **Example Usage:** Ensures **equal fuel distribution** for smooth operation.
  - **Impact if Faulty:** Incorrect fuel mass may cause **uneven combustion, vibration, or fuel economy issues**.
- 

## **239. Fuel Mass Homogeneous as Target Value, Cylinder 3**

- **Definition:** Same as **sensor #237**, but for **cylinder 3**.
- **Example Usage:** Ensures **precise fuel delivery for optimal combustion in a multi-cylinder engine**.
- **Impact if Faulty:** If incorrect, it may cause **fuel mixture imbalances, increased emissions, or poor throttle response**.

---

#### **240. Fuel Mass Homogeneous as Target Value, Cylinder 4**

- **Definition:** Same as **sensor #237**, but for **cylinder 4**.
  - **Example Usage:** Used in **multi-cylinder engines** to maintain uniform combustion.
  - **Impact if Faulty:** A misreading could cause **power imbalances, higher emissions, or misfires**.
- 

#### **241. Fuel Mass Homogeneous as Target Value, Cylinder 5**

- **Definition:** Specifies the **desired fuel mass** for **homogeneous combustion mode** in **cylinder 5**.
  - **Example Usage:** Ensures that **all cylinders receive the correct amount of fuel**, optimizing combustion and efficiency.
  - **Impact if Faulty:** Incorrect readings can lead to **engine misfires, rough idling, increased emissions, or reduced power output**.
- 

#### **242. Fuel Mass Homogeneous as Target Value, Cylinder 6**

- **Definition:** Defines the **target fuel mass** for **homogeneous combustion mode** in **cylinder 6**.
  - **Example Usage:** Used in **fuel injection tuning** to ensure **equal fuel delivery across all cylinders**.
  - **Impact if Faulty:** A miscalculation may cause **knocking, excessive fuel consumption, or unbalanced combustion**.
- 

#### **243. Fuel Tank Level**

- **Definition:** Measures the **amount of fuel in the fuel tank**, ensuring accurate fuel range estimations.
- **Example Usage:** Helps drivers **monitor fuel consumption**, supports **fuel economy calculations**, and alerts when fuel is low.

- **Impact if Faulty:** Incorrect readings may lead to **false low fuel warnings, inaccurate range estimates, or running out of fuel unexpectedly.**
- 

#### 244. Fuel Temperature

- **Definition:** Measures the **temperature of the fuel**, which affects **fuel density, combustion efficiency, and injection timing**.
  - **Example Usage:** Helps adjust **fuel mixture and injection timing** for optimal performance at different temperatures.
  - **Impact if Faulty:** Incorrect readings can cause **fuel system inefficiencies, poor combustion, or hard starting in extreme conditions**.
- 

#### 245. Fuel Temperature (Sensor, Model, or Fixed Substitute Value)

- **Definition:** Reports the **fuel temperature**, either from **a sensor, an ECU-calculated model, or a predefined substitute value** if the sensor fails.
  - **Example Usage:** Ensures that **fuel injection and combustion settings** are optimized for temperature conditions.
  - **Impact if Faulty:** If incorrect, the vehicle may **run rich or lean**, causing **engine hesitation or increased emissions**.
- 

#### 246. Gear

- **Definition:** Displays the **currently engaged gear** (e.g., **1st, 2nd, Neutral, Reverse**) in the **transmission system**.
  - **Example Usage:** Helps control **automatic gear shifting, display gear position to the driver, and enable driving modes**.
  - **Impact if Faulty:** Incorrect gear readings may cause **improper shifting, unintended neutral engagement, or drivetrain malfunctions**.
- 

#### 247. Gear Sensor Error Message

- **Definition:** Detects and reports **errors in the gear position sensor**, which monitors gear selection.
  - **Example Usage:** Ensures that the **ECU knows the exact gear position** for smooth gear shifting.
  - **Impact if Faulty:** If malfunctioning, the vehicle may **fail to shift properly, experience harsh gear changes, or enter limp mode**.
- 

#### 248. Gear Sensor Position in X (Beta) Direction

- **Definition:** Measures the **position of the gear sensor** along the **X-axis** (horizontal movement) for **electronic gear selectors**.
  - **Example Usage:** Helps determine **precise gear engagement** in modern shift-by-wire transmissions.
  - **Impact if Faulty:** If incorrect, the transmission may **fail to detect gear shifts, causing driveability issues**.
- 

#### 249. Gear Sensor Position in Y (Beta) Direction

- **Definition:** Measures the **position of the gear sensor** along the **Y-axis** (vertical movement) for **electronic gear shifters**.
  - **Example Usage:** Ensures that **gear selections are correctly interpreted by the transmission ECU**.
  - **Impact if Faulty:** A bad reading may lead to **delayed gear selection, inability to engage drive or reverse, or gear shift failures**.
- 

#### 250. Gearbox Temperature Between 110°C and 124°C

- **Definition:** Monitors if the **transmission fluid temperature** is in the **110°C to 124°C range**, a key operating window for **automatic transmissions**.
- **Example Usage:** Ensures that the **transmission operates within safe temperature limits**, preventing overheating.
- **Impact if Faulty:** If temperatures exceed this range without correction, it may cause **gear slippage, overheating warnings, or transmission failure**.

---

#### **251. Gearbox Temperature Between 125°C and 129°C**

- **Definition:** Monitors if the **transmission fluid temperature** is within the **125°C to 129°C range**, which is nearing critical overheating levels.
  - **Example Usage:** Used to trigger **cooling strategies** such as **increased fluid circulation or engaging the transmission cooler**.
  - **Impact if Faulty:** If not detected properly, it may lead to **transmission overheating, fluid degradation, or mechanical failure**.
- 

#### **252. Gearbox Temperature Between 80°C and 109°C**

- **Definition:** Measures if the **transmission temperature** is within the **80°C to 109°C range**, which is considered normal operating conditions.
  - **Example Usage:** Helps adjust **gear shift timing and torque converter lock-up for efficiency**.
  - **Impact if Faulty:** If the reading is incorrect, the ECU may **engage cooling systems unnecessarily or fail to prevent overheating**.
- 

#### **253. Gearbox Temperature Greater Than 129°C**

- **Definition:** Detects when the **transmission temperature exceeds 129°C**, a dangerous overheating condition.
  - **Example Usage:** Triggers **limp mode**, warning messages, or emergency cooling activation to prevent transmission damage.
  - **Impact if Faulty:** If undetected, extreme overheating can lead to **clutch slipping, burnt transmission fluid, or complete gearbox failure**.
- 

#### **254. Gearbox Temperature Less Than 80°C**

- **Definition:** Identifies when the **transmission temperature is below 80°C**, indicating the gearbox is **cold**.

- **Example Usage:** Adjusts **shift timing, torque converter engagement, and fluid viscosity compensation.**
  - **Impact if Faulty:** If misread, the transmission may **engage gears too aggressively before warming up, causing wear or poor fuel efficiency.**
- 

## 255. Generator Speed

- **Definition:** Measures the **rotational speed (RPM) of the alternator/generator**, which produces electricity for the vehicle.
  - **Example Usage:** Ensures the **alternator supplies enough power** to charge the battery and support electrical loads.
  - **Impact if Faulty:** Incorrect readings can lead to **battery charging issues, dim lights, or power loss to critical systems.**
- 

## 256. Heating Voltage in Front of the Cat of a Broadband Lambda Probe (ADC Value) Bank 2

- **Definition:** Measures the **voltage supplied to the heater element of the wideband oxygen sensor (Lambda sensor) before the catalytic converter in Bank 2.**
  - **Example Usage:** Ensures that the **oxygen sensor reaches operating temperature quickly for accurate air-fuel ratio readings.**
  - **Impact if Faulty:** If incorrect, it may cause **delayed fuel mixture adjustments, higher emissions, or poor fuel economy.**
- 

## 257. Heating Voltage in Front of the Catalyst of a Broadband Lambda Probe (ADC Value)

- **Definition:** Similar to **sensor #256**, but for the **Lambda sensor before the catalytic converter in Bank 1 or a single-bank engine.**
  - **Example Usage:** Helps stabilize **fuel mixture calculations** in cold-start conditions.
  - **Impact if Faulty:** If not working properly, it may cause **rough idle, high emissions, or failed emissions tests.**
-

## **258. Highest Oil Temperature Measured in the Driving Cycle**

- **Definition:** Records the **maximum oil temperature** reached during the current driving cycle.
  - **Example Usage:** Helps monitor **engine stress levels, cooling efficiency, and oil degradation**.
  - **Impact if Faulty:** If not monitored properly, **high oil temperatures may lead to reduced lubrication, increased wear, and engine overheating**.
- 

## **259. IBS Battery Power**

- **Definition:** Measures the **current power output of the battery** using the **Intelligent Battery Sensor (IBS)**.
  - **Example Usage:** Helps regulate **charging rates, stop-start system operation, and power management**.
  - **Impact if Faulty:** If incorrect, it may cause **unexpected battery drain, failure to start, or inaccurate charge level indications**.
- 

## **260. IBS Battery Temperature**

- **Definition:** Measures the **temperature of the vehicle's battery**, which affects **charging efficiency and battery lifespan**.
  - **Example Usage:** Helps optimize **charging voltage based on temperature** to prevent overcharging or undercharging.
  - **Impact if Faulty:** If misread, it may cause **battery overheating, excessive wear, or difficulty starting in cold conditions**.
- 

## **261. IBS Battery Voltage**

- **Definition:** Measures the **real-time voltage of the vehicle's battery**, recorded by the **Intelligent Battery Sensor (IBS)**.
- **Example Usage:** Helps regulate **charging from the alternator**, support **start-stop functionality**, and prevent **battery over-discharge**.

- **Impact if Faulty:** If incorrect, it may cause **battery drain, failure to charge properly, or erratic electrical system behavior.**
- 

## 262. Idle Control Condition

- **Definition:** Detects whether the engine is in **idle control mode**, adjusting throttle and fuel injection to maintain stable RPMs.
  - **Example Usage:** Used to optimize **fuel efficiency, emissions, and smooth idling.**
  - **Impact if Faulty:** If incorrect, it may cause **rough idling, engine stalling, or excessive fuel consumption at idle.**
- 

## 263. Information About Motoring Out

- **Definition:** Provides details on **engine motoring events**, where the engine rotates without combustion (e.g., fuel cutoff in coasting).
  - **Example Usage:** Helps optimize **fuel cutoff strategies for better efficiency and emissions reduction.**
  - **Impact if Faulty:** Incorrect data may result in **unnecessary fuel injection, reduced engine braking effectiveness, or excessive emissions.**
- 

## 264. Injection Current Maximum Fuel Mass Flow Injectors

- **Definition:** Measures the **maximum electrical current supplied to the fuel injectors** and their **corresponding maximum fuel mass flow rate.**
  - **Example Usage:** Ensures **fuel injectors operate within safe limits** and deliver the correct fuel quantity.
  - **Impact if Faulty:** If incorrect, it may cause **over- or under-fueling, leading to poor combustion, power loss, or increased emissions.**
- 

## 265. Injection Mode, Cylinder 1

- **Definition:** Identifies the **current fuel injection strategy** used for **cylinder 1**, such as direct injection, port injection, or a combination.

- **Example Usage:** Helps optimize **fuel economy, power output, and emissions** based on engine load.
  - **Impact if Faulty:** A misread value may lead to **inefficient combustion, knocking, or increased fuel consumption.**
- 

## 266. Injection Mode, Cylinder 2

- **Definition:** Similar to **sensor #265**, but for **cylinder 2**.
  - **Example Usage:** Ensures **precise fuel control for cylinder 2** during different engine loads and conditions.
  - **Impact if Faulty:** Incorrect values may cause **misfires, poor throttle response, or incorrect air-fuel mixture adjustments.**
- 

## 267. Injection Mode, Cylinder 3

- **Definition:** Same as **sensor #265**, but for **cylinder 3**.
  - **Example Usage:** Helps in **adaptive fuel mapping and knock control** for better efficiency.
  - **Impact if Faulty:** A bad reading can cause **misfire codes, poor acceleration, or excessive carbon buildup.**
- 

## 268. Injection Mode, Cylinder 4

- **Definition:** Similar to **sensor #265**, but for **cylinder 4**.
  - **Example Usage:** Ensures **balanced fuel distribution across all cylinders** for smooth operation.
  - **Impact if Faulty:** If incorrect, the ECU may **overcompensate fuel delivery, affecting power and emissions.**
- 

## 269. Injection Mode, Cylinder 5

- **Definition:** Tracks the **fuel injection strategy used in cylinder 5**, adjusting for performance and emissions.

- **Example Usage:** Helps in **fuel delivery optimization, especially in dynamic driving conditions.**
  - **Impact if Faulty:** If inaccurate, it can cause **uneven power delivery, higher emissions, or reduced fuel efficiency.**
- 

## 270. Injection Mode, Cylinder 6

- **Definition:** Monitors the **fuel injection mode for cylinder 6**, ensuring proper fuel delivery under different load conditions.
  - **Example Usage:** Helps maintain **efficient combustion and power balance** in multi-cylinder engines.
  - **Impact if Faulty:** Incorrect injection mode data may lead to **engine knocking, misfires, or excessive fuel consumption.**
- 

## 271. Inlet NW: Angular Offset Fine Adaptation

- **Definition:** Measures the **fine adjustment offset** of the **intake camshaft (NW - Nockenwelle)** in a variable valve timing (VVT) system.
  - **Example Usage:** Ensures precise **valve timing adjustments** for optimal power and efficiency.
  - **Impact if Faulty:** If incorrect, it may lead to **rough idling, loss of power, or increased emissions** due to improper valve timing.
- 

## 272. Inlet NW: Angular Offset Reference Adaptation

- **Definition:** Measures the **baseline reference offset** for the **intake camshaft angle adaptation**, allowing the system to adjust over time.
  - **Example Usage:** Used in **variable camshaft timing adjustments** to compensate for wear and improve fuel efficiency.
  - **Impact if Faulty:** If misread, it may cause **delayed camshaft adjustments, leading to reduced engine efficiency and performance.**
-

### **273. Inlet Spread**

- **Definition:** Measures the **amount of camshaft advance or retardation** applied to the intake valves.
  - **Example Usage:** Adjusts the **valve opening timing** for optimal fuel-air mixture intake.
  - **Impact if Faulty:** If incorrect, it can cause **poor throttle response, power loss, and fuel inefficiency**.
- 

### **274. Inlet Valve Lift Setpoint Filtered**

- **Definition:** Determines the **desired valve lift position** for the intake valves, with filtering to remove sensor noise.
  - **Example Usage:** Helps in **valve lift adjustments for better combustion and efficiency** in engines with **variable valve lift systems**.
  - **Impact if Faulty:** If incorrect, it may lead to **low power output, improper air intake, and rough idling**.
- 

### **275. Intake Air Temperature**

- **Definition:** Measures the **temperature of the air entering the intake manifold**, critical for combustion calculations.
  - **Example Usage:** Helps adjust **fuel mixture and ignition timing** based on air density and temperature.
  - **Impact if Faulty:** Incorrect readings can lead to **poor fuel efficiency, detonation (knocking), or high emissions**.
- 

### **276. Intake Air Temperature at Start**

- **Definition:** Records the **temperature of the intake air at the time of engine startup**.
- **Example Usage:** Used to optimize **cold start fuel enrichment and ignition timing**.

- **Impact if Faulty:** If incorrect, it may cause **hard starts, excessive fuel consumption, or high emissions on cold starts.**
- 

## 277. Intake Air Temperature Before Throttle Valve, Measured

- **Definition:** Measures the **air temperature before it passes through the throttle body.**
  - **Example Usage:** Helps the ECU calculate **air density and optimize fuel injection timing.**
  - **Impact if Faulty:** If misread, it may cause **incorrect air-fuel mixture calculations, leading to power loss or knocking.**
- 

## 278. Intake Air Temperature, Linearized and Converted

- **Definition:** Provides a **smoothed and converted version of the intake air temperature reading**, making it more usable for ECU calculations.
  - **Example Usage:** Helps in **fuel trim and turbo boost control.**
  - **Impact if Faulty:** If incorrect, the engine may **miscalculate required fuel delivery, causing lean or rich running conditions.**
- 

## 279. Intake Air Temperature, Linearized and Converted, Bank 2

- **Definition:** Same as **sensor #278**, but specifically for **Bank 2** in a **V6/V8 engine.**
  - **Example Usage:** Ensures both engine banks receive **accurate intake air temperature data.**
  - **Impact if Faulty:** Incorrect readings may cause **imbalance between banks, rough idling, or inefficient fuel distribution.**
- 

## 280. Intake Manifold Absolute Pressure

- **Definition:** Measures the **absolute pressure inside the intake manifold**, used to calculate **engine load and fuel injection timing.**

- **Example Usage:** Helps regulate **boost pressure in turbo engines** and optimize **fuel delivery**.
  - **Impact if Faulty:** Incorrect values can cause **engine misfires, poor throttle response, and inefficient turbo operation**.
- 

## 281. Intake Manifold Absolute Pressure Measured

- **Definition:** Measures the **actual pressure inside the intake manifold** using a **MAP (Manifold Absolute Pressure) sensor**.
  - **Example Usage:** Used for **engine load calculations, fuel injection timing, and turbo boost control**.
  - **Impact if Faulty:** If incorrect, it may cause **poor acceleration, erratic idling, incorrect turbo boost pressure, or increased fuel consumption**.
- 

## 282. Intake Manifold Pressure Measured with Pressure Sensor on the Intake Manifold (DS-S)

- **Definition:** Measures the **real-time air pressure inside the intake manifold**, helping adjust **boost pressure and fuel mixture**.
  - **Example Usage:** Helps regulate **engine breathing efficiency and forced induction (turbocharger/supercharger) operation**.
  - **Impact if Faulty:** Incorrect readings can result in **turbo lag, low power output, or rich/lean fuel mixture issues**.
- 

## 283. Intake Manifold Pressure Sensor Voltage

- **Definition:** Measures the **voltage output of the MAP sensor**, which correlates with the **manifold pressure level**.
  - **Example Usage:** Used by the ECU to interpret **engine vacuum and boost levels**.
  - **Impact if Faulty:** A faulty voltage reading may cause **incorrect air-fuel mixture adjustments, leading to hesitation, rough idling, or excessive emissions**.
-

#### **284. Integrated Offset Stroke Adaptation**

- **Definition:** Measures the **adaptive offset correction** for **valve lift or stroke position sensors** to maintain engine efficiency.
  - **Example Usage:** Helps adjust **valve lift and timing dynamically**, improving **power output and emissions control**.
  - **Impact if Faulty:** If incorrect, the engine may experience **power loss, excessive emissions, or inefficient combustion cycles**.
- 

#### **285. Internal Gear (Including Neutral and Reverse)**

- **Definition:** Tracks the **current gear position**, including **neutral and reverse**, in automatic or manual transmissions.
  - **Example Usage:** Used for **gear shift timing, transmission control logic, and start-stop system engagement**.
  - **Impact if Faulty:** A misreading may cause **gear shifting delays, incorrect gear engagement, or transmission warning messages**.
- 

#### **286. Internal Resistance of the Store**

- **Definition:** Measures the **internal electrical resistance of a battery or energy storage system**.
  - **Example Usage:** Helps estimate **battery health, charging efficiency, and performance degradation over time**.
  - **Impact if Faulty:** Incorrect readings can result in **premature battery wear, unexpected battery failure, or improper charging system behavior**.
- 

#### **287. Internal Resistance, HEGO Sensor 3 Bank 1**

- **Definition:** Measures the **internal resistance of the Heated Exhaust Gas Oxygen (HEGO) sensor in Bank 1**.
- **Example Usage:** Ensures proper **oxygen sensor functionality for accurate air-fuel ratio monitoring**.

- **Impact if Faulty:** If resistance is too high or low, the **ECU may miscalculate fuel mixture, leading to poor fuel economy and high emissions.**
- 

## **288. Interval Counter for Emissions-Related Misfires (0-1000 KW Rev. Or 0-500 NW Rev.)**

- **Definition:** Counts the number of **misfires** that occur within a given range of **kilowatt (KW) or Nockenwelle (NW) revolutions**, focusing on emissions impact.
  - **Example Usage:** Helps diagnose **misfire-related emissions problems**, which can damage the **catalytic converter**.
  - **Impact if Faulty:** If inaccurate, the ECU may **fail to detect misfires, leading to potential emissions violations or check engine lights (CELS)**.
- 

## **289. Irregular Burns Event Counter**

- **Definition:** Tracks occurrences of **incomplete or irregular combustion events**, which can indicate **ignition or fuel delivery issues**.
  - **Example Usage:** Used for **knock detection, misfire diagnosis, and performance optimization**.
  - **Impact if Faulty:** If the ECU fails to detect combustion irregularities, it may cause **reduced efficiency, power loss, or increased emissions**.
- 

## **290. Is Banked Road Surface**

- **Definition:** Detects if the vehicle is **driving on a banked (tilted) road surface**, affecting weight distribution and handling.
  - **Example Usage:** Helps **stability control systems adjust braking and suspension settings** for improved handling.
  - **Impact if Faulty:** Incorrect detection may lead to **poor traction control behavior, unnecessary stability control interventions, or inaccurate yaw sensor readings**.
- 

## **291. Is Position Electrical Wastegate (0: WG Closed, 100: WG Open)**

- **Definition:** Measures the **current position of the electronically controlled wastegate**, which regulates turbo boost pressure.
  - **Example Usage:** Ensures **optimal turbocharger efficiency by controlling excess boost pressure**.
  - **Impact if Faulty:** If incorrect, it may cause **boost pressure spikes, turbo lag, or insufficient power delivery**.
- 

#### 292. Is Position Electrical Wastegate 2 (0: WG Closed, 100: WG Open)

- **Definition:** Similar to **sensor #291**, but for a **second electronically controlled wastegate** in twin-turbocharged engines.
  - **Example Usage:** Helps regulate **boost pressure in multi-turbo configurations**.
  - **Impact if Faulty:** If misread, it may cause **boost imbalances, turbo inefficiency, or excessive engine stress**.
- 

#### 293. Is the Longitudinal Slope of the Roadway

- **Definition:** Detects the **grade or incline of the road surface** using vehicle sensors.
  - **Example Usage:** Used by **hill-start assist, adaptive cruise control, and traction control**.
  - **Impact if Faulty:** If incorrect, it may cause **delayed hill-start assist activation, poor traction management, or incorrect brake force application**.
- 

#### 294. Key Refill Quantity

- **Definition:** Tracks the **amount of fuel added during the last refueling event**.
  - **Example Usage:** Helps improve **fuel range estimation and fuel level gauge accuracy**.
  - **Impact if Faulty:** Incorrect readings may cause **wrong fuel range calculations or false low-fuel warnings**.
- 

#### 295. Kilometers of Oil

- **Definition:** Measures the **distance traveled since the last oil change**, used to estimate oil degradation.
  - **Example Usage:** Helps determine **when an oil change is needed based on driving conditions**.
  - **Impact if Faulty:** If incorrect, the ECU may **recommend oil changes too early or too late, leading to either wasted resources or engine wear**.
- 

## 296. Lambda Actual Value

- **Definition:** Measures the **real-time air-fuel ratio (Lambda value)** detected by the oxygen sensor.
  - **Example Usage:** Helps optimize **fuel injection for emissions control and engine efficiency**.
  - **Impact if Faulty:** If misread, it may cause **rich or lean running conditions, increasing emissions and reducing performance**.
- 

## 297. Lambda Actual Value Bank 2

- **Definition:** Similar to **sensor #296**, but for **Bank 2** of a V6, V8, or other multi-bank engine.
  - **Example Usage:** Ensures both banks operate at **optimal air-fuel ratios**.
  - **Impact if Faulty:** A misreading may cause **fuel trim imbalances, affecting emissions and power delivery**.
- 

## 298. Lambda Actual Value Sensor 1 Bank 2

- **Definition:** Reports the **real-time Lambda reading from sensor 1 (pre-catalyst) in Bank 2**.
  - **Example Usage:** Used to regulate **fuel mixture before emissions treatment**.
  - **Impact if Faulty:** Incorrect data may lead to **poor combustion, increased fuel consumption, or emissions failures**.
-

## **299. Lambda Adaptation Total Bank 2**

- **Definition:** Measures the **cumulative adaptation factor** applied to **Bank 2's Lambda control system**.
  - **Example Usage:** Helps fine-tune **long-term fuel mixture adjustments**.
  - **Impact if Faulty:** If incorrect, it may cause **inconsistent fuel trims, incorrect air-fuel ratios, and performance loss**.
- 

## **300. Lambda Controller Output**

- **Definition:** Measures the **control output signal from the ECU** to adjust **air-fuel mixture**, based on Lambda readings.
  - **Example Usage:** Ensures the **engine operates at the ideal stoichiometric ratio** for **emissions and efficiency**.
  - **Impact if Faulty:** If misread, it may cause **inaccurate fuel control, leading to excessive emissions or engine hesitation**.
- 

## **301. Lambda Controller Output Bank 2**

- **Definition:** Measures the **control output signal from the ECU** to adjust the **air-fuel mixture** specifically for **Bank 2**.
  - **Example Usage:** Ensures **Bank 2 operates at the correct stoichiometric ratio** for optimal fuel efficiency and emissions control.
  - **Impact if Faulty:** Incorrect readings may cause **fuel mixture imbalances, increased emissions, or engine hesitation**.
- 

## **302. Lambda Integrator Bank 2**

- **Definition:** Tracks the **short-term fuel trim adjustments** made by the ECU for **Bank 2** based on **Lambda sensor feedback**.
- **Example Usage:** Helps the engine respond to **rapid air-fuel ratio changes**, optimizing combustion in **real time**.

- **Impact if Faulty:** If misread, it may lead to **delayed fuel corrections, rough engine operation, or poor emissions performance.**
- 

### **303. Lambda Offset (Sensor 1, Bank 2)**

- **Definition:** Measures the **offset correction applied to Lambda Sensor 1 in Bank 2**, compensating for sensor aging or inaccuracies.
  - **Example Usage:** Helps maintain **precise fuel control** despite sensor wear over time.
  - **Impact if Faulty:** A miscalculated offset may cause **incorrect fuel delivery, poor combustion, or false check engine lights.**
- 

### **304. Lambda Probe Actual Value, Corrected for Additional Amplitude**

- **Definition:** Provides the **Lambda probe reading** after applying additional **correction factors** to improve accuracy.
  - **Example Usage:** Ensures that the **Lambda sensor accurately reflects real combustion conditions.**
  - **Impact if Faulty:** If incorrect, it may cause **misinterpretation of the air-fuel ratio, leading to inefficient fuel use or engine misfires.**
- 

### **305. Lambda Probe Voltage (4.88mV / LSB) Behind Catalyst Bank 2**

- **Definition:** Measures the **voltage output of the post-catalyst Lambda sensor in Bank 2**, indicating catalyst efficiency.
  - **Example Usage:** Helps monitor the **health of the catalytic converter** by ensuring emissions are properly reduced.
  - **Impact if Faulty:** A failing sensor may cause **incorrect emissions readings, leading to false CELs or excessive fuel correction.**
- 

### **306. Lambda Probe Voltage (4.88mV / LSB) Behind the Catalytic Converter**

- **Definition:** Similar to **sensor #305**, but applies to **a single-bank engine or Bank 1 in a multi-bank setup**.
  - **Example Usage:** Ensures that the **catalyst is functioning correctly and reducing emissions efficiently**.
  - **Impact if Faulty:** If misread, the ECU may **misinterpret catalyst efficiency, leading to unnecessary fuel adjustments or emissions failures**.
- 

### **307. Lambda Setpoint Based on the Installation Location of the Lambda Sensor**

- **Definition:** Determines the **target Lambda value** depending on the **position of the oxygen sensor in the exhaust system**.
  - **Example Usage:** Helps optimize **fuel mixture adjustments based on whether the sensor is pre- or post-catalyst**.
  - **Impact if Faulty:** Incorrect values may cause **fuel control errors, emissions failures, or poor engine performance**.
- 

### **308. Lambda Setpoint Based on the Installation Location of the Lambda Sensor Bank 2**

- **Definition:** Similar to **sensor #307**, but applied specifically to **Bank 2** in multi-bank engines.
  - **Example Usage:** Helps fine-tune **fuel adjustments independently for each engine bank**.
  - **Impact if Faulty:** A bad reading may cause **fuel mixture mismatches between engine banks, leading to imbalanced performance and increased emissions**.
- 

### **309. Lambda Target Limit Bank 2**

- **Definition:** Sets the **upper and lower limits of the target Lambda value** for **Bank 2** to prevent extreme fuel mixture conditions.
- **Example Usage:** Protects against **excessively rich or lean conditions** that could damage the engine.
- **Impact if Faulty:** If incorrect, it may allow **unsafe air-fuel ratios**, leading to **engine knocking, poor fuel economy, or catalyst overheating**.

---

### **310. Lambda Target Limitation**

- **Definition:** Defines the **allowed range for Lambda values** across all banks, preventing extreme fuel corrections.
  - **Example Usage:** Ensures **the ECU does not overcorrect air-fuel ratios**, protecting engine longevity.
  - **Impact if Faulty:** If set incorrectly, it may cause **fuel system instability, leading to hesitation, misfires, or excessive emissions**.
- 

### **301. Lambda Controller Output Bank 2**

- **Definition:** Measures the **control output signal from the ECU** to adjust the **air-fuel mixture** specifically for **Bank 2**.
  - **Example Usage:** Ensures **Bank 2 operates at the correct stoichiometric ratio** for optimal fuel efficiency and emissions control.
  - **Impact if Faulty:** Incorrect readings may cause **fuel mixture imbalances, increased emissions, or engine hesitation**.
- 

### **302. Lambda Integrator Bank 2**

- **Definition:** Tracks the **short-term fuel trim adjustments** made by the ECU for **Bank 2** based on **Lambda sensor feedback**.
  - **Example Usage:** Helps the engine respond to **rapid air-fuel ratio changes**, optimizing combustion in **real time**.
  - **Impact if Faulty:** If misread, it may lead to **delayed fuel corrections, rough engine operation, or poor emissions performance**.
- 

### **303. Lambda Offset (Sensor 1, Bank 2)**

- **Definition:** Measures the **offset correction applied to Lambda Sensor 1 in Bank 2**, compensating for sensor aging or inaccuracies.

- **Example Usage:** Helps maintain **precise fuel control** despite sensor wear over time.
  - **Impact if Faulty:** A miscalculated offset may cause **incorrect fuel delivery, poor combustion, or false check engine lights.**
- 

#### **304. Lambda Probe Actual Value, Corrected for Additional Amplitude**

- **Definition:** Provides the **Lambda probe reading** after applying additional **correction factors** to improve accuracy.
  - **Example Usage:** Ensures that the **Lambda sensor accurately reflects real combustion conditions.**
  - **Impact if Faulty:** If incorrect, it may cause **misinterpretation of the air-fuel ratio, leading to inefficient fuel use or engine misfires.**
- 

#### **305. Lambda Probe Voltage (4.88mV / LSB) Behind Catalyst Bank 2**

- **Definition:** Measures the **voltage output of the post-catalyst Lambda sensor in Bank 2**, indicating catalyst efficiency.
  - **Example Usage:** Helps monitor the **health of the catalytic converter** by ensuring emissions are properly reduced.
  - **Impact if Faulty:** A failing sensor may cause **incorrect emissions readings, leading to false CELs or excessive fuel correction.**
- 

#### **306. Lambda Probe Voltage (4.88mV / LSB) Behind the Catalytic Converter**

- **Definition:** Similar to **sensor #305**, but applies to **a single-bank engine or Bank 1 in a multi-bank setup.**
  - **Example Usage:** Ensures that the **catalyst is functioning correctly and reducing emissions efficiently.**
  - **Impact if Faulty:** If misread, the ECU may **misinterpret catalyst efficiency, leading to unnecessary fuel adjustments or emissions failures.**
-

### **307. Lambda Setpoint Based on the Installation Location of the Lambda Sensor**

- **Definition:** Determines the **target Lambda value** depending on the **position of the oxygen sensor in the exhaust system**.
  - **Example Usage:** Helps optimize **fuel mixture adjustments based on whether the sensor is pre- or post-catalyst**.
  - **Impact if Faulty:** Incorrect values may cause **fuel control errors, emissions failures, or poor engine performance**.
- 

### **308. Lambda Setpoint Based on the Installation Location of the Lambda Sensor Bank 2**

- **Definition:** Similar to **sensor #307**, but applied specifically to **Bank 2** in multi-bank engines.
  - **Example Usage:** Helps fine-tune **fuel adjustments independently for each engine bank**.
  - **Impact if Faulty:** A bad reading may cause **fuel mixture mismatches between engine banks, leading to imbalanced performance and increased emissions**.
- 

### **309. Lambda Target Limit Bank 2**

- **Definition:** Sets the **upper and lower limits of the target Lambda value** for **Bank 2** to prevent extreme fuel mixture conditions.
  - **Example Usage:** Protects against **excessively rich or lean conditions** that could damage the engine.
  - **Impact if Faulty:** If incorrect, it may allow **unsafe air-fuel ratios**, leading to **engine knocking, poor fuel economy, or catalyst overheating**.
- 

### **310. Lambda Target Limitation**

- **Definition:** Defines the **allowed range for Lambda values** across all banks, preventing extreme fuel corrections.
- **Example Usage:** Ensures the **ECU does not overcorrect air-fuel ratios**, protecting engine longevity.

- **Impact if Faulty:** If set incorrectly, it may cause **fuel system instability, leading to hesitation, misfires, or excessive emissions.**
- 

## NEXT STEPS

Would you like to continue with the **next 10 sensors**, or focus on a specific system such as **Lambda/O2 sensors, turbocharging, or fuel injection?** 😊

4o

**You said:**

next 10 sensors

**ChatGPT said:**

Continuing with the **next 10 sensors**, explained in the same detailed format.

---

### 311. Lambda Value Probe 2, Bank 1

- **Definition:** Measures the **Lambda (air-fuel ratio) value** from **oxygen sensor 2 in Bank 1**, typically located post-catalyst.
  - **Example Usage:** Helps the ECU determine **catalytic converter efficiency** and adjust fuel mixture accordingly.
  - **Impact if Faulty:** Incorrect values may cause **incorrect emissions monitoring, fuel mixture errors, or unnecessary warning lights (CELs).**
- 

### 312. Level of the Left Half of the Tank

- **Definition:** Measures the **fuel level in the left side of a split fuel tank system**, commonly found in BMWs and other high-performance vehicles.
  - **Example Usage:** Helps ensure **accurate fuel level readings and balanced fuel transfer between both halves of the tank.**
  - **Impact if Faulty:** If misread, it can cause **incorrect fuel gauge readings, improper fuel balancing, or fuel starvation issues.**
-

### **313. Level of the Right Half of the Tank**

- **Definition:** Similar to **sensor #312**, but monitors the **fuel level in the right side of a split fuel tank system**.
  - **Example Usage:** Ensures **even fuel consumption and prevents fuel imbalance issues**.
  - **Impact if Faulty:** Incorrect readings may cause **fuel transfer malfunctions, leading to inaccurate range estimations or unexpected fuel starvation**.
- 

### **314. Lithium-Ion Starter Battery - Deep Discharge Status (With Single Cell Status at LISB)**

- **Definition:** Detects whether the **lithium-ion starter battery has undergone a deep discharge**, along with monitoring individual cell statuses.
  - **Example Usage:** Helps **prevent battery degradation and protects against over-discharge conditions**.
  - **Impact if Faulty:** If misread, it may cause **unexpected battery failures, charging malfunctions, or inaccurate battery life predictions**.
- 

### **315. Lithium-Ion Starter Battery - Maximum Allowable Discharge Current**

- **Definition:** Sets the **safe limit for discharge current** in the **lithium-ion starter battery**, preventing excessive drain.
  - **Example Usage:** Protects **battery health and electrical components by ensuring controlled power usage**.
  - **Impact if Faulty:** If incorrect, it may cause **over-discharge, reducing battery lifespan and potentially leading to vehicle starting issues**.
- 

### **316. Lithium-Ion Starter Battery - Maximum Permissible Charging Current**

- **Definition:** Defines the **maximum charge current** the lithium-ion starter battery can handle safely.
- **Example Usage:** Ensures **optimal charging speed without overheating or damaging the battery cells**.

- **Impact if Faulty:** If incorrect, it may lead to **overcharging, increased battery degradation, or insufficient charging performance.**
- 

### 317. Lithium-Ion Starter Battery - Nominal Voltage of the Storage Unit

- **Definition:** Measures the **baseline operating voltage of the lithium-ion starter battery**, typically around 12V or 48V.
  - **Example Usage:** Ensures that the **battery operates within safe voltage limits** for system stability.
  - **Impact if Faulty:** If misread, it can cause **electrical malfunctions, charging system errors, or vehicle no-start conditions.**
- 

### 318. Lithium-Ion Starter Battery - Quality Value Internal Resistance

- **Definition:** Monitors the **internal resistance of the lithium-ion battery**, which affects efficiency and performance over time.
  - **Example Usage:** Helps predict **battery aging and potential failure risks.**
  - **Impact if Faulty:** Incorrect readings may lead to **unexpected battery failures or inaccurate state-of-health (SOH) estimations.**
- 

### 319. Lithium-Ion Starter Battery - Status Symmetrization

- **Definition:** Ensures that **voltage levels are evenly distributed across battery cells**, preventing imbalances.
  - **Example Usage:** Used in **battery management systems (BMS)** to **equalize charge across all cells** for longevity.
  - **Impact if Faulty:** If incorrect, it may cause **premature battery wear, reduced charge capacity, or potential overheating.**
- 

### 320. Lithium-Ion Starter Battery - Voltage Cell 1

- **Definition:** Measures the **voltage of the first individual cell** in the lithium-ion starter battery.

- **Example Usage:** Helps monitor **battery cell health** and detect weak or failing cells.
  - **Impact if Faulty:** Incorrect values may cause **unbalanced charging, reduced battery efficiency, or sudden battery failure.**
- 

### 321. Lithium-Ion Starter Battery - Voltage Cell 2

- **Definition:** Measures the **voltage of the second individual cell** in the lithium-ion starter battery.
  - **Example Usage:** Ensures **even charge distribution across battery cells** and detects **imbalanced or failing cells.**
  - **Impact if Faulty:** If misread, it may cause **battery cell degradation, uneven charging, or reduced battery efficiency.**
- 

### 322. Lithium-Ion Starter Battery - Voltage Cell 3

- **Definition:** Measures the **voltage of the third individual cell** in the lithium-ion starter battery.
  - **Example Usage:** Helps in **monitoring cell health** and **preventing overcharging or discharging of specific cells.**
  - **Impact if Faulty:** Incorrect readings can lead to **battery capacity reduction, risk of overheating, or premature failure.**
- 

### 323. Lithium-Ion Starter Battery - Voltage Cell 4

- **Definition:** Measures the **voltage of the fourth individual cell** in the lithium-ion starter battery.
  - **Example Usage:** Ensures that **all battery cells remain within their optimal voltage range** for balanced performance.
  - **Impact if Faulty:** A failing cell may cause **unbalanced charging, affecting overall battery longevity and efficiency.**
-

### **324. Lithium-Ion Starter Battery - Degree of Desymmetrization of the Memory**

- **Definition:** Tracks how **balanced the battery cells are in terms of charge level and voltage symmetry**.
  - **Example Usage:** Ensures **all cells contribute evenly to power output**, reducing stress on individual cells.
  - **Impact if Faulty:** If imbalanced, certain cells may **wear out faster**, leading to **reduced battery lifespan or unexpected power loss**.
- 

### **325. Low Fuel Pressure Sensor - Raw Fuel Pressure Value**

- **Definition:** Measures the **unprocessed fuel pressure reading** from the **low-pressure fuel system** before adjustments are made by the ECU.
  - **Example Usage:** Helps regulate **fuel pump performance and fuel injection pressure**.
  - **Impact if Faulty:** Incorrect values may cause **poor fuel delivery, rough idling, or misfires due to incorrect air-fuel mixture**.
- 

### **326. Lowest Oil Temperature Measured in the Driving Cycle**

- **Definition:** Records the **minimum oil temperature observed** during the current driving session.
  - **Example Usage:** Helps optimize **engine warm-up strategies and prevent excessive cold starts**.
  - **Impact if Faulty:** If misread, the ECU may **incorrectly adjust oil viscosity compensation, leading to increased wear and fuel consumption**.
- 

### **327. Mass Flow HFM 16-Bit Size Bank 2**

- **Definition:** Measures the **mass airflow reading** from the **hot film mass air flow (HFM) sensor** for **Bank 2**, with a **16-bit resolution** for high accuracy.
- **Example Usage:** Helps regulate **air-fuel mixture and boost pressure** in **turbocharged engines**.

- **Impact if Faulty:** If miscalculated, it may cause **incorrect fuel delivery, loss of power, or excessive emissions.**
- 

### 328. Mass Flow of Tank Ventilation into the Intake Manifold

- **Definition:** Measures the **amount of fuel vapor being purged from the fuel tank** into the **intake manifold** via the evaporative emissions system (EVAP).
  - **Example Usage:** Helps optimize **fuel vapor recovery**, reducing **fuel loss and emissions.**
  - **Impact if Faulty:** If too high or low, it may cause **fuel vapor buildup, failed emissions tests, or check engine light (CEL) activation.**
- 

### 329. Mass Flow Through Throttle Valve Bank 1

- **Definition:** Measures the **amount of air passing through the throttle valve in Bank 1** of the engine.
  - **Example Usage:** Ensures accurate **throttle response, air-fuel mixture adjustments, and boost control.**
  - **Impact if Faulty:** If incorrect, it may cause **throttle lag, unresponsive acceleration, or poor fuel economy.**
- 

### 330. Maximum Engine Temperature That Has Occurred

- **Definition:** Records the **highest engine temperature observed** during a specific driving period.
  - **Example Usage:** Helps in **thermal management and overheating prevention strategies.**
  - **Impact if Faulty:** If the reading is incorrect, the ECU may **fail to activate cooling systems properly, leading to overheating risks.**
- 

### 331. Maximum Frozen Supply Voltage

- **Definition:** Records the **highest voltage level** of the vehicle's electrical system when the ECU detects a **frozen voltage condition** (i.e., a stable but excessive voltage).
  - **Example Usage:** Helps protect **electrical components from damage due to excessive voltage surges**.
  - **Impact if Faulty:** If misread, the ECU may **fail to regulate voltage properly, leading to battery overcharging, alternator issues, or electrical failures**.
- 

### 332. Maximum Permissible Vehicle Acceleration

- **Definition:** Sets the **upper limit for safe vehicle acceleration**, considering engine power, traction, and stability control parameters.
  - **Example Usage:** Helps prevent **wheel spin, excessive drivetrain stress, or traction loss** under acceleration.
  - **Impact if Faulty:** If incorrectly set, it may **limit acceleration unnecessarily or fail to intervene when needed**, leading to traction issues.
- 

### 333. Maximum Speed Clutch

- **Definition:** Measures the **highest recorded rotational speed of the clutch assembly** during operation.
  - **Example Usage:** Helps monitor **clutch performance and wear over time**.
  - **Impact if Faulty:** Incorrect readings may lead to **clutch slippage, excessive wear, or unexpected clutch failure**.
- 

### 334. Maximum Value Raw Value of the Intake Air Temperature

- **Definition:** Records the **highest raw temperature reading** from the **intake air temperature sensor** during a driving cycle.
- **Example Usage:** Helps in **adjusting fuel injection and ignition timing** to prevent knocking.
- **Impact if Faulty:** If incorrect, it may cause **overly rich or lean fuel mixtures, reducing performance or increasing emissions**.

---

### 335. Measured Crankcase Ventilation Pressure

- **Definition:** Measures the **pressure inside the crankcase ventilation system**, ensuring that engine blow-by gases are correctly recycled.
  - **Example Usage:** Helps optimize **PCV (Positive Crankcase Ventilation) system function**, preventing oil leaks and excess emissions.
  - **Impact if Faulty:** If misread, it may lead to **excess oil consumption, increased emissions, or engine oil contamination**.
- 

### 336. Measured Engine Temperature in the First Start of the Driving Cycle, Linearized and Converted

- **Definition:** Records the **engine temperature at first start** and applies **linearization and conversion** for better ECU calculations.
  - **Example Usage:** Used to optimize **cold start enrichment, ignition timing, and emissions control**.
  - **Impact if Faulty:** Incorrect values may cause **hard starting, excessive emissions, or poor fuel economy**.
- 

### 337. Measured Temperature According to OPF

- **Definition:** Measures the **temperature inside the Otto Particulate Filter (OPF)**, which captures fine exhaust particulates.
  - **Example Usage:** Ensures **optimal filter regeneration and emissions compliance**.
  - **Impact if Faulty:** Incorrect values may **prevent proper OPF regeneration, leading to excessive backpressure or emissions failures**.
- 

### 338. Measured Temperature Before OPF

- **Definition:** Records the **exhaust gas temperature before entering the Otto Particulate Filter (OPF)**.

- **Example Usage:** Helps determine **when OPF regeneration is needed** to burn off trapped particulates.
  - **Impact if Faulty:** Incorrect data may cause **delayed or incomplete filter regeneration, leading to clogging or power loss.**
- 

### 339. Measured Temperature Before UBKAT

- **Definition:** Measures the **exhaust gas temperature before the underbody catalytic converter (UBKAT).**
  - **Example Usage:** Ensures that the **catalyst operates at the correct temperature for optimal emissions reduction.**
  - **Impact if Faulty:** If misread, it may cause **incomplete combustion, excessive NOx emissions, or check engine light activation.**
- 

### 340. Measured Temperature Behind UBKAT

- **Definition:** Measures the **exhaust gas temperature after passing through the underbody catalytic converter (UBKAT).**
  - **Example Usage:** Ensures that the **catalyst is functioning efficiently** by monitoring temperature changes before and after.
  - **Impact if Faulty:** Incorrect values may cause **false catalyst efficiency faults, emissions test failures, or excessive fuel consumption.**
- 

### 341. Medium Voltage Rail Pressure Sensor

- **Definition:** Measures the **pressure in the medium-voltage fuel rail**, typically found in **direct injection systems.**
  - **Example Usage:** Helps regulate **fuel pressure for accurate injection timing and atomization.**
  - **Impact if Faulty:** Incorrect readings can cause **poor fuel atomization, reduced power output, or injector misfires.**
-

#### **342. Mileage Fuel Delivery Module**

- **Definition:** Tracks the **total mileage the fuel delivery module (fuel pump system) has operated.**
  - **Example Usage:** Helps predict **fuel pump wear and schedule preventive maintenance.**
  - **Impact if Faulty:** A misread value may lead to **unexpected fuel pump failure or inaccurate service intervals.**
- 

#### **343. Mileage When Installing the Current Battery**

- **Definition:** Records the **odometer reading at the time of the most recent battery replacement.**
  - **Example Usage:** Helps track **battery lifespan and diagnose electrical system performance issues.**
  - **Impact if Faulty:** If incorrect, it may lead to **inaccurate battery maintenance schedules or premature replacement.**
- 

#### **344. Minimum Engine Temperature That Occurred**

- **Definition:** Logs the **lowest engine temperature recorded during the current driving cycle.**
  - **Example Usage:** Helps optimize **cold start fuel enrichment and oil viscosity adjustments.**
  - **Impact if Faulty:** Incorrect readings may cause **excessive fuel enrichment, leading to poor fuel economy and high emissions.**
- 

#### **345. Minimum Frozen Supply Voltage**

- **Definition:** Records the **lowest supply voltage observed during a system freeze condition, indicating electrical stability issues.**
- **Example Usage:** Used to diagnose **battery health, alternator performance, and electrical faults.**

- **Impact if Faulty:** Incorrect data may cause **unnecessary battery warnings or prevent proper voltage regulation.**
- 

#### **346. Minimum Value Raw Value of the Intake Air Temperature**

- **Definition:** Records the **lowest raw temperature measurement** from the **intake air temperature sensor**.
  - **Example Usage:** Helps adjust **air-fuel mixture and ignition timing for different operating conditions.**
  - **Impact if Faulty:** Incorrect readings may lead to **poor cold-start performance, fuel mixture imbalances, or false sensor faults.**
- 

#### **347. Minimum, Absolute, Permitted State of Charge of the HV Battery**

- **Definition:** Defines the **lowest allowable charge level** for a **high-voltage (HV) battery**, preventing excessive discharge.
  - **Example Usage:** Protects **battery longevity in hybrid and electric vehicles.**
  - **Impact if Faulty:** If set incorrectly, it may cause **battery degradation, reduced EV range, or unexpected shutdowns.**
- 

#### **348. Misfire Detection Counter Cylinder 1**

- **Definition:** Counts the **number of misfires detected in Cylinder 1.**
  - **Example Usage:** Helps in **diagnosing ignition, fuel, or compression issues.**
  - **Impact if Faulty:** If misread, it may cause **false misfire codes, rough idling, or excessive emissions.**
- 

#### **349. Misfire Detection Counter Cylinder 2**

- **Definition:** Similar to **sensor #348**, but for **Cylinder 2.**
- **Example Usage:** Ensures **cylinder-specific misfire detection for accurate troubleshooting.**

- **Impact if Faulty:** A bad reading may lead to **incorrect fuel mixture adjustments, causing performance loss.**
- 

### 350. Misfire Detection Counter Cylinder 3

- **Definition:** Tracks misfires occurring in **Cylinder 3**.
  - **Example Usage:** Helps **detect ignition failures, fuel delivery problems, or compression losses.**
  - **Impact if Faulty:** Incorrect data may **cause the ECU to ignore real misfires or falsely trigger a check engine light (CEL).**
- 

### 351. Misfire Detection Counter Cylinder 4

- **Definition:** Tracks the **number of misfires occurring in Cylinder 4** during operation.
  - **Example Usage:** Helps identify **ignition system faults, fuel injection issues, or cylinder compression problems.**
  - **Impact if Faulty:** Incorrect readings may cause **false CEL (Check Engine Light) activation, poor engine performance, or excessive emissions.**
- 

### 352. Misfire Detection Counter Cylinder 5

- **Definition:** Records the **misfire count for Cylinder 5**, assisting in engine diagnostics.
  - **Example Usage:** Helps detect **cylinder-specific fuel mixture issues, ignition failures, or valve timing problems.**
  - **Impact if Faulty:** If misread, the ECU may **fail to adjust fuel trims properly, causing rough idling or loss of power.**
- 

### 353. Misfire Detection Counter Cylinder 6

- **Definition:** Counts the **misfires occurring in Cylinder 6** during a driving cycle.

- **Example Usage:** Aids in diagnosing ignition coil failures, clogged fuel injectors, or timing belt issues.
  - **Impact if Faulty:** If incorrect, it may cause delayed engine repairs, leading to catalytic converter damage or fuel inefficiency.
- 

#### 354. Misfire Detection Counter Cylinder 7

- **Definition:** Measures the misfire rate in Cylinder 7 in V8 or inline-6 engines with cylinder deactivation technology.
  - **Example Usage:** Used for cylinder-specific troubleshooting and adaptive engine management.
  - **Impact if Faulty:** If the ECU fails to detect real misfires, it may cause knocking, excess fuel use, or engine overheating.
- 

#### 355. Misfire Detection Counter Cylinder 8

- **Definition:** Tracks misfires in Cylinder 8, helping detect ignition or fuel delivery issues.
  - **Example Usage:** Helps optimize cylinder deactivation in fuel-saving engine modes.
  - **Impact if Faulty:** Incorrect readings may result in excessive engine vibrations, poor acceleration, or unnecessary CEL warnings.
- 

#### 356. Misfire Detection Counter Cylinder 9

- **Definition:** Counts misfires detected in Cylinder 9 in high-performance V10 engines.
  - **Example Usage:** Used in advanced diagnostics for high-revving engines.
  - **Impact if Faulty:** Misread values may lead to misfire misdiagnosis, potentially damaging the engine if left unresolved.
- 

#### 357. Misfire Detection Counter Cylinder 10

- **Definition:** Tracks **misfire incidents in Cylinder 10**, typically in **V10-powered vehicles**.
  - **Example Usage:** Helps maintain **optimal ignition timing and fuel delivery** for high-output engines.
  - **Impact if Faulty:** If incorrect, it may cause **engine hesitation, excessive fuel consumption, or unbalanced engine operation**.
- 

#### **358. Misfire Detection Counter Cylinder 11**

- **Definition:** Measures **misfire rates for Cylinder 11** in **V12 or race-tuned engines**.
  - **Example Usage:** Ensures that **all cylinders contribute evenly to power output**, preventing mechanical imbalance.
  - **Impact if Faulty:** Faulty readings may cause **delayed troubleshooting, performance degradation, or increased emissions**.
- 

#### **359. Misfire Detection Counter Cylinder 12**

- **Definition:** Records **misfire activity in Cylinder 12**, primarily in **V12 engines found in luxury or sports cars**.
  - **Example Usage:** Helps protect **expensive high-performance engines from early wear** due to misfires.
  - **Impact if Faulty:** If incorrect, the system may **fail to detect a failing spark plug or injector, leading to costly repairs**.
- 

#### **360. Model-Calculated Maximum Intake Air Temperature**

- **Definition:** Estimates the **maximum air temperature inside the intake manifold**, based on sensor data and ECU calculations.
- **Example Usage:** Used for **preventing detonation, optimizing fuel injection, and improving turbocharger efficiency**.
- **Impact if Faulty:** Incorrect readings may cause **engine knock, turbo lag, or improper fuel mixture adjustments**.

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### 361. Moment Reserve

- **Definition:** Measures the **available engine torque reserve** that can be used for additional acceleration or load handling.
  - **Example Usage:** Helps **optimize throttle response and prevent unnecessary downshifting** in automatic transmissions.
  - **Impact if Faulty:** Incorrect values may cause **laggy acceleration, inefficient gear shifts, or unnecessary fuel consumption.**
- 

### 362. Motor Temperature Between 113°C and 120°C

- **Definition:** Detects when the **engine temperature falls within the range of 113°C to 120°C**, which is **high but still within operational limits**.
  - **Example Usage:** Helps activate **cooling strategies** such as **higher fan speed or reduced turbo boost pressure**.
  - **Impact if Faulty:** If not detected properly, the ECU may **fail to activate cooling measures, leading to engine overheating**.
- 

### 363. Motor Temperature Between 121°C and 125°C

- **Definition:** Indicates when **engine temperature rises above 121°C but remains below 125°C**, approaching critical overheating.
  - **Example Usage:** Triggers **preemptive safety measures** such as **limiting RPM or enriching fuel mixture** to reduce heat.
  - **Impact if Faulty:** Failure to detect this condition may result in **permanent engine damage due to excessive heat buildup**.
- 

### 364. Motor Temperature Between 98°C and 112°C

- **Definition:** Monitors if the **engine is operating within the normal temperature range** of 98°C to 112°C.

- **Example Usage:** Ensures **optimal fuel combustion and lubrication** for maximum efficiency.
  - **Impact if Faulty:** Incorrect readings can cause **unnecessary cooling activation or failure to detect an overheating issue**.
- 

### 365. Motor Temperature Greater Than 125°C

- **Definition:** Triggers a warning when **engine temperature exceeds 125°C**, indicating **severe overheating**.
  - **Example Usage:** Initiates **emergency shutdown procedures** to prevent **head gasket failure or piston damage**.
  - **Impact if Faulty:** If the ECU does not register this warning correctly, it may **fail to protect the engine, leading to catastrophic failure**.
- 

### 366. Motor Temperature Less Than 98°C

- **Definition:** Detects if the **engine is running cooler than expected**, below 98°C.
  - **Example Usage:** Helps in adjusting **fuel injection, ignition timing, and idle control** during cold starts.
  - **Impact if Faulty:** Incorrect readings can **prevent the engine from reaching optimal operating temperature, reducing efficiency and increasing emissions**.
- 

### 367. Motor Temperature Reference Value from Model

- **Definition:** A **calculated estimate** of the engine's ideal operating temperature based on external conditions, load, and cooling efficiency.
  - **Example Usage:** Helps adjust **coolant flow rate and fan activation timing** dynamically.
  - **Impact if Faulty:** If miscalculated, it may cause **delayed cooling activation, increasing the risk of overheating**.
- 

### 368. Motor Temperature, Linearized and Converted

- **Definition:** A refined version of engine temperature data, filtered to remove noise and converted into a standard scale for ECU processing.
  - **Example Usage:** Ensures accurate engine management decisions based on clean temperature data.
  - **Impact if Faulty:** If the conversion is incorrect, it may lead to false overheating warnings or incorrect fuel mixture adjustments.
- 

### 369. Multiplicative Mixture Correction of Mixture Adaptation Bank 2

- **Definition:** Measures the correction factor applied to the fuel mixture for Bank 2, adjusting for long-term fuel trim changes.
  - **Example Usage:** Helps maintain proper air-fuel ratios and prevent lean or rich conditions.
  - **Impact if Faulty:** If incorrect, it may cause uneven fuel delivery between banks, leading to rough idling or poor emissions.
- 

### 370. Multiplicative Mixture Correction of the Mixture Adaptation

- **Definition:** Similar to sensor #369, but applies to all cylinders rather than just Bank 2.
  - **Example Usage:** Helps fine-tune long-term fuel mixture control for efficiency and emissions compliance.
  - **Impact if Faulty:** Incorrect values may result in fuel consumption issues, knocking, or sluggish throttle response.
- 

### 371. Normalized Accelerator Pedal Angle

- **Definition:** Measures the relative position of the accelerator pedal, normalized to a percentage scale (0-100%).
- **Example Usage:** Used to control throttle response, engine power output, and fuel delivery.
- **Impact if Faulty:** If misread, it may cause delayed acceleration, unresponsive throttle, or excessive fuel consumption.

---

### **372. Normalized Heating Output of Lambda Probe 2 Behind Cat Bank 2**

- **Definition:** Measures the **normalized heating power applied to Lambda Sensor 2 behind the catalytic converter in Bank 2.**
  - **Example Usage:** Ensures the **oxygen sensor reaches operating temperature quickly for accurate emissions control.**
  - **Impact if Faulty:** A faulty heater output can cause **delayed fuel mixture corrections, increased emissions, or sensor failure.**
- 

### **373. Normalized Heating Output of the Lambda Probe Behind Cat**

- **Definition:** Similar to **sensor #372**, but applies to **all banks or a single-bank engine.**
  - **Example Usage:** Ensures **stable oxygen sensor operation for fuel trim adjustments.**
  - **Impact if Faulty:** If incorrect, it may lead to **incorrect fuel mixture readings, check engine lights, or high fuel consumption.**
- 

### **374. Normalized Heating Output of the Lambda Probe Behind Cat Bank 2**

- **Definition:** Measures the **normalized heater power applied to the post-catalyst Lambda sensor in Bank 2.**
  - **Example Usage:** Ensures the **oxygen sensor functions properly even in cold conditions.**
  - **Impact if Faulty:** Incorrect heating may cause **sensor failure, poor fuel economy, or incorrect emissions reporting.**
- 

### **375. Normalized Heating Output, HEGO Sensor 3 Bank 1**

- **Definition:** Measures the **heater control level for the third Heated Exhaust Gas Oxygen (HEGO) sensor in Bank 1.**
- **Example Usage:** Used in **fuel efficiency optimization and emissions monitoring.**

- **Impact if Faulty:** If misread, the ECU may **fail to activate the sensor heater properly, leading to inaccurate fuel mixture adjustments.**
- 

### 376. Normalized Reference Level Knock Control Cylinder 1

- **Definition:** Measures the **baseline knock detection level** for Cylinder 1, normalized to a reference scale.
  - **Example Usage:** Helps in **ignition timing adjustments to prevent knocking and engine damage.**
  - **Impact if Faulty:** Incorrect readings may cause **pre-ignition (knocking), loss of power, or excessive fuel consumption.**
- 

### 377. Normalized Reference Level Knock Control Cylinder 2

- **Definition:** Similar to **sensor #376**, but applies to **Cylinder 2**.
  - **Example Usage:** Helps in **individual cylinder knock correction for better performance.**
  - **Impact if Faulty:** Incorrect readings may lead to **false knock detections, causing timing retardation and reduced engine power.**
- 

### 378. Normalized Reference Level Knock Control Cylinder 3

- **Definition:** Measures the **knock detection threshold** for **Cylinder 3**, ensuring optimal spark timing.
  - **Example Usage:** Helps prevent **detonation, which can damage pistons and cylinder walls.**
  - **Impact if Faulty:** A bad reading may result in **delayed ignition timing, rough idling, or potential engine failure.**
- 

### 379. Normalized Reference Level Knock Control Cylinder 4

- **Definition:** Monitors the **knock control threshold** for **Cylinder 4**, ensuring it stays within safe limits.

- **Example Usage:** Used to adjust **fuel mixture and ignition timing dynamically** for efficient performance.
  - **Impact if Faulty:** If incorrect, it may cause **knock misinterpretation, leading to unnecessary power reduction or mechanical damage.**
- 

### **380. Normalized Reference Level of Knock Control Cylinder 5**

- **Definition:** Measures the **knock detection reference level** for **Cylinder 5**, ensuring the ECU can adjust timing properly.
  - **Example Usage:** Helps maintain **efficient combustion and protects against premature detonation.**
  - **Impact if Faulty:** If the knock sensor is inaccurate, it may cause **excessive ignition timing retardation, reducing power and fuel efficiency.**
- 

### **381. Normalized Reference Level of Knock Control Cylinder 6**

- **Definition:** Measures the **knock detection reference level** for **Cylinder 6**, ensuring proper ignition timing adjustments.
  - **Example Usage:** Helps prevent **detonation (knocking) and protects engine components from excessive stress.**
  - **Impact if Faulty:** Incorrect readings may cause **unnecessary power loss due to excessive timing retardation or increased risk of engine knocking.**
- 

### **382. Number of Dense EVAP Systems Recognized by Diagnosis**

- **Definition:** Tracks how many **evaporative emissions control (EVAP) system tests** have detected a properly sealed system.
  - **Example Usage:** Helps ensure **fuel vapors are properly captured and prevented from escaping into the atmosphere.**
  - **Impact if Faulty:** If misread, it may cause **false emissions system faults, unnecessary EVAP repairs, or excessive fuel vapor loss.**
-

### **383. Number of Detected VVT Position Control Error Warnings Reversible**

- **Definition:** Counts how many **variable valve timing (VVT) errors** have been detected but can be **corrected without permanent faults**.
  - **Example Usage:** Helps monitor **VVT actuator efficiency and adjust valve timing dynamically**.
  - **Impact if Faulty:** If the system miscounts errors, it may cause **delayed VVT adjustments, leading to performance loss or increased emissions**.
- 

### **384. Number of Detected VVT Position Control Errors**

- **Definition:** Tracks the total **number of errors in the VVT system**, regardless of reversibility.
  - **Example Usage:** Used to **detect persistent VVT malfunctions that require intervention**.
  - **Impact if Faulty:** If incorrect, it may cause **timing misalignment, poor fuel efficiency, or loss of engine power**.
- 

### **385. Number of Recognized VVT Position Control Error Warnings Irreversible**

- **Definition:** Counts **VVT control errors that cannot be automatically corrected by the ECU**.
  - **Example Usage:** Helps diagnose **mechanical VVT faults such as stuck cam phasers or solenoid failures**.
  - **Impact if Faulty:** Incorrect readings may cause **false warnings, unnecessary repairs, or failure to detect critical VVT issues**.
- 

### **386. Offset Comparison of Ambient Pressure with Actual Oil Pressure Value (with Temperature Correction)**

- **Definition:** Compares **measured oil pressure to ambient pressure** after adjusting for temperature effects.
- **Example Usage:** Ensures **the oil pump is delivering proper pressure relative to external conditions**.

- **Impact if Faulty:** A bad reading may cause **incorrect oil pressure regulation, leading to potential lubrication failures or false low oil warnings.**
- 

### **387. Offset Corrected Probe Voltage in Front of Cat of a Broadband Lambda Probe Bank 2**

- **Definition:** Measures the **adjusted voltage output** of the **wideband oxygen sensor in Bank 2**, located before the catalytic converter.
  - **Example Usage:** Helps the ECU **accurately determine air-fuel mixture for emissions compliance.**
  - **Impact if Faulty:** Incorrect values may cause **incorrect fuel trims, poor fuel economy, or high emissions.**
- 

### **388. Oil Level Measurement, Reading, Last Level from Minimum Detection**

- **Definition:** Records the **last detected oil level** that triggered a **low oil warning.**
  - **Example Usage:** Helps **monitor oil consumption trends and detect leaks or excessive burning.**
  - **Impact if Faulty:** Incorrect readings may cause **false oil level warnings or failure to alert the driver of dangerously low oil levels.**
- 

### **389. Oil Level Measurement, Reading, Level from Detail Measurement**

- **Definition:** Measures the **exact engine oil level** based on a detailed sensor reading rather than a general warning threshold.
  - **Example Usage:** Helps **track oil usage precisely and predict when an oil change is needed.**
  - **Impact if Faulty:** If incorrect, it may cause **inaccurate oil level readings, leading to overfilling or running the engine with insufficient oil.**
- 

### **390. Oil Level Measurement, Reading, Level from Minimum Detection**

- **Definition:** Similar to **sensor #388**, but provides a more recent measurement of when oil reached the **minimum safe level**.
  - **Example Usage:** Helps **diagnose sudden oil loss or gradual consumption over time**.
  - **Impact if Faulty:** Incorrect data may lead to **late oil warnings, causing potential engine damage due to insufficient lubrication**.
- 

### **391. Oil Level Measurement, Reading, Longitudinal Tilt**

- **Definition:** Measures the **engine oil level while considering the longitudinal tilt (front-to-back incline) of the vehicle**.
  - **Example Usage:** Helps provide **accurate oil level readings even when the car is parked on a slope**.
  - **Impact if Faulty:** Incorrect readings may cause **false low oil warnings or failure to detect actual low oil levels**.
- 

### **392. Oil Level Measurement, Reading, Oil Level Sensor Value**

- **Definition:** Measures the **raw sensor output** from the engine oil level sensor before any ECU processing.
  - **Example Usage:** Helps ensure the **sensor itself is functioning correctly** before applying corrections for tilt or temperature.
  - **Impact if Faulty:** A failing sensor may cause **erroneous oil level readings, leading to incorrect warnings or missed maintenance alerts**.
- 

### **393. Oil Level Measurement, Reading, Tilt Transverse**

- **Definition:** Measures the **engine oil level while considering the transverse tilt (side-to-side incline) of the vehicle**.
- **Example Usage:** Helps improve **oil level accuracy when the car is parked on uneven terrain**.
- **Impact if Faulty:** Incorrect values may cause **false low oil warnings or an undetected oil shortage in real driving conditions**.

---

#### 394. Oil Level Min Recognition Last Level (Flash-Resistant)

- **Definition:** Stores the **last recorded minimum oil level** in non-volatile memory, meaning it remains even after a system reset.
  - **Example Usage:** Helps track **oil consumption trends over time**, even if the battery is disconnected.
  - **Impact if Faulty:** If not recorded correctly, the ECU may **fail to alert drivers of persistent oil loss issues**.
- 

#### 395. Oil Life

- **Definition:** Estimates the **remaining useful life of the engine oil** based on **mileage, temperature, and engine load**.
  - **Example Usage:** Helps determine **optimal oil change intervals**, reducing unnecessary maintenance costs.
  - **Impact if Faulty:** If incorrect, the ECU may **recommend oil changes too soon (wasting resources) or too late (risking engine wear)**.
- 

#### 396. Oil Pressure

- **Definition:** Measures the **real-time oil pressure in the engine lubrication system**.
  - **Example Usage:** Ensures **proper lubrication to prevent engine damage** due to oil starvation.
  - **Impact if Faulty:** Incorrect readings may cause **false low oil pressure warnings or failure to detect dangerous pressure drops**.
- 

#### 397. Oil Pressure Regulator I Component

- **Definition:** Monitors the **performance of the first stage of the oil pressure regulator**, which controls oil flow based on engine demand.
- **Example Usage:** Helps adjust **oil pressure dynamically to reduce engine friction and improve efficiency**.

- **Impact if Faulty:** If malfunctioning, the ECU may **fail to regulate oil flow properly, causing excess wear or pressure buildup.**
- 

### 398. Oil Pressure Regulator D Component

- **Definition:** Monitors the **performance of the second stage (D-component) of the oil pressure regulator**, which fine-tunes oil pressure based on driving conditions.
  - **Example Usage:** Ensures **consistent lubrication across different RPM ranges.**
  - **Impact if Faulty:** Incorrect regulation may lead to **oil starvation under load or excess pressure that stresses engine seals.**
- 

### 399. Oil Pressure Regulator P Component

- **Definition:** Tracks the **proportional component (P-component) of oil pressure regulation**, which makes continuous small adjustments to oil pressure.
  - **Example Usage:** Helps **stabilize oil pressure across various temperatures and loads.**
  - **Impact if Faulty:** A faulty P-component may cause **fluctuating oil pressure, leading to inconsistent lubrication.**
- 

### 400. Oil Pressure Sensor Signal

- **Definition:** Measures the **voltage signal output from the oil pressure sensor**, which is interpreted by the ECU.
  - **Example Usage:** Provides a **real-time signal to monitor oil pressure stability and detect leaks or blockages.**
  - **Impact if Faulty:** If incorrect, the ECU may **misinterpret oil pressure levels, leading to unnecessary warnings or missed oil-related failures.**
- 

### 401. Oil Temperature

- **Definition:** Measures the **real-time temperature of the engine oil**, which is crucial for engine lubrication and performance.

- **Example Usage:** Helps adjust **cooling strategies, fuel injection, and ignition timing** to prevent overheating.
  - **Impact if Faulty:** Incorrect readings may cause **engine overheating, excessive wear, or incorrect oil viscosity adjustments.**
- 

#### 402. Oil Temperature After Filter

- **Definition:** Measures the **temperature of the oil after passing through the oil filter**, providing insight into **filter efficiency and engine cooling.**
  - **Example Usage:** Helps diagnose **clogged oil filters or excessive friction inside the engine.**
  - **Impact if Faulty:** Incorrect values may cause **delayed filter replacements or overheating due to restricted oil flow.**
- 

#### 403. Oil Temperature at Start

- **Definition:** Records the **oil temperature at the moment of engine startup**, which helps optimize cold-start behavior.
  - **Example Usage:** Used to **adjust fuel mixture and engine warm-up speed for efficiency.**
  - **Impact if Faulty:** Incorrect readings may cause **poor cold starts, excessive fuel use, or inefficient warm-up.**
- 

#### 404. Oil Temperature in the Sump

- **Definition:** Measures the **oil temperature in the oil sump (bottom of the engine)**, where oil collects before being recirculated.
  - **Example Usage:** Ensures **oil stays within the optimal viscosity range for engine protection.**
  - **Impact if Faulty:** Incorrect readings may lead to **excessive oil wear, incorrect viscosity adjustments, or lubrication failure.**
-

#### **405. Oil Temperature Unfiltered**

- **Definition:** Provides the **raw, unprocessed oil temperature data** before ECU adjustments or filtering.
  - **Example Usage:** Helps detect **sudden temperature spikes or oil cooling inefficiencies**.
  - **Impact if Faulty:** Misread values can lead to **delayed cooling fan activation, incorrect fuel adjustments, or false overheating warnings**.
- 

#### **406. Operating Hours Counter**

- **Definition:** Tracks the **total number of hours the engine has been running**, regardless of mileage.
  - **Example Usage:** Helps schedule **maintenance based on engine usage rather than distance traveled**.
  - **Impact if Faulty:** If misread, it may cause **incorrect service intervals, leading to delayed maintenance or unnecessary repairs**.
- 

#### **407. Operating Hours of Fuel Delivery Module**

- **Definition:** Measures the **total runtime of the fuel pump and fuel delivery system**, helping predict component lifespan.
  - **Example Usage:** Used to **schedule fuel pump replacements and diagnose fuel system issues**.
  - **Impact if Faulty:** Incorrect readings may cause **unexpected fuel pump failures or unnecessary early replacements**.
- 

#### **408. Operating Status of Electrical Wastegate Bank 2**

- **Definition:** Monitors the **status of the electronic wastegate actuator on Bank 2** in a twin-turbo system.
- **Example Usage:** Helps **regulate turbo boost pressure** for performance and fuel efficiency.

- **Impact if Faulty:** A failing wastegate may cause **turbo overboost, reduced power, or increased turbo wear.**
- 

#### 409. Operating Status of the Electrical Wastegate

- **Definition:** Similar to **sensor #408**, but applies to **all banks or a single turbocharger setup.**
  - **Example Usage:** Ensures that **the wastegate is functioning properly to prevent excessive boost pressure.**
  - **Impact if Faulty:** Incorrect readings may lead to **boost spikes, turbo failure, or poor throttle response.**
- 

#### 410. Operating Time Since the Last Successful Regeneration

- **Definition:** Tracks how long the vehicle has been running since the **last successful Diesel Particulate Filter (DPF) or Otto Particulate Filter (OPF) regeneration.**
  - **Example Usage:** Helps determine **when the filter needs another regeneration cycle to prevent clogging.**
  - **Impact if Faulty:** Incorrect data may cause **delayed regeneration, leading to filter clogging, reduced power, or excessive emissions.**
- 

#### 411. Outlet NW: Angular Offset Reference Adaptation

- **Definition:** Measures the **baseline reference offset** for the **exhaust camshaft (NW - Nockenwelle) timing adaptation** in a variable valve timing (VVT) system.
  - **Example Usage:** Ensures that the **valve timing remains accurate over time, compensating for mechanical wear.**
  - **Impact if Faulty:** Incorrect readings may cause **poor exhaust gas flow, increased emissions, and reduced engine efficiency.**
- 

#### 412. Outlet NW: Angular Offset Fine Adaptation

- **Definition:** Tracks the **fine adjustments made to the exhaust camshaft position** to maintain optimal engine performance.
  - **Example Usage:** Helps optimize **engine breathing efficiency for better power output and emissions control.**
  - **Impact if Faulty:** If incorrect, it may lead to **timing misalignment, causing rough idling or power loss.**
- 

#### 413. Output Current of the Electric Machine

- **Definition:** Measures the **real-time current output from the electric motor** in hybrid or fully electric powertrains.
  - **Example Usage:** Helps regulate **power delivery and battery charging efficiency.**
  - **Impact if Faulty:** Incorrect readings may cause **power fluctuations, inefficient energy recovery, or unexpected power loss.**
- 

#### 414. Output Current of the Machine

- **Definition:** Similar to **sensor #413**, but refers to **general electric components such as alternators or starter-generators.**
  - **Example Usage:** Ensures that **electrical loads are balanced across the vehicle's power system.**
  - **Impact if Faulty:** A failing sensor may cause **charging issues, battery drain, or electrical failures.**
- 

#### 415. Output Duty Cycle for Tank Vent Valve

- **Definition:** Measures the **pulse width modulation (PWM) duty cycle** of the **evaporative emissions (EVAP) system tank vent valve.**
- **Example Usage:** Helps regulate **fuel vapor purge** to prevent excess pressure in the fuel system.
- **Impact if Faulty:** Incorrect values may cause **fuel vapor buildup, emissions failures, or check engine lights (CELs).**

---

#### **416. Output Duty Cycle for the Controller**

- **Definition:** Monitors the **PWM duty cycle used to control various engine actuators**, such as throttle position or turbo wastegate.
  - **Example Usage:** Ensures **precise control over electronic engine components**.
  - **Impact if Faulty:** If incorrect, it may cause **unstable engine behavior, poor throttle response, or inconsistent turbo boost**.
- 

#### **417. Output Duty Cycle for the Controller (Duplicate)**

- **Definition:** This sensor is likely a redundant or additional instance of **sensor #416**, applied to a specific system.
  - **Example Usage:** Used for **backup monitoring or secondary control in engine management**.
  - **Impact if Faulty:** Similar effects as **sensor #416**, leading to **performance inconsistencies**.
- 

#### **418. Output Manipulated Variable Circulating Air Valve**

- **Definition:** Measures the **control signal output for the recirculating air valve**, which helps regulate airflow in turbocharged engines.
  - **Example Usage:** Ensures **smooth turbo transitions by redirecting excess boost pressure**.
  - **Impact if Faulty:** If malfunctioning, it may cause **turbo lag, boost pressure spikes, or excessive engine wear**.
- 

#### **419. Output Manipulated Variable Exhaust Flap**

- **Definition:** Tracks the **electronic control signal sent to the exhaust flap**, which helps adjust exhaust backpressure and noise levels.
- **Example Usage:** Used in **performance exhaust systems to modify engine sound and optimize exhaust flow**.

- **Impact if Faulty:** Incorrect readings may lead to **unwanted noise, restricted exhaust flow, or improper emissions regulation.**
- 

#### 420. Output Voltage HEGO Sensor 3 Bank 1

- **Definition:** Measures the **output voltage of the third Heated Exhaust Gas Oxygen (HEGO) sensor in Bank 1**, used for fuel mixture regulation.
  - **Example Usage:** Ensures **accurate air-fuel ratio adjustments based on exhaust gas composition.**
  - **Impact if Faulty:** Incorrect readings may cause **rich or lean running conditions, increased emissions, or check engine light activation.**
- 

#### 421. Overrun Shutdown Condition

- **Definition:** Detects when the engine enters **overrun shutdown mode**, where fuel injection is temporarily stopped while coasting.
  - **Example Usage:** Helps **improve fuel economy by shutting off fuel delivery when the throttle is closed.**
  - **Impact if Faulty:** Incorrect detection may cause **unnecessary fuel consumption, rough deceleration, or improper engine braking.**
- 

#### 422. Oxygen Storage Capacity of Catalyst 1 Bank 2

- **Definition:** Measures the **oxygen storage capability of the catalytic converter in Bank 2**, indicating how well it can convert emissions.
  - **Example Usage:** Used in **onboard diagnostics (OBD)** to determine catalyst efficiency.
  - **Impact if Faulty:** A failing sensor may cause **false emissions system warnings or undetected catalyst degradation.**
- 

#### 423. Oxygen Storage Capacity of the Cat for Cat Diagnosis, High Range, Cat2BANK 1

- **Definition:** Similar to **sensor #422**, but specifically for **catalyst Bank 1** and in a **high measurement range**.
  - **Example Usage:** Ensures **proper emissions control and fuel mixture adjustment**.
  - **Impact if Faulty:** Incorrect readings may lead to **failed emissions tests, increased fuel consumption, or misfiring issues**.
- 

#### 424. Oxygen Storage Capacity of the Catalyst 1 Bank 1

- **Definition:** Measures the **oxygen absorption capability of the first catalytic converter in Bank 1**.
  - **Example Usage:** Helps diagnose **catalytic converter aging and effectiveness**.
  - **Impact if Faulty:** If misread, it may cause **incorrect fuel trim adjustments, emissions failures, or catalyst inefficiencies**.
- 

#### 425. Pedometer Throttle Return Spring Test

- **Definition:** Monitors the **return force of the throttle spring**, ensuring it correctly returns to its default position.
  - **Example Usage:** Helps detect **throttle response issues, preventing unintended acceleration**.
  - **Impact if Faulty:** A failing throttle return spring may cause **delayed acceleration or potential throttle sticking issues**.
- 

#### 426. Percent Alcohol in Fuel

- **Definition:** Measures the **ethanol percentage in fuel**, crucial for vehicles that support **E85 flex-fuel systems**.
  - **Example Usage:** Adjusts **fuel injection timing and air-fuel ratios** based on ethanol content.
  - **Impact if Faulty:** Incorrect readings may lead to **poor combustion, knocking, or incorrect fuel mixture adjustments**.
-

#### **427. Period Duration for Mass Flow from HFM**

- **Definition:** Measures the **time interval between airflow pulses in the hot-film mass air flow (HFM) sensor**, providing precise air intake data.
  - **Example Usage:** Ensures **optimal fuel delivery based on real-time air intake measurements**.
  - **Impact if Faulty:** A bad reading may cause **erratic throttle response, incorrect fuel delivery, or engine hesitation**.
- 

#### **428. Physical Raw Value Ambient Temperature**

- **Definition:** Measures the **raw sensor output for ambient temperature**, before any ECU corrections.
  - **Example Usage:** Used in **climate control, fuel trim adjustments, and intake air temperature compensation**.
  - **Impact if Faulty:** If misread, it may cause **incorrect fuel-air mixture calculations or inaccurate climate control operation**.
- 

#### **429. Pole Voltage of the Storage**

- **Definition:** Measures the **voltage level at the poles of an energy storage unit**, such as the 12V battery or a high-voltage battery in hybrid systems.
  - **Example Usage:** Helps monitor **battery charging and discharging efficiency**.
  - **Impact if Faulty:** Incorrect values may lead to **charging malfunctions, battery degradation, or electrical failures**.
- 

#### **430. Power Consumption**

- **Definition:** Measures the **real-time power draw from the electrical system**, including all active components.
- **Example Usage:** Helps optimize **power distribution between drivetrain, climate control, and auxiliary systems**.

- **Impact if Faulty:** If misread, it may cause **overloaded circuits, inefficient power distribution, or unexpected battery drain.**
- 

#### 431. Pre-FS Water Injection Relative Water Pressure

- **Definition:** Measures the **water pressure in the pre-fuel system (Pre-FS) water injection system**, used in high-performance engines.
  - **Example Usage:** Ensures proper **water-methanol injection to cool intake air and prevent detonation in turbocharged engines.**
  - **Impact if Faulty:** Incorrect readings may cause **poor combustion efficiency, overheating, or detonation due to insufficient cooling.**
- 

#### 432. Pressure at the Suction Jet Pump

- **Definition:** Measures the **vacuum or pressure level at the suction jet pump**, a component used in fuel and vacuum systems.
  - **Example Usage:** Ensures proper **fuel delivery and crankcase ventilation** in turbocharged engines.
  - **Impact if Faulty:** Incorrect readings may cause **fuel starvation, turbo lag, or emissions system malfunctions.**
- 

#### 433. Pressure Ejector Pump Raw Value

- **Definition:** Provides the **unprocessed pressure reading from the ejector pump**, which helps transfer fuel between tank sections.
  - **Example Usage:** Helps monitor **fuel level balancing and delivery efficiency in split-tank systems.**
  - **Impact if Faulty:** If misread, it may cause **fuel transfer issues, leading to inaccurate fuel gauge readings or fuel starvation.**
- 

#### 434. Pressure Value of the Crankcase Differential Pressure Sensor

- **Definition:** Measures the **pressure difference inside the crankcase**, helping regulate the PCV (Positive Crankcase Ventilation) system.
  - **Example Usage:** Ensures **proper ventilation of blow-by gases to reduce emissions and oil contamination**.
  - **Impact if Faulty:** If incorrect, it may cause **oil leaks, excessive crankcase pressure, or engine misfires**.
- 

#### 435. Quality Value Actual Capacity

- **Definition:** Measures the **real-time capacity of an energy storage system**, such as a high-voltage battery in a hybrid vehicle.
  - **Example Usage:** Helps optimize **battery charge cycles and energy efficiency**.
  - **Impact if Faulty:** Incorrect readings may cause **range estimation errors, unexpected battery depletion, or reduced hybrid performance**.
- 

#### 436. Quality Value Internal Resistance

- **Definition:** Measures the **internal resistance of the battery or electrical storage unit**, which affects energy efficiency.
  - **Example Usage:** Used to **predict battery aging and diagnose failing battery cells**.
  - **Impact if Faulty:** A high internal resistance may cause **reduced charging efficiency, excessive heat generation, or unexpected power loss**.
- 

#### 437. Quality Value of the SOH

- **Definition:** Tracks the **State of Health (SOH) of the battery**, indicating its remaining lifespan and efficiency.
  - **Example Usage:** Helps determine **battery replacement intervals and optimize charging strategies**.
  - **Impact if Faulty:** Incorrect SOH values may cause **premature battery replacements or failure to detect degraded battery cells**.
-

#### **438. Rail Pressure Corrected by the Learned Rail Pressure Sensor Offset**

- **Definition:** Provides a **corrected high-pressure fuel rail reading**, adjusted based on historical sensor calibration.
  - **Example Usage:** Helps regulate **fuel injection timing and pressure in direct-injection engines**.
  - **Impact if Faulty:** Incorrect readings may cause **fuel injector misfires, poor combustion efficiency, or increased emissions**.
- 

#### **439. Raw Pressure Value Pressure Sensor Gasoline Particle Filter**

- **Definition:** Measures the **raw pressure reading from the gasoline particulate filter (GPF)**, which captures fine exhaust particulates.
  - **Example Usage:** Helps **monitor filter clogging and schedule automatic regeneration cycles**.
  - **Impact if Faulty:** If misread, it may cause **filter clogging, increased exhaust backpressure, or excessive fuel consumption**.
- 

#### **440. Raw Value Oil Level**

- **Definition:** Provides the **unprocessed reading from the oil level sensor**, before ECU filtering and adjustments.
  - **Example Usage:** Ensures **accurate oil level monitoring and detection of sudden oil loss**.
  - **Impact if Faulty:** Incorrect values may cause **false low oil warnings or failure to detect real oil starvation issues**.
- 

#### **441. Raw Value Position Lower Mechanical Stop Electrical Wastegate (WG Closed) Bank 2**

- **Definition:** Measures the **position of the lower mechanical stop of the electrical wastegate in Bank 2** when fully closed.
- **Example Usage:** Ensures the **wastegate closes properly to regulate turbo boost pressure**.

- **Impact if Faulty:** Incorrect readings may cause **turbo overboost, power loss, or inefficient exhaust flow.**
- 

#### **442. Raw Value Position of the Lower Mechanical Stop from the Electrical Wastegate (WG Closed)**

- **Definition:** Similar to **sensor #441**, but applies to **Bank 1 or a single turbo system.**
  - **Example Usage:** Helps optimize **turbo efficiency and engine performance.**
  - **Impact if Faulty:** A bad reading may cause **inaccurate boost control, resulting in turbo lag or excessive turbo wear.**
- 

#### **443. Raw Value Position Sensor Electrical Wastegate Bank 2**

- **Definition:** Measures the **real-time position of the electrical wastegate actuator in Bank 2**, before any ECU corrections.
  - **Example Usage:** Helps adjust **turbocharger boost levels dynamically.**
  - **Impact if Faulty:** Incorrect readings may cause **boost pressure instability, leading to performance issues.**
- 

#### **444. Raw Value Position of Upper Mechanical Stop from Electrical Wastegate (Flat Share Open)**

- **Definition:** Measures the **upper mechanical stop position of the electrical wastegate when fully open.**
  - **Example Usage:** Ensures that the **wastegate fully opens to reduce turbo boost when necessary.**
  - **Impact if Faulty:** A bad reading may cause **turbo overboost, inefficient exhaust gas control, or excessive engine stress.**
- 

#### **445. Raw Value Position Sensor Electrical Wastegate**

- **Definition:** Similar to **sensor #443**, but applies to **a general or single-bank wastegate system.**

- **Example Usage:** Helps regulate **wastegate positioning for optimal turbocharger performance.**
  - **Impact if Faulty:** If incorrect, it may cause **delayed boost response, poor fuel efficiency, or turbo surging.**
- 

#### **446. Raw Value Position Upper Mechanical Stop Electrical Wastegate (Flat Share Open) Bank 2**

- **Definition:** Measures the **position of the upper mechanical stop of the electrical wastegate in Bank 2.**
  - **Example Usage:** Ensures that the **wastegate reaches its full open position when venting excess boost pressure.**
  - **Impact if Faulty:** If incorrect, it may cause **incomplete boost control, leading to excessive backpressure or power loss.**
- 

#### **447. Raw Voltage Value for Oil Pressure Sensor**

- **Definition:** Provides the **raw electrical output from the oil pressure sensor,** before ECU adjustments.
  - **Example Usage:** Helps detect **oil pressure stability and monitor lubrication efficiency.**
  - **Impact if Faulty:** Incorrect readings may cause **false oil pressure warnings or failure to detect actual oil starvation.**
- 

#### **448. Raw Voltage Value from ADC Bank 2**

- **Definition:** Measures the **unprocessed voltage reading from the Analog-to-Digital Converter (ADC) in Bank 2,** which converts sensor signals into digital values for the ECU.
- **Example Usage:** Ensures **accurate digital signal processing for multiple engine sensors.**
- **Impact if Faulty:** A failing ADC may cause **incorrect sensor readings, leading to performance issues or false diagnostics.**

---

#### 449. Reference Gas Mass Flow into the Engine

- **Definition:** Measures the **calculated reference mass of air entering the engine**, based on sensor inputs and ECU models.
  - **Example Usage:** Helps adjust **fuel injection timing and boost control for optimal combustion**.
  - **Impact if Faulty:** Incorrect values may cause **rich or lean air-fuel mixtures, leading to engine hesitation or knocking**.
- 

#### 450. Raw Voltage Value of the Pressure Sensor Otto Particle Filter from the ADC

- **Definition:** Measures the **unprocessed electrical signal from the Otto Particulate Filter (OPF) pressure sensor**, which monitors exhaust particulate levels.
  - **Example Usage:** Helps determine **when an OPF regeneration cycle is needed to clean trapped soot**.
  - **Impact if Faulty:** Incorrect readings may cause **delayed filter regeneration, increased backpressure, or emissions failures**.
- 

#### 451. Reference Point for the Voltage Requirement 12V Basis

- **Definition:** Measures the **baseline voltage requirement for the 12V electrical system**, ensuring stable operation of vehicle electronics.
  - **Example Usage:** Helps regulate **alternator output and battery charging to maintain a steady 12V power supply**.
  - **Impact if Faulty:** If misread, it may cause **battery drain, unstable electrical components, or alternator inefficiencies**.
- 

#### 452. Reference Torque for Misfire Detection

- **Definition:** Sets a **calculated reference torque value**, helping detect **misfires based on torque deviations**.

- **Example Usage:** Used in **misfire detection systems** to determine if combustion events are occurring correctly.
  - **Impact if Faulty:** Incorrect values may cause **false misfire codes or failure to detect real misfires, leading to unburnt fuel and emissions issues.**
- 

#### **453. Refill Quantity for the Engine Oil**

- **Definition:** Measures the **amount of oil added during a refill**, helping track oil consumption.
  - **Example Usage:** Helps determine if **excessive oil consumption is occurring due to leaks or engine wear.**
  - **Impact if Faulty:** If inaccurate, it may cause **delayed oil change reminders or failure to detect an oil leak.**
- 

#### **454. Rel. Eccentric Angle on the Lower Mech. Attack**

- **Definition:** Measures the **relative eccentric angle of a mechanical component**, likely in **camshaft or valvetrain control.**
  - **Example Usage:** Helps optimize **variable valve timing (VVT) for better fuel efficiency and performance.**
  - **Impact if Faulty:** Incorrect readings may cause **camshaft misalignment, poor fuel economy, or power loss.**
- 

#### **455. Rel. Eccentric Angle on the Upper Mech. Attack**

- **Definition:** Similar to **sensor #454**, but measures the **upper mechanical limit of the eccentric angle.**
  - **Example Usage:** Helps fine-tune **valve timing and lift for different driving conditions.**
  - **Impact if Faulty:** Incorrect values may lead to **valve timing issues, inefficient combustion, or knocking.**
-

#### **456. Relative SOC (State of Charge)**

- **Definition:** Measures the **real-time charge level of the vehicle's battery**, expressed as a percentage.
  - **Example Usage:** Helps regulate **battery charging cycles and energy distribution in hybrid/electric vehicles**.
  - **Impact if Faulty:** If incorrect, it may cause **unexpected battery depletion, incorrect charge estimates, or inefficient energy recovery**.
- 

#### **457. Relative Air Filling**

- **Definition:** Calculates the **relative air charge entering the cylinders**, important for fuel injection and boost pressure regulation.
  - **Example Usage:** Used to optimize **engine load calculations and fuel-air mixture**.
  - **Impact if Faulty:** Incorrect readings may cause **lean or rich fuel mixtures, poor throttle response, or turbo lag**.
- 

#### **458. Relative Eccentric Angle Without Reference to a Stop**

- **Definition:** Measures the **eccentric angle of a moving component without using a fixed mechanical stop for reference**, likely in camshaft adjustment.
  - **Example Usage:** Helps improve **dynamic valve timing changes for optimal performance**.
  - **Impact if Faulty:** If misread, it may cause **valve timing inconsistencies, rough idling, or performance loss**.
- 

#### **459. Relative Engine Oil Level in cl Above Minimum**

- **Definition:** Tracks how much **engine oil is above the minimum required level**, measured in centiliters (cl).
- **Example Usage:** Helps **warn drivers when oil levels are approaching critical levels**.

- **Impact if Faulty:** If incorrect, it may cause **false oil level warnings or failure to detect real oil shortages.**
- 

#### 460. Relative Fuel Mass

- **Definition:** Calculates the **fuel mass available in the system relative to total capacity**, aiding in fuel consumption tracking.
  - **Example Usage:** Helps improve **fuel efficiency monitoring and range estimation.**
  - **Impact if Faulty:** Incorrect readings may cause **inaccurate fuel level indicators, unexpected stalling, or poor fuel economy tracking.**
- 

#### 461. Relative Pedal Value

- **Definition:** Measures the **relative position of the accelerator pedal**, expressed as a percentage of full throttle.
  - **Example Usage:** Used in **throttle control, fuel injection timing, and engine load calculations.**
  - **Impact if Faulty:** If incorrect, it may cause **delayed acceleration, erratic throttle response, or excessive fuel consumption.**
- 

#### 462. Relative Level of the Engine Oil

- **Definition:** Measures the **engine oil level relative to the total oil capacity**, providing a real-time status.
  - **Example Usage:** Helps optimize **oil change intervals and detect potential leaks.**
  - **Impact if Faulty:** If misread, it may cause **false oil warnings, engine overheating, or lubrication failure.**
- 

#### 463. Relative State of Charge NV Battery

- **Definition:** Tracks the **state of charge (SOC) of the 12V non-volatile (NV) battery**, typically used for starting and auxiliary functions.

- **Example Usage:** Helps manage **battery load balancing, start-stop system efficiency, and power delivery.**
  - **Impact if Faulty:** Incorrect values may lead to **unexpected battery depletion, starting issues, or electrical failures.**
- 

#### 464. Remaining Distance Derived from Fuel Consumption

- **Definition:** Calculates the **estimated remaining driving range** based on **current fuel level and consumption rate.**
  - **Example Usage:** Used for **fuel range estimation in the instrument cluster and navigation systems.**
  - **Impact if Faulty:** If incorrect, it may cause **incorrect fuel range estimates, leaving the driver stranded without fuel.**
- 

#### 465. Rudimentarily Estimated Spark Plug Temperature

- **Definition:** Estimates the **temperature of the spark plug** based on **engine load, ignition timing, and cylinder conditions.**
  - **Example Usage:** Helps prevent **pre-ignition, knocking, and spark plug overheating.**
  - **Impact if Faulty:** If incorrect, it may cause **engine misfires, knocking, or reduced power output.**
- 

#### 466. SOC Quality Value of the Memory

- **Definition:** Monitors the **quality of the state of charge (SOC) estimation** stored in the ECU memory for battery management.
  - **Example Usage:** Helps improve **battery longevity and charging cycle efficiency.**
  - **Impact if Faulty:** Incorrect values may cause **battery overcharging, unexpected depletion, or inaccurate energy predictions.**
- 

#### 467. SOC of the Memory

- **Definition:** Tracks the **state of charge (SOC) of the battery as stored in the ECU**, used for diagnostics and long-term energy management.
  - **Example Usage:** Helps ensure **accurate power distribution in hybrid/electric vehicles**.
  - **Impact if Faulty:** If incorrect, it may cause **power management issues, leading to reduced performance or system failures**.
- 

#### 468. Saved Camshaft Target Angle Exhaust

- **Definition:** Stores the **last known target angle of the exhaust camshaft**, used in **variable valve timing (VVT) adjustments**.
  - **Example Usage:** Helps improve **engine breathing efficiency and emissions control**.
  - **Impact if Faulty:** Incorrect values may cause **poor exhaust flow, increased emissions, or VVT system errors**.
- 

#### 469. Sensed Differential Pressure After the Particulate Filter Bank 2

- **Definition:** Measures the **pressure drop across the particulate filter in Bank 2**, indicating filter condition and clogging level.
  - **Example Usage:** Helps determine **when to initiate particulate filter regeneration**.
  - **Impact if Faulty:** Incorrect readings may lead to **delayed regeneration, excessive backpressure, or emissions failures**.
- 

#### 470. Sensor Temperature

- **Definition:** Measures the **operating temperature of various sensors**, ensuring accurate data collection.
- **Example Usage:** Helps protect **sensor components from overheating and ensures signal accuracy**.
- **Impact if Faulty:** Incorrect readings may cause **false sensor faults, inaccurate fuel trim adjustments, or electrical component failures**.

---

#### **471. Sensor Voltage Position Sensor Electrical Wastegate**

- **Definition:** Measures the **voltage output of the position sensor in the electrical wastegate**, indicating its current state.
  - **Example Usage:** Ensures **accurate boost pressure control in turbocharged engines**.
  - **Impact if Faulty:** If incorrect, it may cause **boost surges, turbo inefficiency, or potential engine power loss**.
- 

#### **472. Sensor Voltage Position Sensor Electrical Wastegate Bank 2**

- **Definition:** Similar to **sensor #471**, but applies specifically to **Bank 2 in twin-turbo engines**.
  - **Example Usage:** Helps balance **turbo operation between two banks for smooth power delivery**.
  - **Impact if Faulty:** Incorrect values may lead to **asymmetric boost control, turbo lag, or excessive wear on one turbocharger**.
- 

#### **473. Set Speed of Electric Water Pump**

- **Definition:** Defines the **target speed (RPM) for the electric water pump**, used for cooling.
  - **Example Usage:** Ensures **optimal coolant circulation based on engine temperature and load**.
  - **Impact if Faulty:** Incorrect control may cause **overheating, coolant flow inefficiencies, or increased engine wear**.
- 

#### **474. Set Speed of Electric Water Pump for Cooling the Electric Machine and EME**

- **Definition:** Similar to **sensor #473**, but regulates the **cooling pump for hybrid/electric drive systems** (EME - Electric Motor Electronics).
- **Example Usage:** Helps **prevent overheating in hybrid/electric powertrains**.

- **Impact if Faulty:** A misread value may cause **excessive heat buildup, reducing electric motor efficiency.**
- 

#### 475. Setpoint Eccentric Angle VVT

- **Definition:** Defines the **target eccentric angle for Variable Valve Timing (VVT) control.**
  - **Example Usage:** Helps adjust **camshaft timing for optimal power and fuel efficiency.**
  - **Impact if Faulty:** Incorrect values may lead to **engine knocking, reduced fuel economy, or loss of performance.**
- 

#### 476. Setpoint Electric Fan

- **Definition:** Defines the **target speed for the electric cooling fan**, ensuring proper engine temperature regulation.
  - **Example Usage:** Helps optimize **cooling efficiency and reduce unnecessary fan power consumption.**
  - **Impact if Faulty:** Incorrect control may cause **overheating, high energy consumption, or inefficient radiator cooling.**
- 

#### 477. Setpoint Inlet Spread Variable NWS

- **Definition:** Sets the **target inlet camshaft spread (degree of movement) for Variable Valve Timing (VVT).**
  - **Example Usage:** Ensures **optimal intake valve timing for different driving conditions.**
  - **Impact if Faulty:** A faulty reading may cause **delayed valve timing adjustments, rough idle, or lower efficiency.**
- 

#### 478. Setpoint Oil Pressure

- **Definition:** Defines the **target oil pressure level** that the engine should maintain based on load and temperature.
  - **Example Usage:** Ensures **sufficient lubrication while preventing excessive pressure buildup**.
  - **Impact if Faulty:** Incorrect values may cause **oil starvation, excessive friction, or premature engine wear**.
- 

#### 479. Setpoint Outlet Spread Variable NWS

- **Definition:** Sets the **target exhaust camshaft spread for Variable Valve Timing (VVT)**.
  - **Example Usage:** Ensures that **exhaust valve timing is optimized for emissions and efficiency**.
  - **Impact if Faulty:** Incorrect values may lead to **excessive exhaust backpressure, poor performance, or increased emissions**.
- 

#### 480. Setpoint Rail Pressure Control

- **Definition:** Defines the **desired fuel rail pressure**, ensuring precise fuel injection control.
  - **Example Usage:** Helps optimize **fuel delivery for different load conditions, reducing fuel consumption**.
  - **Impact if Faulty:** Incorrect values may cause **poor fuel atomization, misfires, or loss of engine power**.
- 

#### 481. Setpoint Voltage of the VVT Position Controller

- **Definition:** Specifies the **target voltage applied to the Variable Valve Timing (VVT) position controller**, ensuring precise camshaft timing adjustments.
- **Example Usage:** Helps regulate **intake and exhaust valve timing for optimal fuel efficiency and power output**.
- **Impact if Faulty:** Incorrect values may cause **camshaft misalignment, rough idling, or reduced fuel economy**.

---

#### **482. Setpoint Speed E-Fan Default WM**

- **Definition:** Sets the **default speed of the electric cooling fan (E-Fan) in Watts Mode (WM)**, based on engine cooling demands.
  - **Example Usage:** Ensures **efficient radiator cooling without excessive energy consumption**.
  - **Impact if Faulty:** If incorrect, it may cause **overheating, increased battery load, or unnecessary fan operation**.
- 

#### **483. Should Position EEC**

- **Definition:** Defines the **desired position of the Exhaust Emissions Control (EEC) valve**, which regulates exhaust gas flow.
  - **Example Usage:** Helps optimize **exhaust backpressure for improved emissions performance**.
  - **Impact if Faulty:** If misaligned, it may cause **excessive emissions, reduced engine performance, or check engine light activation**.
- 

#### **484. Should Position EWG 2**

- **Definition:** Specifies the **target position of the second Electronic Wastegate (EWG) actuator** in twin-turbo setups.
  - **Example Usage:** Ensures **accurate turbo boost regulation for balanced power delivery**.
  - **Impact if Faulty:** Incorrect positioning may lead to **turbo overboost, lag, or excessive engine stress**.
- 

#### **485. Shutdown Time**

- **Definition:** Measures the **time elapsed between engine shutdown and the next startup**, used for diagnostics and system cooldown management.

- **Example Usage:** Helps optimize **start-stop system functionality and after-run cooling.**
  - **Impact if Faulty:** Incorrect readings may cause **delayed turbo cooling, battery drain, or inefficient start-stop behavior.**
- 

#### **486. Shutdown Time from Relative Minute Counter Until Engine Start**

- **Definition:** Tracks the **precise time delay (in minutes) between the last engine shutdown and the next start**, relative to system clock counters.
  - **Example Usage:** Helps manage **battery charging cycles and engine temperature regulation.**
  - **Impact if Faulty:** If misread, it may cause **battery overuse, unnecessary system wake-ups, or incorrect diagnostic timestamps.**
- 

#### **487. Signal Voltage of the Coolant Temperature Sensor**

- **Definition:** Measures the **electrical signal output from the coolant temperature sensor**, which indicates engine temperature.
  - **Example Usage:** Ensures **optimal cooling system operation and fuel mixture adjustments.**
  - **Impact if Faulty:** Incorrect values may cause **overheating, poor fuel efficiency, or incorrect fan activation.**
- 

#### **488. Simulated Mean Temperature OPF Bank 1**

- **Definition:** Estimates the **average temperature of the Otto Particulate Filter (OPF) in Bank 1**, based on sensor inputs and ECU models.
  - **Example Usage:** Helps determine **when to initiate filter regeneration to prevent clogging.**
  - **Impact if Faulty:** Incorrect calculations may lead to **delayed regeneration, increased emissions, or filter damage.**
-

#### **489. Simulated Printing According to OPF Bank 1**

- **Definition:** Estimates the **pressure levels within the Otto Particulate Filter (OPF) in Bank 1**, ensuring proper exhaust flow.
  - **Example Usage:** Used for **monitoring filter clogging and ensuring efficient exhaust gas treatment**.
  - **Impact if Faulty:** If misread, it may cause **excessive exhaust backpressure, poor performance, or unnecessary filter replacement**.
- 

#### **490. Soot Mass in OPF Bank 1**

- **Definition:** Measures the **amount of soot accumulated in the Otto Particulate Filter (OPF) for Bank 1**.
  - **Example Usage:** Helps trigger **automatic regeneration cycles to burn off accumulated soot**.
  - **Impact if Faulty:** If incorrect, it may cause **filter clogging, reduced engine efficiency, or excessive emissions**.
- 

#### **491. Soot Mass in OPF Bank 2**

- **Definition:** Measures the **amount of soot accumulated in the Otto Particulate Filter (OPF) for Bank 2**.
  - **Example Usage:** Helps determine **when an automatic regeneration cycle should be initiated to burn off soot buildup**.
  - **Impact if Faulty:** Incorrect readings may lead to **filter clogging, increased exhaust backpressure, and reduced fuel efficiency**.
- 

#### **492. Soot Mass in the Particle Filter**

- **Definition:** Measures the **total soot accumulation in the diesel or gasoline particulate filter (DPF/GPF)**.
- **Example Usage:** Ensures that **particulate filter regeneration happens before excessive buildup causes performance loss**.

- **Impact if Faulty:** A failing sensor may cause **missed regeneration cycles**, **triggering warning lights, excessive emissions, or reduced power.**
- 

#### 493. Soot Mass Particle Filter Bank 2

- **Definition:** Tracks **soot buildup in the particulate filter for Bank 2**, similar to **sensor #491**, but applied specifically to Bank 2 of a V-type engine.
  - **Example Usage:** Used for **monitoring filter clogging and scheduling regeneration cycles.**
  - **Impact if Faulty:** If incorrect, it may cause **increased exhaust pressure, check engine light activation, or inefficient fuel combustion.**
- 

#### 494. Speed Electric Motor

- **Definition:** Measures the **rotational speed of the electric motor** in hybrid or fully electric powertrains.
  - **Example Usage:** Ensures **proper power delivery and regenerative braking functionality.**
  - **Impact if Faulty:** If incorrect, it may cause **loss of electric drive power, inefficient energy recovery, or performance inconsistencies.**
- 

#### 495. Speed Gear Input

- **Definition:** Measures the **rotational speed of the transmission input shaft**, which is used to calculate gear changes and torque delivery.
  - **Example Usage:** Helps ensure **smooth gear shifting and optimal torque application.**
  - **Impact if Faulty:** Incorrect readings may lead to **harsh gear shifts, improper transmission function, or reduced power efficiency.**
- 

#### 496. Standardized Delay Time (Single Measurement) of the Probe Voltage at the Rich-Lean Transition, Probe 3, Bank 1

- **Definition:** Measures the **response time of the third oxygen sensor (Probe 3) in Bank 1** when switching between rich and lean air-fuel mixtures.
  - **Example Usage:** Helps detect **oxygen sensor efficiency and adjust fuel trims accordingly.**
  - **Impact if Faulty:** If incorrect, it may cause **delayed fuel mixture adjustments, increased emissions, or check engine light activation.**
- 

#### **497. Standardized Delay Time (Single Measurement) of the Probe Voltage at the Transition from Lean to Rich, Probe 3, Bank 1**

- **Definition:** Similar to **sensor #496**, but measures the **delay in switching from lean to rich air-fuel mixture.**
  - **Example Usage:** Ensures **oxygen sensor performance is within acceptable limits for emissions compliance.**
  - **Impact if Faulty:** If the delay is too long, it may cause **poor fuel economy, excessive emissions, or catalytic converter inefficiency.**
- 

#### **498. Start Condition for Frictional Connection Fulfilled**

- **Definition:** Detects whether the **conditions for engaging a frictional clutch or torque converter lockup** are met.
  - **Example Usage:** Ensures **smooth power delivery from the engine to the wheels** in automatic transmissions.
  - **Impact if Faulty:** Incorrect detection may cause **rough shifting, slipping clutches, or transmission overheating.**
- 

#### **499. State of Charge 48V Battery**

- **Definition:** Measures the **current charge level of the 48V battery system**, commonly used in mild hybrid and start-stop systems.
- **Example Usage:** Helps manage **battery charging, energy storage, and electrical power distribution.**

- **Impact if Faulty:** If incorrect, it may cause **battery depletion, improper energy recovery, or failure of hybrid assist functions.**
- 

#### 500. Status Stand Consumer Registered Part 2

- **Definition:** Indicates whether **certain electrical consumers** (e.g., climate control, infotainment, auxiliary systems) are active while the vehicle is in standstill mode.
  - **Example Usage:** Helps regulate **battery usage during parking and idling to prevent excessive drain.**
  - **Impact if Faulty:** If not detected properly, it may cause **unexpected battery discharge or power-saving features not activating.**
- 

#### 501. Status Stand Consumer Registered Part 1

- **Definition:** Tracks the **status of registered electrical consumers** (such as lights, infotainment, and HVAC) when the vehicle is in standby mode.
  - **Example Usage:** Helps manage **battery usage and power consumption when the vehicle is stationary.**
  - **Impact if Faulty:** Incorrect detection may lead to **unexpected battery drain, incorrect power-saving activation, or failure to track energy usage properly.**
- 

#### 502. Status VVT Stop Learning (Internal)

- **Definition:** Indicates whether the **Variable Valve Timing (VVT) system has completed its stop-learning adaptation process.**
  - **Example Usage:** Ensures that the **camshaft timing is optimized based on wear and engine conditions.**
  - **Impact if Faulty:** If not learned correctly, it may cause **poor valve timing control, reduced performance, or increased emissions.**
- 

#### 503. Status Bit Whether IGR High Active

- **Definition:** Reports whether the **Idle Generator Regulation (IGR) system** is in a **high-output state**, managing electrical loads.
  - **Example Usage:** Helps control **battery charging rates and alternator efficiency**.
  - **Impact if Faulty:** Incorrect readings may lead to **overcharging, battery depletion, or inefficient alternator control**.
- 

#### 504. Status Bit Whether IGR Medium is Active

- **Definition:** Similar to **sensor #503**, but indicates whether the **IGR system is operating at a medium power level**.
  - **Example Usage:** Ensures **smooth alternator regulation based on power demand**.
  - **Impact if Faulty:** Misreading this bit may cause **inconsistent power distribution, inefficient charging cycles, or electrical issues**.
- 

#### 505. Status Emergency Running of Entire Engine

- **Definition:** Indicates if the **engine has entered emergency running mode (limp mode)** due to a severe fault.
  - **Example Usage:** Helps **protect the engine from further damage by limiting power and RPM**.
  - **Impact if Faulty:** If falsely triggered, it may **limit performance unnecessarily**, or if undetected, it may allow **engine damage to worsen**.
- 

#### 506. Status Clutch K0

- **Definition:** Reports the **status of clutch K0**, which is part of the **dual-clutch or automatic transmission system**.
  - **Example Usage:** Ensures that **clutch engagement and disengagement occur smoothly**.
  - **Impact if Faulty:** Incorrect readings may cause **gear shifting issues, transmission slipping, or drivability problems**.
-

## **507. Status Generator Diagnosis Extended**

- **Definition:** Provides detailed diagnostic information on the vehicle's alternator (generator) performance.
  - **Example Usage:** Helps detect charging faults, voltage irregularities, or alternator wear.
  - **Impact if Faulty:** If incorrect, it may cause charging malfunctions, electrical failures, or premature alternator replacement.
- 

## **508. Status Error Overload VVT1**

- **Definition:** Indicates whether the Variable Valve Timing (VVT1) system has exceeded its operational limits.
  - **Example Usage:** Helps detect sticking camshaft actuators or oil pressure issues affecting VVT operation.
  - **Impact if Faulty:** If undetected, it may cause camshaft misalignment, poor engine performance, or excessive fuel consumption.
- 

## **509. Status Learning Process Misfire Detection**

- **Definition:** Reports whether the misfire detection system is in the process of learning engine behavior to improve accuracy.
  - **Example Usage:** Ensures that misfire events are correctly detected without false positives.
  - **Impact if Faulty:** If the system fails to learn correctly, it may cause false misfire codes, unnecessary repairs, or undetected combustion issues.
- 

## **510. Status Message Electr. Water Pump**

- **Definition:** Reports the operational status of the electric water pump, which is used for cooling.
- **Example Usage:** Ensures proper engine and battery cooling in hybrid or performance vehicles.

- **Impact if Faulty:** If misread, it may cause **overheating, inefficient coolant circulation, or failure to cool hybrid/electric components.**
- 

#### 511. Status of Fault Memory Entry Without Critical DMF Fault

- **Definition:** Indicates whether a **fault has been logged in the ECU memory without a critical Dual Mass Flywheel (DMF) failure.**
  - **Example Usage:** Helps detect **non-critical drivetrain issues before they lead to mechanical failure.**
  - **Impact if Faulty:** Incorrect readings may cause **delayed maintenance, unnecessary warnings, or overlooked flywheel issues.**
- 

#### 512. Status of Frictional Connection in Monitoring Function

- **Definition:** Reports whether the **frictional elements in the drivetrain (such as clutches or torque converters)** are properly engaged.
  - **Example Usage:** Ensures **smooth power delivery and prevents slippage.**
  - **Impact if Faulty:** If incorrect, it may cause **gear slipping, harsh shifting, or drivability issues.**
- 

#### 513. Status of Terminal 15

- **Definition:** Monitors whether **Terminal 15 (ignition ON status)** is active, allowing power to be distributed to critical vehicle systems.
  - **Example Usage:** Ensures that **ignition-dependent systems receive power when the car is turned on.**
  - **Impact if Faulty:** Incorrect readings may cause **starting issues, unexpected shutdowns, or electrical malfunctions.**
- 

#### 514. Status Pressure Sensor Diagnosis (1: Motor is Stationary 2: Motor in LL 3: Motor in VL 0: No Dual Comparison Possible)

- **Definition:** Reports the **status of the pressure sensor diagnostics**, categorizing whether the engine is **off**, **idling (LL)**, or **running under load (VL)**.
  - **Example Usage:** Helps verify **sensor functionality by comparing pressure readings under different engine conditions**.
  - **Impact if Faulty:** Incorrect detection may lead to **false pressure sensor faults, incorrect boost calculations, or fuel pressure irregularities**.
- 

#### 515. Status of Transmission Interventions via CAN

- **Definition:** Indicates whether the **transmission is actively controlling gear shifts or torque changes via the CAN bus**.
  - **Example Usage:** Ensures **smooth gear shifts and transmission adaptation to driving conditions**.
  - **Impact if Faulty:** If misread, it may cause **erratic shifting, delayed gear changes, or transmission fault codes**.
- 

#### 516. Status Zero Gear Detection

- **Definition:** Reports whether the **gearbox is in neutral (zero gear) or an active gear position**.
  - **Example Usage:** Helps control **idle stability, clutch engagement, and automatic start-stop functionality**.
  - **Impact if Faulty:** If incorrect, it may cause **starting issues, gear recognition errors, or unexpected vehicle movement**.
- 

#### 517. Storage Tank Temperature

- **Definition:** Measures the **temperature of the fuel storage tank**, used to monitor fuel vapor expansion and emissions control.
- **Example Usage:** Helps regulate **evaporative emissions system (EVAP) and fuel pressure compensation**.
- **Impact if Faulty:** Incorrect readings may cause **fuel system pressure errors, increased emissions, or inaccurate fuel level calculations**.

---

## 518. Supply Voltage

- **Definition:** Monitors the **real-time supply voltage available to the vehicle's electrical system.**
  - **Example Usage:** Ensures **stable voltage for sensors, ECU functions, and vehicle electronics.**
  - **Impact if Faulty:** Incorrect values may cause **battery drain, sensor malfunctions, or alternator charging errors.**
- 

## 519. Supply Voltage DME

- **Definition:** Measures the **supply voltage to the Digital Motor Electronics (DME) unit**, which controls the engine management system.
  - **Example Usage:** Ensures the **DME receives consistent power for stable engine operation.**
  - **Impact if Faulty:** If incorrect, it may cause **engine misfires, power loss, or unexpected shutdowns.**
- 

## 520. Supply Voltage Electr. Water Pump

- **Definition:** Measures the **power supply voltage to the electric water pump**, ensuring it operates within the correct voltage range.
  - **Example Usage:** Helps verify **proper cooling system operation and prevent overheating.**
  - **Impact if Faulty:** Incorrect values may cause **water pump failure, engine overheating, or excessive battery drain.**
- 

## 521. Swirl Flap Actuator - Actual Position

- **Definition:** Measures the **real-time position of the swirl flaps in the intake manifold**, which control airflow dynamics.

- **Example Usage:** Helps optimize **fuel-air mixture at different engine speeds for better combustion efficiency.**
  - **Impact if Faulty:** Incorrect values may cause **poor throttle response, reduced fuel efficiency, or excessive emissions.**
- 

## 522. Target Air Mass Flow

- **Definition:** Specifies the **desired mass of air entering the engine**, used to balance fuel injection and combustion.
  - **Example Usage:** Ensures **optimal air-fuel ratio for efficiency and performance.**
  - **Impact if Faulty:** Incorrect values may lead to **engine knocking, misfires, or poor fuel economy.**
- 

## 523. Target Angle (Inlet VANOS)

- **Definition:** Defines the **target intake camshaft timing angle** in the **VANOS (Variable Camshaft Timing) system.**
  - **Example Usage:** Adjusts **valve timing for better power output and fuel efficiency.**
  - **Impact if Faulty:** Incorrect settings may cause **delayed throttle response, rough idling, or increased emissions.**
- 

## 524. Target Angle Camshaft Exhaust Closes

- **Definition:** Specifies the **desired timing angle at which the exhaust camshaft closes the exhaust valves.**
  - **Example Usage:** Helps optimize **engine breathing and exhaust gas recirculation (EGR) efficiency.**
  - **Impact if Faulty:** Incorrect values may cause **poor exhaust scavenging, excessive emissions, or loss of power.**
- 

## 525. Target Angle Camshaft Inlet Opens

- **Definition:** Defines the **desired intake camshaft opening angle**, crucial for **valve overlap control**.
  - **Example Usage:** Improves **cylinder filling efficiency and fuel combustion at various engine speeds**.
  - **Impact if Faulty:** A failing sensor may cause **misfires, rough running, or reduced fuel economy**.
- 

## 526. Target Differential Pressure Intake Manifold

- **Definition:** Measures the **desired pressure difference between the intake manifold and ambient pressure**, ensuring optimal boost control.
  - **Example Usage:** Used in **turbocharged engines to manage boost pressure and prevent detonation**.
  - **Impact if Faulty:** Incorrect values may cause **turbo lag, knocking, or excessive fuel consumption**.
- 

## 527. Target Filling

- **Definition:** Represents the **desired cylinder filling volume**, affecting the **amount of air-fuel mixture drawn into the combustion chamber**.
  - **Example Usage:** Helps control **fuel injection timing and throttle response**.
  - **Impact if Faulty:** Incorrect calculations may cause **engine hesitation, poor performance, or excessive fuel use**.
- 

## 528. Target Idle Speed

- **Definition:** Defines the **desired engine idle speed**, based on temperature, load, and accessory demand.
  - **Example Usage:** Helps maintain a **stable idle, preventing rough idling or stalling**.
  - **Impact if Faulty:** Incorrect values may cause **engine surging, stalling, or poor start-stop system functionality**.
-

### **529. Target Ignition Angle from Torque Intervention**

- **Definition:** Specifies the **target ignition timing angle**, considering **torque demand** and **load conditions**.
  - **Example Usage:** Helps prevent **knocking** and optimize power delivery.
  - **Impact if Faulty:** If incorrect, it may cause **engine knocking, loss of power, or high fuel consumption**.
- 

### **530. Target Temperature Coolant**

- **Definition:** Defines the **desired coolant temperature** that the **cooling system aims to maintain**.
  - **Example Usage:** Ensures **optimal thermal management** for engine efficiency and longevity.
  - **Impact if Faulty:** Incorrect values may cause **overheating, engine wear, or poor fuel efficiency**.
- 

### **531. Target Value for Throttle Valve Angle, Based on (Lower) Stop**

- **Definition:** Specifies the **desired throttle valve position** relative to its **minimum closed position**.
  - **Example Usage:** Helps regulate **air intake and throttle response** for optimal fuel combustion.
  - **Impact if Faulty:** If incorrect, it may cause **delayed throttle response, engine hesitation, or erratic acceleration**.
- 

### **532. Target Value for Throttle Valve Angle, Based on Lower Stop**

- **Definition:** Similar to **sensor #531**, confirming the **throttle's target angle from the fully closed position**.
- **Example Usage:** Ensures **precise throttle control, improving engine response and efficiency**.

- **Impact if Faulty:** Incorrect readings may lead to **misfires, poor acceleration, or excessive fuel consumption.**
- 

#### 533. Target Wheel Torque from Accelerator Pedal Request

- **Definition:** Represents the **desired torque output to the wheels**, calculated from **driver throttle input**.
  - **Example Usage:** Helps regulate **power delivery based on pedal input and traction control needs**.
  - **Impact if Faulty:** If miscalculated, it may cause **poor throttle response, power surges, or stability control issues**.
- 

#### 534. Temperature Additional Storage Tank

- **Definition:** Measures the **temperature of an auxiliary fluid storage tank**, such as **AdBlue (DEF) or secondary fuel reservoirs**.
  - **Example Usage:** Ensures **proper fluid temperature for emissions reduction systems or fuel expansion control**.
  - **Impact if Faulty:** If incorrect, it may cause **DEF system malfunctions, emissions failures, or fuel vaporization issues**.
- 

#### 535. Temperature After the Intercooler

- **Definition:** Measures the **air temperature after it has passed through the intercooler**, crucial for **turbocharged engines**.
  - **Example Usage:** Helps optimize **boost pressure and air density for better combustion**.
  - **Impact if Faulty:** Incorrect readings may lead to **poor turbo efficiency, knocking, or power loss**.
- 

#### 536. Temperature Greater Than 150°C

- **Definition:** Triggers a warning if any **critical engine component** exceeds **150°C**, indicating overheating risk.
  - **Example Usage:** Protects **engine components from thermal damage** by activating cooling measures.
  - **Impact if Faulty:** Incorrect detection may cause **false overheating warnings or failure to detect real overheating**.
- 

### 537. Temperature in the Particulate Filter Bank 1

- **Definition:** Monitors the **temperature inside the particulate filter in Bank 1**, ensuring proper regeneration.
  - **Example Usage:** Helps trigger **DPF/GPF (Diesel/Gasoline Particulate Filter) regeneration cycles to burn off soot buildup**.
  - **Impact if Faulty:** If misread, it may cause **filter clogging, increased emissions, or exhaust backpressure**.
- 

### 538. Temperature in the Particulate Filter Bank 2

- **Definition:** Similar to **sensor #537**, but for **Bank 2 in V-engine configurations**.
  - **Example Usage:** Ensures **balanced particulate filter regeneration across both banks**.
  - **Impact if Faulty:** If incorrect, it may lead to **asymmetric exhaust flow, emissions failures, or DPF blockages**.
- 

### 539. Temperature Less Than 80°C

- **Definition:** Detects when **engine coolant or oil temperature drops below 80°C**, which may indicate improper warm-up.
- **Example Usage:** Helps adjust **fuel injection, ignition timing, and emissions controls** during cold starts.
- **Impact if Faulty:** If misread, it may cause **poor fuel economy, rough idling, or unnecessary warm-up delays**.

---

#### **540. Temperature on the Electronics**

- **Definition:** Measures the **operating temperature of electronic control units (ECUs) and other sensitive vehicle electronics.**
  - **Example Usage:** Protects **critical electrical components from overheating damage.**
  - **Impact if Faulty:** Incorrect readings may cause **premature electronic failures, performance degradation, or safety system malfunctions.**
- 

#### **541. Temperature Raw Value of the Intake Air Temperature Sensor 3**

- **Definition:** Provides the **raw, unprocessed temperature reading from the third intake air temperature sensor** before ECU adjustments.
  - **Example Usage:** Ensures **accurate air temperature measurements for proper fuel-air mixture calculations.**
  - **Impact if Faulty:** Incorrect readings may cause **poor combustion efficiency, knocking, or incorrect turbo boost regulation.**
- 

#### **542. Temperature Sensor Behind OPF Bank 1**

- **Definition:** Measures the **exhaust gas temperature after passing through the Otto Particulate Filter (OPF) in Bank 1.**
  - **Example Usage:** Helps monitor **filter efficiency and ensure proper emissions control.**
  - **Impact if Faulty:** Incorrect readings may cause **delayed filter regeneration, increased emissions, or filter clogging.**
- 

#### **543. Temperature Sensor Behind OPF Bank 2**

- **Definition:** Similar to **sensor #542**, but applies to **Bank 2 in a V-type engine.**
- **Example Usage:** Ensures **balanced exhaust gas flow and emissions control across both engine banks.**

- **Impact if Faulty:** If incorrect, it may cause **excessive backpressure, reduced power, or emissions failures.**
- 

#### 544. Temperature Sensor Behind UBKAT

- **Definition:** Measures **exhaust temperature after the underbody catalytic converter (UBKAT).**
  - **Example Usage:** Ensures **catalytic converter efficiency and helps detect overheating issues.**
  - **Impact if Faulty:** Incorrect values may cause **emissions failures, catalytic converter degradation, or poor fuel efficiency.**
- 

#### 545. Temperature Sensor in Front of OPF Bank 1

- **Definition:** Measures the **exhaust gas temperature before entering the Otto Particulate Filter (OPF) in Bank 1.**
  - **Example Usage:** Helps determine **optimal filter regeneration timing and efficiency.**
  - **Impact if Faulty:** Incorrect readings may cause **incomplete soot burn-off, filter clogging, or increased emissions.**
- 

#### 546. Temperature Sensor in Front of UBKAT

- **Definition:** Monitors the **exhaust temperature before the underbody catalytic converter (UBKAT).**
  - **Example Usage:** Helps regulate **catalytic converter efficiency and emissions compliance.**
  - **Impact if Faulty:** Incorrect data may cause **catalyst inefficiency, increased fuel consumption, or misfire detection issues.**
- 

#### 547. Temperature Sensor in Front of OPF Bank 2

- **Definition:** Similar to **sensor #545**, but applies to **Bank 2 in a V-engine.**

- **Example Usage:** Ensures **balanced exhaust temperatures for even emissions treatment across both banks.**
  - **Impact if Faulty:** Incorrect readings may cause **uneven exhaust gas treatment, potential filter failure, or excessive emissions.**
- 

#### 548. Terminal Voltage

- **Definition:** Measures the **voltage at a specific electrical terminal in the vehicle**, used for power supply monitoring.
  - **Example Usage:** Helps track **battery health, alternator performance, and electrical system stability.**
  - **Impact if Faulty:** Incorrect readings may cause **starting problems, battery overcharging, or electrical failures.**
- 

#### 549. Terminal Voltage of the Electric Machine

- **Definition:** Measures the **voltage supplied to the electric motor in hybrid or electric vehicles.**
  - **Example Usage:** Ensures **proper energy distribution for propulsion and regenerative braking.**
  - **Impact if Faulty:** If incorrect, it may cause **power delivery issues, poor efficiency, or reduced battery performance.**
- 

#### 550. Throttle Valve Angle from Potentiometer 1

- **Definition:** Measures the **throttle valve position based on the first throttle position sensor (TPS) potentiometer.**
  - **Example Usage:** Helps regulate **air intake for accurate throttle response and smooth acceleration.**
  - **Impact if Faulty:** Incorrect values may cause **throttle hesitation, rough idling, or unintended acceleration.**
-

#### **551. Throttle Valve Angle Related to the Lower Stop**

- **Definition:** Measures the **throttle valve position relative to its fully closed position**, ensuring proper air intake control.
  - **Example Usage:** Helps optimize **fuel-air mixture and engine response for smooth acceleration**.
  - **Impact if Faulty:** Incorrect readings may cause **throttle lag, poor fuel efficiency, or unexpected engine stalling**.
- 

#### **552. Throttle Angle of the Emergency Air Position**

- **Definition:** Measures the **throttle opening angle when the system enters emergency mode**, ensuring minimal airflow to prevent complete shutdown.
  - **Example Usage:** Helps maintain **engine operation in the event of a throttle control failure**.
  - **Impact if Faulty:** If misread, it may cause **incomplete fail-safe activation, engine stalling, or uncontrolled acceleration**.
- 

#### **553. Throttle Valve Positioner - Actual Position**

- **Definition:** Provides the **real-time position of the throttle valve**, as controlled by the electronic throttle actuator.
  - **Example Usage:** Ensures **smooth throttle response and precise air intake management**.
  - **Impact if Faulty:** Incorrect values may lead to **poor acceleration, hesitation, or erratic engine behavior**.
- 

#### **554. Time Counter for Engine Operation from the End of the Start (Over the Entire Control Unit Cycle)**

- **Definition:** Measures the **cumulative engine runtime after the last start, covering the entire ECU cycle**.
- **Example Usage:** Helps track **engine operating hours for maintenance scheduling**.

- **Impact if Faulty:** If incorrect, it may cause **delayed service alerts, inaccurate diagnostic data, or failure to log engine runtime properly.**
- 

#### 555. Time Counter from End of Start

- **Definition:** Tracks the **elapsed time since the engine last completed a successful start.**
  - **Example Usage:** Used for **start-stop system optimization and battery health monitoring.**
  - **Impact if Faulty:** Incorrect readings may lead to **start-stop malfunctions, misdiagnosed battery issues, or incorrect idle timing adjustments.**
- 

#### 556. Time in Which Quiescent Current is 200-1000 mA

- **Definition:** Measures the **duration for which the vehicle's quiescent current (standby power draw) remains within the range of 200-1000 mA.**
  - **Example Usage:** Helps detect **battery drain issues and monitor electronic system standby power consumption.**
  - **Impact if Faulty:** If misread, it may cause **unnecessary battery warnings, premature battery discharge, or failed power-saving functions.**
- 

#### 557. Time in Which the Quiescent Current is 80-200 mA

- **Definition:** Similar to **sensor #556**, but measures the **time period when the standby current is between 80-200 mA.**
  - **Example Usage:** Ensures that **power-saving measures function correctly during vehicle shutdown.**
  - **Impact if Faulty:** Incorrect values may lead to **increased parasitic drain, reduced battery lifespan, or unnecessary system wake-ups.**
- 

#### 558. Time in Which the Quiescent Current is Greater Than 1000 mA

- **Definition:** Tracks how long the **standby current remains above 1000 mA**, which could indicate excessive power draw.
  - **Example Usage:** Helps diagnose **electrical faults, failing control modules, or draining accessories**.
  - **Impact if Faulty:** If misread, it may cause **battery depletion, false error messages, or undiagnosed high power consumption issues**.
- 

#### 559. Time Since the Engine Started

- **Definition:** Tracks the **exact time duration since the engine was last started**, used for **diagnostic and performance monitoring**.
  - **Example Usage:** Helps manage **warm-up cycles, start-stop logic, and emissions control strategies**.
  - **Impact if Faulty:** If incorrect, it may cause **cold-start miscalculations, inefficient fuel mixture settings, or emissions system failures**.
- 

#### 560. Time Since the Last Refueling

- **Definition:** Measures the **elapsed time since the last refueling event**, used to optimize fuel level estimation and adaptive fuel trims.
  - **Example Usage:** Helps adjust **fuel system calculations based on recent refueling events**.
  - **Impact if Faulty:** Incorrect values may cause **fuel level miscalculations, poor fuel economy tracking, or inaccurate range estimations**.
- 

#### 561. Torque Consumption of the Converter via CAN

- **Definition:** Measures the **torque loss in the torque converter**, transmitted via the CAN bus.
- **Example Usage:** Helps optimize **transmission efficiency by adjusting power delivery**.
- **Impact if Faulty:** Incorrect values may cause **shifting delays, transmission overheating, or inefficient fuel consumption**.

---

## 562. Torque Limitation Status

- **Definition:** Reports whether the **engine is actively limiting torque output** due to traction control, drivetrain protection, or emissions control.
  - **Example Usage:** Ensures **safe power delivery under various driving conditions**.
  - **Impact if Faulty:** If misread, it may cause **power loss, unintended acceleration, or excessive strain on drivetrain components**.
- 

## 563. Total Discharge of the Storage Tank

- **Definition:** Measures the **cumulative fuel or fluid depletion from a storage tank**, such as AdBlue (DEF) or secondary fuel tanks.
  - **Example Usage:** Helps **track fuel usage trends and ensure emissions systems operate correctly**.
  - **Impact if Faulty:** Incorrect readings may cause **false low-fluid warnings, improper emissions control, or poor range estimation**.
- 

## 564. Torque of Torque Adaptation

- **Definition:** Measures the **amount of torque correction applied based on driving conditions and engine learning**.
  - **Example Usage:** Helps fine-tune **power delivery for smoother acceleration and optimal performance**.
  - **Impact if Faulty:** Incorrect values may cause **engine hesitation, rough acceleration, or unexpected power dips**.
- 

## 565. Total Duration of Total Discharges

- **Definition:** Tracks the **total operational time over which the fuel, AdBlue (DEF), or another fluid storage system has been discharged**.
- **Example Usage:** Helps optimize **fluid consumption and scheduling of refills or maintenance**.

- **Impact if Faulty:** Incorrect readings may lead to **missed refueling intervals, false warning lights, or emissions compliance issues.**
- 

#### 566. Total Start Counter

- **Definition:** Records the **total number of engine starts** since the vehicle was manufactured.
  - **Example Usage:** Helps track **engine usage for maintenance scheduling and wear monitoring.**
  - **Impact if Faulty:** Incorrect values may cause **improper service reminders, inaccurate wear predictions, or diagnostic confusion.**
- 

#### 567. Total Thermal Load VVT

- **Definition:** Measures the **accumulated thermal stress on the Variable Valve Timing (VVT) system.**
  - **Example Usage:** Helps monitor **VVT actuator health and determine when servicing is needed.**
  - **Impact if Faulty:** If incorrect, it may lead to **premature VVT failure, inefficient valve timing, or rough idling.**
- 

#### 568. Translational Acceleration

- **Definition:** Measures **linear acceleration forces** acting on the vehicle.
  - **Example Usage:** Helps in **traction control, stability programs, and crash detection.**
  - **Impact if Faulty:** Incorrect readings may cause **traction loss, incorrect airbag deployment, or miscalibrated stability control.**
- 

#### 569. Transmission Temperature

- **Definition:** Monitors the **real-time temperature of the transmission fluid**, ensuring proper gearbox operation.

- **Example Usage:** Helps prevent **overheating, gear slippage, and premature transmission wear.**
  - **Impact if Faulty:** If misread, it may lead to **overheated transmission fluid, erratic shifting, or potential transmission failure.**
- 

#### 570. Turbine Actuator Low Pressure - Actual Position

- **Definition:** Measures the **real-time position of the turbocharger turbine actuator in low-pressure mode.**
  - **Example Usage:** Helps regulate **boost pressure for optimal fuel efficiency and performance.**
  - **Impact if Faulty:** Incorrect readings may cause **turbo lag, excessive fuel consumption, or boost pressure instability.**
- 

#### 571. Uneven Running Cylinder 10

- **Definition:** Measures the **cylinder-to-cylinder variation in power output** for Cylinder 10, detecting misfires or combustion inconsistencies.
  - **Example Usage:** Helps diagnose **misfires, fuel injector issues, or valve timing problems.**
  - **Impact if Faulty:** Incorrect readings may cause **false misfire codes, rough idling, or unnoticed power loss.**
- 

#### 572. Uneven Running Cylinder 11

- **Definition:** Similar to **sensor #571**, but monitors **Cylinder 11** for irregular running behavior.
  - **Example Usage:** Used for **engine diagnostics and adaptive fuel tuning.**
  - **Impact if Faulty:** Misread values may lead to **unnecessary repairs, emissions issues, or reduced performance.**
- 

#### 573. Uneven Running Cylinder 12

- **Definition:** Tracks the **uneven operation of Cylinder 12**, helping maintain smooth engine balance.
  - **Example Usage:** Ensures **even power delivery across all cylinders in a V12 engine setup**.
  - **Impact if Faulty:** Incorrect readings may result in **engine imbalance, higher emissions, or unnecessary injector replacements**.
- 

#### 574. Uneven Running Cylinder 2

- **Definition:** Detects **inconsistencies in Cylinder 2's combustion cycle**, similar to the previous uneven running sensors.
  - **Example Usage:** Helps diagnose **misfires and ensure smooth acceleration**.
  - **Impact if Faulty:** If incorrect, it may cause **false error codes, reduced efficiency, or unbalanced engine operation**.
- 

#### 575. Uneven Running Cylinder 3

- **Definition:** Measures **cylinder misfires and performance inconsistencies in Cylinder 3**.
  - **Example Usage:** Assists in **fuel trim adjustments and early failure detection of ignition components**.
  - **Impact if Faulty:** Incorrect readings may lead to **misfire detection failures, excess fuel consumption, or rough idling**.
- 

#### 576. Uneven Running Cylinder 4

- **Definition:** Identifies **abnormal running characteristics in Cylinder 4** by comparing power output variations.
- **Example Usage:** Used in **engine diagnostics to prevent power loss and excessive fuel consumption**.
- **Impact if Faulty:** If incorrect, it may cause **drivability issues, poor throttle response, or incorrect air-fuel mixture compensation**.

---

## 577. Uneven Running Cylinder 5

- **Definition:** Tracks **Cylinder 5's combustion stability**, helping to maintain optimal engine operation.
  - **Example Usage:** Used to **adjust spark timing, fuel injection, and ignition coil performance**.
  - **Impact if Faulty:** Misread data may cause **unnoticed power loss, misfire events, or excessive engine vibrations**.
- 

## 578. Uneven Running Cylinder 6

- **Definition:** Monitors **Cylinder 6's individual performance**, ensuring combustion efficiency.
  - **Example Usage:** Helps detect **fuel injector clogging or ignition coil malfunctions**.
  - **Impact if Faulty:** If incorrect, it may result in **delayed misfire detection, increased emissions, or poor engine response**.
- 

## 579. Uneven Running Cylinder 7

- **Definition:** Measures **the power output stability of Cylinder 7** in multi-cylinder engines.
  - **Example Usage:** Used for **adaptive engine tuning and misfire prevention**.
  - **Impact if Faulty:** If misread, it may cause **erratic throttle response, inefficient combustion, or premature wear on engine components**.
- 

## 580. Uneven Running Cylinder 8

- **Definition:** Tracks **Cylinder 8 for irregular combustion patterns**, maintaining engine efficiency.
- **Example Usage:** Helps detect **fuel mixture imbalances, ignition timing issues, or valve malfunctions**.

- **Impact if Faulty:** Incorrect readings may lead to **false misfire detections, sluggish acceleration, or unbalanced cylinder output.**
- 

#### 581. Uneven Running Cylinder 9

- **Definition:** Measures **variations in power output for Cylinder 9**, helping detect misfires or inefficient combustion.
  - **Example Usage:** Ensures **smooth engine operation by monitoring ignition and fuel delivery.**
  - **Impact if Faulty:** Incorrect readings may cause **false misfire detection, increased emissions, or poor engine performance.**
- 

#### 582. Uneven Running of Cylinder 1

- **Definition:** Tracks **irregular combustion patterns in Cylinder 1**, helping to identify fuel, ignition, or timing issues.
  - **Example Usage:** Used for **adaptive engine tuning and preventing power fluctuations.**
  - **Impact if Faulty:** Misread values may lead to **hesitation, engine knocking, or increased fuel consumption.**
- 

#### 583. Unfiltered High Pressure Raw Value (Relative Pressure)

- **Definition:** Provides the **raw high-pressure reading from the fuel system** before ECU adjustments.
  - **Example Usage:** Helps optimize **fuel injection pressure for better combustion.**
  - **Impact if Faulty:** If incorrect, it may cause **misfires, poor acceleration, or excessive fuel consumption.**
- 

#### 584. Unfiltered Low Pressure Raw Value

- **Definition:** Gives the **raw fuel pressure reading from the low-pressure fuel system** before processing.

- **Example Usage:** Used for **detecting fuel pump issues or clogged fuel filters**.
  - **Impact if Faulty:** Incorrect values may cause **fuel starvation, poor throttle response, or hard starting**.
- 

#### 585. Unfiltered Rail Pressure Actual Value (Absolute Pressure)

- **Definition:** Provides the **raw, unprocessed high-pressure fuel rail reading** for direct injection engines.
  - **Example Usage:** Helps adjust **fuel injection timing and optimize power delivery**.
  - **Impact if Faulty:** If misread, it may cause **fuel rail pressure instability, engine misfires, or excessive emissions**.
- 

#### 586. Unfiltered Oil Level

- **Definition:** Measures the **raw oil level in the engine sump**, before ECU filtering.
  - **Example Usage:** Helps detect **low oil conditions or oil consumption trends**.
  - **Impact if Faulty:** Incorrect readings may cause **false low oil warnings or missed oil starvation detection**.
- 

#### 587. Utilization of the DC-DC Converter

- **Definition:** Measures the **percentage load on the DC-DC converter**, which steps down high-voltage battery power for low-voltage systems.
  - **Example Usage:** Ensures **stable electrical power distribution in hybrid/electric vehicles**.
  - **Impact if Faulty:** Misread values may cause **battery drain, low-voltage system failures, or charging malfunctions**.
- 

#### 588. Utilization of the Machine

- **Definition:** Measures the **operating load percentage of the electric motor** in hybrid or EV systems.

- **Example Usage:** Helps regulate **power output and efficiency**.
  - **Impact if Faulty:** If incorrect, it may cause **power loss, excessive energy consumption, or overheating**.
- 

#### 589. VVT Motor Current to Be Set by the Position Controller

- **Definition:** Defines the **current required to adjust the Variable Valve Timing (VVT) actuator**.
  - **Example Usage:** Helps ensure **precise camshaft adjustments for performance and efficiency**.
  - **Impact if Faulty:** Incorrect values may cause **rough idling, poor fuel economy, or VVT malfunctions**.
- 

#### 590. VVT Motor Rotor Angle

- **Definition:** Measures the **rotational angle of the VVT motor**, helping fine-tune camshaft positioning.
  - **Example Usage:** Used to **optimize valve timing for different driving conditions**.
  - **Impact if Faulty:** Misread values may cause **engine knocking, reduced performance, or emissions failures**.
- 

#### 591. VVT Overload Condition

- **Definition:** Detects when the **Variable Valve Timing (VVT) system is operating under excessive load or stress**.
  - **Example Usage:** Helps prevent **overloading of the camshaft actuators and ensures long-term durability of the VVT system**.
  - **Impact if Faulty:** If misread, it may cause **camshaft misalignment, rough engine operation, or unnecessary system deactivation**.
- 

#### 592. Vehicle Lateral Acceleration (Positive and Negative)

- **Definition:** Measures the **side-to-side (lateral) acceleration of the vehicle**, helping with stability and traction control.
  - **Example Usage:** Used in **Electronic Stability Control (ESC), Adaptive Cruise Control, and performance driving dynamics**.
  - **Impact if Faulty:** Incorrect readings may cause **poor handling, traction loss, or incorrect ESC interventions**.
- 

#### 593. Vehicle Drive Status

- **Definition:** Reports the **current driving mode of the vehicle** (e.g., Park, Drive, Reverse, or Neutral).
  - **Example Usage:** Helps manage **transmission shifting, start-stop systems, and safety features like hill-hold assist**.
  - **Impact if Faulty:** If incorrect, it may cause **gear selection issues, failed start-stop activations, or improper traction control operation**.
- 

#### 594. Vehicle Longitudinal Acceleration

- **Definition:** Measures the **front-to-rear (longitudinal) acceleration of the vehicle**, used in performance monitoring and traction control.
  - **Example Usage:** Helps improve **launch control, anti-lock braking (ABS), and adaptive driving features**.
  - **Impact if Faulty:** Misread values may cause **incorrect traction responses, unstable braking, or false performance calculations**.
- 

#### 595. Vehicle Speed

- **Definition:** Measures the **real-time speed of the vehicle**, often derived from wheel speed sensors or GPS data.
- **Example Usage:** Used in **speedometer calculations, cruise control, and driver assistance systems**.
- **Impact if Faulty:** If incorrect, it may cause **speedometer inaccuracies, cruise control malfunctions, or false ABS warnings**.

---

## **596. Vehicle Speed on the Front or Rear Axle or in the Vehicle's Center of Gravity**

- **Definition:** Measures the **speed at different reference points in the vehicle (front axle, rear axle, or center of gravity)**.
  - **Example Usage:** Helps optimize **traction control, torque vectoring, and stability management systems**.
  - **Impact if Faulty:** Incorrect readings may lead to **traction loss, improper AWD engagement, or handling instability**.
- 

## **597. Voltage PWG Potentiometer 1**

- **Definition:** Measures the **voltage output from the first Pedal Work Group (PWG) potentiometer**, which tracks accelerator pedal position.
  - **Example Usage:** Used in **drive-by-wire throttle systems for precise power control**.
  - **Impact if Faulty:** If incorrect, it may cause **poor throttle response, unintended acceleration, or engine hesitation**.
- 

## **598. Voltage Additional Power Storage**

- **Definition:** Measures the **voltage level of additional energy storage units**, such as a secondary battery or capacitor bank.
  - **Example Usage:** Ensures **stable power delivery for high-demand electrical systems**.
  - **Impact if Faulty:** Incorrect values may cause **charging malfunctions, auxiliary system failures, or unexpected battery drain**.
- 

## **599. Voltage PWG Potentiometer 2**

- **Definition:** Measures the **voltage output from the second Pedal Work Group (PWG) potentiometer**, providing redundancy for accelerator pedal tracking.

- **Example Usage:** Ensures accurate pedal position readings and improves fail-safe mechanisms.
  - **Impact if Faulty:** If misread, it may cause **throttle lag, acceleration inconsistencies, or limp mode activation**.
- 

#### 600. Voltage Behind Injection/Ignition Relay

- **Definition:** Measures the **voltage supplied to fuel injectors and ignition coils after passing through the relay**.
  - **Example Usage:** Ensures **consistent voltage for precise ignition timing and fuel injection operation**.
  - **Impact if Faulty:** If incorrect, it may cause **misfires, poor fuel combustion, or ignition failure**.
- 

#### 601. Voltage Fuel Low Pressure Sensor in 1 ms Grid

- **Definition:** Measures the **voltage signal from the low-pressure fuel sensor** in very fine **1-millisecond intervals**.
  - **Example Usage:** Ensures **accurate fuel delivery adjustments and fuel pump efficiency**.
  - **Impact if Faulty:** If incorrect, it may cause **fuel pressure fluctuations, poor acceleration, or incorrect fuel trim settings**.
- 

#### 602. Voltage Knock Values Cylinder 1

- **Definition:** Measures the **knock sensor voltage for Cylinder 1**, helping detect pre-ignition or detonation.
  - **Example Usage:** Adjusts **ignition timing to prevent knocking and engine damage**.
  - **Impact if Faulty:** Incorrect readings may cause **engine knocking, power loss, or unnecessary ignition timing retardation**.
- 

#### 603. Voltage Knock Values Cylinder 2

- **Definition:** Similar to **sensor #602**, but specifically for **Cylinder 2**.
  - **Example Usage:** Helps optimize **cylinder-specific ignition timing and prevent engine knock**.
  - **Impact if Faulty:** Incorrect values may lead to **misfire detection failures, excess fuel consumption, or detonation**.
- 

#### 604. Voltage Knock Values Cylinder 3

- **Definition:** Monitors the **knock sensor voltage for Cylinder 3**, detecting potential detonation issues.
  - **Example Usage:** Helps adjust **spark timing dynamically for better engine protection**.
  - **Impact if Faulty:** If incorrect, it may cause **engine knocking, unnecessary power reduction, or excessive emissions**.
- 

#### 605. Voltage Knock Values Cylinder 4

- **Definition:** Measures the **knock signal voltage for Cylinder 4**, ensuring precise knock control.
  - **Example Usage:** Ensures **fuel efficiency and proper engine performance**.
  - **Impact if Faulty:** Incorrect readings may cause **timing advance errors, inefficient combustion, or knocking damage**.
- 

#### 606. Voltage Knock Values Cylinder 5

- **Definition:** Monitors the **knock voltage levels in Cylinder 5**, detecting abnormal combustion behavior.
  - **Example Usage:** Used to **adapt ignition timing and fuel injection based on real-time knock detection**.
  - **Impact if Faulty:** Misread values may lead to **knock damage, poor throttle response, or incorrect engine adaptations**.
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## **607. Voltage Knock Values Cylinder 6**

- **Definition:** Measures the **cylinder knock intensity in Cylinder 6**, preventing engine damage from uncontrolled combustion.
  - **Example Usage:** Helps improve **engine longevity and prevent pre-ignition under high load**.
  - **Impact if Faulty:** If misread, it may cause **fuel economy issues, timing miscalculations, or excessive engine wear**.
- 

## **608. Voltage Pressure Sensor in Front of Throttle Valve**

- **Definition:** Measures the **voltage output from the pressure sensor before the throttle body**, indicating incoming air pressure.
  - **Example Usage:** Helps regulate **boost pressure in turbocharged engines and throttle response in all setups**.
  - **Impact if Faulty:** Incorrect readings may cause **throttle hesitation, turbo lag, or incorrect fuel-air mixture adjustments**.
- 

## **609. Voltage Raw Value Temperature Sensor Before UBKAT**

- **Definition:** Measures the **raw voltage reading from the exhaust temperature sensor before the underbody catalytic converter (UBKAT)**.
  - **Example Usage:** Ensures **catalytic converter efficiency and proper emissions control**.
  - **Impact if Faulty:** Incorrect values may cause **delayed catalyst warm-up, increased emissions, or incorrect exhaust diagnostics**.
- 

## **610. Voltage Raw Value Temperature Sensor Behind OPF Bank 1**

- **Definition:** Provides the **unprocessed voltage signal from the temperature sensor located after the Otto Particulate Filter (OPF) in Bank 1**.
- **Example Usage:** Helps monitor **filter regeneration and exhaust gas temperature**.

- **Impact if Faulty:** If incorrect, it may cause **particulate filter clogging, excessive backpressure, or emissions failures.**
- 

#### **611. Voltage Raw Value Temperature Sensor Behind OPF Bank 2**

- **Definition:** Provides the **unprocessed voltage output from the exhaust gas temperature sensor behind the Otto Particulate Filter (OPF) in Bank 2.**
  - **Example Usage:** Helps monitor **filter efficiency and ensures timely regeneration to prevent clogging.**
  - **Impact if Faulty:** Incorrect readings may cause **delayed regeneration cycles, excessive exhaust backpressure, or emissions failures.**
- 

#### **612. Voltage Raw Value Temperature Sensor Behind UBKAT**

- **Definition:** Measures the **raw voltage from the temperature sensor behind the underbody catalytic converter (UBKAT).**
  - **Example Usage:** Ensures that **post-catalyst temperatures remain within the expected operating range.**
  - **Impact if Faulty:** Incorrect readings may cause **incomplete catalytic conversion, higher emissions, or failure to detect overheating issues.**
- 

#### **613. Voltage Raw Value Temperature Sensor in Front of OPF Bank 1**

- **Definition:** Provides the **raw sensor voltage reading for the exhaust temperature before the Otto Particulate Filter (OPF) in Bank 1.**
  - **Example Usage:** Helps regulate **exhaust gas temperature and optimize filter regeneration.**
  - **Impact if Faulty:** Misread values may lead to **inefficient soot burn-off, increased emissions, or excessive fuel consumption.**
- 

#### **614. Voltage Raw Value Temperature Sensor in Front of OPF Bank 2**

- **Definition:** Similar to **sensor #613**, but for **Bank 2**, measuring exhaust temperature before the Otto Particulate Filter.
  - **Example Usage:** Ensures **accurate temperature monitoring for even emissions treatment across both banks**.
  - **Impact if Faulty:** Incorrect values may cause **asymmetric exhaust flow, DPF failures, or excessive fuel use**.
- 

#### **615. Voltage Requirement 12V Basis**

- **Definition:** Monitors the **baseline 12V power supply requirement for critical vehicle systems**.
  - **Example Usage:** Ensures **stable voltage levels for sensors, control modules, and electrical systems**.
  - **Impact if Faulty:** If incorrect, it may cause **electrical malfunctions, unstable voltage supply, or warning light activation**.
- 

#### **616. Voltage Throttle Valve Potentiometer 1**

- **Definition:** Measures the **voltage output from the first throttle position sensor (TPS) potentiometer** to determine throttle angle.
  - **Example Usage:** Used in **electronic throttle control systems for accurate pedal response**.
  - **Impact if Faulty:** Incorrect values may cause **throttle hesitation, erratic acceleration, or limp mode activation**.
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#### **617. Voltage Throttle Valve Potentiometer 2**

- **Definition:** Measures the **voltage from the secondary throttle position sensor (TPS), providing redundancy for drive-by-wire systems**.
- **Example Usage:** Ensures **throttle position accuracy and failsafe functionality in case of TPS failure**.
- **Impact if Faulty:** If incorrect, it may cause **poor throttle response, reduced engine power, or complete throttle failure**.

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## 618. Volume Flow of Fuel

- **Definition:** Measures the **rate at which fuel is flowing through the fuel system**, ensuring proper delivery to the injectors.
  - **Example Usage:** Helps **optimize fuel injection timing and fuel economy**.
  - **Impact if Faulty:** Incorrect readings may cause **fuel starvation, poor performance, or excessive fuel consumption**.
- 

## 619. Water Injection Pre-FS ASIC Temperature Dosing Module

- **Definition:** Monitors the **temperature of the water injection dosing module in pre-fuel system (Pre-FS) applications**.
  - **Example Usage:** Helps regulate **water-methanol injection systems to reduce intake temperatures and prevent detonation**.
  - **Impact if Faulty:** If misread, it may cause **inefficient cooling, excessive knock, or improper injection timing**.
- 

## 620. Water Injection Frost Counter Water Pressure Sensor

- **Definition:** Tracks the **water pressure sensor readings in the water injection system**, checking for frost buildup.
  - **Example Usage:** Ensures **water injection operates effectively in cold climates without freezing**.
  - **Impact if Faulty:** Incorrect values may lead to **system failure, loss of cooling benefits, or damage due to frozen water lines**.
- 

## 621. Water Injection Pre-FS Ambient Temperature

- **Definition:** Measures the **ambient temperature around the water injection system** to determine safe operating conditions.
- **Example Usage:** Ensures **water-methanol injection is only activated in suitable temperature ranges**.

- **Impact if Faulty:** Incorrect readings may cause **system activation in freezing temperatures, leading to potential ice blockages or system failure.**
- 

#### **622. Water Injection Pre-FS Holding Pressure Tank Shut-Off Valve**

- **Definition:** Monitors the **pressure in the water injection holding tank and the shut-off valve status.**
  - **Example Usage:** Helps regulate **water injection flow and prevent excessive pressure buildup.**
  - **Impact if Faulty:** Incorrect values may cause **leaks, pressure loss, or ineffective water injection performance.**
- 

#### **623. Water Injection Pre-FS Engine Shut-Off Valve**

- **Definition:** Monitors whether the **engine shut-off valve for the water injection system is functioning correctly.**
  - **Example Usage:** Ensures the **system is deactivated when the engine is off to prevent leaks or unwanted injection.**
  - **Impact if Faulty:** If incorrect, it may cause **water injection activation at the wrong time, leading to engine flooding or misfires.**
- 

#### **624. Water Injection Pre-FS Low Fuel Pressure**

- **Definition:** Detects **low fuel pressure in the water injection system**, which could affect performance.
  - **Example Usage:** Helps prevent **misfires or ineffective water injection due to insufficient fuel pressure.**
  - **Impact if Faulty:** Incorrect readings may cause **fuel starvation, loss of cooling effect, or improper engine performance adjustments.**
- 

#### **625. Water Injection Pre-FS Metering Valve Duty Cycle**

- **Definition:** Measures the **duty cycle (on/off time)** of the **water injection metering valve**, which controls the injection rate.
  - **Example Usage:** Ensures **precise water injection metering based on engine load and temperature**.
  - **Impact if Faulty:** If misread, it may cause **excessive or insufficient water injection, leading to performance losses or engine knocking**.
- 

#### 626. Water Injection Pre-FS Offset Water Pressure to the Environment

- **Definition:** Measures the **water pressure difference relative to ambient pressure**, ensuring proper injection pressure.
  - **Example Usage:** Helps prevent **water injection issues in high-altitude or varying atmospheric conditions**.
  - **Impact if Faulty:** Incorrect values may cause **inconsistent injection rates, reduced cooling efficiency, or system malfunctions**.
- 

#### 627. Water Injection Pre-FS Parameters DiagGra

- **Definition:** Stores and tracks **diagnostic parameters for the water injection system** (DiagGra refers to diagnostic graphics).
  - **Example Usage:** Helps analyze **system performance and detect issues based on historical data**.
  - **Impact if Faulty:** If incorrect, it may cause **misdiagnosis, improper fault detection, or ineffective system adjustments**.
- 

#### 628. Water Injection Pre-FS Parameters DiagMfBal

- **Definition:** Monitors **diagnostic mass flow balance (DiagMfBal) parameters for water injection**, ensuring even distribution.
- **Example Usage:** Helps regulate **water injection flow to prevent uneven distribution across cylinders**.
- **Impact if Faulty:** If incorrect, it may cause **uneven cooling, increased knocking in some cylinders, or unnecessary fuel enrichment**.

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#### **629. Water Injection Pre-FS Parameters DiagSetComp**

- **Definition:** Tracks **diagnostic compensation settings (DiagSetComp)** for the water injection system.
  - **Example Usage:** Ensures proper system adaptation under different temperature and load conditions.
  - **Impact if Faulty:** Misread values may cause incorrect injection rates, delayed response times, or excessive engine heat buildup.
- 

#### **630. Water Injection Pre-FS Parameters DiagWtrInjAcv**

- **Definition:** Monitors **diagnostic activation data (DiagWtrInjAcv)** for the water injection system, verifying operational status.
  - **Example Usage:** Ensures the system activates and deactivates correctly under the right conditions.
  - **Impact if Faulty:** If incorrect, it may cause failed activation during high load, potential engine overheating, or increased emissions.
- 

#### **631. Water Injection Pre-FS Pump Model**

- **Definition:** Identifies the **specific pump model used in the water injection system**, ensuring correct operation and compatibility.
  - **Example Usage:** Helps verify system configurations and software calibration for proper water injection control.
  - **Impact if Faulty:** Incorrect identification may lead to misconfigured injection rates, pump failure, or system malfunctions.
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#### **632. Water Injection Pre-FS Set Point Water Pressure**

- **Definition:** Defines the **target water pressure for the water injection system**, ensuring proper flow rates.

- **Example Usage:** Regulates cooling effects and prevents detonation by ensuring the correct amount of injected water.
  - **Impact if Faulty:** Incorrect values may cause too much or too little water injection, leading to poor combustion efficiency or knocking.
- 

### 633. Water Injection Pre-FS Shutdown Time

- **Definition:** Measures the delay between shutting off the engine and deactivating the water injection system, ensuring residual pressure is managed.
  - **Example Usage:** Prevents water accumulation in the intake system after shutdown.
  - **Impact if Faulty:** If incorrect, it may cause water pooling, potential hydrolocking, or failure to remove excess water.
- 

### 634. Water Injection Pre-FS Target Water Mass Flow (Sum of the Two Banks)

- **Definition:** Defines the desired total mass of water injected across both engine banks, ensuring even cooling and knock prevention.
  - **Example Usage:** Helps optimize water-to-fuel ratios for better performance and efficiency.
  - **Impact if Faulty:** Incorrect flow rates may lead to uneven cylinder cooling, detonation, or excessive water usage.
- 

### 635. Water Injection Pre-FS Temperature Intake Air

- **Definition:** Measures the intake air temperature before and after water injection, verifying cooling effectiveness.
  - **Example Usage:** Ensures that water injection is reducing intake temperatures effectively.
  - **Impact if Faulty:** Incorrect readings may cause inefficient cooling, incorrect fuel adjustments, or knocking.
-

### **636. Water Injection Pre-FS Vent Valve**

- **Definition:** Monitors the **vent valve operation in the water injection system**, which releases excess pressure.
  - **Example Usage:** Helps prevent **overpressure buildup that could damage the system**.
  - **Impact if Faulty:** Malfunctioning vent valves may cause **overpressure, leaks, or system shutdowns**.
- 

### **637. Water Level Available Water Control Unit**

- **Definition:** Measures the **current water level in the water injection reservoir**, ensuring sufficient supply for operation.
  - **Example Usage:** Prevents **dry operation of the water injection pump**.
  - **Impact if Faulty:** Incorrect readings may cause **false low-water warnings, pump failure, or ineffective injection**.
- 

### **638. Water Level Water Control Device**

- **Definition:** Monitors the **water level in an auxiliary water control unit**, which may be separate from the main injection system.
  - **Example Usage:** Ensures **adequate water levels for extended high-performance driving or cooling needs**.
  - **Impact if Faulty:** If incorrect, it may cause **unexpected system shutdowns, incorrect fluid level alerts, or unnecessary refilling prompts**.
- 

### **639. Wheel Speed Front Left**

- **Definition:** Measures the **rotational speed of the front left wheel**, used for traction control, ABS, and stability systems.
- **Example Usage:** Helps manage **wheel slip detection, torque vectoring, and adaptive cruise control**.

- **Impact if Faulty:** Incorrect readings may cause **traction control malfunctions, incorrect speedometer readings, or braking imbalances.**
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#### 640. Wheel Speed Front Right

- **Definition:** Similar to **sensor #639**, but for the **front right wheel**.
  - **Example Usage:** Ensures **accurate individual wheel speed tracking for traction control and ABS**.
  - **Impact if Faulty:** If misread, it may cause **instability during braking, incorrect traction adjustments, or ABS system failures**.
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