

GENERIC · POWERTRAIN

P029B

OBD-II DIAGNOSTIC TROUBLE CODE (DTC)

P029B

Cylinder 1 - Fuel Trim at Min Limit

P029B means the engine computer has detected that the fuel trim correction for cylinder 1 has reached its minimum limit, so the powertrain control module can no longer remove enough fuel to bring that cylinder's mixture back to stoichiometric. Cylinder 1 is running so rich that the computer has maxed out its ability to lean it out, which points to excess fuel entering that cylinder or a false rich signal from its oxygen sensor.

SYSTEM

Powertrain

CODE TYPE

Generic (all makes)

SEVERITY

Medium

FIX DIFFICULTY

Professional

AREA

Fuel and air metering (injector circuits)

Symptoms you may notice

- Illuminated check engine light, often with no other symptoms besides the warning light
- Rough idle or a noticeable shake that is worse when the engine is cold
- Black sooty exhaust smoke and a strong fuel smell at the tailpipe
- Poor fuel economy and a gradual loss of engine power
- Misfire-like shudder under acceleration if the excess fuel fouls the spark plug
- Elevated hydrocarbon readings or a failed emissions test

Common causes, most likely first

- 1 Leaking or stuck-open fuel injector on cylinder 1 delivering excess fuel
- 2 Contaminated or failed oxygen sensor on bank 1 reading falsely lean, driving the computer to add fuel
- 3 Faulty engine coolant temperature sensor reporting a cold engine so the computer commands a rich mixture
- 4 Leaking intake manifold gasket or injector O-ring admitting unmetered air that skews fuel trim learning
- 5 Restricted or dirty mass airflow sensor element causing inaccurate air measurement
- 6 Worn spark plug or ignition coil on cylinder 1 causing incomplete combustion and a false rich reading
- 7 Leaking evaporative emissions purge valve allowing fuel vapor into the intake when it should be closed



How to diagnose and fix it

- 1 Scan all modules and record freeze-frame data for P029B, then check for related misfire or oxygen sensor codes before touching any parts
- 2 Inspect the spark plug on cylinder 1 for black soot or fuel fouling and compare it with the other cylinders
- 3 Measure long-term and short-term fuel trim on bank 1 at idle and at 2500 rpm to see whether the rich condition is cylinder-specific or bank-wide
- 4 Test the cylinder 1 fuel injector for leakage, resistance and spray pattern, and swap it with a known-good injector to see if the fault follows
- 5 Check the engine coolant temperature sensor reading against actual engine temperature with a scan tool or infrared thermometer
- 6 Smoke-test the intake system for vacuum leaks and inspect the evaporative purge valve for sticking open
- 7 Verify the bank 1 upstream oxygen sensor responds correctly to a propane enrichment test before condemning it

Why cylinder 1 fuel trim maxes out

- A rich fuel trim limit on a single cylinder is often caused by a leaking injector rather than a sensor fault, so swapping the injector to another cylinder is the fastest way to confirm it.
- A lazy upstream oxygen sensor can report a false lean condition that makes the computer add fuel until the trim hits its minimum, even though the actual mixture is correct.
- Technicians frequently replace oxygen sensors for this code when the real cause is a sticking purge valve or a leaking injector O-ring that lets raw fuel into the intake.
- Fuel trim limits are learned values, so after a repair the code may return until the adaptive memory is cleared and a relearn drive cycle is completed.
- A misfire on cylinder 1 from a worn plug or coil can push unburned fuel into the exhaust, which the oxygen sensor reads as rich and drives the trim to its limit.

Can I keep driving with P029B?

You can usually drive the vehicle to a workshop, but avoid hard acceleration and long trips because excess fuel can wash cylinder walls, foul the spark plug and overheat the catalytic converter. If the check engine light starts flashing or the engine misfires badly, stop driving and have it towed.

Tools that help

- OBD-II scan tool with live fuel trim and freeze-frame data
- Infrared thermometer for checking engine coolant temperature sensor accuracy
- Fuel injector tester or noid light and injector balance tester
- Smoke machine for intake and evaporative leak testing
- Digital multimeter for sensor and injector resistance checks
- Spark plug socket and torque wrench



Reading P029B

- P** Powertrain: engine, transmission and emissions.
- 0** Generic (SAE) code: it means the same thing on every OBD-II vehicle.
- 2** Fuel and air metering (injector circuits).
- 9B** The exact fault within that area.

Often seen with

P0132 O2 Sensor Circuit High Voltage (Bank 1 Sensor 1) · **P0172** System Too Rich (Bank 1) · **P0175** System Too Rich (Bank 2) · **P0301** Cylinder 1 Misfire Detected · **P2188** System Too Rich at Idle (Bank 1)

See it working

Watch the animated explainer [Four-Stroke Engine Cutaway: Intake to Exhaust](#) on Auto Veteran to see the parts involved moving.

Full guide, related articles and animations: <https://www.autoveteran.tech/dtc-codes/p029b/>

