

GENERIC · POWERTRAIN

P02BB

OBD-II DIAGNOSTIC TROUBLE CODE (DTC)

P02BB

Cylinder 9 - Fuel Trim at Min Limit

P02BB means the engine computer has detected that the fuel trim correction for cylinder 9 has reached its minimum limit, so the powertrain control module can no longer lean out that cylinder's fuel mixture any further. The computer is reporting that the air-fuel ratio in that specific cylinder is excessively rich and it has exhausted its ability to compensate.

SYSTEM	CODE TYPE	SEVERITY	FIX DIFFICULTY	AREA
Powertrain	Generic (all makes)	Medium	Professional	Fuel and air metering (injector circuits)

Symptoms you may notice

- Illuminated check engine light, often with no other noticeable symptoms
- Rough idle or misfire sensation, especially when the engine is cold
- Black sooty exhaust smoke or a strong fuel odor from the tailpipe
- Reduced fuel economy and frequent refueling
- Engine hesitation or stumble during acceleration
- Failed emissions test due to high hydrocarbon or carbon monoxide readings

Common causes, most likely first

- 1 Leaking or stuck-open fuel injector on cylinder 9
- 2 Faulty oxygen sensor or air-fuel ratio sensor reading rich for that bank
- 3 High fuel pressure from a failing fuel pressure regulator or restricted return line
- 4 Leaking intake manifold gasket or injector O-ring admitting extra fuel
- 5 Contaminated engine oil with fuel dilution affecting crankcase ventilation
- 6 Wiring or connector fault to the cylinder 9 injector causing it to stay energized
- 7 Mechanical fault such as low compression or a worn camshaft lobe on that cylinder



How to diagnose and fix it

- 1 Connect a scan tool and record freeze-frame data and fuel trim values for all cylinders to confirm the rich condition is isolated to cylinder 9
- 2 Inspect the cylinder 9 spark plug for black soot or fuel fouling, which confirms an overly rich mixture in that hole
- 3 Perform a fuel injector balance test or swap the cylinder 9 injector with a known-good one to see if the fault moves
- 4 Check fuel pressure with a gauge and compare to specification, looking for a stuck regulator or restricted return line
- 5 Smoke-test the intake system and inspect injector O-rings for leaks that could add unmetered fuel
- 6 Test the upstream oxygen sensor response with a scan tool or oscilloscope to rule out a false rich signal
- 7 If all external causes are ruled out, perform a compression test and cylinder leak-down test to check for mechanical faults

When fuel trim bottoms out on one cylinder

- A min-limit fuel trim on a single cylinder often points to a leaking injector rather than a sensor fault, because a bad sensor usually affects the whole bank and sets a bank-specific code instead.
- Fuel dilution of the engine oil is a common side effect that owners miss; a strong gasoline smell on the dipstick means the injector has been leaking for a while and the oil should be changed after repair.
- Some technicians replace the oxygen sensor first, but a rich exhaust can foul a new sensor quickly, so confirm the injector and fuel pressure before condemning the sensor.
- Cylinder 9 exists only on engines with nine or more cylinders, so this code is rare and often misdiagnosed as a generic bank-rich fault on V8 engines where cylinder numbering differs.
- A stuck-open purge valve or EVAP system fault can add fuel vapor to the intake and cause a rich trim on one bank, so check purge operation before tearing into the injectors.

Can I keep driving with P02BB?

You can drive the vehicle short distances to a repair shop, but avoid heavy acceleration and long trips because the rich condition can wash cylinder walls, dilute the oil, and overheat the catalytic converter. If the check engine light starts flashing, stop driving and have the vehicle towed.

Tools that help

- OBD-II scan tool with live data and fuel trim display
- Fuel pressure gauge
- Infrared thermometer or oscilloscope for injector testing
- Compression tester
- Smoke machine for intake leaks
- Basic hand tools and noid light for injector pulse testing



Reading P02BB

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).
BB	The exact fault within that area.

Often seen with

P0172 System Too Rich (Bank 1) · **P0175** System Too Rich (Bank 2) · **P02B9** Cylinder 8 - Injector Leaking · **P02BC** Cylinder 9 - Injector Restricted · **P0309** Cylinder 9 Misfire Detected

See it working

Watch the animated explainer [How a Padlock Works: Pin Tumbler Lock in X-Ray](#) on Auto Veteran to see the parts involved moving.

Full guide, related articles and animations: <https://www.autoveteran.tech/dtc-codes/p02bb/>

