

GENERIC · POWERTRAIN

P2C52

OBD-II DIAGNOSTIC TROUBLE CODE (DTC)

P2C52

Cylinder 1 Fuel Injector B Offset Learning At Min Limit

P2C52 indicates that the engine control module has learned a fuel injector offset correction for cylinder 1 that has reached its minimum allowable limit, meaning the injector is flowing more fuel than the computer expects and the module can no longer lean it out. The ECM stores this code when the adaptive learning value for the cylinder 1 injector's B offset bottoms out during closed-loop fuel control.

SYSTEM

Powertrain

CODE TYPE

Generic (all makes)

SEVERITY

Medium

FIX DIFFICULTY

Intermediate

AREA

Hybrid propulsion

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
- Slightly elevated or erratic fuel consumption
- Black smoke or fuel odor from the exhaust in severe cases
- Poor throttle response or hesitation under light load
- Possible cylinder 1 misfire code stored alongside P2C52

Common causes, most likely first

- 1 Leaking or partially stuck-open cylinder 1 fuel injector
- 2 Contaminated or clogged injector nozzle causing an abnormal spray pattern
- 3 High fuel pressure from a faulty pressure regulator or restricted return line
- 4 Wiring harness chafe or poor connector contact at the cylinder 1 injector
- 5 Internal ECM driver fault on the cylinder 1 injector circuit
- 6 Mechanical engine issue such as low compression on cylinder 1 altering fuel demand
- 7 Aftermarket or incorrect injector installed previously with mismatched flow characteristics



How to diagnose and fix it

- 1 Scan all modules and record freeze-frame data to confirm when the code set and check for companion misfire or fuel trim codes
- 2 Inspect the cylinder 1 injector connector and harness for corrosion, chafe, or loose pins, and perform a wiggle test while watching live data
- 3 Measure fuel pressure with a gauge and compare to specification to rule out a high-pressure condition
- 4 Run a cylinder contribution or injector balance test to compare cylinder 1 flow against the others
- 5 Perform a compression test on cylinder 1 to rule out a mechanical cause before condemning the injector
- 6 Remove and flow-test the cylinder 1 injector, or swap it to another cylinder to see if the offset limit follows the injector
- 7 Replace the faulty injector with a correct OEM-specification unit, clear adaptations, and relearn the offset before verifying the repair

What the offset limit really tells you

- A min-limit offset code means the ECM has already leaned cylinder 1 as far as its calibration allows, so the injector is delivering too much fuel rather than too little, which is the opposite of what many technicians assume.
- A dirty or partially restricted injector can cause this code just as often as a leaking one, because a distorted spray pattern changes combustion efficiency and skews the learned offset.
- Fuel pressure that is only slightly above specification will not always set a pressure code but can push the cylinder 1 offset to its limit, so always verify pressure mechanically.
- Swapping the suspect injector to another cylinder is the fastest way to confirm the fault follows the part rather than the wiring or the ECM driver.
- After replacing the injector, the ECM must relearn the offset; skipping the adaptation reset can leave the code pending or immediately returning.

Can I keep driving with P2C52?

The vehicle is generally safe to drive short distances to a repair shop, but avoid heavy throttle and prolonged idling because a rich cylinder can wash oil from the bore and overheat the catalytic converter. If the check engine light is flashing or a misfire is felt, stop driving and arrange a tow.

Tools that help

- OBD-II scan tool with live data and bidirectional control
- Fuel pressure gauge
- Compression tester
- Digital multimeter
- Injector balance tester or scan-tool cylinder contribution function
- Basic hand tools for injector removal



Reading P2C52

- P** Powertrain: engine, transmission and emissions.
- 2** Generic (SAE) code: it means the same thing on every OBD-II vehicle.
- C** Hybrid propulsion.
- 52** The exact fault within that area.

Often seen with

P0087 Fuel Rail/System Pressure - Too Low · **P0172** System Too Rich (Bank 1) · **P0201** Injector Circuit Malfunction - Cylinder 1 · **P0301** Cylinder 1 Misfire Detected · **P2C53** Cylinder 1 Fuel Injector B Offset Learning At Max Limit

See it working

Watch the animated explainer [How the PCV System Works: Crankcase Ventilation](#) on Auto Veteran to see the parts involved moving.

Full guide, related articles and animations: <https://www.autoveteran.tech/dtc-codes/p2c52/>

