

GENERIC · POWERTRAIN

P02D9

OBD-II DIAGNOSTIC TROUBLE CODE (DTC)

P02D9

Cylinder 7 Fuel Injector A Offset Learning At Max Limit

P02D9 indicates that the engine control module has learned a fuel injector offset correction for cylinder 7 that has reached its maximum allowable limit, meaning the injector is flowing outside the range the computer can compensate for. The computer detects this when the short-term fuel trim or injector pulse-width adaptation for that specific cylinder can no longer bring the air-fuel ratio back to target.

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

Symptoms you may notice

- Illuminated check engine light, often with no other noticeable symptoms
- Rough idle or a noticeable vibration that may be worse when the engine is cold
- Slight misfire or hesitation during acceleration, particularly under light load
- Decreased fuel economy as the computer struggles to correct the imbalance
- A faint fuel odor from the exhaust if the injector is over-fueling
- In rare cases, a flashing check engine light if the misfire becomes severe enough to damage the catalytic converter

Common causes, most likely first

- 1 Clogged, restricted, or dirty fuel injector on cylinder 7
- 2 Failed or leaking fuel injector on cylinder 7
- 3 Wiring fault or poor electrical connection at the cylinder 7 injector harness
- 4 Low fuel pressure or a restricted fuel supply affecting that injector
- 5 Internal engine mechanical issue such as low compression on cylinder 7
- 6 Contaminated fuel or fuel system deposits affecting injector performance
- 7 Engine control module software calibration issue or faulty injector driver circuit



How to diagnose and fix it

- 1 Perform a visual inspection of the cylinder 7 injector connector and harness for corrosion, chafing, or loose pins
- 2 Check fuel pressure and fuel quality to rule out a supply-side restriction or contamination
- 3 Run a cylinder contribution or injector balance test with a scan tool to compare cylinder 7 against the others
- 4 Perform a compression test and, if needed, a cylinder leak-down test on cylinder 7 to rule out mechanical faults
- 5 Remove and flow-test the cylinder 7 injector, or swap it with a known-good injector from another cylinder to see if the code follows
- 6 Clean or replace the cylinder 7 fuel injector if it fails flow or resistance testing
- 7 Clear the adaptive learning values and re-learn the injector offsets, then verify the code does not return after a road test

What the offset learning limit really means

- A maxed-out offset learning value does not automatically condemn the injector; a weak spark plug, coil, or vacuum leak on that cylinder can force the computer to overcompensate the injector and set this code.
- Many technicians replace the injector without first checking compression on cylinder 7, and a mechanical fault such as a worn cam lobe or valve seat will set the same code again on the new part.
- Fuel injector offset learning is sensitive to fuel pressure, so a failing fuel pump or a clogged fuel filter can cause this code on one cylinder even when the injector itself is healthy.
- This code can appear after a battery replacement or ECU reflash because the learned values are cleared, and the computer must relearn offsets from scratch; a short drive cycle may resolve it without any repair.
- A dirty mass airflow sensor or a small intake leak can skew the air-fuel mixture enough that the computer reaches the offset limit on a single cylinder, so always check fuel trims across all cylinders before condemning the injector.

Can I keep driving with P02D9?

You can usually drive the vehicle short distances at moderate speed, but avoid heavy acceleration or towing until the fault is diagnosed because a persistent rich or lean condition on cylinder 7 can damage the catalytic converter over time. If the check engine light begins flashing, stop driving and have the vehicle towed.

Tools that help

- OBD-II scan tool with live data and cylinder balance or injector test capability
- Fuel pressure gauge
- Compression tester
- Digital multimeter
- Noid light or injector pulse tester
- Basic hand tools for injector removal and replacement



Reading P02D9

- 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).
- D9** The exact fault within that area.

Often seen with

P0171 System Too Lean (Bank 1) · **P0172** System Too Rich (Bank 1) · **P02D8** Cylinder 7 Fuel Injector A Offset Learning At Min Limit · **P02DA** Cylinder 8 Fuel Injector A Offset Learning At Min Limit · **P0307** Cylinder 7 Misfire Detected

See it working

Watch the animated explainer [Engine Cooling System Trainer: How Engines Stay Cool](#) on Auto Veteran to see the parts involved moving.

Full guide, related articles and animations: <https://www.autoveteran.tech/dtc-codes/p02d9/>

