

GENERIC · POWERTRAIN

P02A3

OBD-II DIAGNOSTIC TROUBLE CODE (DTC)

P02A3

Cylinder 3 - Fuel Trim at Min Limit

P02A3 indicates that the engine control module has detected that the fuel trim correction for cylinder 3 has reached its minimum limit, meaning the engine is running excessively rich on that cylinder and the computer can no longer lean it out. The powertrain control module monitors crankshaft speed fluctuations to identify individual cylinder imbalances and sets this code when the trim value stays at the lean-most authority for a calibrated time.

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
- Noticeable black smoke from the exhaust under acceleration
- Decreased fuel economy and a strong fuel odor around the vehicle
- Engine hesitation or stumbling during light-throttle cruising
- Elevated hydrocarbon emissions that may cause a failed emissions test

Common causes, most likely first

- 1 Leaking or stuck-open fuel injector on cylinder 3
- 2 Faulty or contaminated oxygen sensor affecting that bank's fuel control
- 3 Intake manifold runner control stuck closed for cylinder 3, restricting air
- 4 Worn or misadjusted spark plug or ignition coil causing incomplete combustion on cylinder 3
- 5 Mechanical fault such as low compression or a bad valve seat on cylinder 3
- 6 Leaking intake manifold gasket or vacuum leak near cylinder 3
- 7 Engine control module software calibration issue or faulty injector driver circuit



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 on cylinder 3
- 2 Perform a cylinder balance test or compression test to rule out mechanical faults on cylinder 3
- 3 Inspect the spark plug and ignition coil for cylinder 3, replacing if fouled or worn
- 4 Check for vacuum leaks around the intake manifold and injector seals using a smoke machine
- 5 Swap the cylinder 3 fuel injector with another cylinder and see if the rich trim follows the injector
- 6 Test the oxygen sensor response and replace if sluggish or contaminated
- 7 Verify injector pulse width and driver circuit integrity with an oscilloscope or noid light

Cylinder 3 fuel trim limits and hidden causes

- A rich fuel trim at the minimum limit on a single cylinder often points to a leaking injector, but a restricted intake runner can cause the same code by reducing air to that cylinder.
- Technicians sometimes replace the oxygen sensor when the real problem is a mechanical fault like a worn cam lobe or valve seat that reduces airflow to cylinder 3.
- The code can be set by a faulty injector driver inside the engine control module even when the injector itself tests good, so circuit testing is essential.
- Fuel trim limits are learned over time, so a recently cleared code may not return until the vehicle has completed several drive cycles.
- A misfire code for cylinder 3 may or may not be stored alongside P02A3, so the absence of a misfire code does not rule out an ignition or mechanical issue.

Can I keep driving with P02A3?

You can drive the vehicle short distances to a repair shop, but avoid heavy acceleration and prolonged idling because the rich condition can damage the catalytic converter and waste fuel. If the check engine light starts flashing or the engine runs very rough, stop driving and have it towed.

Tools that help

- OBD-II scan tool with live data and fuel trim graphing
- Compression tester
- Vacuum gauge or smoke machine
- Digital multimeter
- Oscilloscope for injector and ignition signals
- Noid light for injector pulse testing



Reading P02A3

- 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).
- A3** The exact fault within that area.

Often seen with

P0172 System Too Rich (Bank 1) · **P02A1** Cylinder 2 - Injector Leaking · **P02A2** Cylinder 3 - Fuel Trim at Max Limit · **P02A4** Cylinder 3 - Injector Restricted · **P0303** Cylinder 3 Misfire Detected

See it working

Watch the animated explainer [How a Supercharger Works: Roots Blower in X-Ray](#) on Auto Veteran to see the parts involved moving.

Full guide, related articles and animations: <https://www.autoveteran.tech/dtc-codes/p02a3/>

