

GENERIC · POWERTRAIN

P02A2

OBD-II DIAGNOSTIC TROUBLE CODE (DTC)

P02A2

Cylinder 3 - Fuel Trim at Max Limit

P02A2 means the engine computer has reached the maximum authority it is allowed to add or subtract fuel on cylinder 3 while trying to keep the air-fuel mixture correct. The powertrain control module (PCM) monitors crankshaft speed variations and exhaust oxygen content, and when the fuel trim correction for that one cylinder stays pinned at its limit, it stores this code.

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

Symptoms you may notice

- Illumination of the check engine light, often with no other noticeable symptoms
- A rough idle or noticeable vibration that is worse when the engine is cold
- Slight hesitation or stumble during acceleration from a stop
- A persistent misfire feel or shaking under light load
- Reduced fuel economy over time as the computer struggles to balance the mixture
- Occasional surging or uneven power delivery at steady cruising speed

Common causes, most likely first

- 1 A leaking or clogged fuel injector on cylinder 3, causing an imbalance the computer cannot correct
- 2 A vacuum leak at the intake manifold runner or injector O-ring specific to cylinder 3
- 3 Worn or fouled spark plug on cylinder 3 that alters combustion efficiency and skews the trim
- 4 A failing ignition coil or plug wire for cylinder 3 causing incomplete combustion
- 5 Low compression on cylinder 3 from worn rings, a bad valve, or a head gasket issue
- 6 A faulty oxygen sensor or a lazy upstream sensor that misreports the mixture
- 7 A dirty mass airflow sensor or a restricted fuel filter affecting the whole bank but showing up first on one cylinder



How to diagnose and fix it

- 1 Scan all stored and pending codes and check freeze-frame data to confirm the fault is specific to cylinder 3
- 2 Inspect the spark plug and ignition coil for cylinder 3, looking for fouling, cracks, or weak spark
- 3 Perform a fuel injector balance test or swap the cylinder 3 injector with another cylinder to see if the code follows
- 4 Smoke-test the intake system for vacuum leaks around the cylinder 3 runner and injector seal
- 5 Check fuel pressure and volume at the rail to rule out a weak pump or restricted filter
- 6 Run a compression test and, if low, a cylinder leak-down test on cylinder 3
- 7 Verify the upstream oxygen sensor response with a scan tool and replace it only if it is slow or biased

When the trim limit points to one cylinder

- A fuel trim at max limit on a single cylinder often means the computer has been adding or subtracting fuel for a long time, so the underlying cause may be a slow wear item rather than a sudden failure.
- Technicians frequently replace the oxygen sensor first, but a cylinder-specific trim code usually points to that cylinder's injector, ignition, or compression rather than the sensor itself.
- A vacuum leak at the intake manifold gasket can affect one runner more than others, so a smoke test is more reliable than guessing from fuel trim numbers alone.
- The code can set without a misfire code because the computer may be correcting the mixture enough to keep combustion smooth, which is why the warning light may be the only clue.
- Fuel trim limits are learned over time, so after a repair the computer may need several drive cycles to relearn and clear the code on its own.

Can I keep driving with P02A2?

You can usually drive the vehicle short distances to a repair shop, but avoid heavy acceleration, towing, or long highway trips until the fault is diagnosed. Continuing to drive with a persistent cylinder imbalance can damage the catalytic converter and worsen engine wear.

Tools that help

- OBD-II scan tool with live data and fuel trim display
- Vacuum gauge or smoke machine for intake leak testing
- Compression tester and cylinder leak-down tester
- Fuel pressure gauge
- Spark tester and basic hand tools for plug and coil access



Reading P02A2

- 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).
- A2** The exact fault within that area.

Often seen with

P0171 System Too Lean (Bank 1) · **P0172** System Too Rich (Bank 1) · **P0203** Injector Circuit Malfunction - Cylinder 3 · **P0261** Cylinder 1 Injector Circuit Low · **P0303** Cylinder 3 Misfire Detected

See it working

Watch the animated explainer [Readiness Monitors and the OBD-II Drive Cycle](#) on Auto Veteran to see the parts involved moving.

Full guide, related articles and animations: <https://www.autoveteran.tech/dtc-codes/p02a2/>

