

GENERIC · POWERTRAIN

P02AA

OBD-II DIAGNOSTIC TROUBLE CODE (DTC)

P02AA

Cylinder 5 - Fuel Trim at Max Limit

P02AA indicates that the powertrain control module (PCM) has detected that the fuel trim correction for cylinder 5 has reached its maximum allowed limit, meaning the engine computer can no longer add or subtract enough fuel to bring that cylinder's air-fuel ratio back to the target. This typically signals an extreme lean or rich condition specific to cylinder 5 that the PCM cannot compensate for.

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 misfire sensation, especially when the engine is cold
- Reduced engine power or hesitation during acceleration
- Poor fuel economy or a strong fuel odor from the exhaust
- Increased emissions, possibly failing an emissions test
- Engine may enter limp mode in severe cases

Common causes, most likely first

- 1 Faulty fuel injector for cylinder 5 (clogged, leaking, or stuck open/closed)
- 2 Vacuum leak at the intake manifold runner or gasket near cylinder 5
- 3 Malfunctioning ignition coil or spark plug causing incomplete combustion
- 4 Exhaust leak before the oxygen sensor affecting fuel trim readings
- 5 Low fuel pressure or restricted fuel filter affecting all cylinders but most noticeable on one
- 6 Wiring or connector issue to the cylinder 5 fuel injector or ignition coil
- 7 Mechanical engine problem such as low compression or valve issue on cylinder 5



How to diagnose and fix it

- 1 Scan all stored codes and freeze-frame data to confirm P02AA and check for related misfire or lean/rich codes
- 2 Inspect the engine air intake and vacuum hoses for leaks, especially near cylinder 5
- 3 Test the fuel injector for cylinder 5 for resistance, pulse, and spray pattern; compare with other injectors
- 4 Check spark plug and ignition coil for cylinder 5; swap with a known-good cylinder to see if the code moves
- 5 Measure fuel pressure and verify the fuel filter is not restricted
- 6 Perform a compression test and cylinder leak-down test on cylinder 5 to rule out mechanical faults
- 7 Repair or replace the faulty component and clear codes, then verify fuel trims return to normal

Cylinder 5 fuel trim maxed out: look beyond the injector

- A vacuum leak at the intake manifold gasket can affect only one cylinder if the leak is at the runner for that cylinder, causing a lean condition that maxes out fuel trim on that cylinder alone.
- A failing ignition coil or spark plug can cause unburned oxygen to enter the exhaust, which the oxygen sensor interprets as a lean condition, leading the PCM to add fuel until the trim limit is reached.
- Fuel trim at max limit does not always mean the injector is faulty; a restricted fuel filter or weak fuel pump can cause lean conditions across all cylinders, but cylinder 5 may be the first to trigger the code due to its position in the fuel rail.
- Exhaust leaks upstream of the oxygen sensor can introduce outside air, skewing the sensor reading and causing the PCM to add fuel unnecessarily, which can max out fuel trim on one or more cylinders.
- Mechanical issues like a worn camshaft lobe or a sticking valve on cylinder 5 can cause incomplete combustion and trigger this code even when fuel and ignition systems are functioning properly.

Can I keep driving with P02AA?

You can drive the vehicle short distances to a repair shop, but avoid heavy acceleration or sustained high speeds because the engine is running with an uncorrectable fuel mixture that can damage the catalytic converter and cause misfires. Prolonged driving with this code may lead to more expensive repairs.

Tools that help

- OBD-II scan tool with live data and fuel trim capabilities
- Fuel pressure gauge
- Vacuum gauge
- Compression tester
- Multimeter
- Spark tester



Reading P02AA

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

Often seen with

P0171 System Too Lean (Bank 1) · **P0172** System Too Rich (Bank 1) · **P0205** Injector Circuit/Open - Cylinder 5
· **P0300** Random/Multiple Cylinder Misfire Detected · **P0305** Cylinder 5 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/p02aa/>

