

GENERIC · POWERTRAIN

P02BF

OBD-II DIAGNOSTIC TROUBLE CODE (DTC)

P02BF

Cylinder 10 - Fuel Trim at Min Limit

P02BF means the engine computer has detected that cylinder 10's fuel trim has reached its minimum correction limit, indicating the engine is running excessively rich on that cylinder and the computer can no longer lean it out. The powertrain control module monitors fuel trim as a learned correction to injector pulse width, and when the long-term trim for cylinder 10 hits the negative limit, it stores this code.

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
- Black sooty exhaust smoke and a strong fuel odor from the tailpipe
- Reduced fuel economy and frequent refueling
- Engine hesitation or stumble during acceleration
- Elevated hydrocarbon emissions that may fail an emissions test

Common causes, most likely first

- 1 Leaking or stuck-open fuel injector on cylinder 10
- 2 Faulty oxygen sensor or air-fuel ratio sensor reading rich incorrectly
- 3 Contaminated engine oil from excessive fuel dilution affecting combustion
- 4 Restricted intake or air filter causing low air mass and rich mixture
- 5 Faulty mass airflow sensor under-reporting air intake
- 6 High fuel pressure from a failing fuel pressure regulator or restricted return line
- 7 Mechanical issue such as low compression or a worn camshaft lobe on cylinder 10



How to diagnose and fix it

- 1 Connect a scan tool and record freeze-frame data and long-term fuel trim values for all cylinders to confirm the rich condition is isolated to cylinder 10
- 2 Inspect the air intake system and air filter for restrictions or leaks, and verify the mass airflow sensor reading is plausible
- 3 Check fuel pressure with a gauge and compare to specification, looking for excessive pressure that would enrich the mixture
- 4 Perform a cylinder balance test or injector flow test to compare cylinder 10 with the others and identify a leaking injector
- 5 Swap the ignition coil and spark plug from cylinder 10 to a neighboring cylinder to see if the misfire or rich trim follows, ruling out ignition-related false enrichment
- 6 Use a vacuum gauge and compression test to check for mechanical faults on cylinder 10 that could cause incomplete combustion and false rich readings
- 7 If all external checks pass, replace the suspect fuel injector on cylinder 10 and clear the adaptive fuel trim memory with a scan tool

Why cylinder 10 fuel trim maxes out rich

- A leaking injector is the most common cause, but technicians often overlook a stuck-open purge valve or evap system fault that can flood the intake with fuel vapor and drive trims rich across multiple cylinders.
- Fuel trim at the minimum limit does not always mean the engine is truly rich; a skewed oxygen sensor or exhaust leak before the sensor can report a false rich condition and cause the computer to overcorrect.
- Cylinder-specific fuel trim codes on high-cylinder-count engines are frequently caused by a single faulty ignition coil that causes a misfire, which the computer misinterprets as a rich condition due to unburned fuel in the exhaust.
- After replacing the injector or repairing the root cause, the long-term fuel trim must be reset with a scan tool, or the code may return immediately because the learned correction is still at the limit.
- On engines with cylinder deactivation, a stuck lifter or deactivation fault on cylinder 10 can cause incomplete combustion and set this code without any injector problem at all.

Can I keep driving with P02BF?

You can drive the vehicle short distances to a repair shop, but avoid heavy acceleration and long trips because continued rich operation can damage the catalytic converter and dilute engine oil. If the check engine light is 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 capability
- Fuel pressure gauge
- Vacuum gauge
- Compression tester
- Infrared thermometer or injector flow test kit
- Basic hand tools and a multimeter

Reading P02BF

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).
BF	The exact fault within that area.

Often seen with

P0172 System Too Rich (Bank 1) · **P0175** System Too Rich (Bank 2) · **P02BE** Cylinder 10 - Fuel Trim at Max Limit · **P02C0** Cylinder 10 - Injector Restricted · **P030A** Ignition A Control Signal Circuit/Open

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/p02bf/>

