



DIESEL AIR FLOW 224

AIR FLOW CHALLENGES

With Turbocharged Diesel Engines

Troubleshooting intake air flow issues prompting P0299 Turbocharger Underboost code can be a challenge. Having a thorough knowledge of how the system functions is imperative in making an accurate diagnosis.

DODGE TURBO DIESEL CODE P0299 TURBOCHARGER UNDERBOOST

Intake air flow is monitored by the Powertrain Control Module (PCM) and controls the variable geometry turbocharger position to obtain the correct amount of air and exhaust gas recirculation for the injected amount of fuel. Through sensor input, the PCM compares the actual air flow versus a commanded air flow. These sensors include a mass air flow sensor and a manifold absolute pressure sensor. When the actual charged air flow is less than the commanded air flow beyond a calibrated amount based on a calibrated period of time, the system test will indicate a failure, and a fault code will be set.

Following are possible conditions that will result in a P0299 trouble code. These checks should be performed as a first step in the diagnostic process:

- 1) Restrictions in the air intake system or air leaks
- 2) Damaged air filter housing or air filter not properly seated and sealed
- 3) Air filter contamination
- 4) Flow restrictions in the air charge cooler
- 5) Contaminated mass air flow sensor
- 6) Manifold absolute pressure sensor contaminated/defective
- 7) EGR valve
- 8) Defective turbocharger

When performing an air filter inspection, it should include more than just the presence of debris. This is especially true if the vehicle has been operated in weather conditions that include rain, floods or snow. The presence of water/snow on the media forms a hydro-lock condition restricting air flow to the engine. These elements can elude the technician, as the moisture may have evaporated, thereby removing all evidence, by the time the technician receives the vehicle for diagnostics.

GM DURAMAX FILTER RESTRICTION

Restricted air filter elements on 2017-2019 applications equipped with the 6.6 L5P turbocharged engines.

Customer complaints include a Service Engine Soon light accompanied with drivability concerns such as surge, transmission slipping/jerking, vibration or shudder, loss of power, or heavy exhaust smoke under load conditions. The driver information center message may display Clean Exhaust Filter or Diesel Particulate Filter is Full.

When performing the diagnostics, the technician may identify the following trouble codes:

- P0101 Mass Air Flow Sensor Performance
- P0106 Manifold Absolute Pressure Sensor Performance
- P0171 Fuel System Lean
- P0172 Fuel System Rich
- P0299 Engine Underboost
- P0401 Exhaust Gas Recirculation Flow Insufficient
- P0402 Exhaust Gas Recirculation Flow Excessive
- P140B Exhaust Gas Recirculation Slow Response-Increasing Flow

P140C Exhaust Gas Recirculation Slow Response-
Decreasing Flow

P2459 Diesel Particulate Filter Regeneration Frequency

P2463 Diesel Particulate Filter Soot Accumulation

The symptoms described are an indication that the air filter element has become restricted or compromised. The Duramax equipped with the 6.6 L5P engine features a functioning hood scoop added to the heavy-duty trucks. Sixty percent of the air is drawn from the hood scoop arrangement and forty percent from a dry location in the inner fender. One of the first concerns is water entry through the hood scoop. The design of the intake prevents moisture from entering the air filter housing. When air enters the scoop, it passes through an expansion chamber that contains a 180-degree turn en route to the air filter housing. This 180-degree turn creates a velocity change, forcing any moisture against the outside housing wall where it is expelled through a water drain valve. The airbox housing that contains the filter is fitted with a flexible seal that must make contact with the hood when closed. The housing is held into position by rubber grommets, and it is imperative that the housing is in proper alignment with the inner fender. The position of the housing may be impaired via a headlight change or when performing a lamp upgrade and failing to properly position the housing. This can compromise the integrity of the seal or damage the housing, promoting leakage. Be aware of any modification that can affect the housing to hood seal. The presence of water or snow on the filter media can result in a hydro-lock condition, blocking the air flow.

AIR FILTER AND HOUSING INSPECTION

When performing an inspection of the air filter are you evaluating the condition of the filter housing and related plumbing? Damage to the housing or air box may result in the replacement of some expensive electronic components or result in a catastrophic engine or turbocharger failure. Not enough time is spent inspecting the integrity of the housing and hardware to be certain the air filter is properly sealed. Plastic, rubber and metal components fail, causing unfiltered air to enter the engine, resulting in major expensive repairs or inaccurate sensor readings, engine related performance issues, or fault codes stored. Look for evidence of damaged or missing clamps, a deformed or cracked air box or housing. Never

allow a vehicle to leave missing a filter hold down clamp without notifying the customer and documenting it on the repair order.

Air filter service intervals can vary greatly in relation to the environment in which the vehicle is being operated. In extreme conditions, it is not uncommon to encounter a restricted air filter in 3K miles or less. This is usually characteristic of vehicles operating in dusty conditions such as construction sites, road building, farming, etc. In addition, consider vehicles that encounter prolonged idling, which would not be reflected in terms of mileage.

Vehicles operated in heavy rain or flood conditions are subject to failure, as the water hydro-locks the filter media, restricting airflow into the engine. The results are the same as a filter heavily contaminated with debris. The engine may encounter a stalling condition, the air box can collapse, or the filter can be sucked into the air box, resulting in unfiltered air entering the engine. Wet filters often disintegrate and are consumed by the turbocharger and engine, resulting in major expensive repairs.

Snow can promote the same symptoms as a filter heavily contaminated with debris or water. The engine will encounter a loss of power, stalling, Malfunction Indicator Lamp illumination, or an Engine Power Reduced message may be displayed. Performance symptoms resulting from water or snow can be elusive, as evaporation may have erased the evidence by the time the technician performs the diagnostics.

Dusting is another concern. Examine the clean air side of the air box and related housings for evidence of dust/dirt. The presence of dust is an indication of filter bypass or dust being pulled through the filter media. Dusting is not uncommon on turbocharged diesel applications, especially those operated in dusty environments such as farming, road building, etc. Examine the air filter seal for evidence of dust trails across the seal. This could be an indication of a damaged or distorted air box or missing or broken latches/clamps.

Make a thorough diagnosis instead of replacing a part and hoping that it resolves the symptom. The last thing the shop needs is a customer returning with recurring symptoms.

LARRY HAMMER, Technical Services
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