Turbocharger

General Equipment
Ford diagnostic equipment

Principles of Operation

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. For information about these, REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

The turbocharger is an exhaust-driven centrifugal air compressor. Its purpose is to increase power output by supplying compressed air to the engine.

Expanding exhaust gases drive the turbine shaft assembly to speeds up to 200,000 rpm. Filtered air entering the compressor side of the turbocharger is compressed and delivered through a CAC (charge air cooler). The very hot compressed air is cooled by the charge air cooler, then continues on to fill the intake manifold at a higher pressure than atmospheric pressure. Because considerably more air is forced into the intake manifold, the results are increased power, fuel efficiency and the ability to maintain power at higher altitudes.

The turbocharger is governed by a wastegate actuator. The wastegate actuator redirects some of the exhaust gas past the turbine and therefore acts as a governor. The wastegate actuator is preset during manufacture and must not be tampered with. The wastegate actuator is controlled by the wastegate control valve solenoid.

The intake air system is fitted with a turbocharger bypass valve. This vents the intake air system when the throttle is closed and recirculates the air back into the intake air system. It also releases pressure on the turbocharger which will reduce turbo lag and improve acceleration and increase engine performance.

The internal components are oil, coolant and air cooled. Engine oil and coolant are circulated through the center housing which acts as a heat barrier between the "hot" turbine and the "cold" compressor. Bearings are sleeve type and lubricated by engine oil. Oil is circulated to the turbocharger center housing and returned to the sump through an oil drain in the center housing.

The EcoBoost twin turbochargers are used in a parallel arrangement with one turbocharger connected to each cylinder bank. This configuration improves engine responsiveness due to the reduced interia of 2 small turbochargers. This also leads to an improved turbocharger package and better utilization of heat energy from the compact exhaust manifolds. The compact design of the system allows the catalysts to be located very close to the turbocharger outlet for improved emissions.

Inspection and Verification

NOTE: *This section provides mechanical diagnosis of the turbocharger assembly. If there is a MIL (malfunction indicator lamp illuminated, or a DTC (diagnostic trouble code) is present, these should be diagnosed prior to performing turbocharger mechanical diagnosis.*

1. For a PCM (powertrain control module) DTC (diagnostic trouble code,
   REFER to: Electronic Engine Controls (303-14B Electronic Engine Controls - 2.7L EcoBoost (238kW/324PS), Diagnosis and Testing).
   For driveability symptoms without a DTC (diagnostic trouble code), Refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual. See Section 3 Symptom Charts.
2. Verify the customer concern.
3. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical