

Diagnosis and Testing

Special Tool(s) / General Equipment

	Hand Vacuum/Pressure Pump 416-D001 (23-036A)
Ford diagnostic equipment	

Inspection and Verification

NOTE: The turbocharger uses engine oil as a lubricant and coolant. Due to the high operating temperatures of the turbocharger and with the expansion and contraction of the internal components a proportion of engine oil may enter the air intake system. This is not an indication that the turbocharger oil seal has failed. The turbocharger oil seal will not fail unless the bearings fail first, which will cause the turbocharger to become noisy. Do not install a new turbocharger due to oil inside the turbocharger or the air intake components. If a leak is detected in the supply or return tubes or connections, locate and rectify the source. Do not install a new turbocharger due to an oil leak.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

VISUAL INSPECTION CHART

Mechanical	Electrical
• Oil leak(s) • Air cleaner element • Air cleaner outlet pipe • Air cleaner intake pipe • Turbocharger oil supply tube • Turbocharger oil return tube • Turbocharger housing • Charge air cooler • Charger air cooler intake pipe • Charger air cooler outlet pipe	• Wiring harness(es) • Electrical connector(s) • Variable vane electric actuator • PCM

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

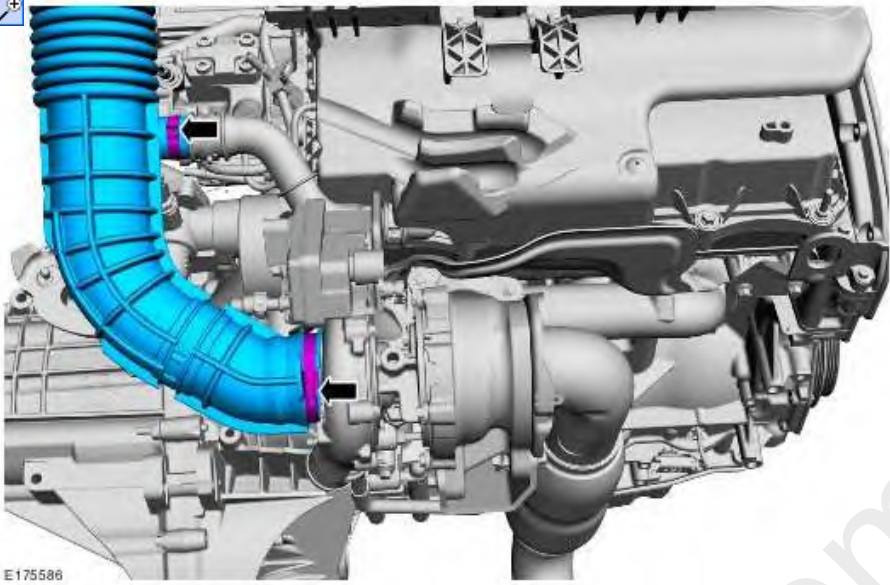


NOTICE: The variable vane electric actuator must not be transferred between the old and new turbochargers. Failure to follow this instruction may result in incorrect calibration, exhaust emissions and engine operation.

Symptom	Possible Sources	Action
Blue smoke with excessive turbocharger noise	* Turbocharger compressor rubbing on housing walls. * Turbocharger turbine rubbing on housing walls. * Turbocharger bearings and oil seal(s). * Turbocharger oil supply tube blocked or damaged.	* GO to Pinpoint Test A .
Blue smoke without excessive turbocharger noise	* Turbocharger oil return tube blocked or damaged.	* GO to Pinpoint Test B .
Poor engine performance	* Charge air cooler system.	* CHECK the charge air cooler and charge air cooler pipe(s) for leaks and obstructions. REPAIR as necessary.
	* Air cleaner intake pipe.	* CHECK the air cleaner intake pipe for obstructions. REPAIR as necessary.
	* Variable vane electric actuator.	* REFER to the Ford diagnostic equipment.

Pinpoint Tests

PINPOINT TEST A : BLUE SMOKE WITH EXCESSIVE TURBOCHARGER NOISE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: INSPECT THE TURBOCHARGER ROTOR VANES FOR DAMAGE	
	1 Disconnect the air cleaner outlet pipe from the turbocharger.
	2 Inspect the turbocharger rotor vanes for damage.
	Is there visible damage to the rotor vanes? Yes GO to A2. No GO to A3.
A2: CHECK FOR FOREIGN MATERIAL IN THE INTAKE AIR SYSTEM COMPONENTS	
	1 Check the intake air system components for signs of foreign material.
	Are there any signs of foreign material? Yes CLEAN the intake air system components. INSTALL a new turbocharger. REFER to: Turbocharger (303-04C Fuel Charging and Controls - Turbocharger, Removal and Installation). TEST the system for normal operation. No GO to A4.
A3: CHECK THE TURBOCHARGER BEARINGS FOR EXCESSIVE MOVEMENT	
NOTE: A small amount of movement in the bearings is normal.	
NOTE: The initial rotor rotation of a cold turbocharger may feel rough and uneven but should rotate freely after a few turns.	
	1



E63195

Make sure the turbocharger rotor spins freely within the housing.

- 1. With the turbocharger stationary, gently lift the shaft (the shaft will naturally lay in the bottom of the bearings).
- 2. Make sure the rotor spins freely within the housing.

Does the rotor spin freely within the housing?

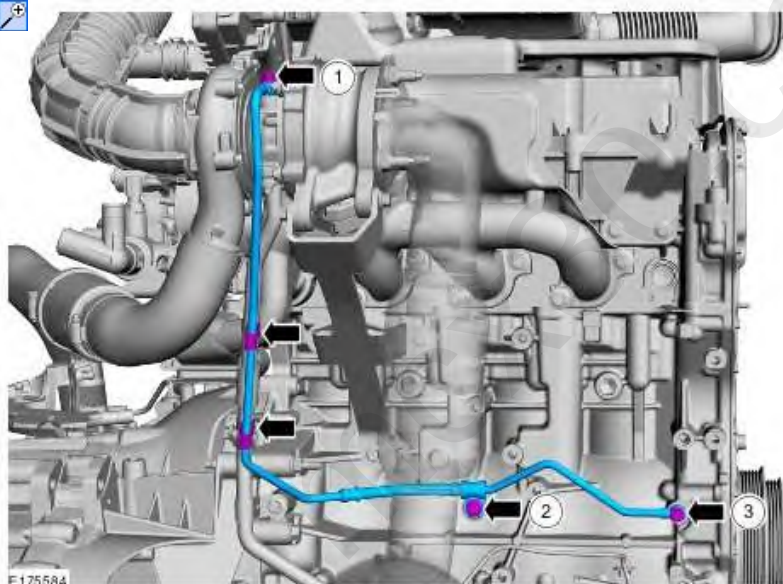
Yes

GO to A4.

No

INSTALL a new turbocharger.
REFER to: [Turbocharger](#) (303-04C Fuel Charging and Controls - Turbocharger, Removal and Installation).
TEST the system for normal operation.

A4: CHECK THE TURBOCHARGER OIL SUPPLY TUBE FOR BLOCKAGE



E175584

- 1** Remove the turbocharger oil supply tube.

- 2** Using workshop compressed air and a compressed air nozzle, check the oil supply tube for blockage.

Is the oil supply tube free from blockage?

Yes

GO to A5.

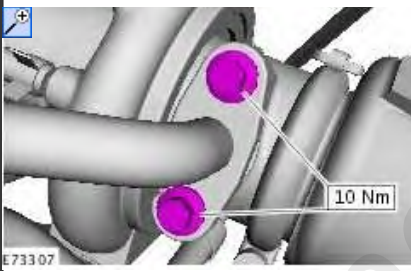
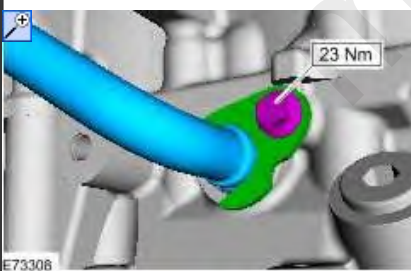
No

INSTALL a new turbocharger and turbocharger oil supply tube.
REFER to: [Turbocharger](#) (303-04C Fuel Charging and Controls - Turbocharger, Removal and Installation).
TEST the system for normal operation.

A5: CHECK THE TURBOCHARGER OIL SUPPLY TUBE OIL GALLERY FOR BLOCKAGE

	1 Visually inspect the oil supply tube oil gallery in the cylinder block for blockage.
	Is the oil supply tube oil gallery free from blockage? Yes INSTALL a new turbocharger and turbocharger oil supply tube. REFER to: Turbocharger (303-04C Fuel Charging and Controls - Turbocharger, Removal and Installation). TEST the system for normal operation. No REMOVE the blockage. INSTALL a new turbocharger. REFER to: Turbocharger (303-04C Fuel Charging and Controls - Turbocharger, Removal and Installation). TEST the system for normal operation.

PINPOINT TEST B : BLUE SMOKE WITHOUT EXCESSIVE TURBOCHARGER NOISE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK THE TURBOCHARGER OIL RETURN TUBE	
	1 Disconnect the turbocharger oil return tube from the turbocharger.
	2 Remove the turbocharger oil return tube.
	3 Check the turbocharger oil return tube for a blockage or signs of damage.
	Is the turbocharger oil return tube blocked? Yes GO to Fuel Charging and Controls for further blue smoke diagnostics. REFER to: Fuel Charging and Controls (303-04A Fuel Charging and Controls, Diagnosis and Testing). No INSTALL a new turbocharger oil return tube. TEST the system for normal operation.