Published: Jul 26, 2004

Turbocharger

Principle of operation

The turbochargers used on the 2.7L diesel engine are **variable geometry** units, which means that the amount of boost generated can be varied according to the engine load, not just the engine speed.

The vane angles are varied by solenoids mounted on the turbochargers.

The solenoid operation is governed by the engine control module in response to engine load and conditions, ensuring the correct boost pressure for the prevailing conditions.

Inspection and Verification

WARNING: The following tests may involve working in close proximity to hot components. Make sure adequate protection is used. Failure to follow this instruction may result in personal injury.

WARNING: The turbochargers can continue to rotate after the engine has stopped. Do not attempt to check the turbochargers until one minute has elapsed since the engine was switched off. Failure to follow this instruction may result in personal injury.

CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00. Failure to follow this instruction may result in damage to the vehicle.

NOTE:

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to 3 decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

NOTE:

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

NOTE:

If diagnostic trouble codes (DTCs) are recorded and the symptom is not present when performing the pinpoint tests, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

NOTE:

This section contains references to Parameter Identifiers (PIDs). Where the Jaguar approved diagnostic system is not available, a scantool may be used to access these PIDs, all of which give information, and some of which can be used to both read information and to activate components. The format of the information may vary, depending on the tool used.

1 . Verify the customer concern.

2 . Visually inspect for obvious signs of mechanical or electrical damage.

Visual inspection

- Restrictions/Leakage in the air intake. Intake Air Distribution and Filtering
- Loose hoses and/or clips
- Electrical connections and harnesses to the solenoids
- Solenoid(s) failure
- General engine condition. Engine - 2.7L Diesel

Symptom chart

Symptom	Possible source	Action
Poor performance	• Low/Contaminated fuel • Restricted air intake • General engine condition • Engine management fault	Check the fuel level and condition, Fuel Charging and Controls Check the air intake for restriction, Intake Air Distribution and Filtering Check the engine condition, compressions, etc, Engine - 2.7L Diesel Check for DTCs.
No boost	• Electrical connections and harnesses to the solenoid(s) • Engine air intake restricted/leaking • Charge air cooler restricted/leaking • Turbocharger actuator failure(s) • Turbocharger failure(s)	Check the electrical connections and harnesses to the solenoid(s). Check the air intake for restriction/leakage (see visual inspection). For air intake checks, Intake Air Distribution and Filtering For turbocharger actuator tests, GO to Pinpoint Test G407709p1. and GO to Pinpoint Test G407709p2. For turbocharger mechanical checks, GO to Pinpoint Test G407709p3.
No boost/excessive noise	• Turbocharger failure	For turbocharger mechanical checks, GO to Pinpoint Test G407709p3.

DTC index

NOTE:

For a full list of DTCs, Electronic Engine Controls

DTC	Condition	Possible source	Action
P0045	Turbocharger boost control solenoid circuit	• Turbocharger boost control solenoid circuit A: open circuit	For turbocharger boost control solenoid circuit tests, GO to Pinpoint Test G407709p1.
P0046	Turbocharger boost control solenoid circuit	• Turbocharger boost control solenoid circuit A: range/performance	For turbocharger boost control solenoid circuit tests, GO to Pinpoint Test G407709p1.
P0047	Turbocharger boost control solenoid circuit	• Turbocharger boost control solenoid circuit A: short circuit to ground	For turbocharger boost control solenoid circuit tests, GO to Pinpoint Test G407709p1.

P0048	Turbocharger boost control solenoid circuit	• Turbocharger boost control solenoid circuit A: short circuit to battery	For turbocharger boost control solenoid circuit tests, GO to Pinpoint Test G407709p1.
P0234	Turbocharger overboost condition	• Turbocharger boost control solenoid circuit B fault	For turbocharger boost control solenoid circuit tests, GO to Pinpoint Test G407709p2.
P0263	Turbocharger boost system performance	• Turbocharger boost control solenoid circuit B fault	For turbocharger boost control solenoid circuit tests, GO to Pinpoint Test G407709p2.
P0299	Turbocharger underboost condition	• Turbocharger boost control solenoid circuit B fault	For turbocharger boost control solenoid circuit tests, GO to Pinpoint Test G407709p2.

Pinpoint Tests

PINPOINT TEST G407709p3 : CHECK THE TURBOCHARGER MECHANICAL CONDITION

G407709t11 : CHECK FOR EXCESSIVE PLAY IN THE TURBOCHARGER SHAFT

1. Disconnect the intake and outlet hoses from the turbocharger.
Turbocharger LH
Turbocharger RH 2. Check that the turbocharger rotates freely, and without noise. 3. Grip the ends of the turbine shaft at either side of the turbocharger and assess the play.

- **Is the play in the shaft excessive? (Compare the play to a known good unit in the event of uncertainty).**

-> Yes
INSTALL a new turbocharger.
Turbocharger LH
Turbocharger RH CLEAR any DTCs, test the vehicle for normal operation.

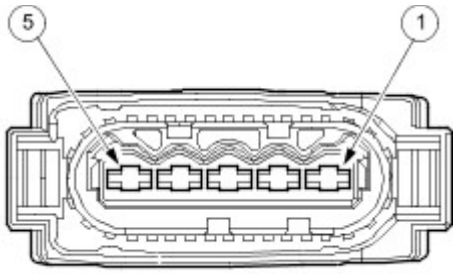
-> No
CHECK for other sources of noise. RECHECK the turbocharger system for the cause of the lack of boost.

Inspection and Verification

This pinpoint test is intended to diagnose the following:

- Short circuit to GROUND in the variable geometry turbo actuator A (VGTA1) circuit.
- Short circuit to POWER in the VGTA1 circuit.
- Open circuit in the VGTA1 circuit.
- VGTA1 fault
- ECM fault

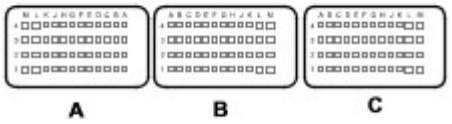
VGTA1 connector



E54256

Variable geometry turbo actuator 1 - signal	04
Variable geometry turbo actuator 1 - power	01
Variable geometry turbo actuator 1 - ground	02

Engine control module (ECM) connector



E54251

Variable geometry turbo actuator 1 - signal	B-H3

Pinpoint Tests

PINPOINT TEST G407709p1 : CHECK THE TURBOCHARGER ACTUATOR CIRCUIT A

G407709t1 : CHECK THE VGTA1 GROUND CIRCUIT FOR CONTINUITY

1. Key off. 2. VGTA1 connector disconnected. 3. Key on, engine off. 4. Measure the resistance between:

Variable geometry turbo actuator 1 - ground - Pin 02	Negative post

- **Is the resistance less than 10 ohms?**

-> Yes
GO to Pinpoint Test G407709t2.

-> No
REPAIR the open circuit. For additional information, refer to the wiring diagrams.

G407709t2 : CHECK THE POWER SUPPLY TO THE VGTA1

1. Measure the voltage between:

Variable geometry turbo actuator 1 - power - Pin 01	Negative post

- **Is the voltage between 9 volts - 15 volts?**

-> Yes
GO to Pinpoint Test G407709t3.

-> No
No supply to the VGTA1 circuit. Check and repair the circuit as necessary.

G407709t3 : CHECK THE VGTA1 SIGNAL CIRCUIT FOR SHORT CIRCUIT TO GROUND

1. Measure the resistance between:

Variable geometry turbo actuator 1 - signal - Pin 04	Negative post

- **Is the resistance greater than 100 Kohms?**

-> Yes
GO to Pinpoint Test G407709t4.

-> No
GO to Pinpoint Test G407709t6.

G407709t4 : CHECK THE VGTA1 SIGNAL CIRCUIT FOR SHORT CIRCUIT TO POWER

1. Measure the resistance between:

Variable geometry turbo actuator 1 - signal - Pin 04	Positive post

- **Is the resistance greater than 100 Kohms?**

-> Yes
GO to Pinpoint Test G407709t5.

-> No
GO to Pinpoint Test G407709t7.

G407709t5 : CHECK THE VGTA1 SIGNAL CIRCUIT FOR OPEN CIRCUIT

1. Key off. 2. ECM connector disconnected. 3. Measure the resistance between:

Variable geometry turbo actuator 1 - signal - Pin 04	Variable geometry turbo actuator 1 - signal - Pin B-H3

- **Is the resistance less than 10 ohms?**

-> Yes
An intermittent fault may be present in the wiring harness. Visually check for chaffed wires or other physical damage to the harness. If no fault is found in the circuit, suspect the following component(s): **-** VGTA1 connector **-** ECM connector **-** VGTA1 **-** ECM

-> No
REPAIR the open circuit. For additional information, refer to the wiring diagrams.

G407709t6 : CHECK WHETHER THE SHORT CIRCUIT TO GROUND IS IN THE VGTA1 HARNESS OR ECU

1. Key off. 2. ECM connector disconnected. 3. Key on, engine off. 4. Measure the resistance between:

Variable geometry turbo actuator 1 - signal - Pin 04	Negative post

- **Is the resistance greater than 100 Kohms?**

-> Yes
Harness is OK. Suspect: **-** ECM

-> No
REPAIR the short circuit. For additional information, refer to the wiring diagrams.

G407709t7 : CHECK WHETHER THE SHORT CIRCUIT TO POWER IS IN THE VGTA1 HARNESS OR ECU

1. Key off. 2. ECM connector disconnected. 3. Key on, engine off. 4. Measure the resistance between:

Variable geometry turbo actuator 1 - signal - Pin 04	Positive post

- **Is the resistance greater than 100 Kohms?**

-> Yes
Harness is OK. Suspect: **-** ECM

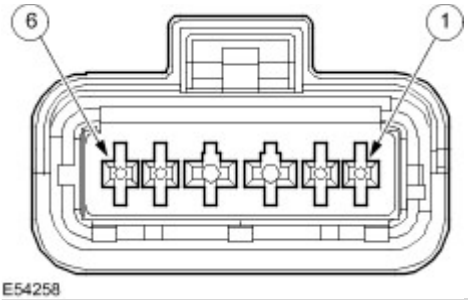
-> No
REPAIR the short circuit. For additional information, refer to the wiring diagrams.

Inspection and Verification

This pinpoint test is intended to diagnose the following:

- Short circuit to GROUND in the variable geometry turbo actuator B (VGTA2) circuit
- Short circuit to POWER in the VGTA2 circuit
- Open circuit in the VGTA2 circuit
- VGTA2 fault
- ECM fault

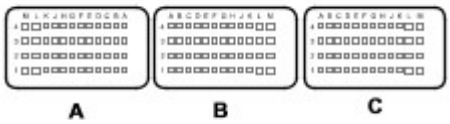
VGTA2 connector



E54258

Variable geometry turbo actuator 2 - signal	04
Variable geometry turbo actuator 2 - power	01
Variable geometry turbo actuator 2 - ground	02

Engine control module (ECM) connector



E54251

Variable geometry turbo actuator 2 - signal	B-H4

Pinpoint Tests

PINPOINT TEST G407709p2 : CHECK THE TURBOCHARGER ACTUATOR AND CIRCUIT B

G407709t8 : CHECK THE VGTA2 GROUND CIRCUIT FOR CONTINUITY

1. Key off. 2. VGTA2 connector disconnected. 3. Key on, engine off. 4. Measure the resistance between:

Variable geometry turbo actuator 2 - ground - Pin 02	Negative post

- **Is the resistance less than 10 ohms?**

-> Yes
GO to Pinpoint Test G407709t9.

-> No
REPAIR the open circuit. For additional information, refer to the wiring diagrams.

G407709t9 : CHECK THE POWER SUPPLY TO THE VGTA2

1. Measure the voltage between:

Variable geometry turbo actuator 2 - power - Pin 01	Negative post

- **Is the voltage between 9 volts - 15 volts?**

-> Yes
GO to Pinpoint Test G407709t10.

-> No
No supply to VGTA2 circuit. Check and repair the circuit as necessary.

G407709t10 : CHECK THE VGTA2 SIGNAL CIRCUIT FOR SHORT CIRCUIT TO GROUND

1. Measure the resistance between:

Variable geometry turbo actuator 2 - signal - Pin 04	Negative post

- **Is the resistance greater than 100 Kohms?**

-> Yes

GO to Pinpoint Test G407709t12.

-> No
GO to Pinpoint Test G407709t14.

G407709t12 : CHECK THE VGTA2 SIGNAL CIRCUIT FOR SHORT CIRCUIT TO POWER

1. Measure the resistance between:

Variable geometry turbo actuator 2 - signal - Pin 04	Positive post

- **Is the resistance greater than 100 Kohms?**

-> Yes
GO to Pinpoint Test G407709t13.

-> No
GO to Pinpoint Test G407709t15.

G407709t13 : CHECK THE VGTA2 SIGNAL CIRCUIT FOR OPEN CIRCUIT

1. Key off. 2. ECM connector disconnected. 3. Measure the resistance between:

Variable geometry turbo actuator 2 - signal - Pin 04	Variable geometry turbo actuator 2 - signal - Pin B-H4

- **Is the resistance less than 10 ohms?**

-> Yes
An intermittent fault may be present in the wiring harness. Visually check for chaffed wires or other physical damage to the harness. If no fault is found in the circuit, suspect the following component(s): **-** VGTA2 connector **-** ECM connector **-** VGTA2 **-** ECM

-> No
REPAIR the open circuit. For additional information, refer to the wiring diagrams.

G407709t14 : CHECK WHETHER THE SHORT CIRCUIT TO GROUND IS IN THE VGTA2 HARNESS OR ECU

1. Key off. 2. ECM connector disconnected. 3. Key on, engine off. 4. Measure the resistance between:

Variable geometry turbo actuator 2 - signal - Pin 04	Negative post

- **Is the resistance greater than 100 Kohms?**

-> Yes
Harness is OK. Suspect: **-** ECM

-> No
REPAIR the short circuit. For additional information, refer to the wiring diagrams.

G407709t15 : CHECK WHETHER THE SHORT CIRCUIT TO POWER IS IN THE VGTA2 HARNESS OR ECU

1. Key off. 2. ECM connector disconnected. 3. Key on, engine off. 4. Measure the resistance between:

Variable geometry turbo actuator 2 - signal - Pin 04	Positive post

- **Is the resistance greater than 100 Kohms?**

-> Yes
Harness is OK. Suspect: **-** ECM

-> No
REPAIR the short circuit. For additional information, refer to the wiring diagrams.