(501-02 Front End Body Panels, Removal and Installation).

12. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Glow Plug System -

Torque Specifications

Item	Nm	lb-ft	lb-in
Glow plugs	10	-	89

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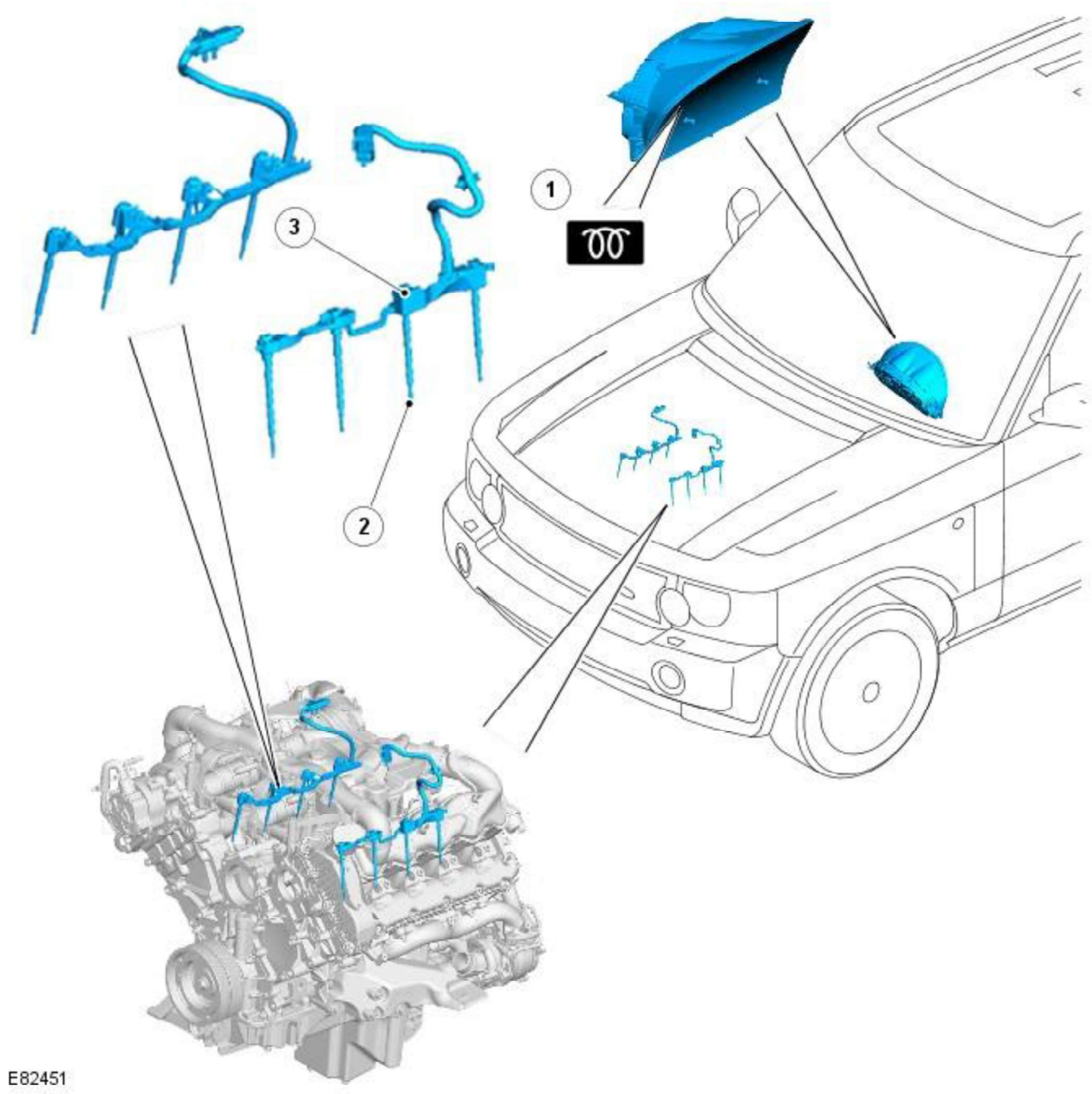
Glow Plug System - Glow Plug System

Description and Operation

COMPONENT LOCATION



Item	Part Number	Description
1	-	Glow plug warning lamp
2	-	Glow plugs (8 off)
3	-	Glow plug harness

OVERVIEW

The glow plug system has a glow plug installed in the inlet side of each cylinder. The glow plugs heat the combustion chambers before and during cranking, to aid cold starting, and after the engine starts to reduce emissions and engine noise when idling with a cold engine.

A glow plug wiring harness on each bank of glow plugs is connected to a separate relay and fusible link in the battery junction box (BJB). The individual glow plugs are grounded through their fixing in the cylinder head. Operation of the glow plug relays is controlled by the engine control module (ECM) , which also controls the illumination of the glow plug indicator in the instrument cluster.

Each glow plug is a tubular heating element which contains a spiral filament encased in magnesium oxide powder. At the tip of the tubular heating element is the heater coil. Behind the heater coil, and connected in series, is a control coil. The control coil regulates the current to the heater coil to safeguard against overheating.

SYSTEM OPERATION

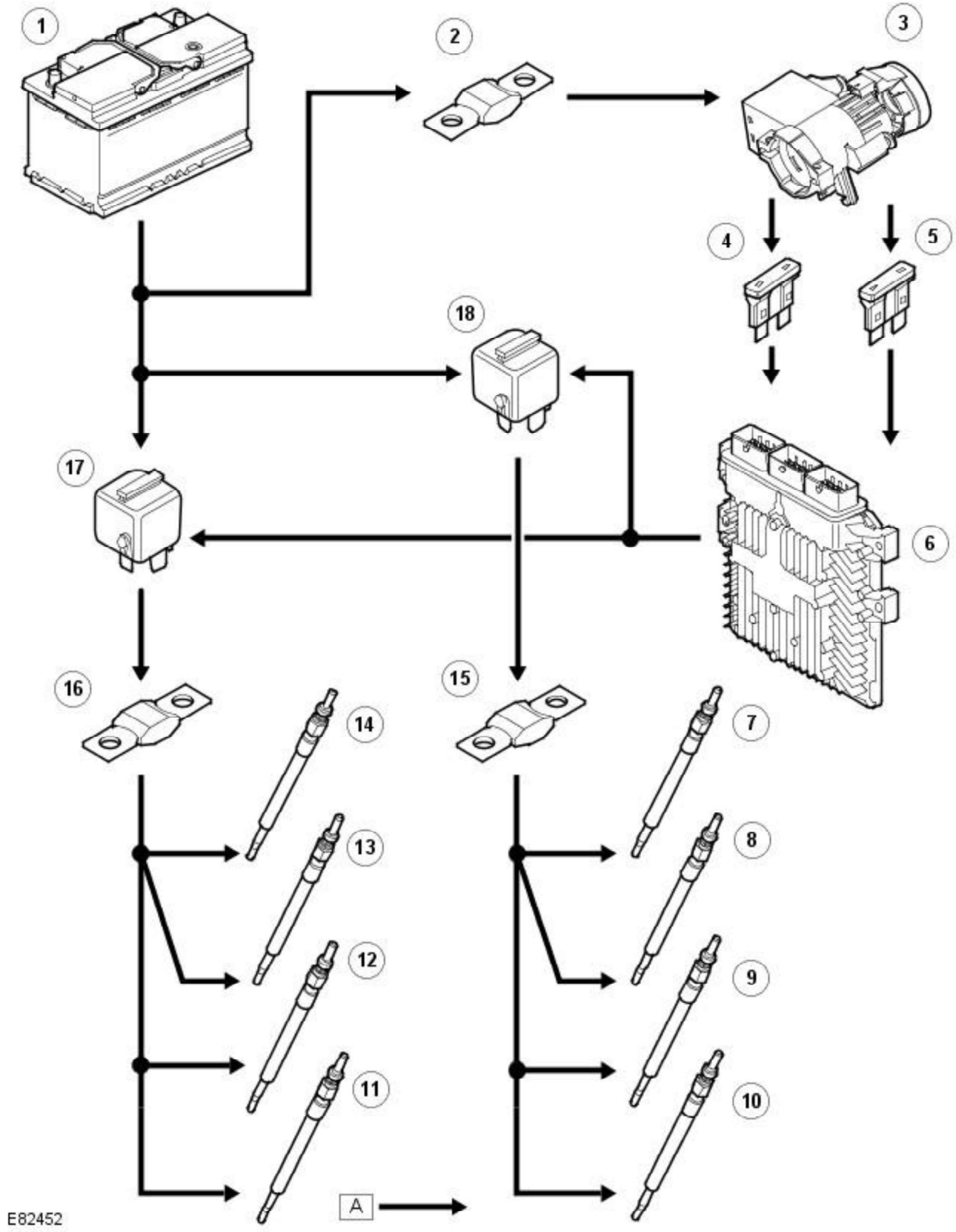
There are three phases of glow plug heating: Pre heating, crank heating and post heating. The ECM determines the heating times from the engine coolant temperature (ECT). The lower the ECT, the longer the heating times.

When the ignition switch is turned to position II, the ECM calculates any required heating times and, if heating is required, energizes the glow plug relays in the BJB. When pre heating is required, the ECM also sends a message to the instrument cluster, on the high speed controller area network (CAN), to request illumination of the glow plug indicator. The glow plug indicator remains illuminated for the duration of the pre heating phase, or until the ignition switch is turned to the crank position, whichever occurs first. If required, the ECM keeps the glow plug relays energized during cranking and for the duration of any post heating phase.

The ECM monitors the drive circuit of the glow plug relays for plausibility of operation, continuity, and short and open circuits. If a fault is detected, the ECM stores a related fault code and permanently illuminates the glow plug indicator while the ignition switch is in position II.

CONTROL DIAGRAM

- NOTE: A = Hardwired



Item	Part Number	Description
1	-	Battery
2	-	Fuse 9E
3	-	Ignition switch

4	-	Fuse
5	-	Fuse
6	-	ECM
7	-	Glow plug
8	-	Glow plug
9	-	Glow plug
10	-	Glow plug
11	-	Glow plug
12	-	Glow plug
13	-	Glow plug
14	-	Glow plug
15	-	Fuse 1/2 G
16	-	Fuse 3/4 G
17	-	Glow plug relay
18	-	Glow plug relay

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Glow Plug System - Glow Plug System

Diagnosis and Testing

Overview

For information on the description and operation of the system:
REFER to: Glow Plug System (303-07C Glow Plug System, Description and Operation).

Inspection and Verification

1. Verify the customer concern.

2. Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Electrical
Glow plug lamp Fuses - 1, 2, 3 and 4 G Glow plug relays Engine management relay Wiring harness(es)/connectors Glow plugs Engine control module (ECM)

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. Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.

Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom	**Possible cause**	**Action**
Poor starting	Glow plugs	Check the glow plug harnesses at the glow plugs and at

Symptom	Possible cause	Action
(extreme weather conditions)	inoperative/inefficient Fuel temperature too low - The fuel system recycles fuel until operating temperature is reached to reduce this possibility	the connections to the main harness. Refer to the electrical guides. Check for DTCs indicating a glow plug fault. Rectify as necessary. Clear the DTCs and check for normal operation.
High cold-engine emissions	After-glow phase inoperative	Check the glow plug harnesses at the glow plugs and at the connections to the main harness. Refer to the electrical guides. Check for DTCs indicating a glow plug fault. Rectify as necessary. Clear the DTCs and check for normal operation. After-glow is designed to function at engine temperatures below 50° C (122° F) and below 2,500 rpm.
High cold-engine noise, vibration or harshness	After-glow phase inoperative	Check the glow plug harnesses at the glow plugs and at the connections to the main harness. Refer to the electrical guides. Check for DTCs indicating a glow plug fault. Rectify as necessary. Clear the DTCs and check for normal operation. After-glow is designed to function at engine temperatures below 50° C (122° F) and below 2,500 rpm.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs:
REFER to: Electronic Engine Controls (303-14C Electronic Engine Controls - TDV8 3.6L Diesel, Description and Operation).

DTC	Description	Possible cause	Action
P038072	Right-hand bank glow plug circuit - actuator stuck open	Low battery voltage Relay circuit **from** relay	Check the battery condition and state of charge. Check the relay and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new relay. Clear the DTCs and test for normal operation.
P038073	Right-hand bank glow plug circuit - actuator stuck closed	Low battery voltage Relay circuit **to** relay	
P038311	Glow plug control module - control circuit low	Glow plug relay control circuit: short circuit to ground Glow plug relay fault	Check the relay and circuits. Refer to the electrical guides. Activate the relay and check for an audible "click". Rectify as necessary. Clear the DTCs and test for normal operation.
P038412	Glow plug control module - control circuit high	Glow plug relay, control circuit: short circuit to power Glow plug relay fault	
P067013	Glow plug control module - control circuit open	Glow plug relay circuits: high resistance Glow plug relay	

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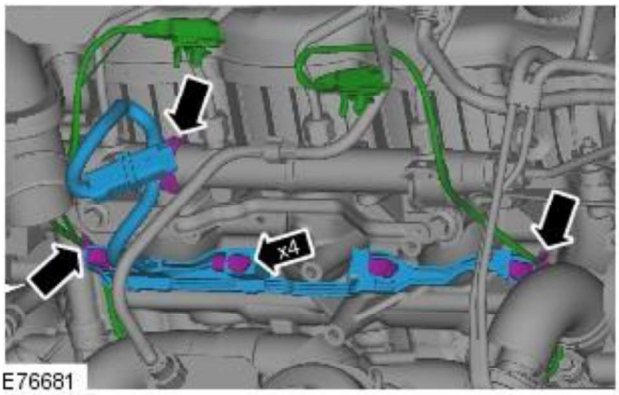
Glow Plug System - Glow Plugs

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00, Specifications).
2. Remove the RH exhaust gas recirculation (EGR) valve and cooler assembly.
   For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve RH (303-08A Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).
3. Remove the LH EGR valve and cooler assembly.
   For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve LH (303-08A Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).



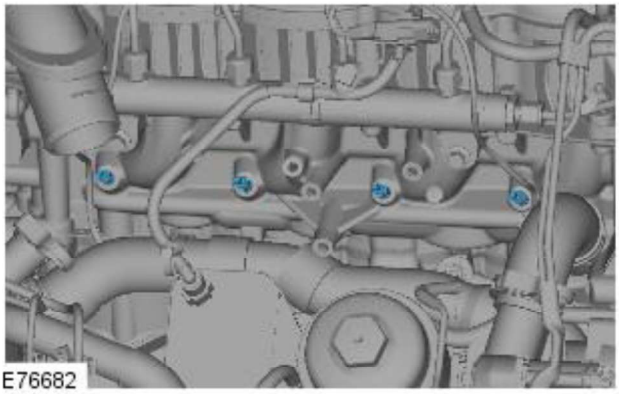
E76681

4. NOTE: LH illustration shown, RH is similar.

   Remove the LH and RH glow plug wiring harnesses.

   Release the LH and RH knock sensor (KS) wiring harnesses.

   Disconnect the LH and RH wiring harnesses from the glow plugs.


E76682

5. NOTE: LH illustration shown, RH is similar.

   Remove the glow plugs.

Installation

1. Install the glow plugs.

   Tighten the glow plugs to 10 Nm (7 lb.ft).
2. Install the LH and RH glow plug wiring harnesses.

   Connect the LH and RH wiring harnesses to the glow plugs.

   Secure the LH and RH KS wiring harnesses.
3. Install the RH EGR valve and cooler assembly.
   For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve RH (303-08A Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).
4. Install the LH EGR valve and cooler assembly.

For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve LH (303-08A Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00, Specifications).

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Glow Plug System - Glow Plugs

Removal and Installation

Removal

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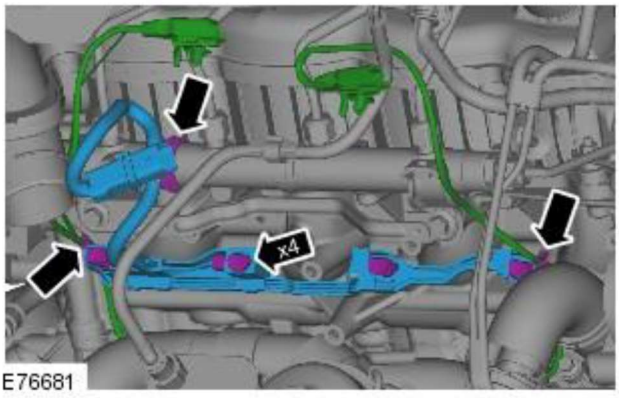
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve LH (303-08A Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).

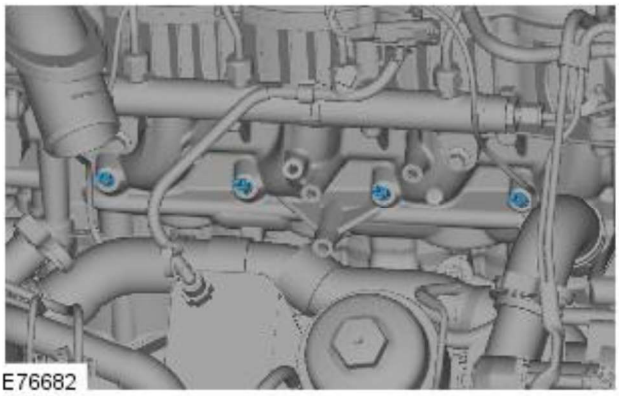


4. NOTE: LH illustration shown, RH is similar.

Remove the LH and RH glow plug wiring harnesses.

Release the LH and RH knock sensor (KS) wiring harnesses.

Disconnect the LH and RH wiring harnesses from the glow plugs.



5. NOTE: LH illustration shown, RH is similar.

Remove the glow plugs.

Installation

1. Install the glow plugs.

Tighten the glow plugs to 10 Nm (7 lb.ft).

2. Install the LH and RH glow plug wiring harnesses.

Connect the LH and RH wiring harnesses to the glow

plugs.

Secure the LH and RH KS wiring harnesses.

3. Install the RH EGR valve and cooler assembly.
   For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve RH (303-08A Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).
4. Install the LH EGR valve and cooler assembly.
   For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve LH (303-08A Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).
5. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00, Specifications).

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Engine Emission Control - TDV8 3.6L Diesel - Engine Emission Control

Description and Operation

COMPONENT LOCATION