2.6 PROTECTIVE SLEEVE

Perform the following procedures for removal and installation of the protective sleeve.

2.6.1 Protective Sleeve Removal

Remove the protective sleeve as follows:

⚠ WARNING:

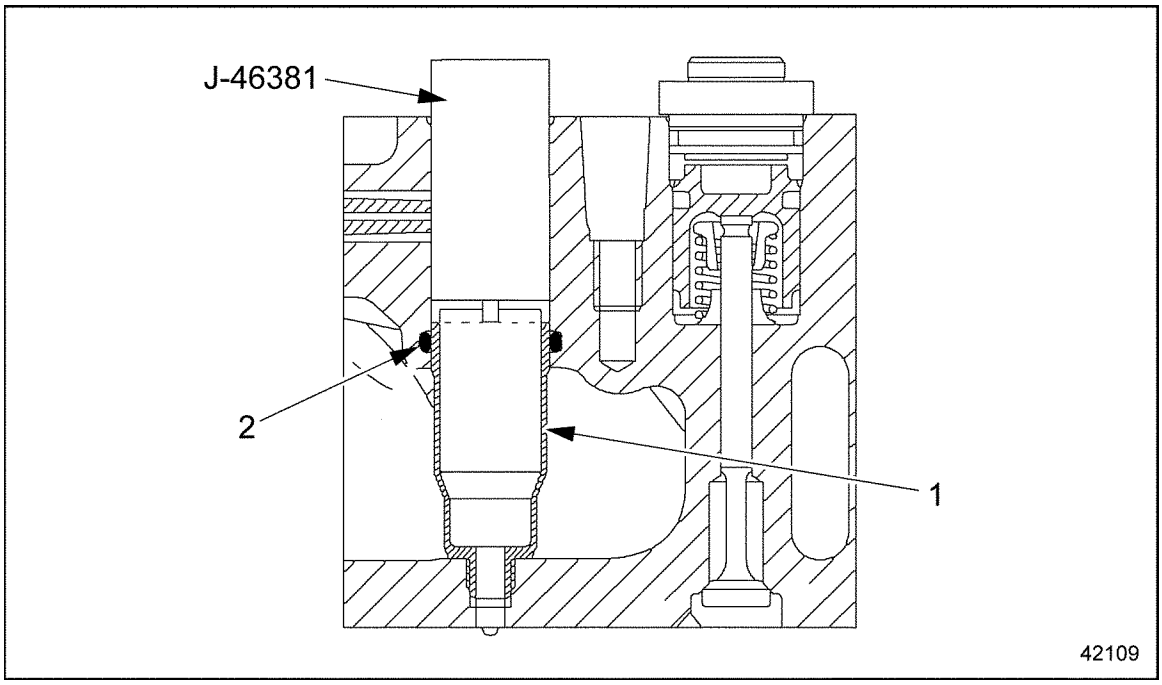
HOT COOLANT

To avoid scalding from the expulsion of hot coolant, never remove the cooling system pressure cap while the engine is at operating temperature. Wear adequate protective clothing (face shield, rubber gloves, apron, and boots). Remove the cap slowly to relieve pressure.

1. Drain the engine coolant into a clean container. If the coolant is clean, save it for later use.
2. Remove the injector nozzle. Refer to section 2.4.1.

NOTE:
The injector sleeve puller kit J-46381 comes with two sockets; a 4-toothed and a rubber-ended socket.

3. Using the injector sleeve puller (J-46381), remove the protective sleeve from the cylinder head. See Figure 2-15.



1. Protective Sleeve
2. O-ring

Figure 2-15 Pulling the Protective Sleeve

[a] Insert the 4-toothed socket (part of toolset J-46381) into the protective sleeve. Make sure the teeth of the socket engage the four openings on the protective sleeve.

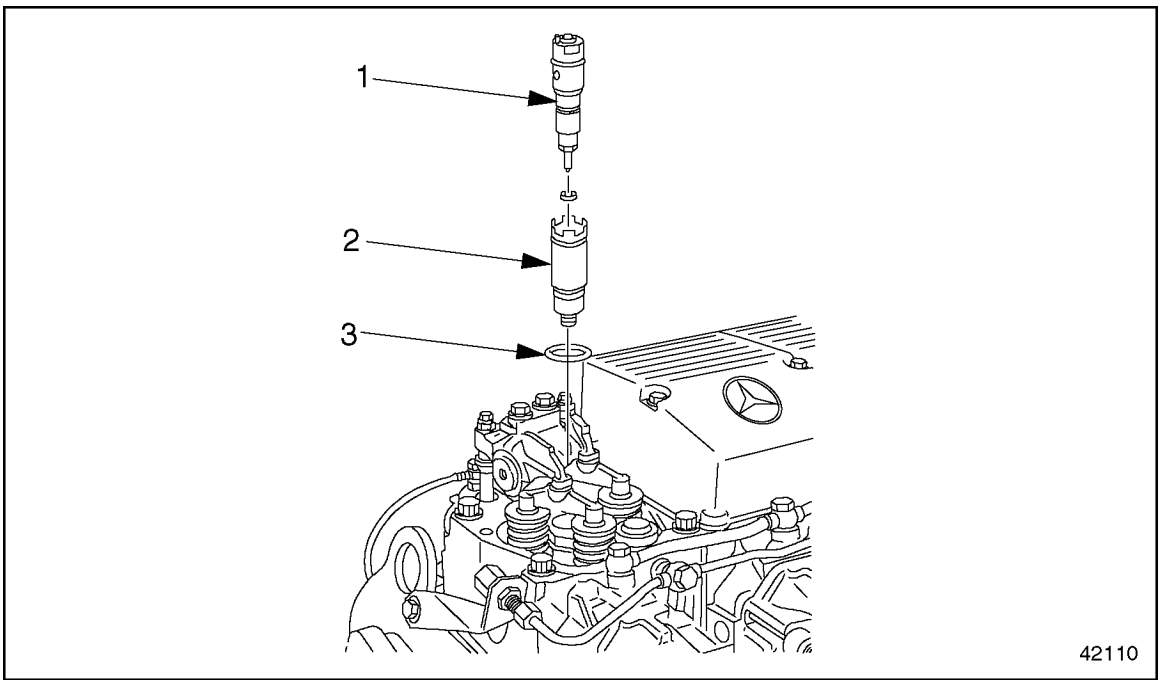
[b] Loosen the protective sleeve with a ratchet until the threads of the sleeve are disengaged from the cylinder head.

[c] Attach the rubber-ended socket to the puller from injector sleeve puller toolset J-46381.

[d] Insert the rubber-ended socket into the protectiv esleeve. Expand the rubber-ended socket by turning the handle on the tool counterclockwise.

[e] Pulll while roating the protective sleeve counterclockwise to reome it from the cylinder head.

4. Remove the O-ring from the cylinder head. See Figure 2-16.



1. Nozzle
2. Protective Sleeve
3. O-ring

Figure 2-16 Removing the O-ring

NOTE:
Replace the O-ring whenever the protective sleeve is removed.

2.6.2 Protective Sleeve Installation

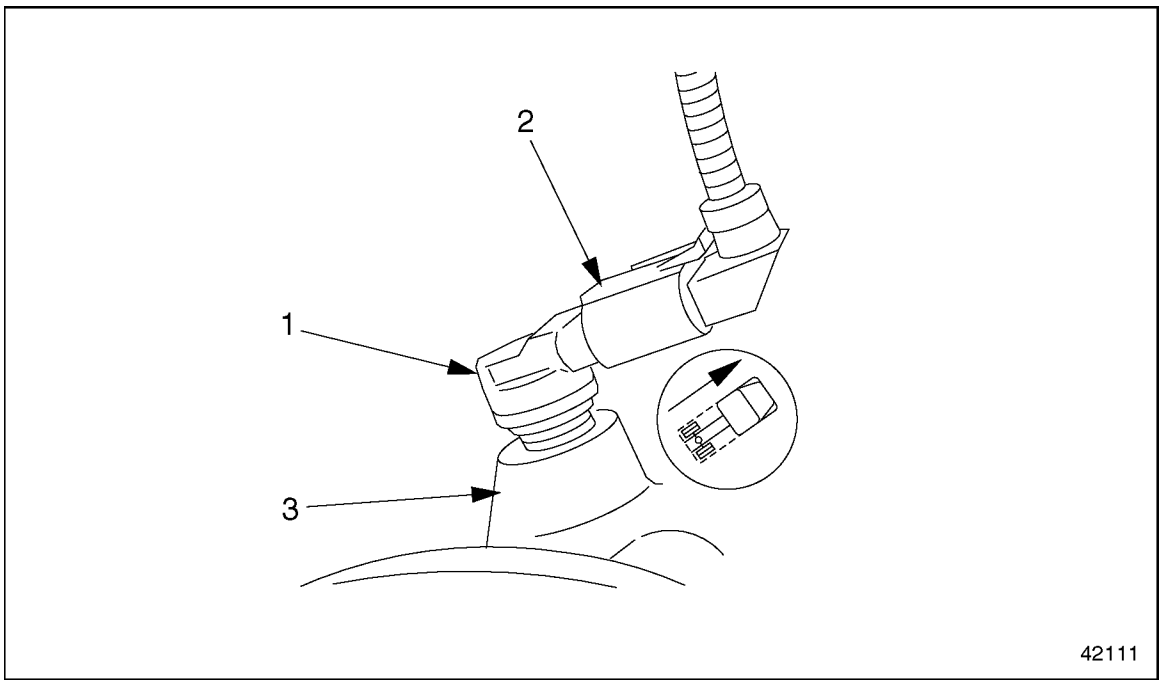
Install the protective sleeve as follows:

1. Clean the sealing surfaces of the protective sleeve and the cylinder head.
2. Lubricate the new O-ring with a light coating of engine oil. Install the O-ring in the cylinder head.
3. Install the protective sleeve into the cylinder head. Using the 4-toothed socket (part of toolset J-46381) and tighten the protective sleeve to 45 N·m (33 lb·ft).
4. Install the nozzle. Refer to section 2.4.2.
5. Fill the cooling system with clean coolant.

2.6.3 Crank Angle Position Sensor Replacement

Replace the crank angle position sensor as follows:

1. Disconnect the electrical connector. See Figure 2-17.



1. Crank Angle Position Sensor
2. Electrical Connector
3. Flywheel Housing (Timing Case)

Figure 2-17 Crank Angle Position Sensor Installation

2. Remove the sensor from the access hole in the flywheel housing.
3. Install a new sensor in the flywheel housing.
4. Connect the electrical connector.

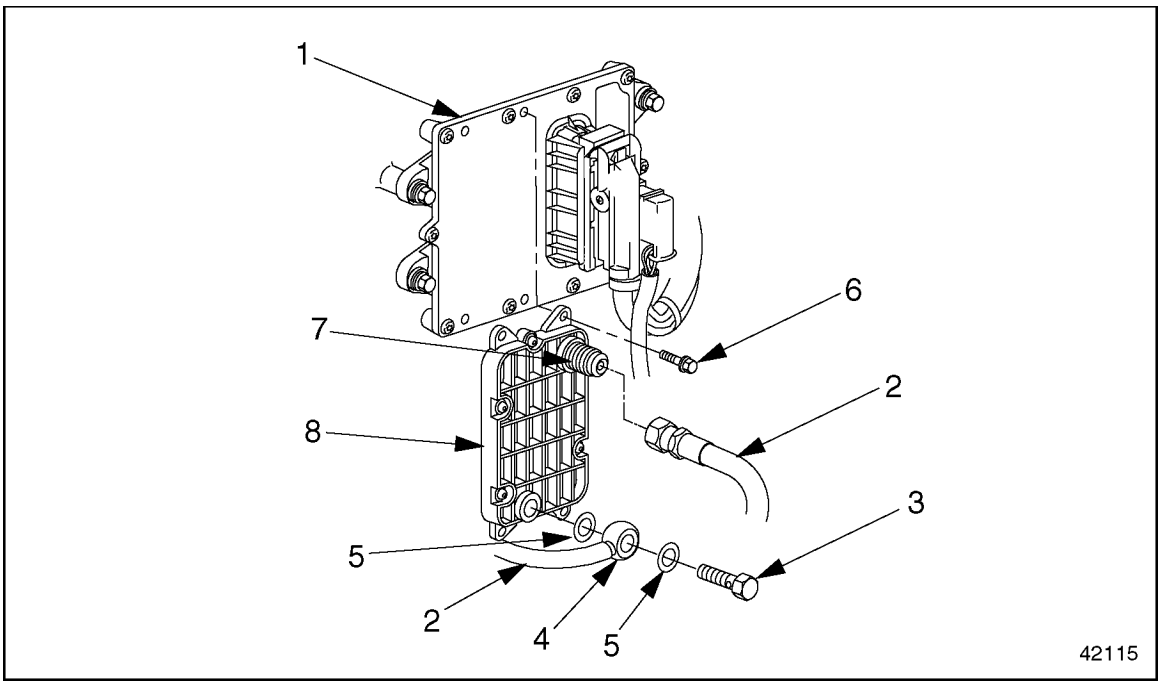
NOTE:
Be sure that the correct electrical connector is connected to the sensor.

WARNING:

PERSONAL INJURY

To avoid injury from the sudden release of a high-pressure hose connection, wear a face shield or goggles.

3. Disconnect the fuel lines on the heat exchanger. Discard the seal rings. See Figure 2-21.



1. DDEC-ECU Control Unit
2. Fuel Feed Line
3. Banjo (Hollow-core) Bolt
4. Banjo Fitting
5. Seal Ring
6. Fuel Heat Exchanger Mounting Bolt
7. Fuel Heat Exchanger Inlet
8. Fuel Heat Exchanger

Figure 2-21 Fuel Heat Exchanger

NOTE:
Catch any fuel in a clean container.

4. Remove the mounting bolts attaching the fuel heat exchanger to the DDEC-ECU control unit. Then remove the fuel heat exchanger.

NOTE:
Do not disassemble the fuel heat exchanger. It cannot be serviced.

2.8.2 Fuel Heat Exchanger Installation

Install the fuel heat exchanger as follows:

1. Attach the fuel heat exchanger to the DDEC-ECU control unit with the mounting bolts. Tighten the bolts to 8 N·m (6 lb·ft).
2. Connect the fuel lines to the fuel heat exchanger. Use new seal rings. Tighten the fuel lines to 50 N·m (37 lb·ft).
3. Close the hood.
4. Connect the batteries.
5. Prime the fuel system. Refer to section 11.1.5.

⚠ WARNING:

PERSONAL INJURY

To avoid injury from the sudden release of a high-pressure hose connection, wear a face shield or goggles.

4. Disconnect the fuel return line from the filter housing. Mark both sides of the connection with a paint pen. Discard the seal rings.

NOTE:
Catch any fuel that runs out of the filter housing or fuel return line.

5. Remove the fuel delivery and drain lines from the filter housing. Mark both sides of each connection with paint pens. Discard the seal rings.

NOTE:
In a suitable container, catch any fuel that runs out of the filter housing or fuel lines.

6. Remove the bolts attaching the filter housing to the mounting bracket.
7. Remove the filter housing from the engine.
8. Clean the fuel filter cap. Discard the filter element.

2.9.2 Fuel Filter Installation

Install the fuel filter as follows:

1. Install the filter housing on the mounting bracket. Tighten the mounting bolts to 25 N·m (18 lb·ft).
2. Install the drain and delivery lines, as removed. Install new seal rings on the banjo fittings. Tighten the banjo bolts to 40-50 N·m (30-37 lb·ft).
3. Install the return line, as removed. Install new seal rings on the banjo fitting. Tighten the banjo bolt to 40-50 N·m (30-37 lb·ft).
4. Install a new filter element in the main filter cap. Inspect the O-ring and replace it if necessary. Screw the cap onto the filter housing. Tighten the cap to 25 N·m (18 lb·ft).
5. Connect the batteries.

6. Prime the fuel system. Refer to section 11.1.5.

NOTE:
DDC does not recommend opening the high-pressure fuel lines and bleeding the air from the fuel system as part of the priming process.

NOTE:
MBE 4000 engines in March 2005 will be equipped with a fuel priming valve which is located in the secondary filter. Engines built before March 2005 require the installation of a fuel priming valve before using the Diesel Fuel System Primer tool (J-47912).

2.10 EGR FUEL FILTER

The removal and installation procedures remain the same for the non-EGR and EGR fuel filter assembly; however, because of the fuel filter's new location on an EGR engine, there are modified mounting bracket changes.

2.10.1 EGR Fuel Filter Bracket Removal

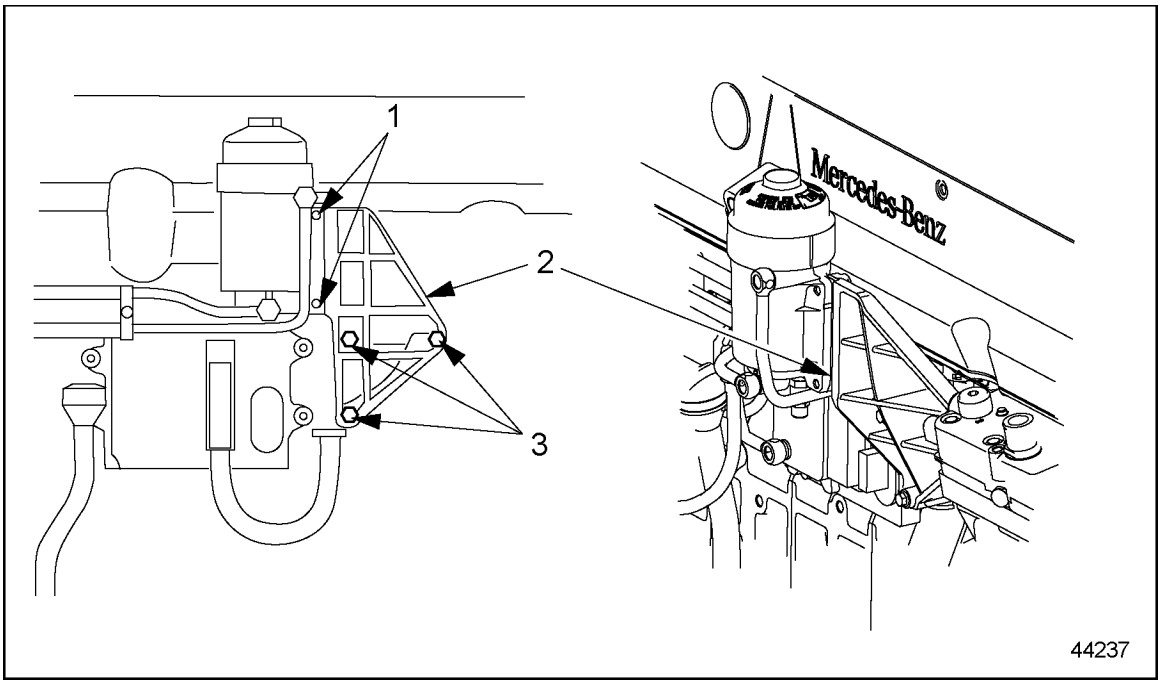
Remove the EGR fuel filter bracket as follows:

⚠ WARNING:

PERSONAL INJURY

To avoid injury from the sudden release of a high-pressure hose connection, wear a face shield or goggles.

1. Disconnect fuel outlet, fuel inlet, and fuel drain connection hoses from the fuel filter on the EGR engine.
2. Remove the two filter-to-bracket threaded mounting bolts and carefully remove the filter. See Figure 2-23.



1. Fuel Filter-to-Bracket Threaded Mounting Bolts
2. Fuel Filter Mounting Bracket
3. Bracket Mounting Bolts

Figure 2-23 Removal or Installation of EGR Fuel Filter Bracket

3. Remove the three filter bracket mounting bolts from bracket and block.
4. Remove the filter bracket.

2.10.2 EGR Fuel Filter Bracket Installation

Install the EGR fuel filter bracket as follows:

1. Install the fuel filter bracket to the block using the three 8 mm x 90 mm fuel filter bracket mounting bolts. Torque bolts to 25 N·m (19 lb·ft). See Figure 2-23.
2. Install the fuel filter to the mounting bracket using the two 10 mm x 40 mm threaded bolts. Torque bolts to 60 N·m (44 lb·ft).

WARNING:

PERSONAL INJURY

To avoid injury from the sudden release of a high-pressure hose connection, wear a face shield or goggles.

3. Attach fuel inlet, fuel outlet, and fuel drain connection hoses to the fuel filter.
4. Prime the fuel system. Refer to section 11.1.5.