

## Installation

### Valve Cover Gasket with Pass-Through Connectors



**WARNING:** To avoid serious personal injury, possible death, or damage to the engine or vehicle, disconnect the main negative battery terminal before removing or installing any electrical components.

**CAUTION:** To avoid engine damage, make sure the key is in the OFF position before unplugging the connector or relay for the ECM, IDM, and EGR drive module. Failure to turn the key to the OFF position will cause a voltage spike and damage the electrical components.

**CAUTION:** To avoid engine damage, do not tug on any wiring harnesses while trying to remove them. If resistance is felt, find the source of resistance and free up any connectors or clips that are caught before proceeding.

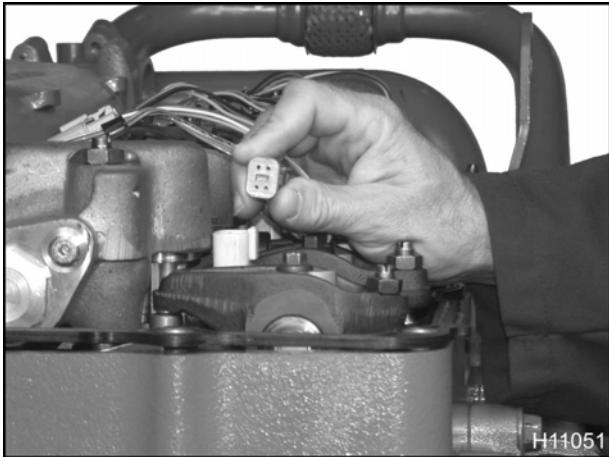


Figure 449 Injector connector

1. Install the valve cover harness by connecting harness to the high-pressure oil manifold.
2. Install valve cover gasket.
3. Connect (6) injectors connectors.

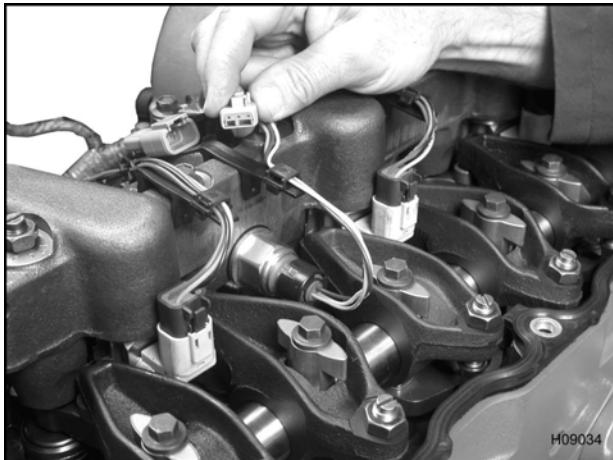


Figure 450 Connecting the ICP sensor

4. Connect the ICP sensor connector to the valve cover gasket connection.



Figure 451 Connecting the BCP sensor

5. Connect the BCP sensor connector to the valve cover gasket connection.

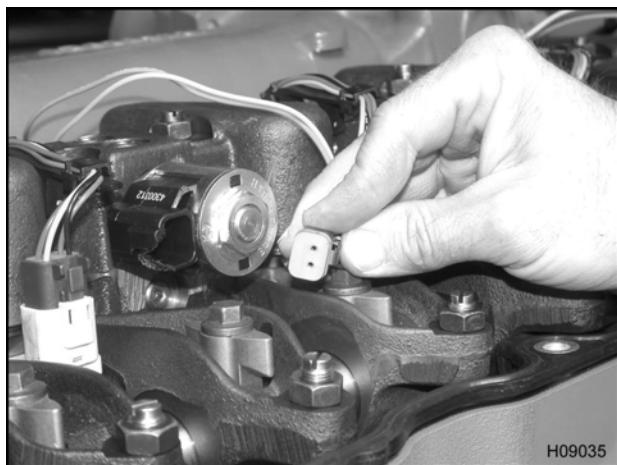


Figure 452 Connecting brake shutoff valve

6. Connect the brake shutoff valve connector to the valve cover gasket connection.

**NOTE:** When removing, disconnecting, or installing the brake shutoff valve, ICP and BCP sensors, the valve cover must be removed.

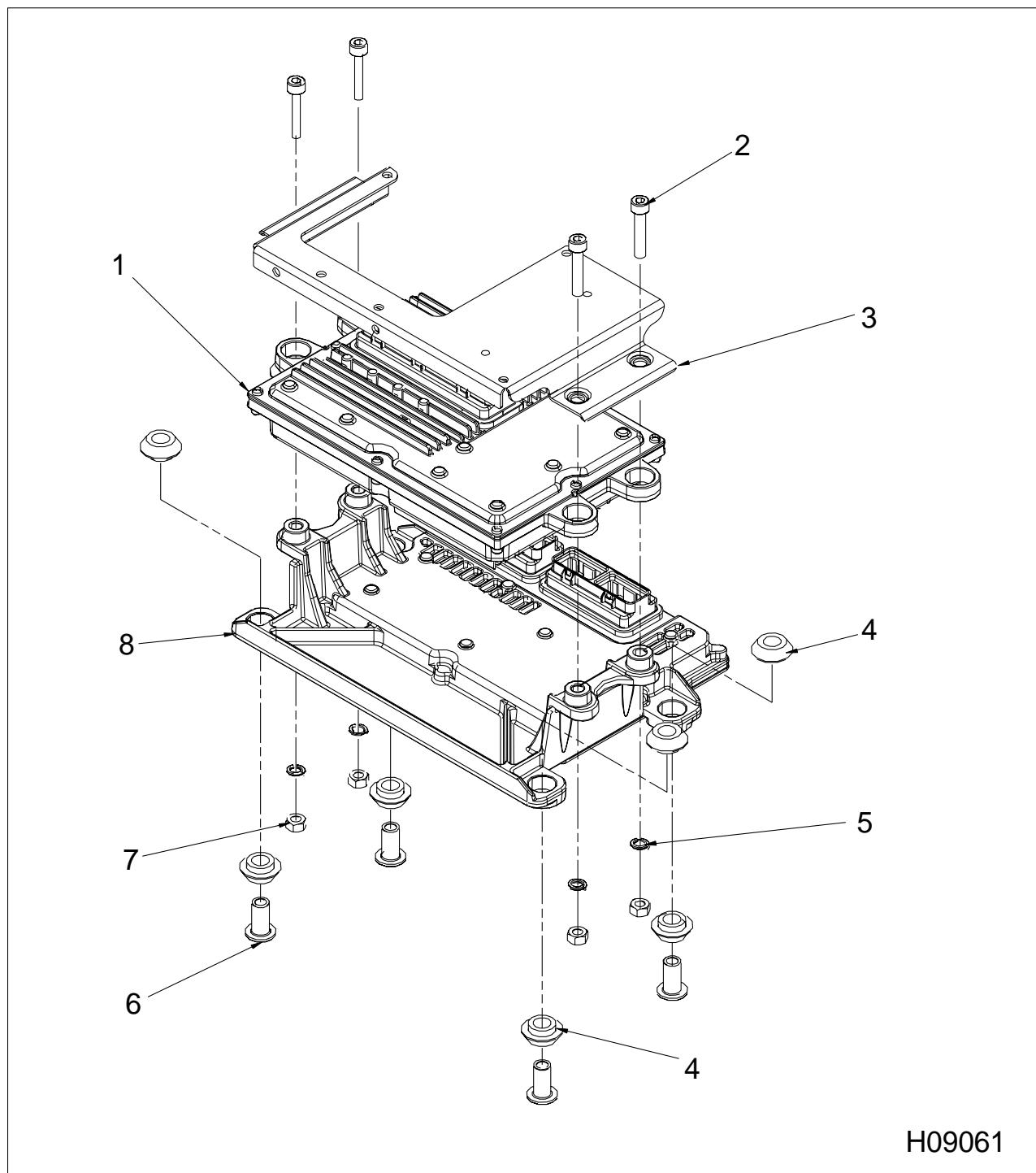
**ECM, IDM, EGR Drive Module, and Intake Air Heater**

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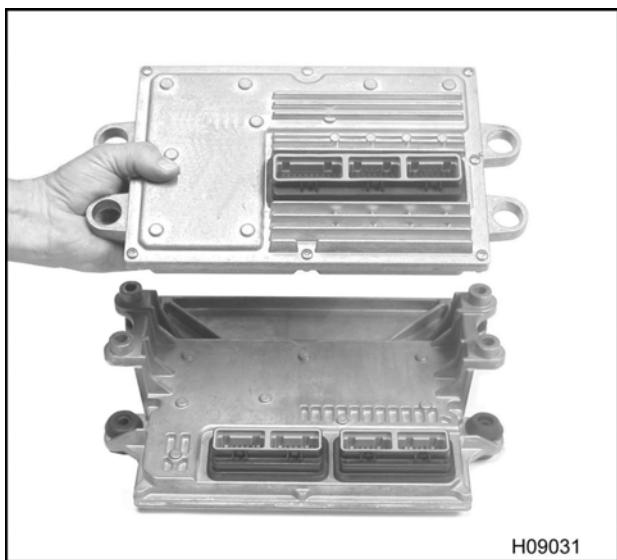
**CAUTION:** To avoid engine damage, do not tug on any wiring harnesses while trying to remove them. If resistance is felt, find the source of resistance and free up any connectors or clips that are caught before proceeding.

**NOTE:** The ECM, IDM, and EGR drive modules can be assembled as a single unit on a workbench or they can be installed individually on the crankcase. It will be assembled here on a workbench for illustrative purposes.



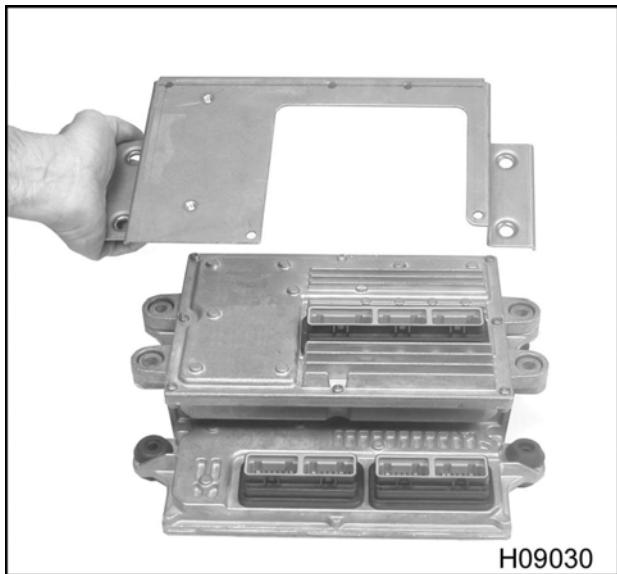
**Figure 453 ECM / IDM module assembly**

- |  |                                    |                                    |
|--|------------------------------------|------------------------------------|
| 1. Injector Drive Module (IDM)         | 4. Vibration isolation grommet (8) | 7. Nut, M8 (4)                     |
| 2. Hex socket head screws, M8 x 40 (4) | 5. Spiral lockwasher (4)           | 8. Electronic Control Module (ECM) |
| 3. ECM / IDM bracket                   | 6. Vibration isolation bushing (4) |                                    |



**Figure 454** Installing the IDM onto the ECM

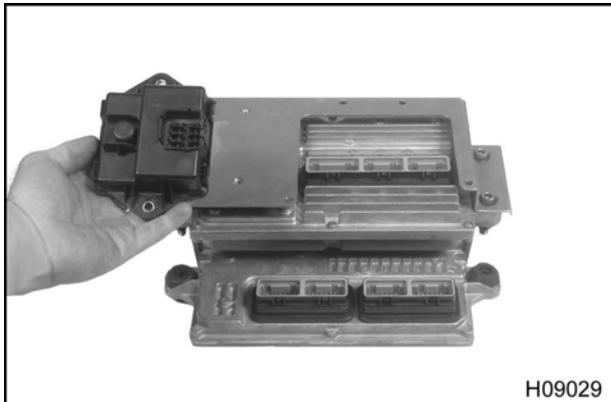
1. Lay the IDM over the ECM as shown.



**Figure 455** IDM / ECM bracket assembly

2. Lay the IDM / ECM bracket assembly over the IDM.

3. Install four hex socket head screws (M8 x 40), lockwashers and nuts (M8) to secure the IDM / ECM bracket assembly to the IDM and hand tighten. These screws will be torqued later when mounting assembly onto crankcase.

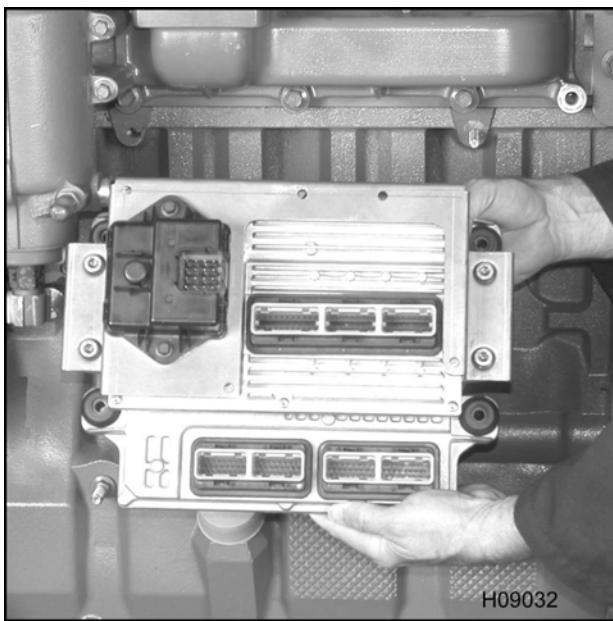


**Figure 456** EGR drive module

4. Install the EGR drive module with two bolts (M6 x 16) and hand tighten. Bolts will be torqued later when mounting to crankcase.



**Figure 457** ECM, IDM and EGR drive modules assembled



**Figure 458** Installing the ECM, IDM, and EGR drive module assembly to crankcase

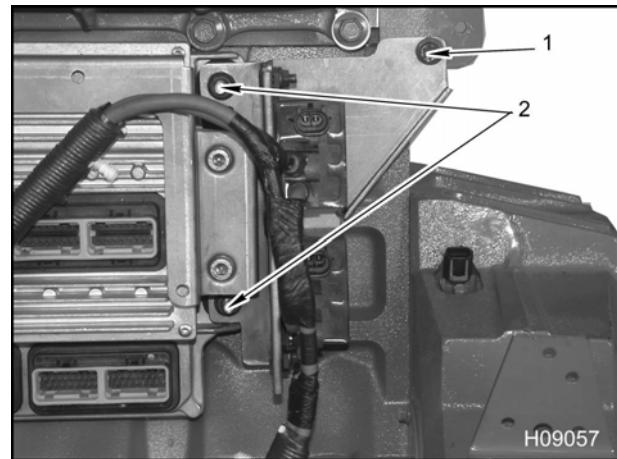
5. Install ECM, IDM, and EGR drive module assembly to the crankcase with two mounting stud bolts (M8 x 45/19) on right side.

Install two bolts (M8 x 45) on left side to secure ECM, IDM, and EGR drive module assembly to crankcase.

6. Torque module assembly mounting bolts (M8 x 45) and stud bolts (M8 x 45/19) to the special torque value (Table 44).
7. Torque both EGR drive module bolts (M6 x 16) to the standard torque value (See General Torque Guidelines, page 409).

**NOTE:** If your engine has the intake air heater feature, then continue with the following steps.

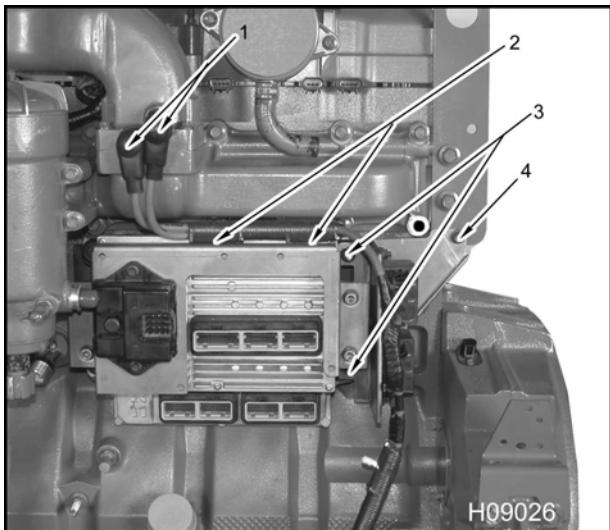
#### Intake Air Heater Wiring Harness Assembly



**Figure 459** Intake air heater relay bracket

1. Heater relay bracket bolt, M6 x 20 and nut, M6
2. Heater relay bracket nuts, M8 (2)

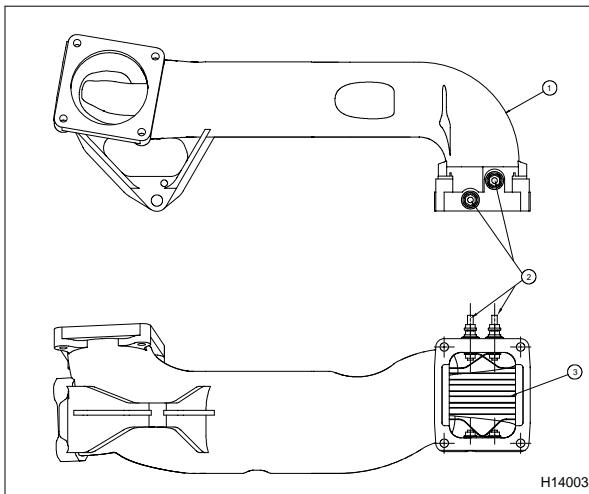
8. If applicable, install the intake air heater and bracket assembly over the two ECM / IDM assembly mounting stud bolts (M8 x 45/19).
9. Place injector shield ground wire onto top stud. Install a nut (M8) onto each stud and torque to the standard torque value (See General Torque Guidelines, page 409).



**Figure 460 Intake air heater and relay wiring harness**

1. Intake air heater mounting nuts, M6 (2)
2. Harness routing anchor points (2)
3. Heater relay bracket nuts, M8 (2)
4. Heater relay bracket bolt, M6 x 20 and nut, M6

10. Position intake heater harness assembly into place.

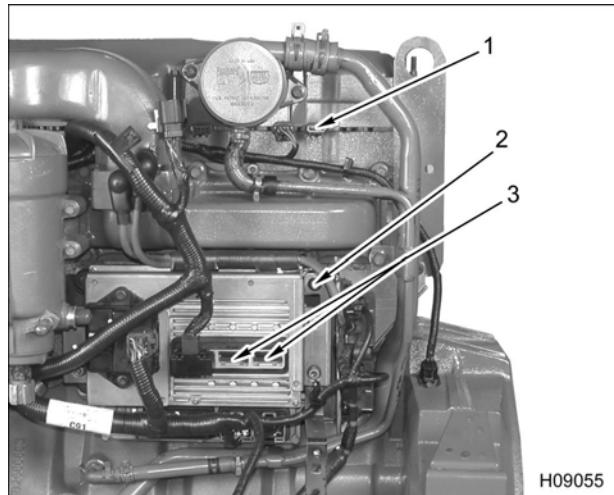


**Figure 461 Intake air heater cable locations**

1. Inlet and EGR mixer
2. Intake air heater cable locations
3. Intake air heater element

11. Install intake air heater cable at starter solenoid.
12. Install intake air heater connections at the heater with two nuts (M6). Slide boots over the connections.

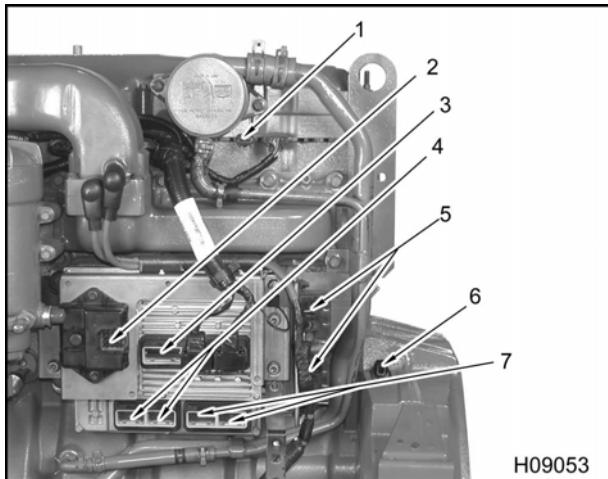
**Injector harness at ECM, IDM, and EGR drive module**



**Figure 462 Injector harness locations**

1. Injector connectors (6)
2. Injector shield ground connection
3. IDM connectors (2)
13. Connect two ECM engine connectors.
14. Connect two IDM connectors.
15. Connect the injector shield ground connection.
16. Connect six injector connectors to the valve cover gasket.

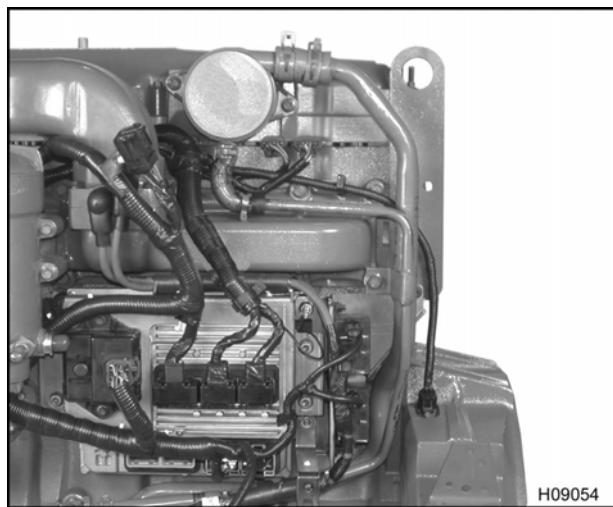
**Sensor harness at ECM, IDM, and EGR drive module**



**Figure 463 Sensor harness locations**

1. ICP sensor connector
2. EGR drive module
3. IDM connector
4. ECM chassis connectors (2)
5. Intake air heater relay connections
6. CKP sensor
7. ECM engine connectors (2)
  
17. Connect two ECM engine connectors.
18. Connect the CKP sensor.
19. Connect two intake air heater relay connectors.
20. Connect two ECM chassis connectors.

21. Connect the IDM connector.
22. Connect the EGR drive module.
23. Connect the ICP connector to the valve cover gasket.



**Figure 464 ECM, IDM, EGR drive module, and tube assembly overview**

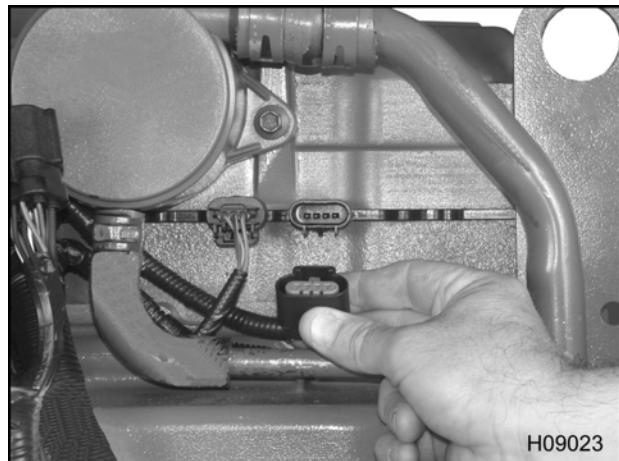
24. Install injector wiring harness underneath the EGR mixer duct and place harness snaps into anchor locations along the top side of the intake manifold.
25. Install all wiring harness snaps securing the sensor and injector wiring harnesses to the engine.

**Injector Wiring Harness**

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H09023

**Figure 465** Connecting the No. 6 fuel injector connector

1. Connect six, four wire injector drive connectors to the valve cover gasket.
2. Slide ground eyelet over injector shielded ground stud (Figure 435). Install nut and tighten.

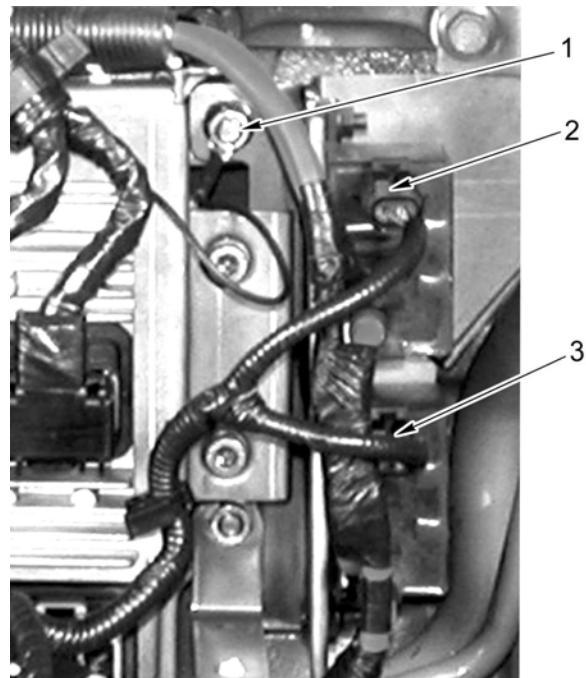
### Sensor Wiring Harness



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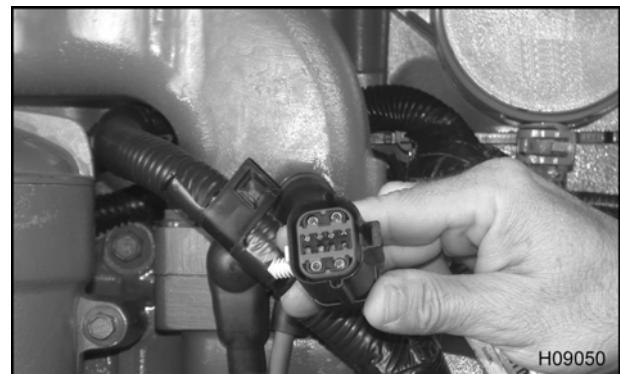
**CAUTION:** To avoid engine damage, do not tug on any wiring harnesses while trying to remove them. If resistance is felt, find the source of resistance and free up any connectors or clips that are caught before proceeding.



**Figure 466 Intake air heater relay connectors (2)**

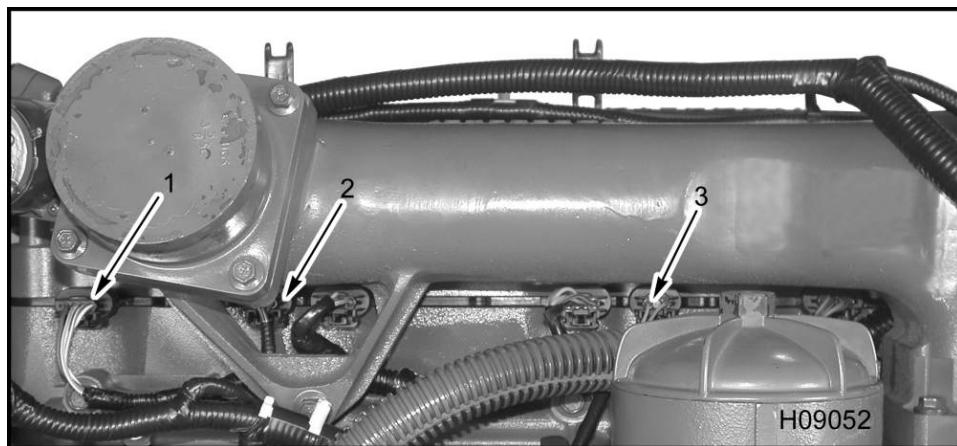
1. Injector ground stud
2. Top relay connector
3. Bottom relay connector

1. Position the sensor harness by connecting the harness at various tie down locations.
2. Connect two intake air heater relay connectors at the intake air heater relays.



**Figure 467 12 wire engine connector**

3. Connect one, 12 wire connector engine to the chassis connection point.



**Figure 468 BCP, brake shutoff valve, and injector locations**

- |   |   |
|---|---|
| 1. Injector connector (6)<br>2. BCP sensor connector (optional) | 3. Brake shutoff valve connector (optional) |
|---|---|
- 4. Connect two ECM engine connectors.
  - 5. Connect one IDM connector.
  - 6. Connect one connector at EGR drive module.
  - 7. Connect one, three wire ICP connector to the valve cover gasket.
  - 8. Connect two additional, three wire connectors for the BCP sensor connector and brake shutoff valve connector to the valve cover gasket (optional).
  - 10. Connect the ECM, IDM, and EGR drive module assembly ground.
  - 11. Connect two ECM engine module connectors.
  - 12. Connect three IDM Module connectors.
  - 13. Connect the engine harness by connecting the harness at the various tie down locations.
  - 14. Connect the wiring harness to the CKP sensor.



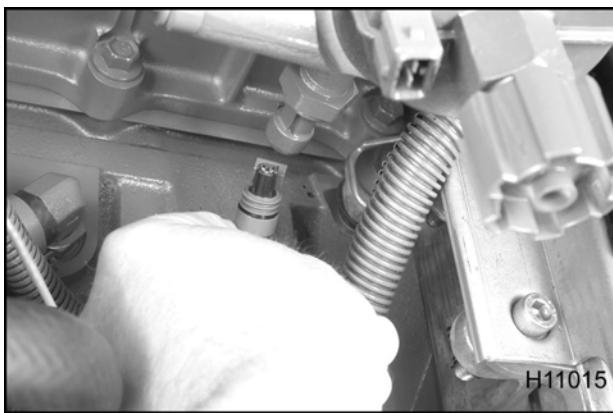
**Figure 469 Connecting to the CKP sensor**

- 9. Connect wiring harness at EGR drive module.



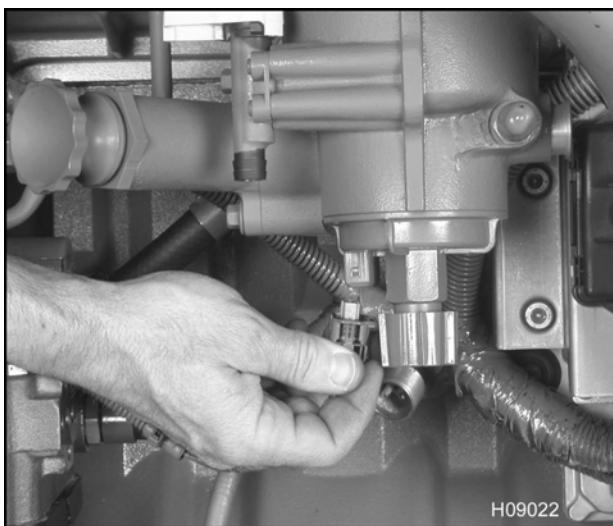
**Figure 470 Connecting to the WIF sensor**

- 15. Connect the wiring harness at the WIF sensor.



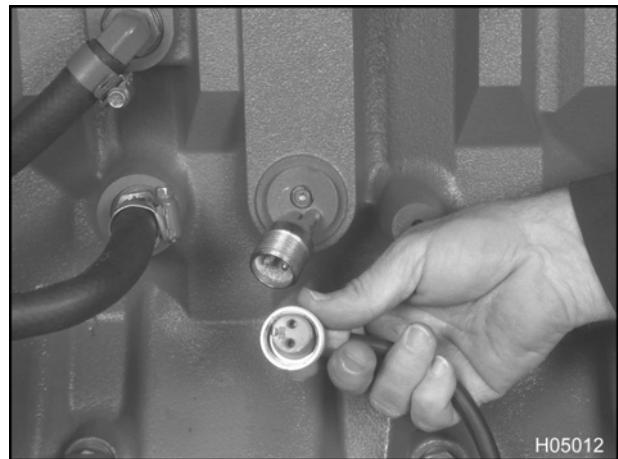
**Figure 471** Connecting to the fuel pressure sensor

16. Connect the wiring harness to the fuel pressure sensor (optional).



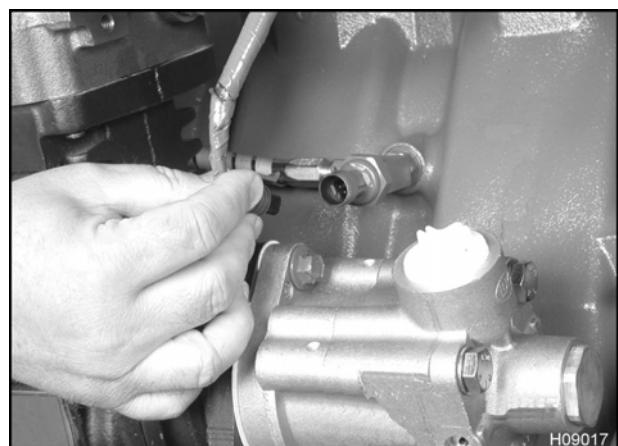
**Figure 472** Connecting to the fuel heater

17. Connect the wiring harness at the fuel heater (optional).



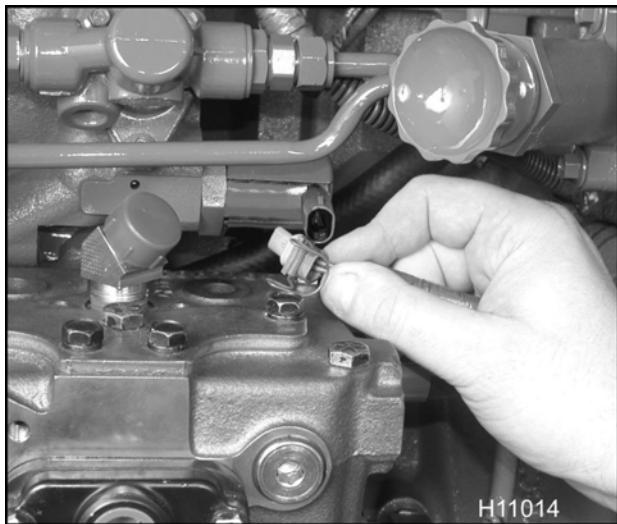
**Figure 473** Connecting to the block heater

18. Install the block heater cable connections (optional).



**Figure 474** Connecting to the EOP sensor

19. Connect the wiring harness connector to the EOP sensor.



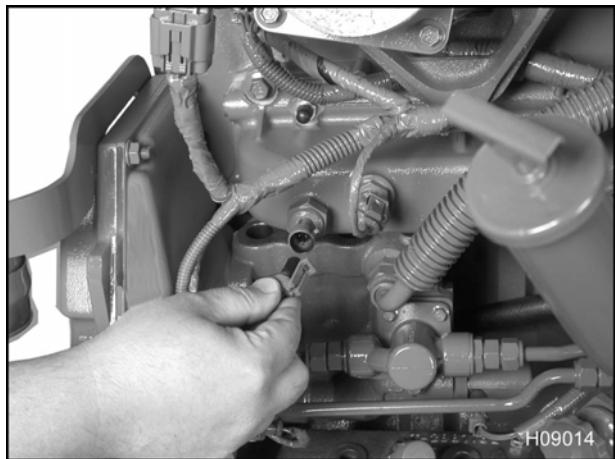
**Figure 475** Connecting to the IPR valve

20. Connect wiring harness connector to the IPR valve solenoid.



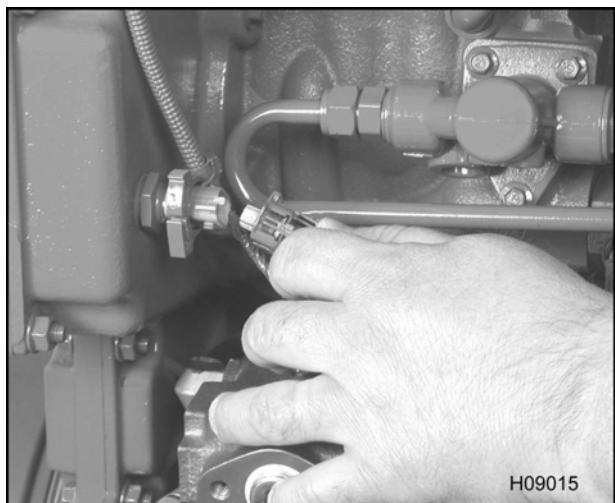
**Figure 476** Connecting to the MAT sensor

21. Connect the wiring harness connector to the MAT sensor.



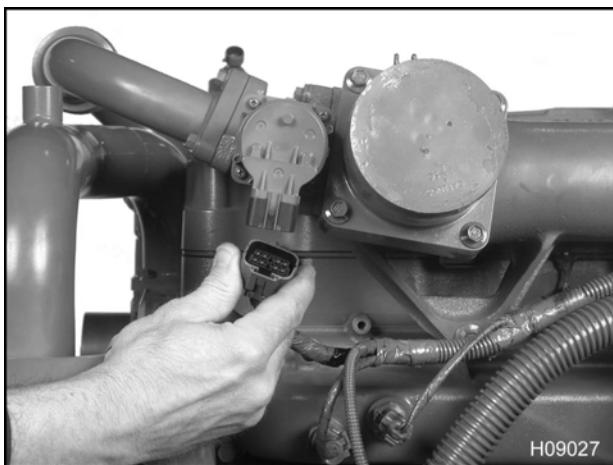
**Figure 477** Connecting the MAP sensor

22. Connect the wiring harness connector to the MAP sensor.

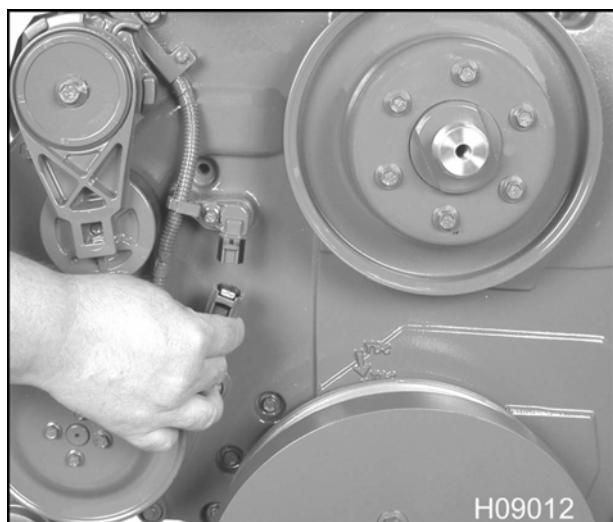


**Figure 478** Connecting to the EOT sensor

23. Connect the wiring harness connector to the EOT sensor.



**Figure 479** Connecting to the EGR control valve



**Figure 481** Connecting to the CMP sensor

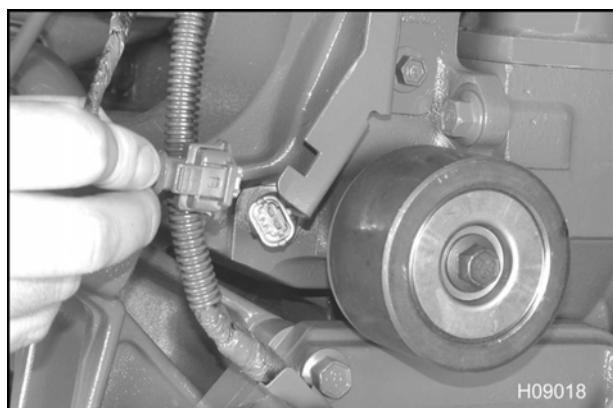
24. Connect the wiring harness connector at the EGR control valve.



**Figure 480** Connecting to the EBP sensor

25. Connect the wiring harness connector to the EBP sensor.

26. Connect the wiring harness connector to the CMP sensor.



**Figure 482** Connecting to the ECT sensor

27. Connect the wiring harness connector to the ECT sensor.



28. Connect the VGT harness at the VGT.

**Figure 483 Connecting to the VGT harness**

## Special Torque

**Table 44 Engine Electrical Special Torques**

ECM / IDM mounting bolts (2), M8 x 45	20 N·m (15 lbf·ft)
ECM / IDM mounting stud bolts (2), M8 x 45/19	20 N·m (15 lbf·ft)
Engine coolant temperature (ECT) sensor	15-20 N·m (11-15 lbf·ft)
Engine oil pressure (EOP) sensor	9-14 N·m (79-124 lbf·in)
Engine oil temperature (EOT) sensor	15-20 N·m (11-15 lbf·ft)
Injection control pressure (ICP) sensor and Brake Control (BCP) sensor	20-30 N·m (15-22 lbf·ft)
Intake Manifold Air Pressure (MAP) sensor	10-20 N·m (88-176 lbf·in)
Intake Manifold Air Temperature (MAT) sensor	10-20 N·m (88-176 lbf·in)

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Read all safety instructions in the "Safety Information" section of this manual before doing any procedures.

Follow all warnings, cautions, and notes.

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