## Service Information Bulletin

### SUBJECT
- Cylinder Head Removal and Installation

### DATE
- August 2015

### Additions, Revisions, or Updates

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| DDC-SVC-MAN-0081           | DD Platform Euro IV | Removal of the DD13 Cylinder Head Assembly | Title Change  
| DDC-SVC-MAN-0181           |                | Step 6 - Added step for removing side fairings and splash shields  
| DDC-SVC-MAN-S081           |                | Step 30 - Added note for repositioning the oil dipstick tube  
| DDC-SVC-MAN-S181           |                | Step 37 - Added step referencing cylinder head replacement  |
|                            |                | Installation of the DD13 Cylinder Head Assembly | Title Change  
|                            |                | Step 39 - Added step to change the engine oil and oil filter  
|                            |                | Added notice regarding normal oil seepage post repairs  |
|                            |                | Removal of the DD15 and DD16 Cylinder Head Assembly | Title Change  
|                            |                | Step 29 - Added step referencing cylinder head replacement  |
|                            |                | Installation of the DD15 and DD16 Cylinder Head Assembly | Title Change  
|                            |                | Step 34 - Added step to change the engine oil and oil filter  
|                            |                | Added notice regarding normal oil seepage post repairs  |
|                            |                | DD Platform Cylinder Head Replacement | New procedure for replacing the cylinder head  |

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2 Removal of the DD13 Cylinder Head Assembly

**WARNING: PERSONAL INJURY**

To avoid injury, never remove any engine component while the engine is running.

Remove as follows:

1. Shut off the engine, apply the parking brake, chock the wheels, and perform any other applicable safety steps.
2. Disconnect the batteries. Refer to OEM procedures.
3. Open the hood.
4. If needed, remove the bumper. Refer to OEM procedures.
5. For a vehicle with a short (less than 120 inches) Bumper-to-Back-of-Cab (BBC), remove the hood. Refer to the OEM procedure.
6. If necessary, remove the side fairings and inner fenders/splash shields for access. Refer to the OEM procedures.
7. If needed, remove the rain tray. Refer to OEM procedures.
8. Drain the coolant. Refer to section "Cooling System Drain Procedure".
9. Disconnect and remove the ducting from the turbo compressor outlet to the Charge Air Cooler (CAC).
10. Remove the turbocharger compressor outlet elbow.
11. Open the hood.
12. Remove the air cleaner assembly and turbocharger inlet.
13. Disconnect and remove the ducting from the CAC to the intake throttle valve adaptor.
14. Disconnect the coolant level sensor.
15. Disconnect the EGR cooler vent (de-aeration) line from the EGR cooler water manifold assembly.
16. Remove the coolant surge tank. Refer to OEM procedures.
17. For a vehicle with a short BBC, remove the cooling package. Refer to the OEM procedures.
18. For a vehicle with a short BBC, remove the engine cooling fan. Refer to the OEM procedures.
19. Remove the camshaft housing. Refer to section "Removal of the Camshaft Housing".
20. Remove coolant lines from the Exhaust Gas Recirculation (EGR) cooler water manifold assembly to the fuel doser injector housing.
21. Disconnect the cab heater lines from the water manifold.
22. If equipped, disconnect the DEF system heater lines from the water manifold.
23. Remove the coolant line from the EGR valve actuator to the EGR cooler water manifold.
24. Remove the turbocharger heat shield.
25. Remove the EGR hot pipe and discard the spherical clamps.
26. Disconnect the EGR valve pull rod from the EGR valve actuator.
27. Remove the turbocharger mounting bolts
28. Remove the Coolant Crossover Pipe. Refer to section "Removal of the Coolant Crossover Pipe".
29. Disconnect the Intake Throttle Valve (ITV) electrical harness connector.
30. If the oil dipstick tube is attached to the intake throttle valve bracket, remove the attachment hardware.
31. Remove the two bolts attaching the cold boost pipe to the cold boost pipe support bracket.

**NOTICE:** The high pressure fuel rail feed lines, vibration dampers, mounting bracket and hardware are one-time-use components and MUST be replaced any time they are removed.

32. Remove needle, amplifier, and pressure limiting valve (PLV) return lines.
   Refer to section "Removal of the Needle, Amplifier, and Pressure Limiting Valve Return Lines - Three-Filter System"
   Refer to section "Removal of the Needle, Amplifier, and Pressure Limiting Valve (PLV) Return Lines – Two-Filter System"
33. Remove the two small cylinder head mounting bolts (39 and 40). See illustration below. For EPA07 DD13 engines, these bolts are located on the outside perimeter of the cylinder head casting at the rear of the engine.
34. Using the flywheel and main pulley socket tool (J-45390), remove the 38 large mounting bolts securing the cylinder head to the cylinder block.

**WARNING: PERSONAL INJURY**
To avoid injury when removing or installing a heavy engine component, ensure the component is properly supported and securely attached to an adequate lifting device to prevent the component from falling.

35. Using the cylinder head/engine lifting bar tool (W470589006200), carefully lift and remove the cylinder head from the cylinder block. Place the cylinder head on a suitable surface using caution to avoid damage to the protruding fuel injector tips.

36. Remove and discard the cylinder head gasket.

37. If the cylinder head must be replaced, refer to section "DD Platform Cylinder Head Replacement".
3 Installation of the DD13 Cylinder Head Assembly

Install as follows:

NOTICE: If the coolant grommets on the head gasket have failed, do not proactively replace the cylinder liner seals unless there is evidence of extensive cylinder block erosion around the liners.

NOTICE: Do not use any abrasive tools or methods to clean the oil and coolant grommet counter bores or other gasket surfaces of the cylinder head or cylinder block. Foreign material may enter the oil system and cause serious engine damage.

NOTICE: Failure to properly clean the oil and coolant grommet counter bores in the cylinder block may result in cylinder head gasket grommet failure.

1. Thoroughly clean the oil and coolant grommet counter bores in the cylinder block with a suitable scraper to remove any foreign material before installation of cylinder head gasket. Counter bores must be clean and dry.
2. Inspect the cylinder head bolt holes in the cylinder block for the presence of oil, water, dirt, rust or damaged threads. Clean and re-tap as necessary.
3. Ensure piston domes and cylinder block deck surfaces are clean, dry and free of oil, water or any other foreign material.

WARNING: PERSONAL INJURY

To avoid injury when removing or installing a heavy engine component, ensure the component is properly supported and securely attached to an adequate lifting device to prevent the component from falling.

4. If re-using the cylinder head, lift the head using lifting tool (W470589006200) so it can hang at a 30 to 45 degree angle lengthwise for 10 minutes. The residual oil and coolant will need to drain before the cylinder head can be installed onto the cylinder block. Use caution to avoid damage to the protruding fuel injector tips.

NOTE: The area of the cylinder block between the liners is not a sealing surface for the head gasket and will not cause a coolant leak.
NOTE: When measuring liner protrusion, avoid measuring the areas between the liners if there is erosion present.

5. Using liner protrusion tool J-47415-A, measure and record the cylinder liner protrusion for all six cylinders. Minimum allowable liner protrusion is 0.1397 mm (0.0055 in.) and maximum allowable liner protrusion is 0.26924 mm (0.0106 in.). The maximum variation allowed between cylinders is 0.0889 mm (0.0035 in.).

6. If re-using the cylinder head, alternate the head to hang in the opposite direction at the same 30 to 45 degree angle lengthwise for another ten minutes. Use caution to avoid damage to the protruding fuel injector tips.

7. If re-using the cylinder head, clean any oil, water or other foreign material from the cylinder head bolt holes and head gasket surface of the cylinder head.

8. Ensure both head gasket surfaces on the cylinder block and the cylinder head are clean and dry, especially the oil and coolant grommet counter bores.

9. Position a new cylinder head gasket onto the cylinder block.

10. Lift the cylinder head into position using cylinder head/engine lifting bar tool (W470589006200). Lower the cylinder head into place until it is fully seated onto the dowel pins and cylinder block.

11. If reusing the cylinder head mounting bolts, make sure they do not exceed the maximum bolt length of 194 mm (7.638 inches).

NOTICE: Do not dip the entire cylinder head mounting bolt in oil as the excessive oil could cause improper torque results or external oil seepage at the head gasket joint.

12. Using a suitable brush, lightly coat the threads and underside of the bolt heads with clean engine oil.

13. Using the flywheel and main pulley socket tool (J-45390), install the 38 large cylinder head mounting bolts and tighten using the torque sequence shown below. Torque bolts (1 through 38) in three steps as follows
   - a. 200 N·m (147 lb·ft).
   - b. 90° torque turn.
   - c. 90° torque turn.

14. Install and torque the small bolts (39 and 40) to 60 N·m (44 lb·ft). For EPA07 DD13, these bolts are located on the outside perimeter of the cylinder head casting at the rear of the engine.

15. Install the needle, amplifier, and pressure limiting valve (PLV) return lines.
   Refer to section "Installation of the Needle, Amplifier, and Pressure Limiting Valve Return Lines - Three-Filter System"
   Refer to section "Installation of the Needle, Amplifier, and Pressure Limiting Valve Return Lines – Two-Filter System"

16. Install the two bolts attaching the cold boost pipe to the cold boost pipe support bracket. Torque the bolts to 30 N·m (22 lb·ft).

17. Connect the Intake Throttle Valve (ITV) electrical harness connector.

18. Install the Coolant Crossover Pipe. Refer to section "Installation of the Coolant Crossover Pipe".

19. Install the turbocharger mounting bolts. Torque the bolts to 50 N·m (37 lb·ft).
20. Connect the EGR valve actuator pull rod to the EGR valve actuator. Refer to section "Installation of the DD13 Exhaust Gas Recirculation Valve Actuator Pull Rod".
21. Install the EGR hot pipe with two new spherical clamps. Refer to section "Installation of the Exhaust Gas Recirculation Hot Pipe".
22. Install the turbocharger heat shield.
23. Install the coolant line from the EGR valve actuator to the EGR cooler water manifold assembly. Tighten coolant line to 35 N·m (26 lb·ft).
24. If equipped, connect the DEF system heater lines to the water manifold.
25. Connect the cab heater lines to the water manifold.
26. Install the doser injection valve coolant lines to the EGR cooler water manifold assembly
   a. For the 5mm long thread fitting, torque to 15 N·m (11 lb·ft).
   b. For the 15mm long thread fitting, torque to 22 N·m (16 lb·ft).
27. Install the camshaft housing. Refer to section "Installation of the Camshaft Housing".
28. If disconnected, reattach oil dipstick tube to intake throttle valve bracket.
29. If removed, install the engine cooling fan. Refer to the OEM procedure.
30. If removed, install the cooling package. Refer to the OEM procedure.
31. Install the coolant surge tank. Refer to the OEM procedure.
32. Connect the EGR cooler vent (de-aeration) line.
33. Connect the coolant level sensor.
34. Install the ducting from the CAC to the intake throttle valve adaptor.
35. Install the turbocharger compressor outlet elbow.
36. Install the ducting from the turbocharger compressor outlet to the CAC.
37. Install the air cleaner assembly and turbocharger inlet. Refer to the OEM procedure.
38. Reconnect the batteries. Refer to the OEM procedure.
39. Prime fuel system.
   Refer to section "Priming the Fuel System Using ESOC 350 Fuel Priming Pump - Two-Filter System".
   Refer to section "Priming the Fuel System Using ESOC 350 Fuel Priming Pump - Three-Filter System".
40. Change the oil and oil filter due to possible coolant contamination during repairs.
41. Fill the cooling system. Refer to section "Cooling System Fill Procedure".
42. If removed, install the windshield wiper linkage. Refer to OEM procedures.
43. If removed, install the rear frame. Refer to OEM procedures.
44. If removed, install the hood. Refer to the OEM procedure.
45. If removed, install the inner fenders/splash shields and side fairings. Refer to the OEM procedures.
46. If removed, install the bumper. Refer to OEM procedures.

**NOTICE:** It is normal to see oil seepage or small oil bubbles at the head gasket joint when running the engine after a head gasket replacement. Oil seepage or small oil bubbles should not be present after approximately 805 km (500 mi).

**WARNING: PERSONAL INJURY**
To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

**WARNING: ENGINE EXHAUST**
To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

47. Start the engine and check for leaks.
4 Removal of the DD15 and DD16 Cylinder Head Assembly

Remove as follows:

**WARNING: PERSONAL INJURY**

To avoid injury, never remove any engine component while the engine is running.

1. Shut off the engine, apply the parking brake, chock the wheels, and perform any other applicable safety steps.
2. Disconnect the batteries. Refer to OEM procedures.
3. Open the hood.
4. If necessary, remove the bumper. Refer to OEM procedures.
5. If necessary, remove the rain tray. Refer to OEM procedures.
6. If necessary, remove the windshield wiper linkage. Refer to OEM procedures.
7. Drain the engine cooling system. Refer to section "Cooling System Drain Procedure".
8. Disconnect the coolant level sensor.
9. Disconnect the EGR cooler vent (de-aeration) line from the EGR cooler.
10. Remove the coolant surge tank. Refer to the OEM procedure.
11. Remove the camshaft housing assembly. Refer to section "Removal of the Camshaft Housing Assembly".
12. Remove coolant lines from the water manifold to the fuel doser injector housing.
13. Disconnect the cab heater lines from the water manifold.
14. If equipped, disconnect the DEF system heater lines from the water manifold.
15. Disconnect the EGR actuator connector and remove the heat shield. Refer to section "Removal of DD15 and DD16 Delphi® Exhaust Gas Recirculation Valve Actuator".
16. Remove the EGR actuator coolant line from the cylinder block.
17. Remove the EGR pull rod from the EGR valve.
18. Remove the turbocharger heat shield.
19. Remove the turbocharger mounting bolts.
20. Remove the Coolant Crossover Pipe. Refer to section "Removal of the Coolant Crossover Pipe".
21. Disconnect the Intake Throttle Valve (ITV) electrical harness connector.
22. Remove the ducting from the CAC to the intake throttle valve adaptor.
23. Remove the two bolts attaching the cold boost pipe to the cold boost pipe support bracket.
24. Disconnect the needle, amplifier, and pressure limiting valve return lines.
   Refer to section "Removal of the Needle, Amplifier, and Pressure Limiting Valve (PLV) Return Lines – Two-Filter System".
   Refer to section "Removal of the Needle, Amplifier, and Pressure Limiting Valve Return Lines - Three-Filter System".
25. Remove the two small cylinder head bolts (39 and 40). See illustration below. For EPA07 DD15, these bolts are located on the outside perimeter of the cylinder head casting at the rear of the engine.
26. Using the flywheel and main pulley socket tool (J-45390), remove the 38 large mounting bolts securing the cylinder head to the cylinder block.

**WARNING: PERSONAL INJURY**

To avoid injury when removing or installing a heavy engine component, ensure the component is properly supported and securely attached to an adequate lifting device to prevent the component from falling.

27. Using cylinder head/engine lifting bar tool (W470589006200), carefully lift and remove the cylinder head from the cylinder block. Place the cylinder head on a suitable surface using caution to avoid damage to the protruding fuel injector tips.  
28. Remove and discard the cylinder head gasket.  
29. If the cylinder head must be replaced, refer to section "DD Platform Cylinder Head Replacement".
5 Installation of the DD15 and DD16 Cylinder Head Assembly

Install as follows:

**NOTICE:** If the coolant grommets on the head gasket have failed, do not proactively replace the cylinder liner seals unless there is evidence of extensive cylinder block erosion around the liners.

**NOTICE:** Do not use any abrasive tools or methods to clean the oil and coolant grommet counter bores or other gasket surfaces of the cylinder head or cylinder block. Foreign material may enter the oil system and cause serious engine damage.

**NOTICE:** Failure to properly clean the oil and coolant grommet counter bores may result in cylinder head gasket grommet failure.

1. Thoroughly clean the oil and coolant grommet counter bores in the cylinder block with a suitable scraper to remove any foreign material before installation of cylinder head gasket. Counter bores must be clean and dry.
2. Inspect the cylinder head bolt holes in the cylinder block for the presence of oil, water, dirt, rust or damaged threads. Clean and re-tap as necessary.
3. Ensure piston domes and cylinder block deck surfaces are clean, dry and free of oil, water or any other foreign material.

**WARNING: PERSONAL INJURY**

To avoid injury when removing or installing a heavy engine component, ensure the component is properly supported and securely attached to an adequate lifting device to prevent the component from falling.

4. If re-using the cylinder head, lift the head using lifting tool (W470589006200) so it can hang at a 30 to 45 degree angle lengthwise for 10 minutes. The residual oil and coolant will need to drain before the head can be installed on the engine. Use caution to avoid damage to the protruding fuel injector tips.

**NOTE:** The area of the cylinder block between the liners is not a sealing surface for the head gasket and will not cause a coolant leak.
NOTE: When measuring liner protrusion, avoid measuring the areas between the liners if there is erosion present.

5. Using liner protrusion tool J-47415-A, measure and record the cylinder liner protrusion for all six cylinders. Minimum allowable liner protrusion is 0.1397 mm (0.0055 in.) and maximum allowable liner protrusion is 0.2692 mm (0.0106 in.). The maximum variation allowed between cylinders is 0.0889 mm (0.0035 in.).

6. If re-using the cylinder head, alternate the head to hang in the opposite direction at the same 30 to 45 degree angle lengthwise for another ten minutes. Use caution to avoid damage to the protruding fuel injector tips.

7. If re-using the cylinder head, clean any oil, water or other foreign material from the cylinder head bolt holes and head gasket surface of the cylinder head.

8. Ensure both head gasket surfaces on the cylinder block and the cylinder head are clean and dry, especially the oil and coolant grommet counter bores.

9. Position a new cylinder head gasket onto the cylinder block.

WARNING: PERSONAL INJURY

To avoid injury when removing or installing a heavy engine component, ensure the component is properly supported and securely attached to an adequate lifting device to prevent the component from falling.

10. Lift the cylinder head into position using cylinder head/engine lifting bar tool (W470589006200). Install guide studs (J-35784) through the cylinder head and into the cylinder block. Lower the cylinder head onto the cylinder block.

11. Remove the cylinder head guide studs.

12. If reusing the cylinder head mounting bolts, make sure they do not exceed the maximum bolt length of 194 mm (7.638 inches).

NOTICE: Do not dip the entire cylinder head mounting bolt in oil as the excessive oil could cause improper torque results or external oil seepage at the head gasket joint.

13. Using a suitable brush, lightly coat the threads and underside of the bolt heads with clean engine oil.

14. Install the 40 cylinder head mounting bolts.

15. Using the sequence shown below, torque the 38 large bolts in four steps to:
   • 50 N·m (37 lb·ft).
   • 250 N·m (184 lb·ft).
   • 90° torque turn.
   • 90° torque turn.
16. Torque the small bolts (39 and 40) to 60 N·m (44 lb·ft). For EPA07 DD15, these bolts are located on the outside perimeter of the cylinder head casting at the rear of the engine.

17. Connect the needle, amplifier, and pressure limiting valve return lines.
   - Refer to section "Installation of the Needle, Amplifier, and Pressure Limiting Valve Return Lines – Two-Filter System".
   - Refer to section "Installation of the Needle, Amplifier, and Pressure Limiting Valve Return Lines - Three-Filter System".

18. Install the two bolts attaching the cold boost pipe to the cold boost pipe support bracket. Torque bolts to 30 N·m (22 lb·ft).

19. Install the ducting from the CAC to the intake throttle valve adaptor.

20. Connect the Intake Throttle Valve (ITV) electrical harness connector.

21. Install the Coolant Crossover Pipe. Refer to section "Installation of the Coolant Crossover Pipe".

22. Install the turbocharger mounting bolts. Torque the bolts to 50 N·m (37 lb·ft).

23. Connect the EGR pull rod to the EGR valve. Install and torque the clamping nuts to 20 N·m (15 lb·ft).

24. Install the EGR actuator coolant supply line.

25. Install the turbocharger heat shield.

26. Connect the EGR actuator connector and install the heat shield. Refer to section "Installation of the DD15 and DD16 Delphi© Exhaust Gas Recirculation Valve Actuator".

27. If equipped, connect the DEF system heater lines to the water manifold.

28. Connect the cab heater lines to the water manifold.

29. Install the coolant lines from the water manifold to the fuel doser injector housing.

30. Install the camshaft housing assembly. Refer to section "Installation of the Camshaft Housing Assembly".

31. Install the coolant surge tank. Refer to OEM procedures.

32. Connect the EGR cooler vent (de-aeration) line to the EGR cooler.

33. Connect the coolant level sensor.

34. Prime fuel system.
   - Refer to section "Priming the Fuel System Using ESOC 350 Fuel Priming Pump - Two-Filter System"
   - Refer to section "Priming the Fuel System Using ESOC 350 Fuel Priming Pump - Three-Filter System"

35. Reconnect the batteries. Refer to OEM procedures.

36. Change the oil and oil filter due to possible coolant contamination during repairs.

37. Fill the cooling system. Refer to section "Cooling System Fill Procedure".

38. If removed, install the windshield wiper linkage. Refer to OEM procedures.

39. If removed, install the rain tray. Refer to OEM procedures.

40. If removed, install the bumper. Refer to OEM procedures.

**NOTICE:** It is normal to see oil seepage or small oil bubbles at the head gasket joint when running the engine after a head gasket replacement. Oil seepage or small oil bubbles should not be present after approximately 805 km (500 mi).

**WARNING: PERSONAL INJURY**
To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

**WARNING: ENGINE EXHAUST**
To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

41. Start the engine and check for leaks.
6 DD Platform Cylinder Head Replacement

This procedure lists the necessary steps for the replacement of a cylinder head after the failed cylinder head assembly has been removed from the engine. Several components from the failed cylinder head assembly must be transferred to the replacement cylinder head.

Replace as follows:

**NOTICE:** New gaskets and seals must be used when transferring parts from the failed cylinder head to the replacement cylinder head.

1. If the failed cylinder head has not been removed from the engine, use the following section:
   a. For DD13, refer to section “Removal of the DD13 Cylinder Head Assembly”.
   b. For DD15 and DD16, refer to section “Removal of the DD15 and DD16 Cylinder Head Assembly”.
2. Clean the replacement cylinder head to remove all rust and rust preventative compound, especially from the fuel and oil galleries.

**WARNING: EYE INJURY**

To avoid injury from flying debris when using compressed air, wear adequate eye protection (face shield or safety goggles) and do not exceed 276 kPa (40 psi) air pressure.

3. When clean, use compressed air to dry the replacement head.
4. Place the failed cylinder head assembly on a suitable work table using blocks under the deck of the cylinder head to avoid damaging the injector tips.
5. Place the replacement cylinder head on a suitable work table using blocks under the deck of the cylinder head to prepare for transferring parts.
6. Remove the fuel injectors from the failed cylinder head assembly.
7. Install all six fuel injectors into the replacement cylinder head.
8. Install a new copper washer with the recess facing UP toward the fuel injector and the flat side of the washer facing DOWN.
9. Apply a thin coat of acid-free grease or clean engine oil to the fuel injector seal rings and then use J-48837 (Fuel Injector O-ring Installer) to install them in the fuel injector nut ring grooves. Make sure they are properly seated.
10. Install the fuel injector and clamp as an assembly into the respective fuel injector bore. Align the clamp over the bolt hole, install a new bolt into fuel injector clamp and snug until the fuel injector fully seats, and then release the fuel injector bolt. DO NOT torque.
11. Torque the fuel injector hold-down bolt to 20 N·m (15 lb·ft) + 90 degree torque turn.
12. Remove the exhaust manifold from the failed cylinder head as an assembly.
13. Remove the EGR cooler, water manifold and water outlet from the failed cylinder head as an assembly.
14. Install the EGR cooler, water manifold and water outlet assembly onto the replacement cylinder head.
   a. Install and hand tighten the seventeen water manifold assembly mounting bolts. Torque the bolts to 30 N·m (22 lb·ft) using the sequence shown below.
15. Install the exhaust manifold assembly onto the replacement cylinder head.
   a. For EPA07, EPA10 and GHG14 TC engines, Refer to section "Installation of the Exhaust Manifold".
   b. For GHG14 AT engines, Refer to section "Installation of the GHG14 DD15 Asymmetrical Turbocharger Exhaust Manifold".

16. Remove the EGR crossover pipe/front engine lifter bracket from the failed cylinder head.
17. Remove the rear engine lifter brackets from the failed cylinder head.
18. Remove the fuel return fittings from the failed cylinder head.
19. Remove the air intake manifold from the failed cylinder head.
20. Install the air intake manifold onto the replacement cylinder head.
21. Install the thirteen flanged screws and isolator gaskets to the air intake manifold.
22. Secure the air intake manifold to the cylinder head and tighten the bolts by hand.
23. Torque the bolts to 25 N·m (18 lb·ft) starting at the center of the manifold and then outward until all bolts are torqued.

**NOTE:** EPA07 engines have one M18x1.5 and one M16x1.5 fuel return fitting. EPA10 and newer engines use two M18x1.5 fittings.

24. Install the fuel return fittings onto the replacement cylinder head. Torque as follows:

   **Table 2.**
   | M18 x 1.5 fitting to 55 to 60 N·m (40 to 44 lb·ft). |
   | M16 x 1.5 fitting to 45 to 50 N·m (33 to 37 lb·ft). |

25. Install the rear engine lifter brackets onto the replacement cylinder head. Torque the bolts to 180 N·m (132 lb·ft).
26. Install the EGR crossover pipe/front engine lifter bracket onto the replacement cylinder head. Torque the mounting bolts to 60 N·m (44 lb·ft).
27. The replacement cylinder head is now an assembly and ready to be installed onto the engine. Refer to the appropriate section of the repair manual for cylinder head assembly installation instructions.
   a. For DD13, refer to section “Installation of the DD13 Cylinder Head Assembly”.
   b. For DD15 and DD16, refer to section “Installation of the DD15 and DD16 Cylinder Head Assembly”.

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