

**SAFETY RECALL – NORTH AMERICA**  
**High Pressure Fuel Pump**



Reference: 01A / NHTSA 23V-263

FCA US LLC



Remedy available for  
 2021-2023 JL Wrangler and JT Gladiator



Remedy available for  
 2022-2023 DT Ram 1500 Pickup

Template Version 1.8

Revision	Edition	Detail
0	October 2023	Revision 2 – Remedy for DT now available. Consider the document to be all new.

**SUBJECT**

The High-Pressure Fuel Pump (HPFP) on about 49,900 of the above vehicles may fail prematurely. A HPFP failure may introduce internally failed component debris into the fuel system potentially causing fuel starvation. Vehicle occupants may notice a Malfunction Indicator Lamp, service Electronic Throttle Control indicator, a fuel leak at the HPFP, or excessive noise from the HPFP. Fuel starvation may result in an unexpected loss of motive power, which can cause vehicle crash without prior warning.

**SCOPE**

This recall applies only to the above vehicles equipped with a 3.0L engine (sales code EXH or EXJ).

NOTE: Some vehicles above may have been identified as not involved in this recall and therefore have been excluded from this recall.

IMPORTANT: Some of the involved vehicles may be in dealer new vehicle inventory. Federal law requires you to complete this recall service on these vehicles before retail delivery. Dealers should also consider this requirement to apply to used vehicle inventory and should perform this recall on vehicles in for service. Involved vehicles can be determined by using the VIP inquiry process.

**REPAIR TO BE PERFORMED**

Vehicles delivered to the dealer in good running condition should complete HPFP replacement only(non-contaminated system).

If the vehicle is brought to the dealer not running, the technician will follow the current diagnostic procedure to determine if there was an HPFP failure. If HPFP failure was determined, replacement of both the HPFP and fuel pump module is required, including fuel system cleaning (contaminated system).

**ALTERNATE TRANSPORTATION**

Dealers should attempt to minimize customer inconvenience by placing the owner in a loaner vehicle if inspection determines that complete fuel system cleaning and replacement is required, and the vehicle must be held overnight.

**COMPLETION REPORTING AND REIMBURSEMENT**

Claims for vehicles that have been serviced must be submitted on the DealerCONNECT Claim Entry Screen located on the Service tab. Claims paid will be used by FCA to record recall service completions and provide dealer payments.

Use the following labor operation numbers and time allowances:

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Labor Description	Number	Hrs
Replace High Pressure Fuel Pump (JL and JT Only)	14-01-A1-84	1.7
Replace High Pressure Fuel Pump, Fuel Rails, Fuel Lines, Fuel Injectors, Fuel Filter, In Tank Fuel Pump, and Flush Lines (JL and JT Only)	14-01-A1-85	6.6
Replace High Pressure Fuel Pump (DT only)	14-01-A1-82	1.8
Replace High Pressure Fuel Pump, Rails, Injectors, Filter, In Tank Pump, and Flush Lines (DT Only)	14-01-A1-83	6.5

Labor Description	Number	Allowance
Floor Plan Reimbursement	95-95-95-97	Calculate See Below

Floor Plan Reimbursement represents the vehicle's average daily allowance (see table below) multiplied by the number of days the vehicle was in dealer inventory and not available for sale. This reimbursement is limited to the number of days from the date of the stop sale to the date that the remedy was made available. Note: If the vehicle was received by your dealership (KZX date) AFTER the stop sale date, you will use the KZX date instead of the stop sale date. For this Recall, the stop sale was initiated on **04/20/2023**. The remedy for JL/JT was made available on **10/03/2023**, therefore, the number of days cannot exceed **166** days. The remedy for DT was made available on **10/31/2023**, therefore, the number of days cannot exceed **194** days.

Vehicle	Average Daily Allowance
2021-2023 (JL) Jeep Wrangler	██████
2021-2023(JT) Jeep Gladiator	██████
2022-2023 DT Ram 1500 Pickup	██████

Add the cost of the recall parts package plus applicable dealer allowance to your claim.

In addition, enter "MATL" in the Part Number section of your claim with the applicable Material Allowance where appropriate.

**NOTE: See the Warranty Administration Manual, Recall Claim Processing Section, for complete recall claim processing instructions.**

**PARTS INFORMATION**

Part No.	Qty.	Part Name
<b>JL/JT &amp; DT PARTS</b>		
<b>ORDER THESE PARTS FOR ALL VEHICLES</b>		
CSSMZ461AA	1	HP Fuel Pump (JL/JT/DT) (Contaminated and Non-Contaminated Vehicle)
CSGNZ961AA		HP Fuel Pump Campaign Kit (JL/JT/DT) (Contaminated and Non-Contaminated Vehicle)
	1	EGR Tube (Gasket)
	1	Rubber Gasket - Upper EGR Tube
04275086AE	1	Authorized Modification Label (Contaminated and Non-Contaminated Vehicle)
CSFP01A1AA		SEE ORDERING INFORMATION BELOW THIS TABLE. (Contaminated and Non-Contaminated Vehicle)
	1	Owner's Manual Addendum
	1	Tip Card
	1	Fuel Door Decal

**Process Steps to Order Campaign kit CSFP01A1AA:**

1. Access the "DealerCONNECT" website.
2. Select the "Marketing" link in the header of DealerCONNECT.
3. Locate the "Product Information" section heading on the Marketing page.
4. Select the "Literature and Merchandising Materials" link in the product information section.
5. Locate the "MOPAR" section heading on the Literature and Merchandising Materials page.
6. Select the "Recall Labels / Cards" link listed in the MOPAR section.
7. Select **Item > Update Cart > Submit Order**.

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<b>JL/JT PARTS</b>		
<b>ALONG WITH THE PARTS ON PAGE 2, ORDER THESE PARTS FOR NON-CONTAMINATED JL/JT VEHICLES (NO HPFP FAILURE)</b>		
CSGNZ965AA		HPFP Campaign Kit (JL/JT) (Non - Contaminated vehicles only)
	1	Tube - Fuel Feed to Pump (Pump to Right Rail)
	1	Tube - Fuel Feed to Pump (Pump to Left Rail)
	1	Tube - Fuel Injector Supply

<b>JL/JT PARTS</b>		
<b>ALONG WITH THE PARTS ON PAGE 2, ORDER THESE PARTS FOR CONTAMINATED JL/JT VEHICLES (WITH HPFP FAILURE)</b>		
CSGNZ966AA		Fuel Pump & Level Unit (JL/JT) (Contaminated vehicles only)
	1	Fuel Pump and Level Unit (O-Ring)
	1	Fuel Pump/Level Unit (Pkg Part)
68490022AA	6	Fuel Injector (JL/JT) (Contaminated vehicles only)
68148333AA	6	Seal - Fuel Injector (JL/JT) (Contaminated vehicles only)
68148329AB	1	Fuel Rail – Right (JL/JT) (Contaminated vehicles only)
68490028AA	1	Fuel Rail – Left (JL/JT) (Contaminated vehicles only)
68436631AA	1	Filter Kit (Fuel Water Separator) (JL/JT) (Contaminated vehicles only)
68493361AA	1	O-Ring (Upper Turbo Inlet Elbow/EGR Cooler Elbow to LP EGR Valve) (JL/JT) (Contaminated vehicles only)
68487031AA	1	O-Ring (Turbo Upper Air Intake Elbow/EGR Cooler Elbow to Turbo Air Intake Elbow) (JL/JT) (Contaminated vehicles only)
68524869AA	1	TUBE KIT - FUEL SUPPLY (6 Tubes injector to rail, 2 tubes rail to pump, 1 tube rail to rail) (JL/JT) (Contaminated vehicles only)

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<b>DT PARTS</b>		
<b>ALONG WITH THE PARTS ON PAGE 2, ORDER THESE PARTS FOR NON-CONTAMINATED DT VEHICLES (NO HPFP FAILURE)</b>		
CSGNZ963AA		HPFP Campaign Kit (DT) (Non - Contaminated vehicles only)
	1	Fuel Feed to Pump (Pump to Left Rail)
	1	Fuel Feed to Pump (Pump to Right Rail)
	4	NUT - Injection Pump Cover
	1	Tube - Fuel Injector Supply
	1	Tube - Fuel Injector Supply

<b>DT PARTS</b>		
<b>ALONG WITH THE PARTS ON PAGE 2, ORDER THESE PARTS FOR CONTAMINATED DT VEHICLES (WITH HPFP FAILURE)</b>		
CSGNZ964AA		HPFP Campaign Kit (DT) (Contaminated vehicles only)
	1	Tube Kit - Fuel Supply (6 Tubes injector to rail, 2 tubes rail to pump, 1 tube rail to rail)
	1	Fuel Pump and Level Unit (O-Ring)
	1	Fuel Pump/Level Unit (Pkg Part)
68490022AA	6	Fuel Injector (DT) (Contaminated vehicles only)
68148333AA	6	Seal - Fuel Injector (DT) (Contaminated vehicles only)
68148329AB	1	Fuel Rail – Right (DT) (Contaminated vehicles only)
68490028AA	1	Fuel Rail – Left (DT) (Contaminated vehicles only)
68436631AA	1	Filter Kit (Fuel Water Separator) (DT) (Contaminated vehicles only)
68493361AA	1	O-Ring (Upper Turbo Inlet Elbow/EGR Cooler Elbow to LP EGR Valve) (DT) (Contaminated vehicles only)
68487031AA	1	O-Ring (Turbo Upper Air Intake Elbow/EGR Cooler Elbow to Turbo Air Intake Elbow) (DT) (Contaminated vehicles only)

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**PARTS RETURN**

No parts return required for this campaign.

**SPECIAL TOOLS**

Number	Description	Picture
NPN	wiTECH MicroPod II	
NPN	Laptop Computer	
NPN	wiTECH Software	
VM.10345	Tool, High Pressure Pump Installation	
1023	Puller (Originally Shipped In Kit Number(s) 8678)	
APS35IB	Blue Point Spanner Wrench or equivalent	
2025400090	Remover-Installer, Fuel Rail Bolt	
VM.10358A	Remover, Fuel Injector	
9717	Brush, Injector Bore (Originally Shipped In Kit Number(s) 9910)	
8978A	Decay Tool, Fuel	
9340	SAE Fuel Pump Lock Ring Wrench (Originally Shipped In Kit Number(s) 9327, 9327CC, 9397, 9575.	

**DEALER NOTIFICATION**

To view this notification on DealerCONNECT, select “Global Recall System” on the Service tab, then click on the description of this notification.

**OWNER NOTIFICATION AND SERVICE SCHEDULING**

All involved vehicle owners known to FCA are being notified of the service requirement by first class mail. They are requested to schedule appointments for this

service with their dealers. A generic copy of the owner letter is attached.

**VEHICLE LISTS, GLOBAL RECALL SYSTEM, VIP AND DEALER FOLLOW UP**

All involved vehicles have been entered into the DealerCONNECT Global Recall System (GRS) and Vehicle Information Plus (VIP) for dealer inquiry as needed.

GRS provides involved dealers with an updated VIN list of their incomplete vehicles. The owner’s name, address and phone number are listed if known. Completed vehicles are removed from GRS within several days of repair claim submission.

To use this system, click on the “**Service**” tab and then click on “**Global Recall System**.” Your dealer’s VIN list for each recall displayed can be sorted by: those vehicles that were unsold at recall launch, those with a phone number, city, zip code, or VIN sequence.

**Dealers must perform this repair on all unsold vehicles before retail delivery.** Dealers should also use the VIN list to follow up with all owners to schedule appointments for this repair.

*Recall VIN lists may contain confidential, restricted owner name and address information that was obtained from the Department of Motor Vehicles of various states. Use of this information is permitted for this recall only and is strictly prohibited from all other use.*

**ADDITIONAL INFORMATION**

If you have any questions or need assistance in completing this action, please contact your Service and Parts District Manager.

Customer Services / Field Operations  
 FCA US LLC.

## SERVICE PROCEDURE

For vehicles with a contaminated fuel system, use the procedure below.

### A. DT Vehicles

#### Replace

**WARNING:** High-pressure lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 2000 bar (29,008 psi). Use extreme caution when inspecting for high-pressure fuel leaks. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect for high-pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system.

**WARNING:** Observe the following precautions when working on fuel systems: No sparks, open flames or smoking. Avoid inhaling and swallowing fuel. Avoid eye and skin contact with fuel. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing. Failure to observe these precautions may result in fire, explosion, property damage, and serious or fatal injury.

**WARNING:** High-pressure lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 2000 bar (29,008 psi). Use extreme caution when inspecting for high-pressure fuel leaks. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect for high-pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system.

**WARNING:** Observe the following precautions when working on fuel systems: No sparks, open flames or smoking. Risk of poisoning from inhaling and swallowing fuel. Risk of injury to eyes and skin from contact with fuel. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing.

**NOTE:** When key is cycled to the off position, fuel system pressure automatically bleeds down.

**NOTE:** The fuel injection pump can be replaced without having to perform the entire base engine valve timing procedure. This procedure gives instruction on how to remove and install the new fuel injection pump without performing the base engine timing. Do not rotate the pump shaft after removing from the vehicle. The alignment of the pump shaft must be measured and recorded using a commercially available degree wheel after the pump is removed and before transferring the pump gear over to the new pump. This is done to align the pump to the same position during installation. If the base engine valve timing must be performed as part of the repair, refer to Service Library 09 - Engine/Valve Timing/Standard Procedure.

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1. Remove and isolate the negative battery cable eyelet from the IBS. This will isolate the 12 volt from the vehicle electrical system (Figure 1).

**NOTE: If removing the negative battery cable clamp from the battery post instead of removing the negative battery cable eyelet, the Intelligent Battery Sensor (IBS) wire harness connector must be disconnecting prior to removing the cable end. Failure to disconnect the IBS wire harness connector can lead to damage of the IBS wire harness connector.**

2. Disconnect the negative battery cable by removing the ground terminal nut (1) (Figure 1).



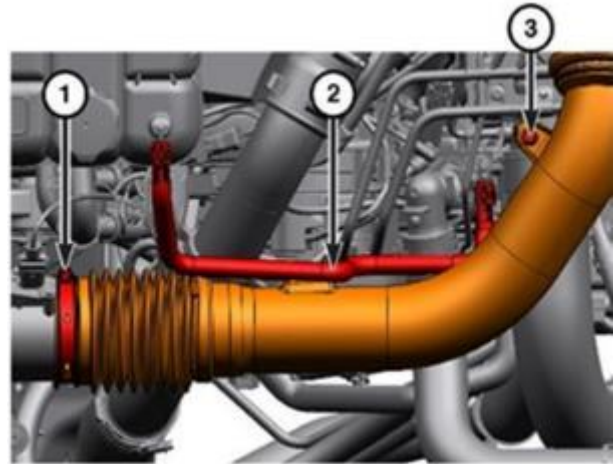
Figure 1 – Battery Disconnect

3. Remove the two bolts (1) securing the engine cover (2) (Figure 2).
4. Lift up and pull forward and remove the engine cover (2) (Figure 2).



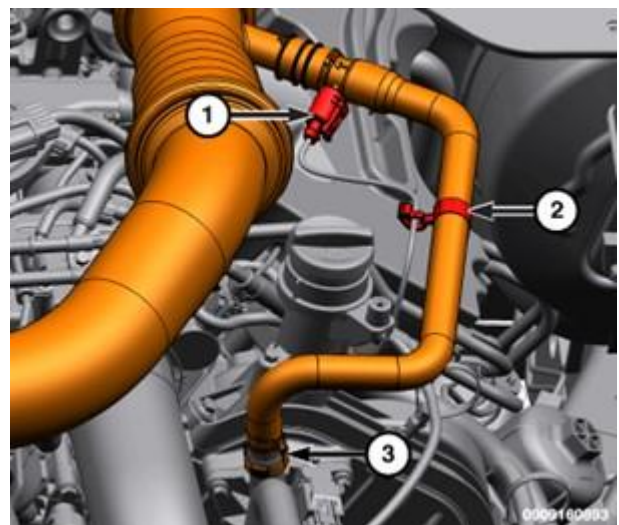
Figure 2 – Engine Cover

5. Loosen the clamp (1) and disconnect the clean air hose (Figure 3).
6. Detach the coolant hose retainer (2) from the clean air hose (Figure 3).
7. Remove the bolt (3) securing the clean air hose (Figure 3).



**Figure 3 – Clean Air Hose**

8. Disconnect the Closed Crankcase Heater Ventilation (CCV) heater wire harness connector (1) (Figure 4).
9. Detach the CCV heater wire harness retainer (2) (Figure 4).
10. Disconnect the crankcase breather hose (3) (Figure 4).



**Figure 4 – Closed Crankcase  
Ventilation Connector**



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11. Loosen clamp (1) and remove the clean air hose (2) (Figure 5).

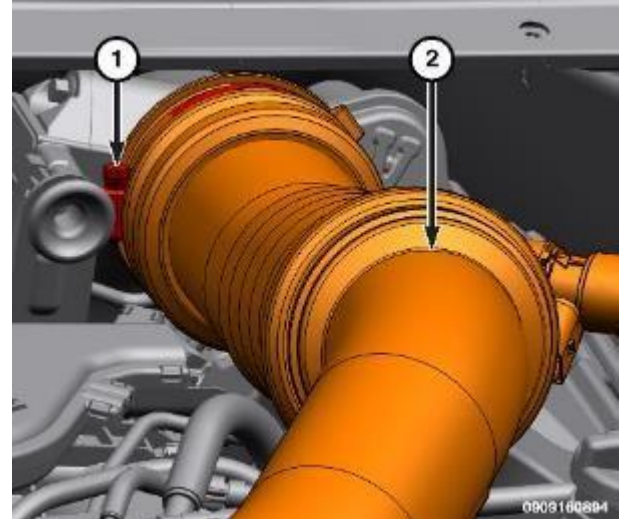


Figure 5 – Clean Air Hose

12. Remove the fastener (1) securing the right Charge Air Cooler (CAC) hose (Figure 6).
13. Release the retaining lock and disconnect the right CAC hose (2) from the turbocharger (Figure 6).

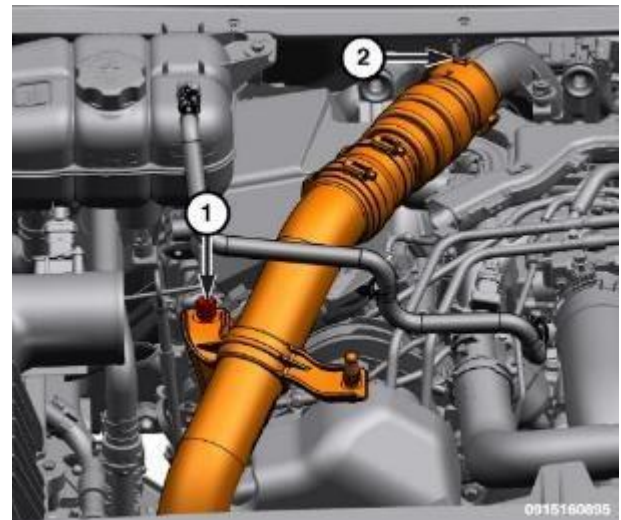


Figure 6 – CAC Hose

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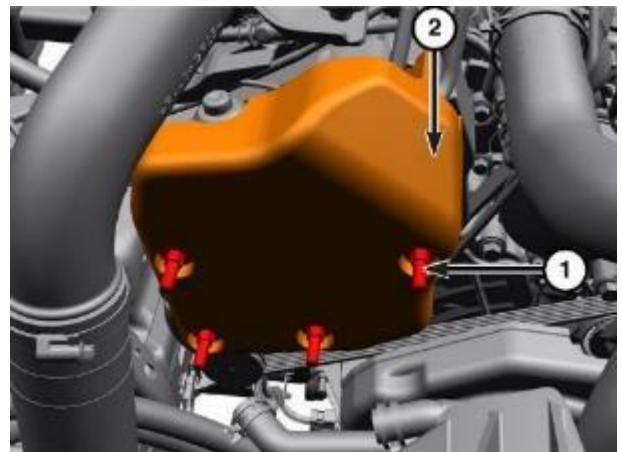
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14. Remove the retainers (1) that secure the cover (2) for the high-pressure fuel pump (Figure 7).



**Figure 7 – Pump Cover**

15. Remove the bolts (1) securing the sound proofing (2) to the fuel injection pump (Figure 8).



**Figure 8 – Pump Sound Proofing**

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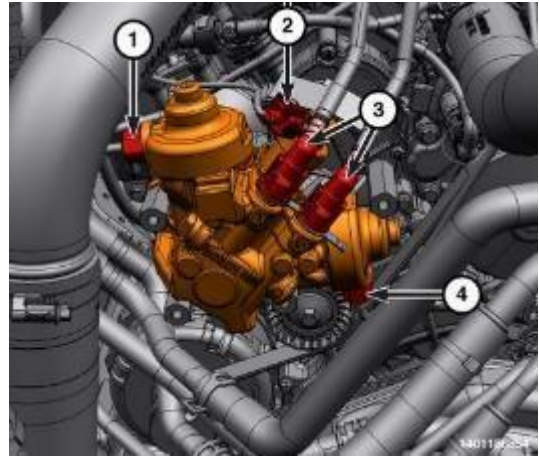
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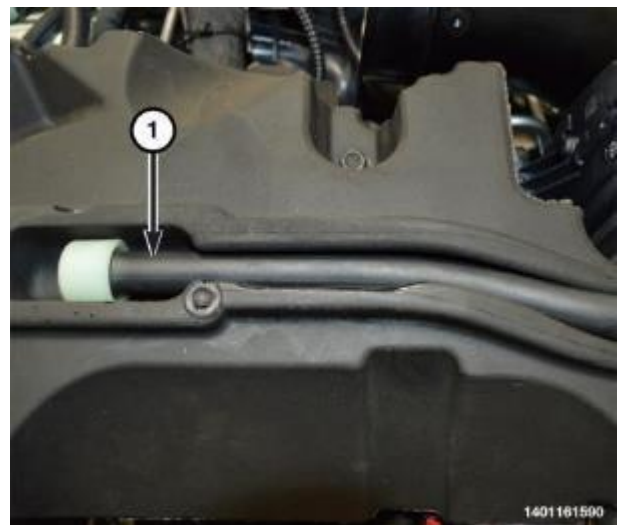
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- 16. Disconnect the fuel injection pump wire harness connector (2) (Figure 9).



**Figure 9 – Pump Connections**

- 17. Remove the vent hose (1) from the left fuel rail cover (Figure 10).



**Figure 10 – Left Bank Fuel Rail Cover**

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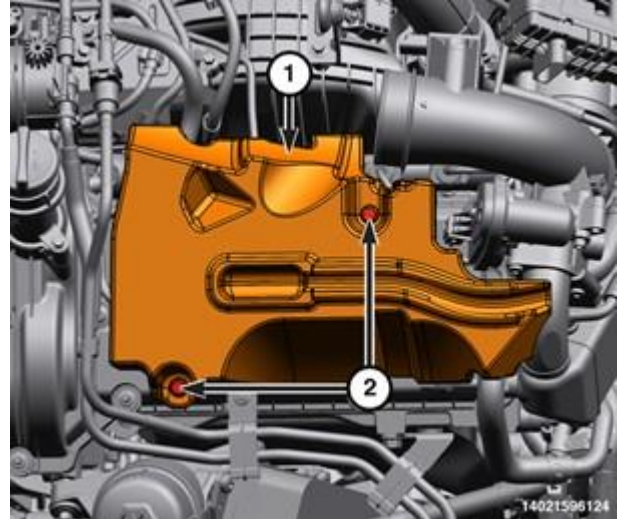
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18. Remove the bolts (2) and the left fuel rail cover (1) (Figure 11).



**Figure 11 – Left Bank Fuel Rail Cover Bolts**

19. Remove the fuel line supply safety clip (1) (Figure 12).

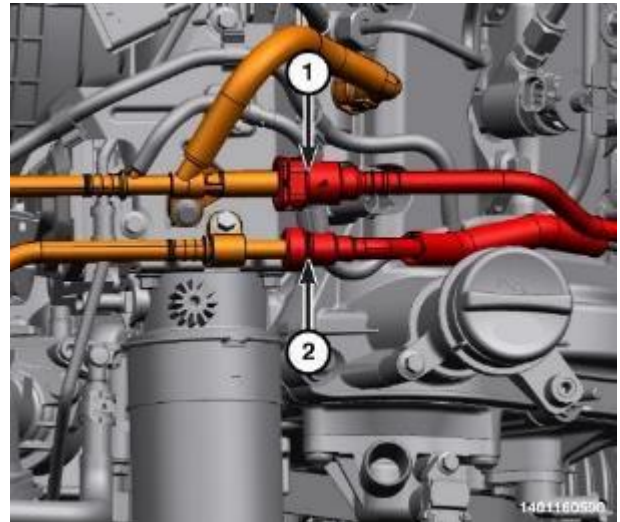


**Figure 12 – Safety Clip**

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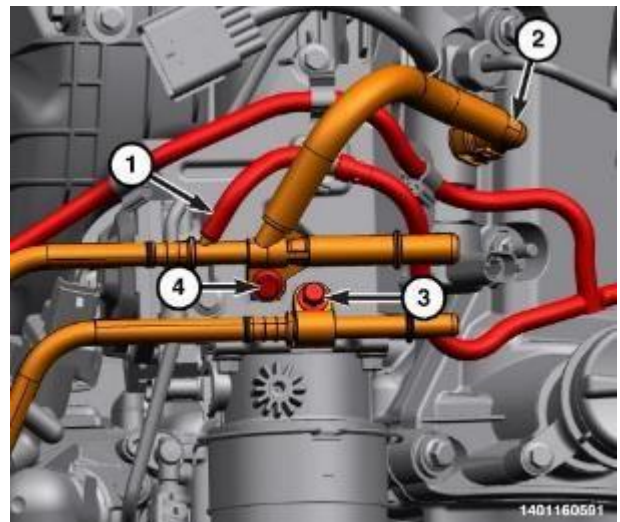
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20. Disconnect the fuel supply (2) and return (1) lines (Figure 13).



**Figure 13 – Fuel Supply and Return Lines**

21. Disconnect the fuel return lines (1, 2) (Figure 14).
22. Remove the fuel supply line bolt (3) and return line bolt (4) and both lines (Figure 14).



**Figure 14 – Fuel Return Lines**

23. Disconnect the low-pressure fuel supply and return lines (3) (Figure 9).
24. Remove the fuel rail supply tubes (1, 4) (Figure 9).

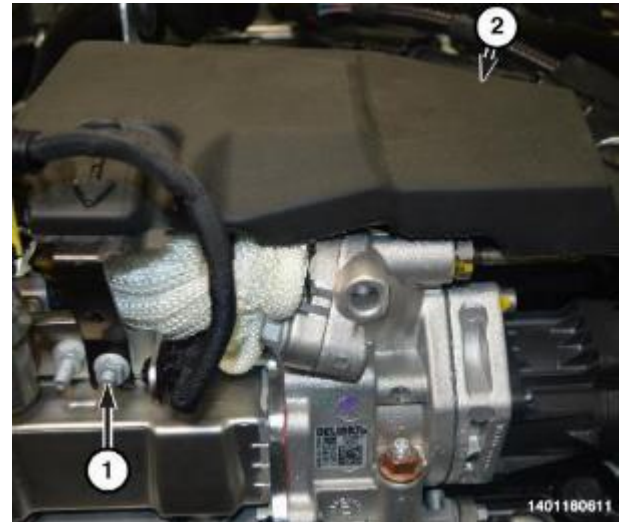
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25. Loosen the nut (1) and remove the right fuel rail cover (2) (Figure 15).



**Figure 15 – Right Fuel Rail Cover**

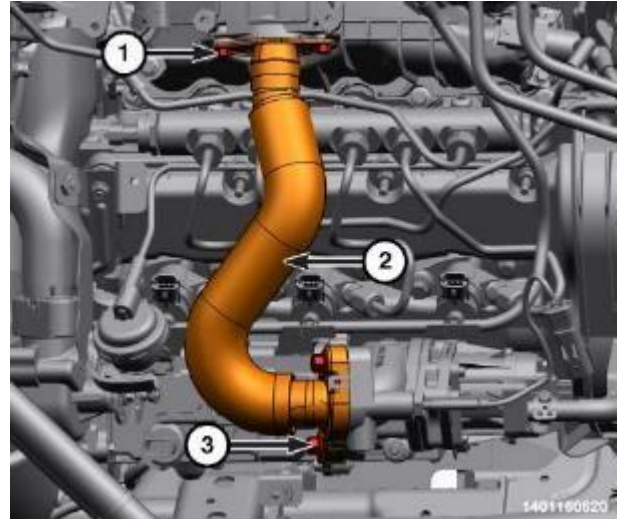
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26. Remove the left side bolts (1) from the upper High Pressure (HP) Exhaust Gas Recirculation (EGR) tube (2) (Figure 16).
27. Remove the right-side bolts (3) and the upper HP EGR tube (2) (Figure 16).
28. Remove and discard both gaskets.
29. Remove the bolts, nuts and CAC hose support bracket.



**Figure 16 – Upper High Pressure EGR Tube**

30. Remove the wire harness retainer (1) from the right front of cylinder head cover (Figure 17).



**Figure 17 – Harness Retainer**

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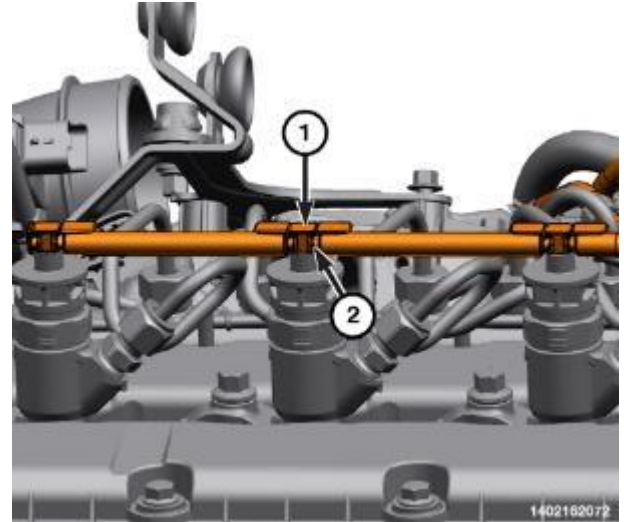


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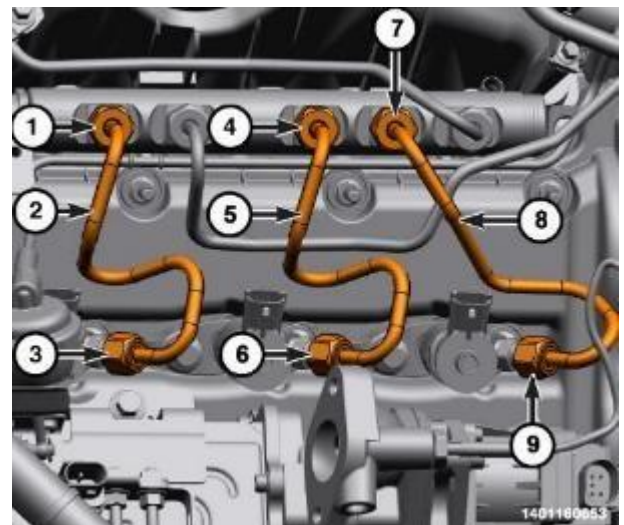
31. Lift up on the locking retaining tab (1) to unlock the lock (Figure 18).
32. Disconnect the fuel return line (2) by wiggling the hose free from the fuel injector (Figure 18).

**NOTE: Use a backing wrench on the fuel injector when unscrewing the union nut.**



**Figure 18 – Fuel Return Lines and Locking Tabs**

33. Unscrew the union nuts (7 and 9) and remove cylinder No. 1 fuel tube (8) and the discard fuel tube (Figure 19).
34. Install protective caps to the fuel injector and fuel rail for cylinder No. 1 (Figure 19).
35. Unscrew the union nuts (4, 6) and remove cylinder No. 2 fuel tube (5), and discard the fuel tube (Figure 19).
36. Install protective caps to the fuel injector and fuel rail for cylinder No. 2 (Figure 19).
37. Unscrew the union nuts (1, 3) and remove cylinder No. 3 fuel tube (2), and discard the fuel tube (Figure 19).
38. Install protective caps to the fuel injector and fuel rail for cylinder No. 3 (Figure 19).



**Figure 19 – Right Bank Fuel Pipes**



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39. Unscrew the union nuts (1, 3) and remove and discard the fuel tube (2) (Figure 20).
40. Remove the PCV pipe from the valve cover.
41. Remove the right high pressure fuel line that connects the pump to the rail.

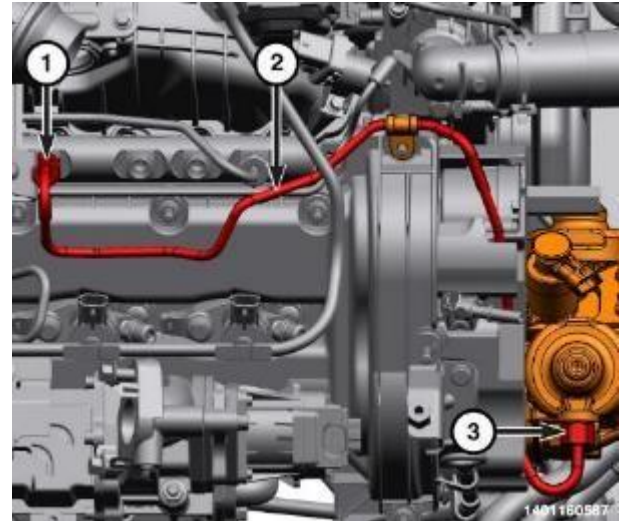


Figure 20 – Right Bank Fuel Supply

42. Detach the retainers (1) securing the fuel return hose to the fuel line support bracket (Figure 21).

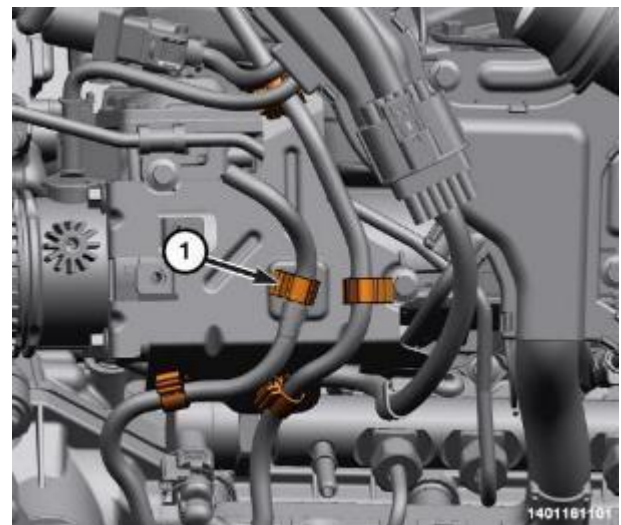


Figure 21 – Fuel Return Hose Retainers

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- 43. Detach the wire harness retainer (3) (Figure 22).
- 44. Remove the bolts (1) fuel line support bracket (2) (Figure 22).

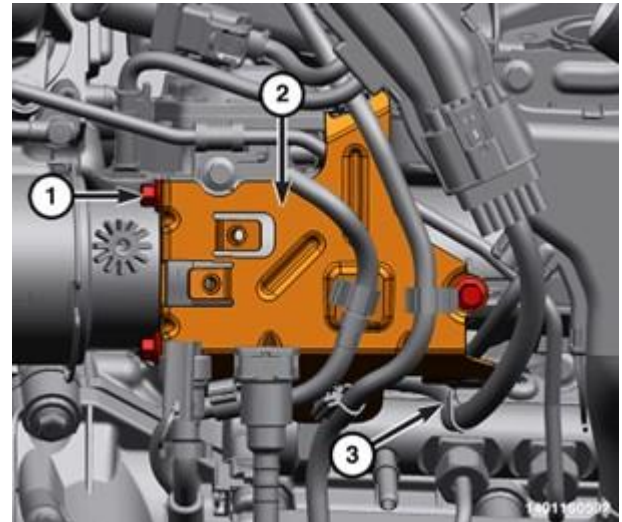


Figure 22 – Harness Retainer

- 45. Remove the bolt (1) securing the fuel tube (Figure 23).

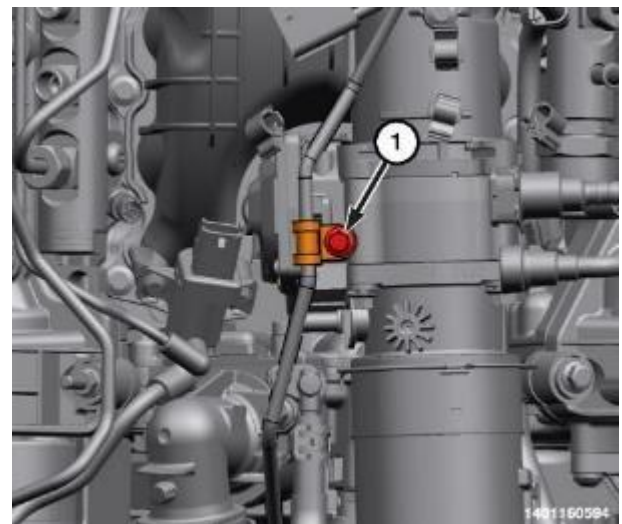


Figure 23 – Fuel Tube Bolt

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46. Unscrew the union nut (2) and remove the fuel tube (1) and then discard the fuel tube (Figure 24).

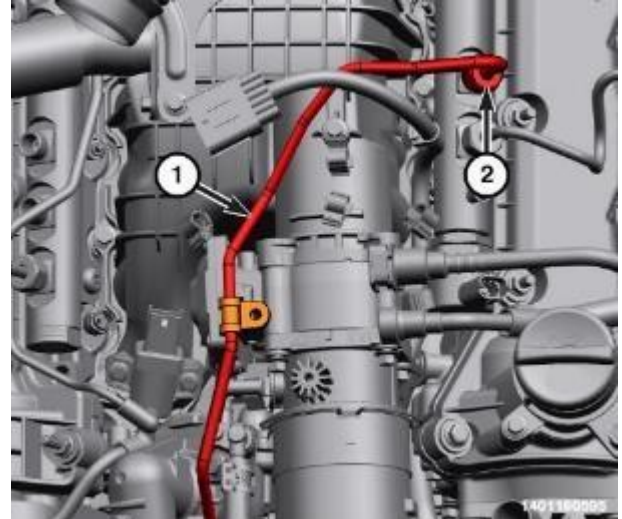


Figure 24 – Fuel Tube

47. Lift up on the locking retaining tab (1) to unlock the lock (Figure 25).
48. Disconnect the fuel return line (2) by wiggling the hose free from the fuel injector (Figure 25).

**NOTE: Use a backing wrench on the fuel injector when unscrewing the union nut.**

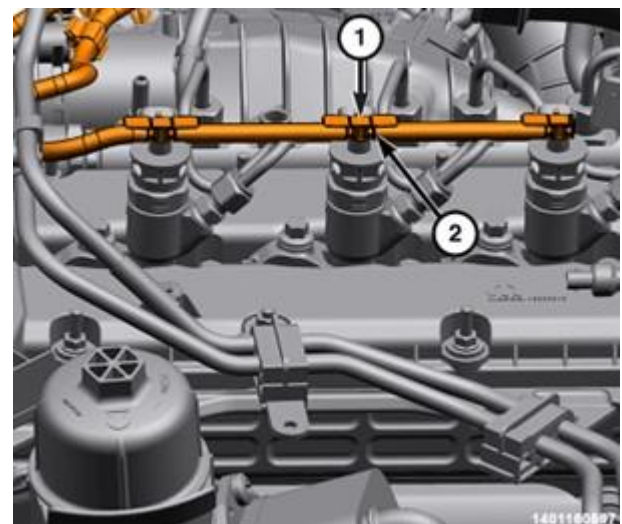


Figure 25 – Fuel Return Lines and Locking Tabs

## SAFETY RECALL – NORTH AMERICA High Pressure Fuel Pump



Reference: 01A / NHTSA 23V-263

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49. Unscrew the union nuts (1 and 3) and remove cylinder No. 4 fuel tubes (2) and discard the fuel tubes (Figure 26).
50. Install protective caps onto the fuel injectors and fuel rail.
51. Unscrew the union nuts (4, 6) and remove cylinder No. 5 fuel tube (5), and discard the fuel tube (Figure 26).
52. Install protective caps onto the fuel injectors and fuel rail.
53. Unscrew the union nuts (7, 9) and remove cylinder No. 5 fuel tube (8), and discard the fuel tube (Figure 26).
54. Install protective caps onto the fuel injectors and fuel rail.

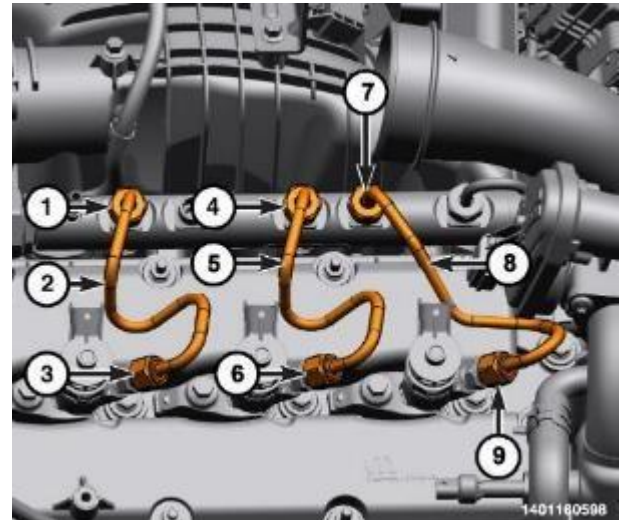


Figure 26 – Right Bank Fuel Pipes

### CROSS-OVER FUEL TUBE

55. Remove the bolt (2) and reposition the differential pressure sensor (1) away from the upper turbocharger inlet elbow (Figure 27).



Figure 27 – Differential Pressure Sensor

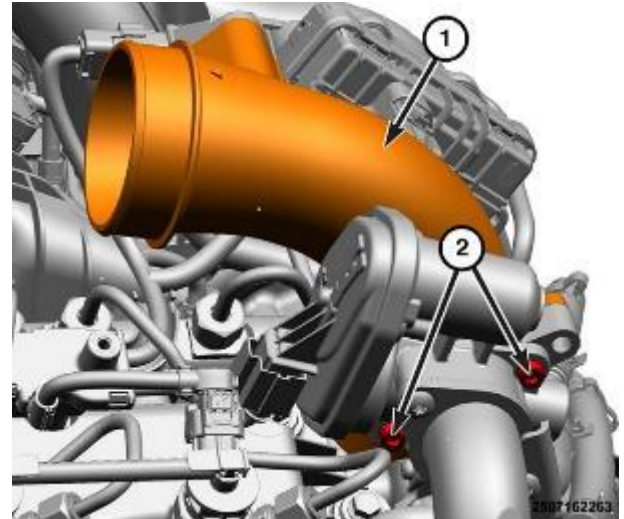
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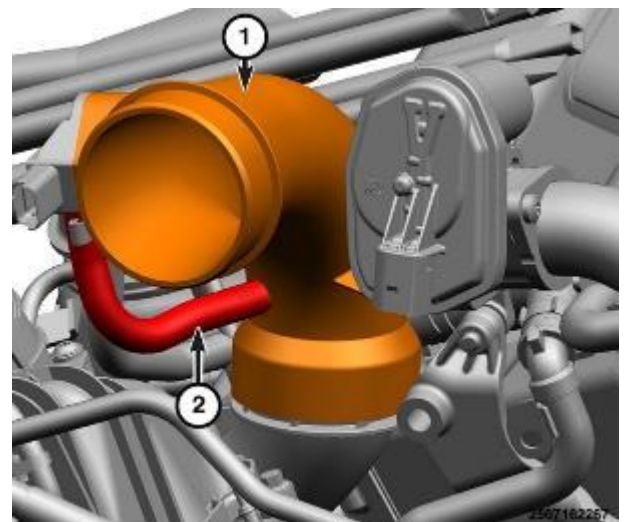
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56. Remove and bolts (2) securing the low pressure EGR valve to the upper turbocharger inlet elbow (1) (Figure 28).



**Figure 28 – Low Pressure EGR Valve**

57. Remove the differential pressure sensor hose (2) from the upper turbocharger inlet elbow and remove the upper turbocharger inlet elbow (1) from the lower turbocharger inlet elbow (Figure 29).



**Figure 29 – Differential Pressure Sensor Hose**

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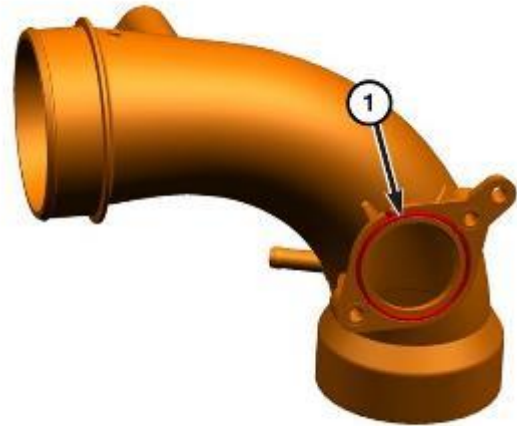
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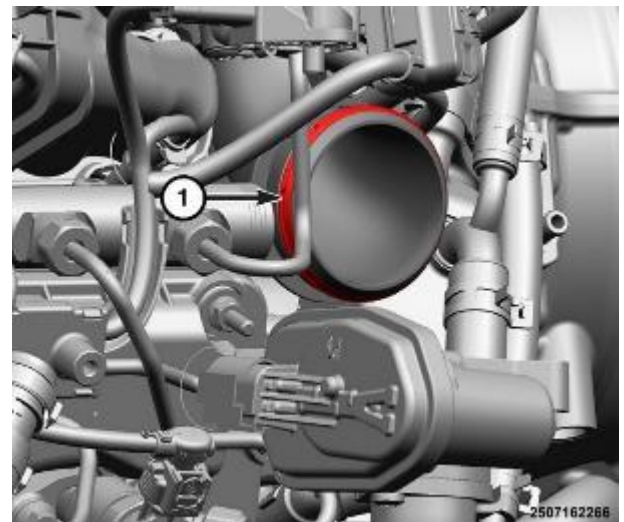
- 58. Remove and DISCARD the low pressure EGR valve gasket (1) (Figure 30).



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**Figure 30 – Low Pressure EGR Valve Gasket**

- 59. Remove and DISCARD the lower turbocharger inlet elbow gasket (1) (Figure 31).



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**Figure 31 – Lower Turbocharger Inlet Elbow Gasket**

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- 60. Disconnect the boost pressure sensor wire harness connector (1) (Figure 32).
- 61. Disconnect cylinder No. 3 glow plug wire harness connector.
- 62. Disconnect the fuel rail pressure sensor wire connector.
- 63. Disconnect the right-side rear swirl valve wire harness connector.

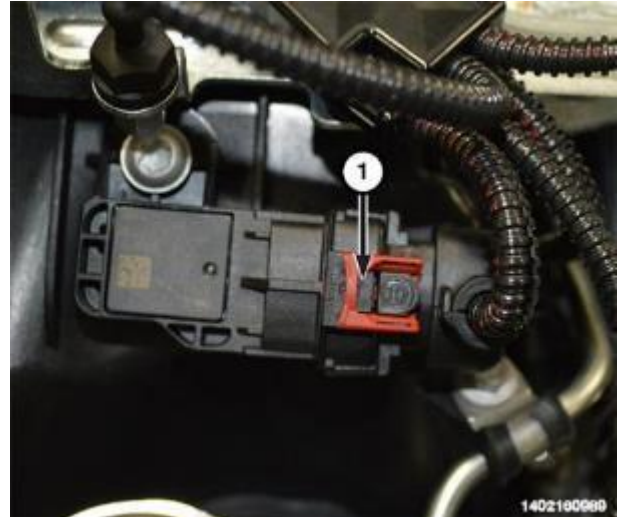


Figure 32 – Sensor Harness Connector

- 64. Remove the bolt (1) securing the fuel crossover tube (Figure 33).

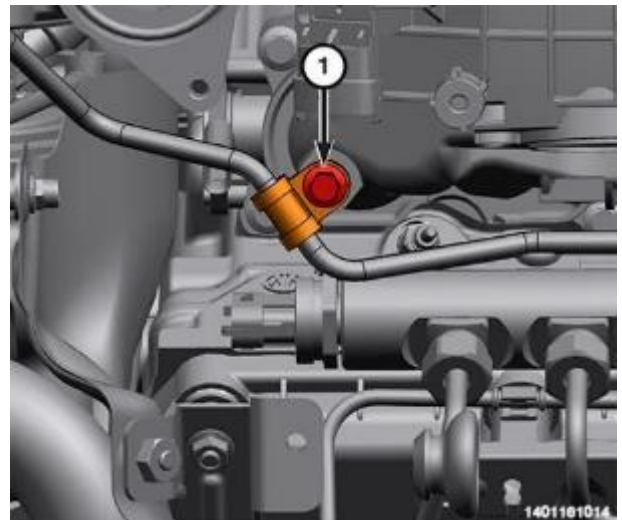


Figure 33 – Crossover Tube Bolt

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65. Unscrew the union nuts (1, 3) and remove the fuel crossover tube (2) and discard (Figure 34).

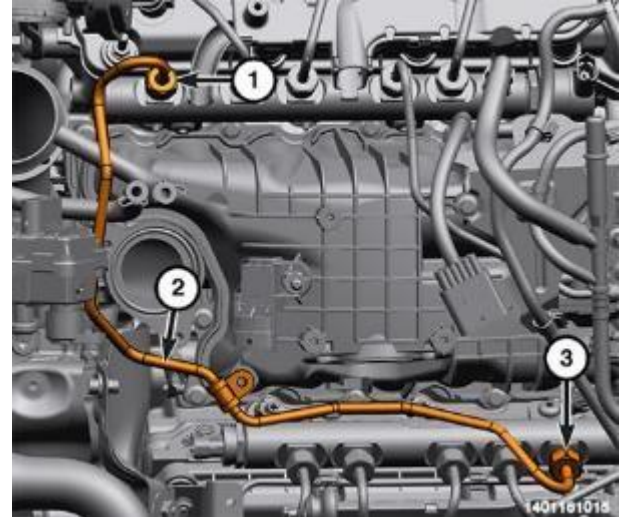


Figure 34 – Crossover Tube

### FUEL RAILS - Remove

66. Using the Remover-Installer, Fuel Rail Bolt 2025400090 remove the bolts (1) and the right fuel rail (2) (Figure 35).

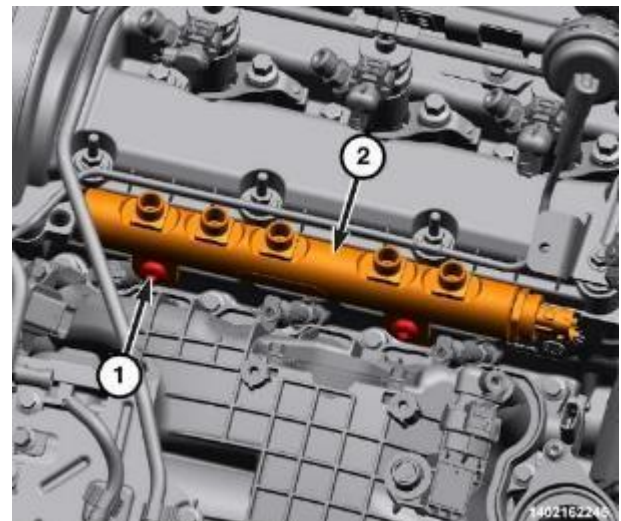


Figure 35 – Right Fuel Rail Bolts

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- 67. Using the Remover-Installer, Fuel Rail Bolt 2025400090, remove the bolts (1) and the left fuel rail (2) and discard (Figure 36).

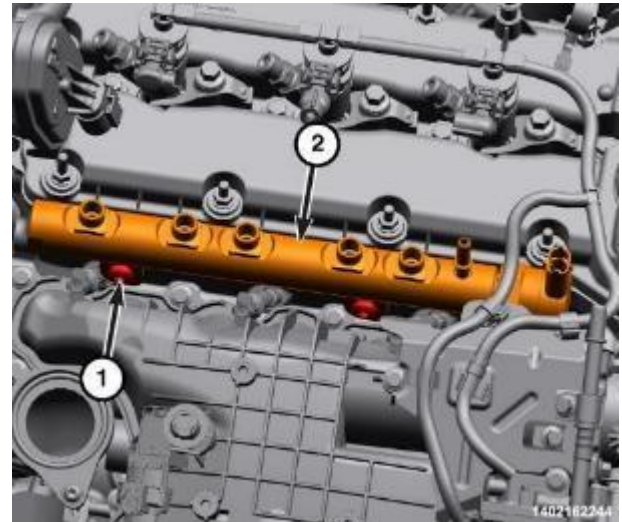


Figure 36 – Left Fuel Rail Bolts

- 68. Disconnect the fuel injection pump electrical connector (2) (Figure 37).
- 69. Disconnect the low-pressure fuel supply and return lines (3) (Figure 37).

**NOTE: Use a backing wrench on the fuel injector when unscrewing the union nut.**

- 70. Unscrew the union nuts for the fuel rail supply tubes (1 and 4) (Figure 37).
- 71. Disconnect the fuel quantity solenoid wire harness connector (2) (Figure 37).

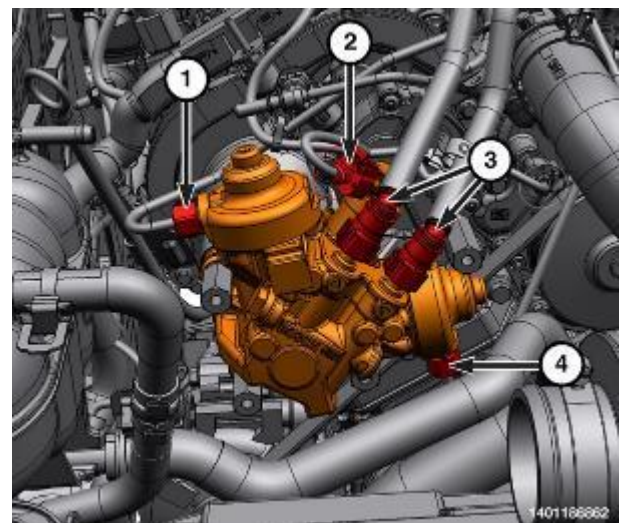


Figure 37 – HPFP Electrical Connector

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## High Pressure Fuel Pump

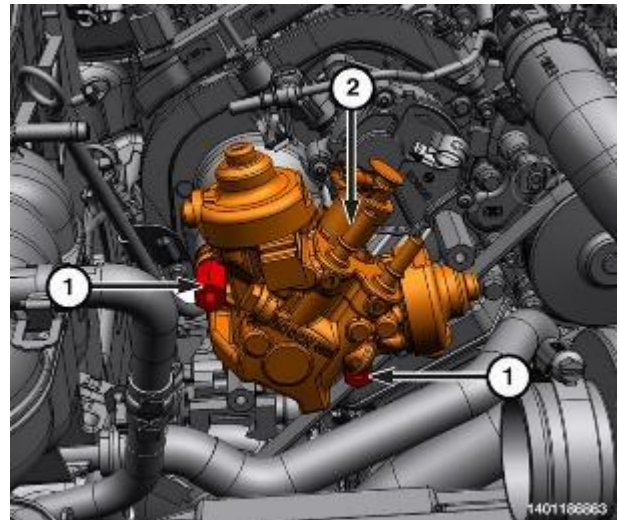


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**NOTE: The fuel injection pump can be replaced without having to perform the entire base engine valve timing procedure. Do not rotate the pump shaft after removing from the vehicle. The alignment of the pump shaft must be measured and recorded using a commercially available degree wheel after the pump is removed and before transferring the pump gear over to the new pump. This is done to align the pump to the same position during installation. If the base engine valve timing must be performed as part of the repair (Refer to 09 - Engine/Valve Timing/Standard Procedure).**

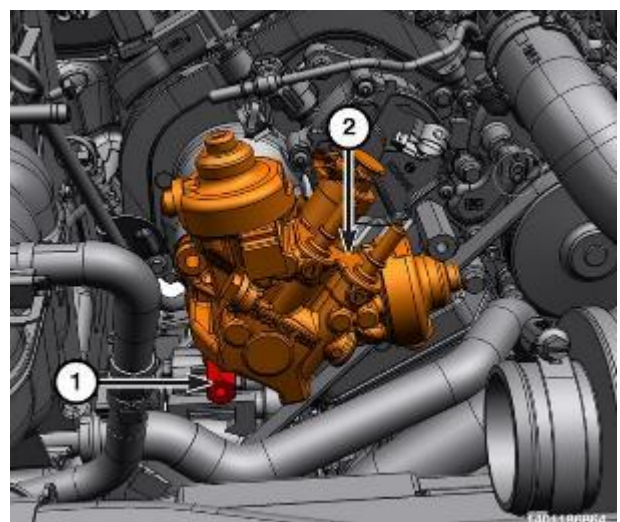
- 72. Remove the upper bolts (1) from the high-pressure pump (2) (Figure 38).
- 73. Using Tool, High Pressure Pump Installation VM.10345 Install the studs in the upper locations.



**Figure 38 – Fuel Quantity Solenoid Connector and HPFP Upper Bolts**

- 74. Remove the lower bolt (1) from the HPFP (2) and remove it from the vehicle (Figure 39).

**NOTE: The fuel injection pump needs to be timed using a commercially available degree wheel.**



**Figure 39 – HPFP Lower Bolt**

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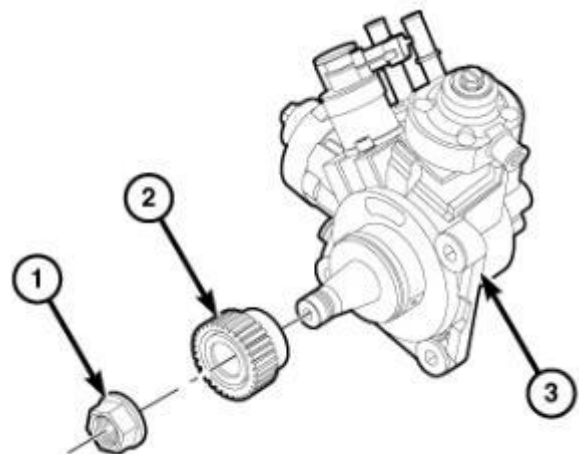
- 75. Install the degree wheel onto the pump and record the position of the hole in the gear on the degree wheel (Figure 40).
- 76. The use of Puller 1023 or a commercially available gear puller is required to remove the fuel injection pump gear (Figure 41).



Figure 40 – Degree Wheel

**NOTE:** The use of Puller 1023 or a commercially available gear puller is required to remove the fuel injection pump gear (2) (Figure 41).

**CAUTION:** Do Not Force the high-pressure pump into the right timing cover or attempt to seat it by drawing it in with the bolts. The pump gear must be properly aligned with the drive gear on the camshaft before the high-pressure pump will seat on the cylinder head mounting surface. Failure to properly align drive gears will damage the high-pressure pump or camshaft drive gear.



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Figure 41 – Gear Removal

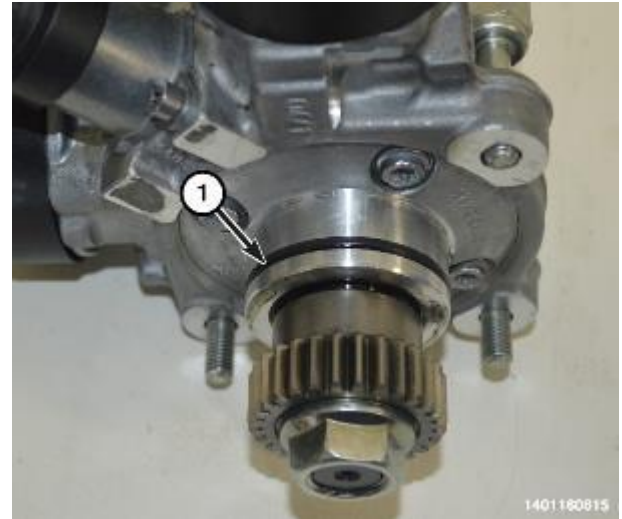
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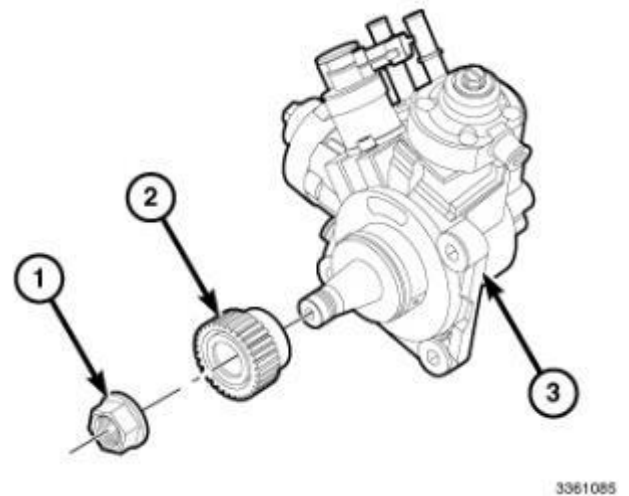
- 77. Install a **NEW** O-ring seal (1) to the fuel injection pump (Figure 42).



**Figure 42 – O-ring Seal**

- 78. Install the gear (2) and nut (1) onto the fuel injection pump (3) and tighten the nut (1) finger tight (Figure 43).

**Note: NEVER use an impact to tighten the gear nut.**



**Figure 43 – O-ring Seal**

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- 79. Using a commercially available spanner wrench (2) such as Blue Point APS351B or equivalent, tighten the nut (1) to 50 N·m (37 ft. lbs.) (Figure 44).



Figure 44 – Nut with Spanner Wrench

- 80. Install the degree wheel and rotate the pump shaft so that the hole aligns with the reference mark on the degree wheel referenced during the removal (Figure 45).
- 81. Install the fuel injection pump onto the Tool, High Pressure Pump Installation VM.10345 in the upper timing cover.
- 82. Install the lower fuel injection pump bolt (2) and hand tighten the bolt (1) (Figure 39).
- 83. Remove the Tool, High Pressure Pump Installation VM.10345 from the upper bolts location and install the bolts.
- 84. Tighten the bolts (1) that secure the fuel injection pump to 25 N·m (18 ft. lbs.) (Figures 38 and 39).
- 85. Connect the fuel injection pump electrical connector (2) (Figure 37).



Figure 45 – Degree Wheel

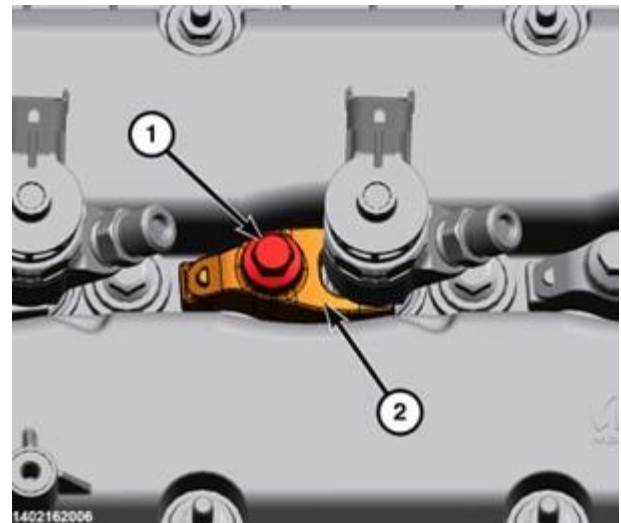
**WARNING:** Observe the following precautions when working on fuel systems: No sparks, open flames or smoking. Avoid inhaling and swallowing fuel. Avoid eye and skin contact with fuel. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing. Failure to observe these precautions may result in fire, explosion, property damage, and serious or fatal injury.

**WARNING:** High-pressure lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 2000 bar (29,008 psi). Use extreme caution when inspecting for high-pressure fuel leaks. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect for high-pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system.

**NOTE:** High pressure fuel tubes are a one time only use and must be replaced anytime they have been removed.

### FUEL INJECTORS – Remove and Replace

86. Clean the area around the fuel injector to be removed so that no debris falls into the injector bore.
87. Remove the bolt (1) and the fuel injector clamp (2) (Figure 46).



**Figure 46 – Fuel Injector Bolt and Clamp**

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- 88. Using your hand, pull the fuel injector (1) straight up from the cylinder head for removal. Discard the lower sealing washer and place a protective cap over the nozzle and injector bore (Figure 47).

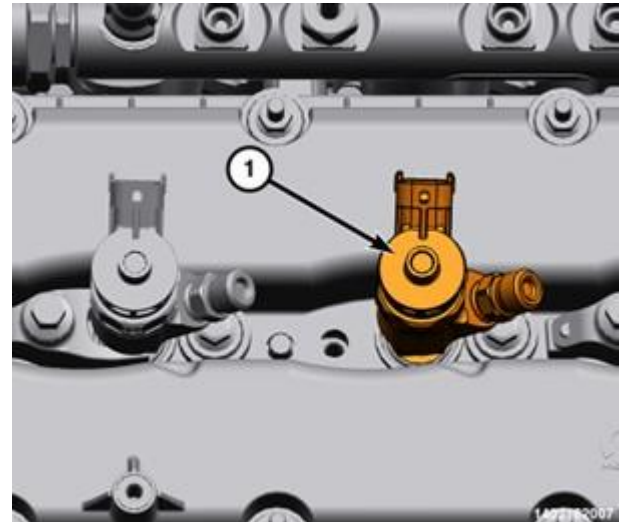


Figure 47 – Fuel Injector Bolt

- 89. If injector can't be removed by hand, install the Remover, Fuel Injector VM.10358A (1) to remove the fuel injector. Discard the injector. Place a protective cap over the injector bore (Figure 48).

**NOTE: Check and MAKE SURE that the copper sealing washer did not remain in the cylinder head.**



Figure 48 – Fuel Injector Remover

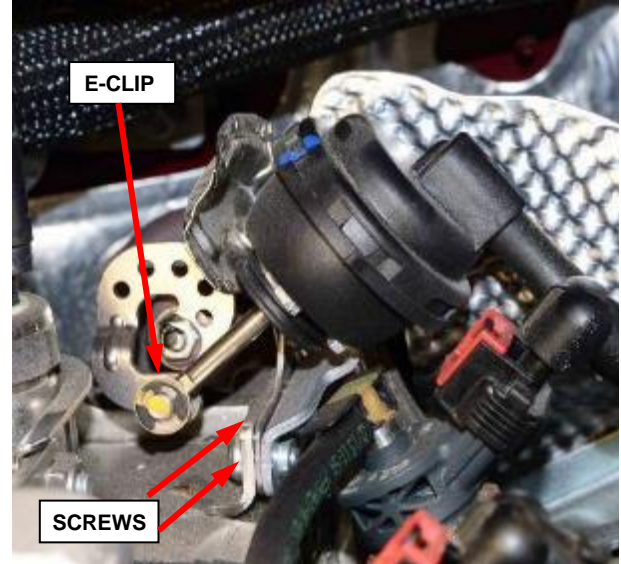
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90. To remove the rear injector on the right side of the engine, remove the EGR Cooler Vacuum Bypass. Remove the E-clip from shaft on the cooler, and two T25 Torx screws. Set the bypass aside with heat shield and bracket (Figure 49).



**Figure 49 – EGR Cooler Bypass**

**NOTE: When a NEW fuel injector is being installed, or if an existing injector is installed in any location other than its original location, the injector quantity adjustment procedure must be performed (Refer to 14 - Fuel System/Fuel Injection - Standard Procedure).**

91. Remove the protective cap from the appropriate injector bore.

**NOTE: Make sure the old copper sealing washer is not stuck in bore.**

92. Clean the fuel injector bore (Refer to 09 - Engine/Fuel Injection/INJECTORS, Fuel/Cleaning).



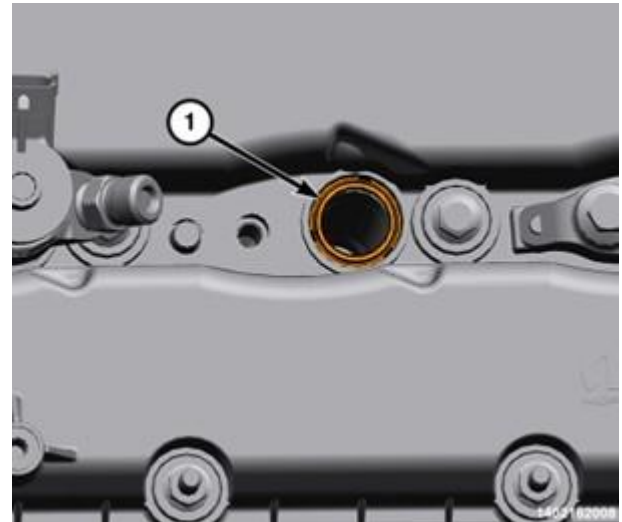
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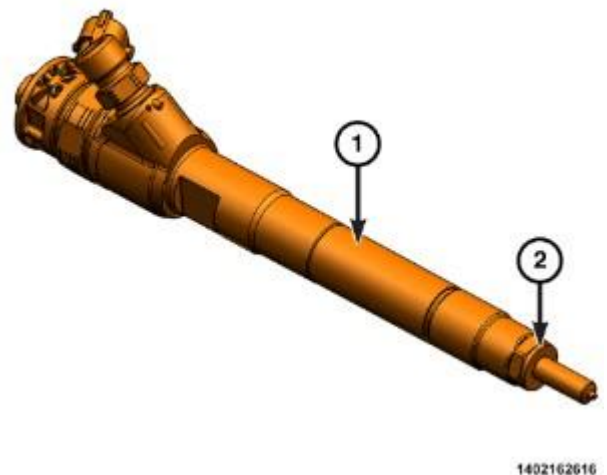
- 93. Install a **NEW** fuel injector seal (1) in the cylinder head cover (Figure 50).



**Figure 50 – Upper Sealing Washer**

- 94. Install a **NEW** sealing washer (2) onto the fuel injector (1) (Figure 51).

**NOTE: Do Not apply any lubricant to the fuel injector nozzle. Care must be taken not to restrict the discharge orifices in the nozzle.**



**Figure 51 – Lower Sealing Washer**

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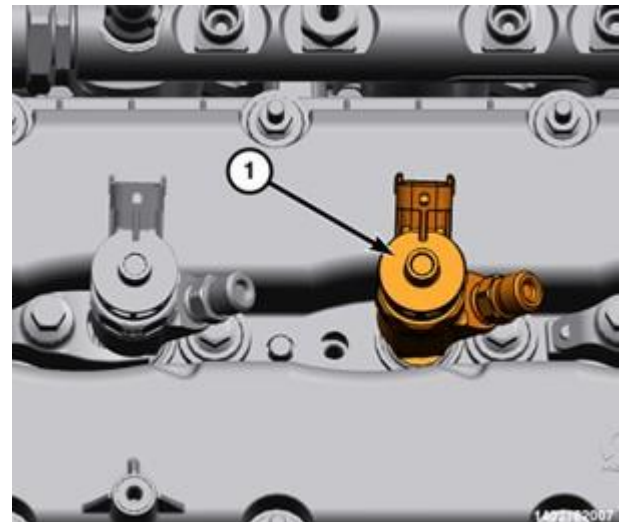
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95. Lubricate the injector body with Nickel Anti-Seize Lubricant (Figure 52).



**Figure 52 – Lubricate the Fuel Injector**

96. Install the fuel injector (1) in the cylinder head (Figure 53).



**Figure 53 – Fuel Injector Bolt**

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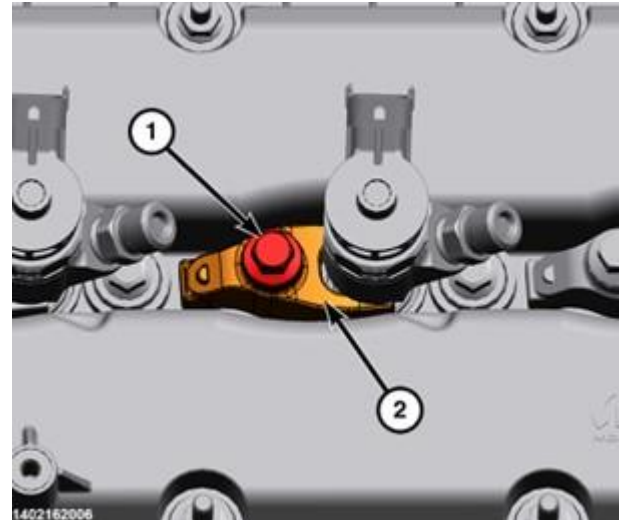
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97. Install the fuel injector clamp (2) and tighten the bolt (1) and tighten the bolt (1) to 33 N·m (24 ft. lbs.) (Figure 54).

### LEFT BANK - INSTALL

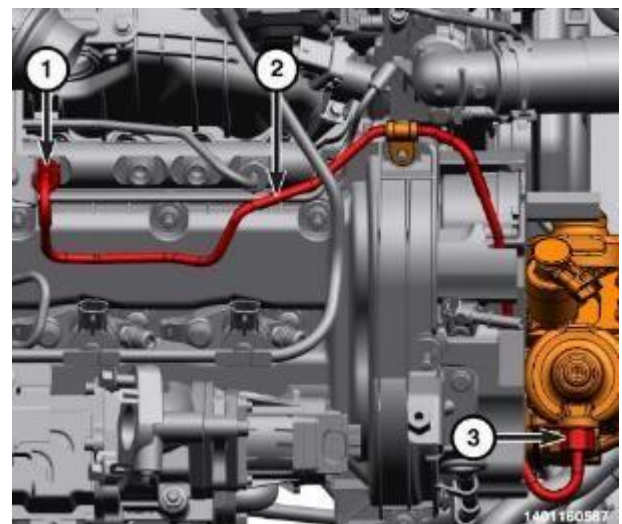
**NOTE:** Fuel tubes are a one-time only use and must be replaced anytime they have been removed.

**NOTE:** Transfer pipe clamps and dampers from the old lines to the new as necessary.



**Figure 54 – Fuel Injector Bolt and Clamp**

98. Install the fuel rails. Using the Remover-Installer, Fuel Rail Bolt 2025400090 tighten the bolts to 25 N·m (18 ft. lbs.).
99. Install the **NEW** right high-pressure fuel tube (2) and tighten the union nuts (1, 3) to 11 N·m + 75° (8 ft. lbs. + 75°) (Figure 55).



**Figure 55 – Right High-Pressure Fuel Tube**

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100. Install the nut (1) securing the high-pressure fuel tube and tighten to 11 N·m (8 ft. lbs.) (Figure 56).



Figure 56 – High Pressure Fuel Tube Bolt

**NOTE:** Use a backing wrench on the fuel injector when tightening the union nut.

**NOTE:** Do not use any type of lubrication when installing the fuel injector return line.

101. Install a **NEW** fuel crossover tube (2) and tighten the union nuts (1, 3) to 11 N·m + 75° (8 ft. lbs. + 75°) (Figure 57).

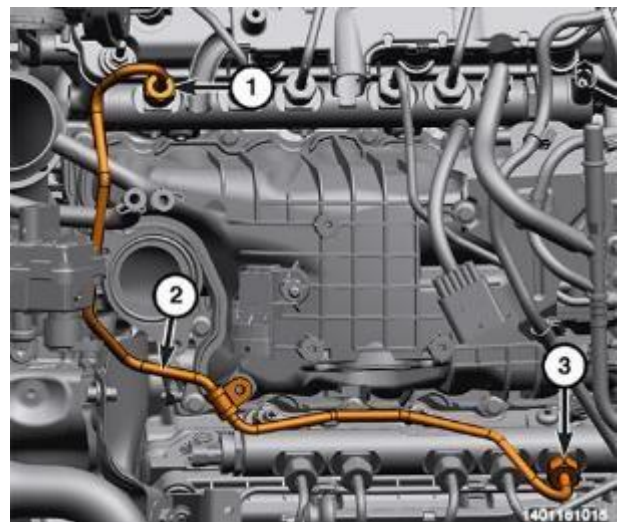


Figure 57 – Crossover Tube

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102. Install the bolt (1) securing the fuel crossover tube and tighten to 11 N·m (8 ft. lbs.) (Figure 58).
103. Install the fuel supply tubes and tighten the fuel tube union nuts to:
  - At fuel injector, tighten to 11 N·m + 75° (8 ft. lbs. + 75°).
  - At fuel rail, tighten to 11 N·m + 75° (8 ft. lbs. + 75°).

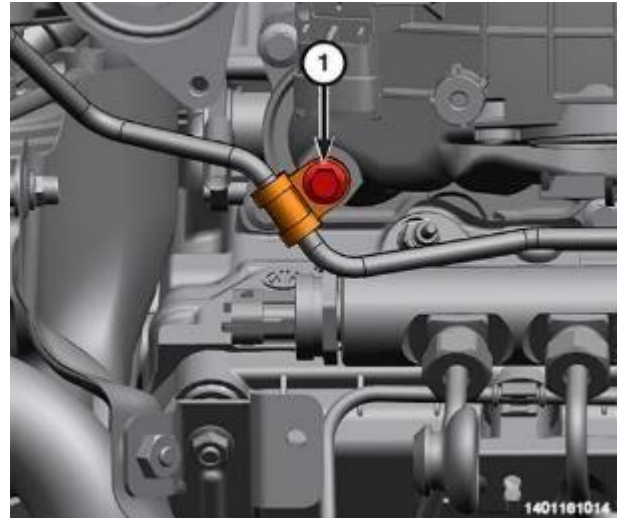


Figure 58 – Crossover Tube Bolt

104. Install the wire harness bracket (1) and securely tighten the bolts (2) (Figure 59).
105. Connect the right-side rear swirl valve wire harness connector.
106. Connect the fuel rail pressure sensor wire connector.
107. Connect cylinder No. 3 glow plug wire harness connector.

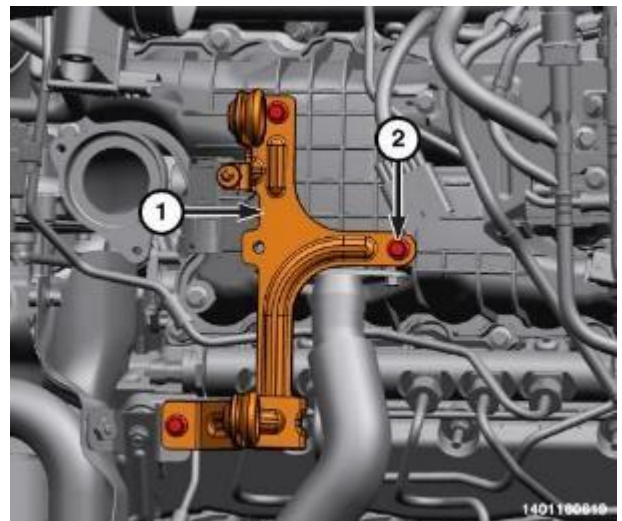


Figure 59 – Harness Bracket Bolts

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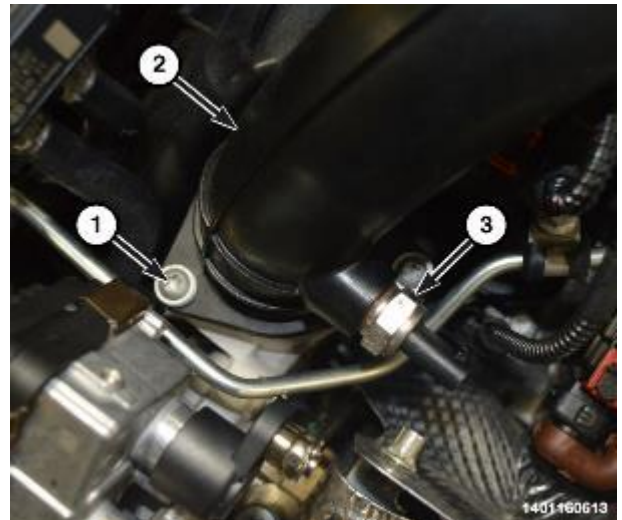
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- 108. Connect the boost pressure sensor wire harness connector (1) (Figure 60).
- 109. Install the turbocharger outlet elbow and securely tighten the screws.



**Figure 60 – Sensor Connector**

- 110. Using a **NEW** gasket, install the turbocharger outlet elbow (2) and securely tighten the screws (1) (Figure 61).



**Figure 61 – Turbo Outlet Elbow**

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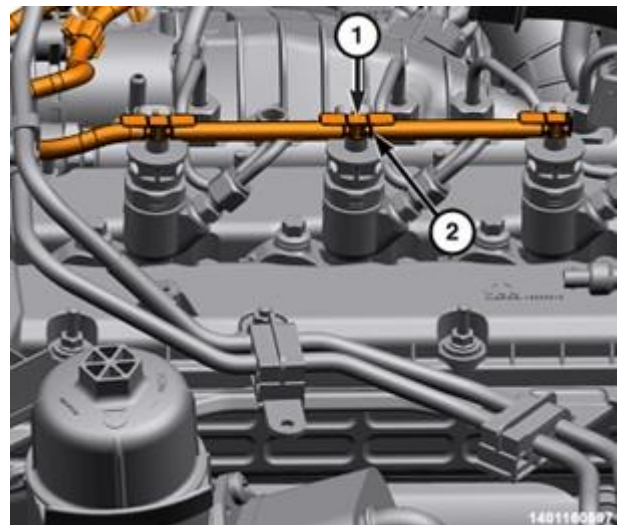
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- 111. Connect the outlet air temperature sensor wire harness connector (1) (Figure 62).



**Figure 62 – Sensor Wire Harness Connector**

- 112. Install the fuel injector return line (2) and be sure it is fully seated (Figure 63).
- 113. Push down on the lock tab (1) to lock in place (Figure 63).



**Figure 63 – Fuel Return Lines and Locking Tabs**

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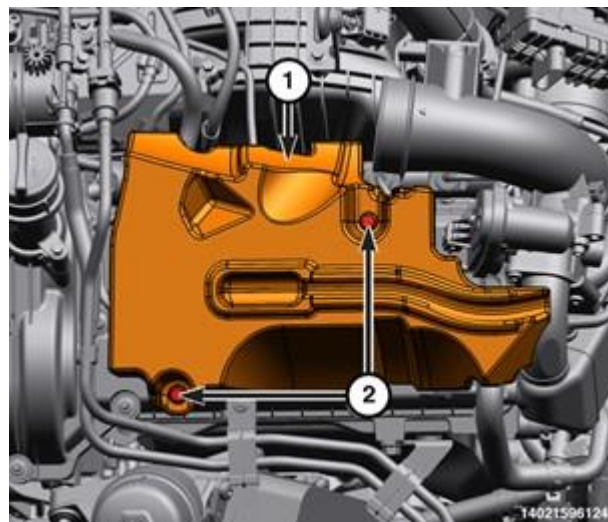
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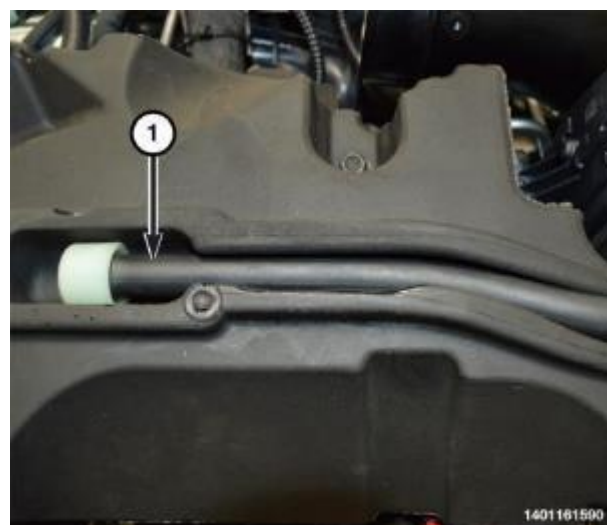
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114. Install the left fuel rail cover (1) and securely tighten the bolts (2) (Figure 64).



**Figure 64 – Left Bank Fuel Rail Cover Bolts**

115. Install the vent hose to the left fuel rail cover (1) (Figure 65).



**Figure 65 – Left Bank Fuel Rail Cover**



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- 116. Install the **NEW** left high pressure fuel tube (1) and tighten the rail union nut (2) finger tight (Figure 66).

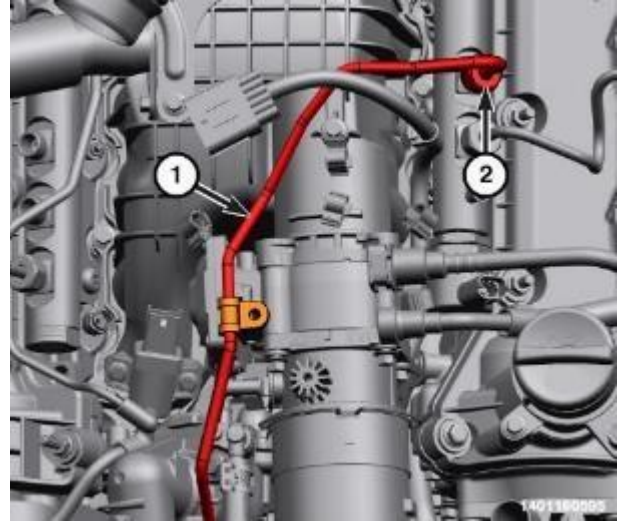


Figure 66 – Fuel Tube

- 117. Tighten the pump union nut (2) finger tight (Figure 67).
- 118. Tighten both the union nuts to 11 N·m + 75° (8 ft. lbs. + 75°).

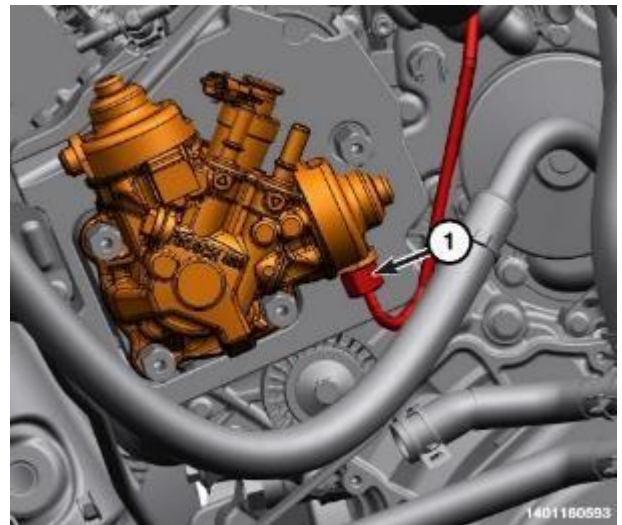


Figure 67 – Fuel Tube

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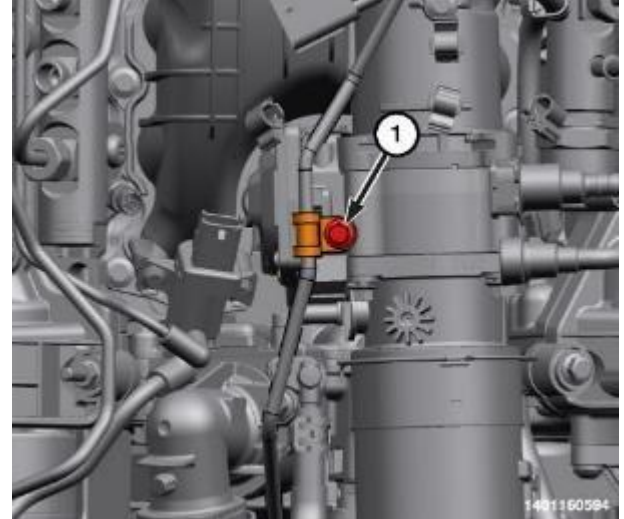
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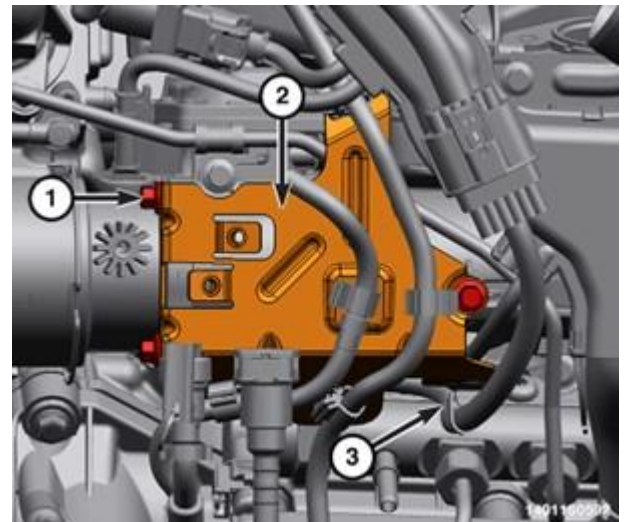
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- 119. Install the bolt (1) securing the high-pressure fuel tube and tighten to 11 N·m (8 ft. lbs.) (Figure 68).



**Figure 68 – Fuel Tube Bolt**

- 120. Install the fuel line support bracket (2) and tighten the bolts (1) to 11 N·m (8 ft. lbs.) (Figure 69).



**Figure 69 – Harness Retainer**

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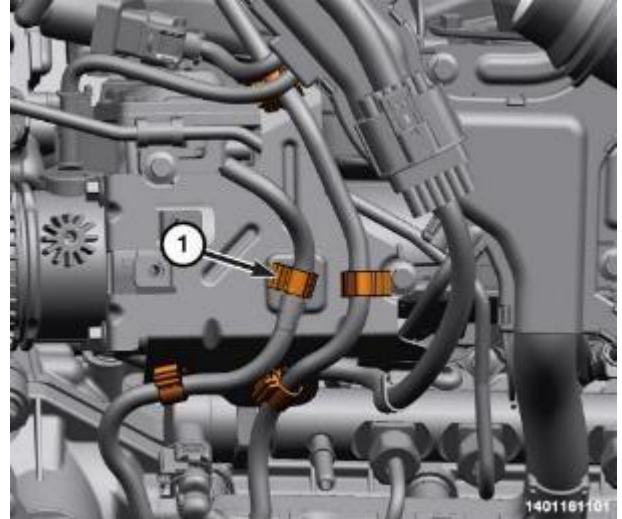
**SAFETY RECALL – NORTH AMERICA**  
**High Pressure Fuel Pump**



Reference: 01A / NHTSA 23V-263

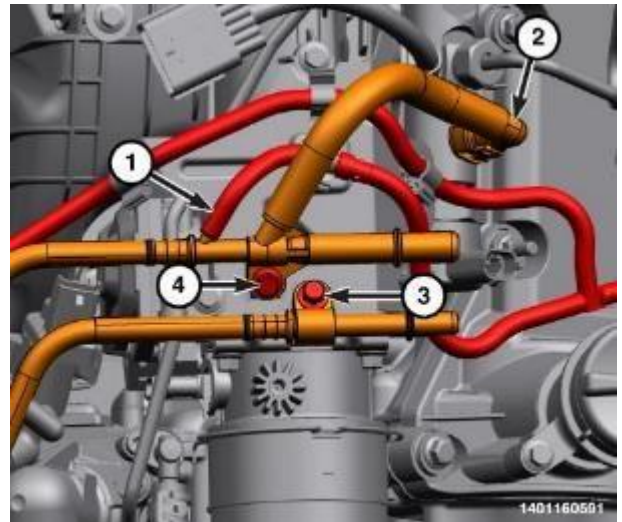
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- 121. Attach the retainers (1) securing the fuel return hose to the fuel line support bracket (Figure 70).



**Figure 70 – Hose Retainers**

- 122. Install the fuel return lines (1, 2) (Figure 71).
- 123. Install the fuel supply line and return line and tighten the bolt (3, 4) to 11 N·m (8 ft. lbs.).



**Figure 71 – Fuel Return Lines**

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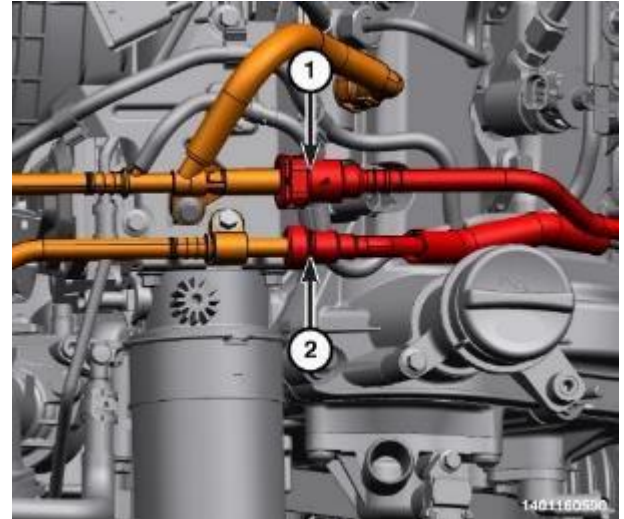
## High Pressure Fuel Pump



Reference: 01A / NHTSA 23V-263

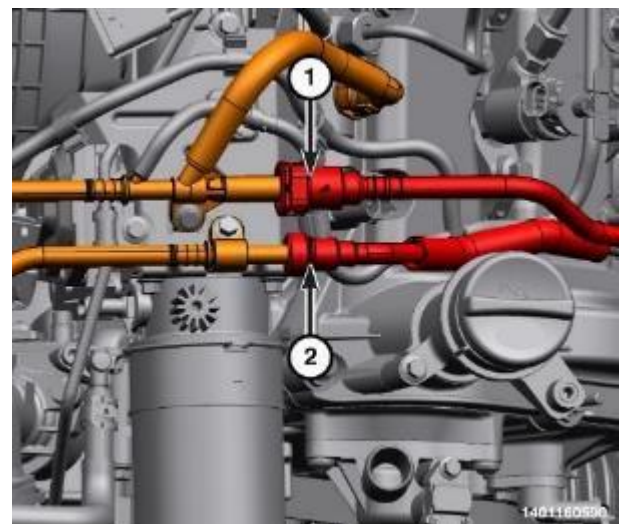
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124. Connect the fuel supply (2) and return (1) lines (Figure 72).



**Figure 72 – Fuel Supply and Return Lines**

125. Install the fuel line supply safety clip (1) (Figure 73).



**Figure 73 – Safety Clip**

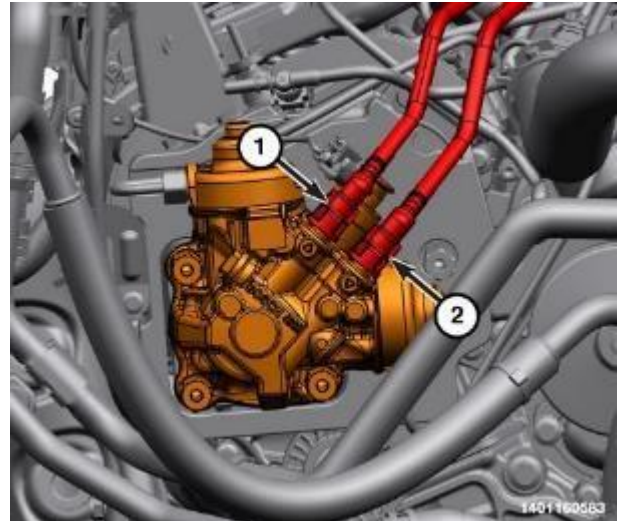
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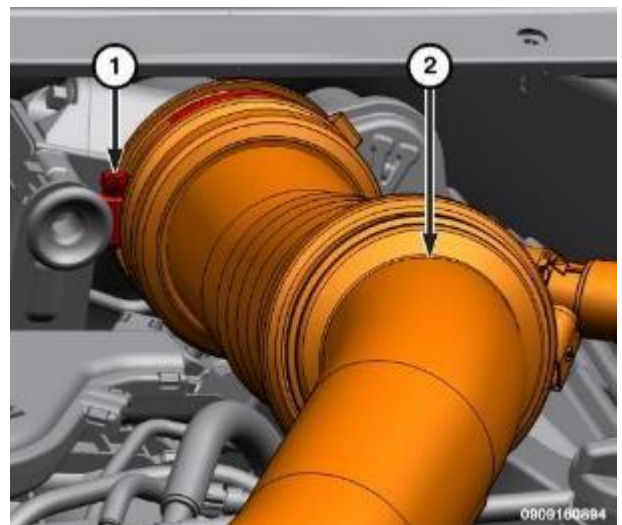
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- 126. Connect the low-pressure return (1) line to the fuel injection pump. Leave the supply (2) loose at this time (Figure 74).



**Figure 74 – Low Pressure Supply Lines**

- 127. Install the clean air hose (2) to turbocharger and securely tighten the clamp (1) (Figure 75).

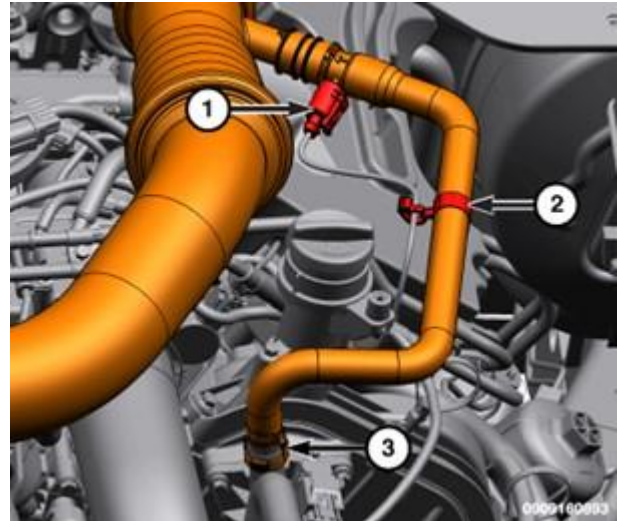


**Figure 75 – Clean Air Hose**

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128. Connect the crankcase breather hose.
129. Attach the Closed Crankcase Heater Ventilation (CCV) heater wire harness retainer (2) (Figure 76).
130. Connect the CCV hose heater wire harness connector (1) (Figure 76).



**Figure 76 – CCV Harness Retainer and Connector**

### **FUEL TANK – DRAIN, CLEAN, REPLACE PUMP**

#### Conventional Procedure

**CAUTION: Dispose of petroleum based products in a manner consistent with all applicable Local, State, Federal, and Provincial regulations.**

**NOTE: Due to a one-way check valve installed into the fuel fill fitting at the tank, the tank cannot be drained at the fuel fill cap.**

131. Disconnect the fuel supply line at the quick-connect fitting near the cowl.
132. Install the appropriate Fuel Line Adapters / Fitting from the Decay Tool, Fuel 8978A. Route the opposite end of this hose to a diesel fuel draining station.

**NOTE: Activation of the fuel pump module may time out and need to be restarted several times to completely drain the fuel tank.**

133. Using a diagnostic scan tool, activate the fuel pump module until the fuel tank has been evacuated.

#### Alternative Procedure

**NOTE: If the electric fuel pump is not operating, the fuel tank must be removed and drained through the fuel pump module opening of the fuel tank.**

134. Raise and support the vehicle.

**WARNING: The fuel system may be under a constant pressure (even with the engine off). Before servicing the fuel pump module, the fuel system pressure must be released.**

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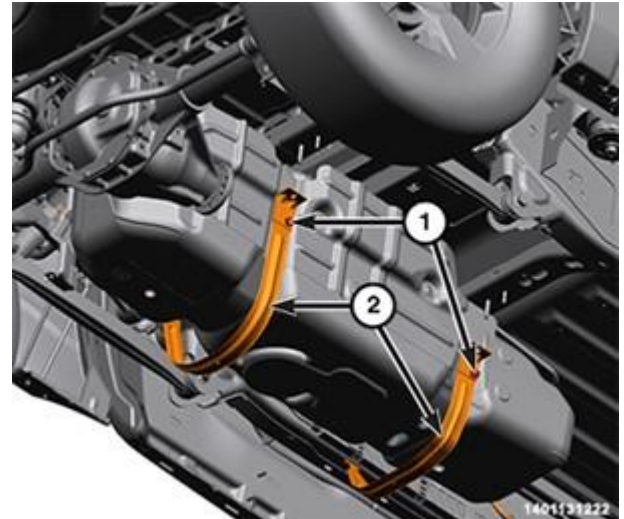
## High Pressure Fuel Pump



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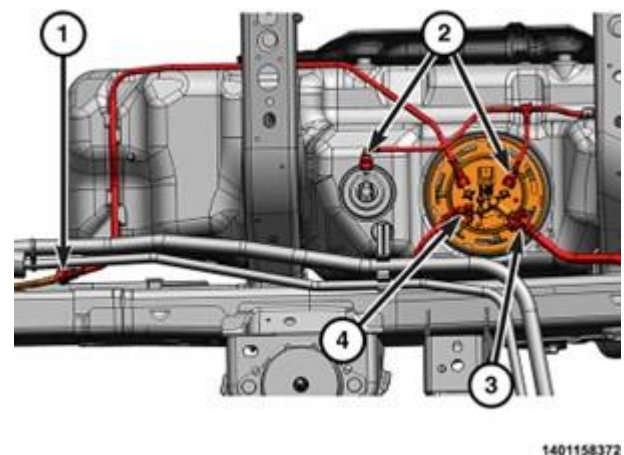
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- 135. Using a suitable hydraulic jack with a fuel tank adapter, support the fuel tank.
- 136. Remove the nuts (1) from the tank straps (Figure 77).
- 137. Remove both fuel tank straps (2) (Figure 77).



**Figure 77 – Tank Straps**

- 138. Disconnect the return fuel line quick-connect fitting (1) at the front of fuel tank (Figure 78).
- 139. Disconnect the two fuel vent line quick-connect fittings (2) (Figure 78).
- 140. Disconnect the fuel supply line quick-connect fitting (4) (Figure 78).
- 141. Disconnect the fuel filler vent line quick-connect fitting (3) at the fuel pump module (Figure 78).



**Figure 78 – Top View of Tank**

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## High Pressure Fuel Pump



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- 142. Disconnect the fuel pump module wire harness connector (1) (Figure 79).

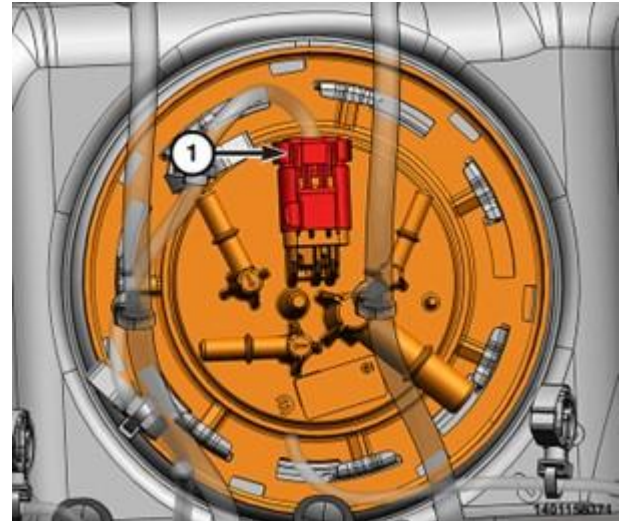


Figure 79 – Pump Module Connector

- 143. Loosen the clamp (2) and disconnect fill hose from fuel tank (Figure 80).
- 144. Remove the fuel vent lines from the retaining clips (1) (Figure 80).
- 145. Lower the fuel tank and remove from hydraulic jack.

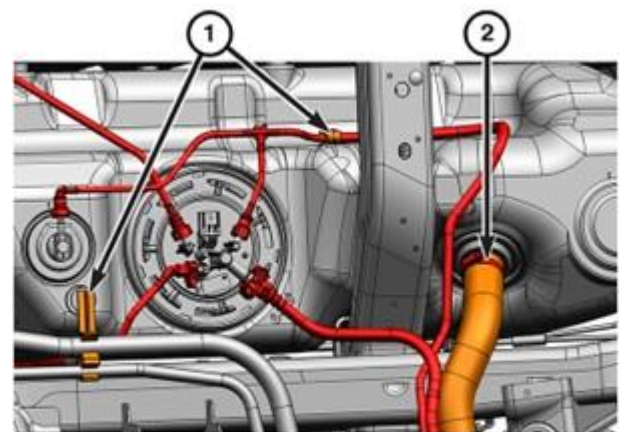


Figure 80 – Tank Connections

**CAUTION:** An indexing arrow is located on top of the main fuel pump module to clock its position into the fuel tank, note its location for reassembly.

**CAUTION:** When positioning the Fuel Pump Lock Ring Wrench, do so that the tool will not contact the fuel return fitting. Failure to do so may result in breaking the fitting.

**NOTE:** Prior to removing the fuel pump module, use compressed air to remove any accumulated dirt and debris from around fuel tank opening.



# SAFETY RECALL – NORTH AMERICA

## High Pressure Fuel Pump



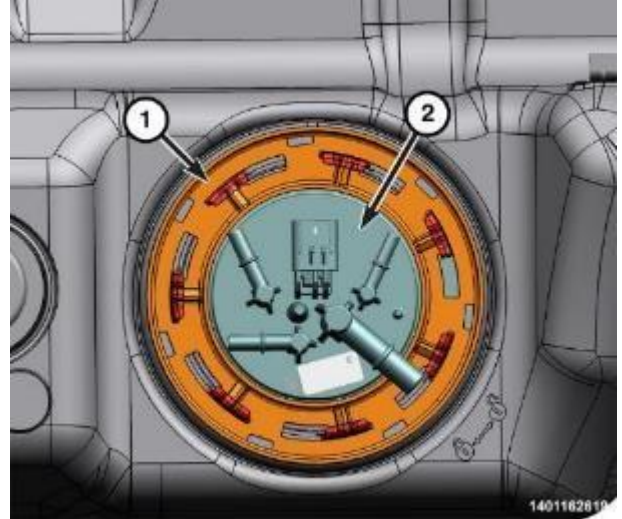
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- 146. Position the 9340 SAE Fuel Pump Lock Ring Wrench in the notches on the outside edge of the lock ring (1) (Figure 81).
- 147. Install a 1/2-inch drive breaker bar into the top of the lock ring remover/installer.
- 148. Rotate the breaker bar counterclockwise and remove the lock ring (1) (Figure 81).

**CAUTION: Whenever the fuel pump module is serviced, the rubber O-ring seal must be replaced.**

- 149. Remove the fuel pump module (2) from the fuel tank and discard (Figure 81).
- 150. Ensure the swirl pot indentation below the in-tank electric fuel pump inlet is completely drained of any contaminated fuel and thoroughly clean the fuel tank.

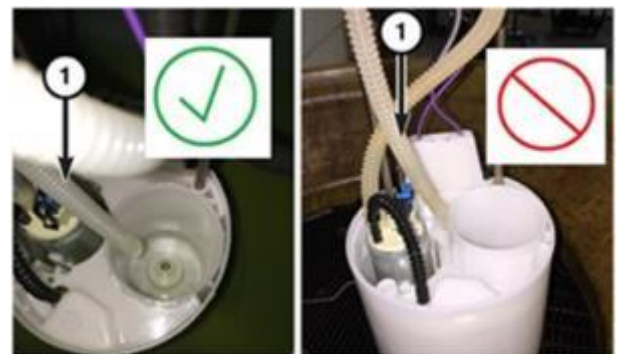


**Figure 81 – Tank Connections**

- 151. Completely drain the low-pressure fuel lines and flush with clean diesel fuel, then install a **NEW** fuel filter.

**CAUTION: An indexing arrow is located on top of the main fuel pump module to clock it's position into the fuel tank. The fuel pump module must be installed in the same position as removed.**

- 152. Make sure the fuel return tube (1) is inside the cup (Figure 82).
- 153. Using a **NEW** rubber O-ring seal, position the **NEW** fuel pump module into the fuel tank opening.



**Figure 82 – Fuel Return Tube**

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**High Pressure Fuel Pump**



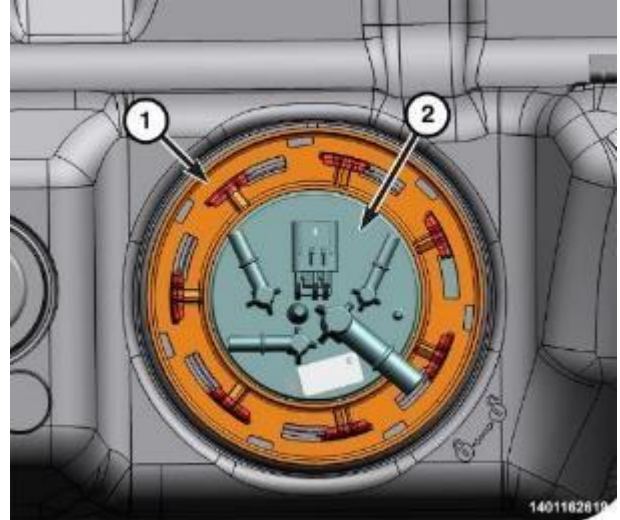
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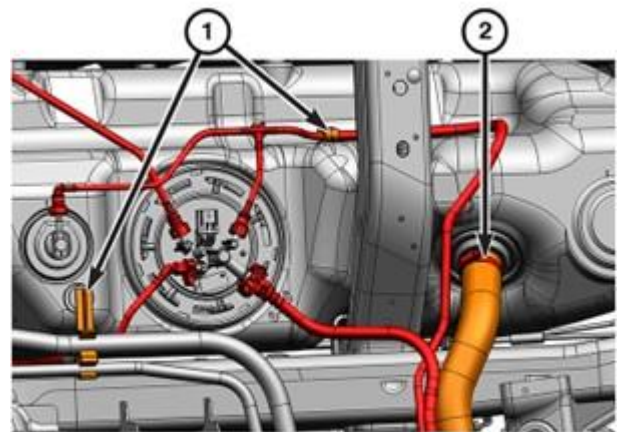
- 154. Position the lock ring (1) over top of the fuel pump module (2) (Figure 83).
- 155. Rotate the fuel pump module (2) until the embossed alignment arrow points to the center alignment mark or the same position as noted during removal. This step must be performed to prevent the float from contacting the side of the fuel tank (Figure 83).

**CAUTION: When positioning the Fuel Pump Lock Ring Wrench, do so that the tool will not contact the fuel return fitting. Failure to do so may result in breaking the fitting.**

- 156. Install the 9340 SAE Fuel Pump Lock Ring Wrench in the notches on the outside edge of the lock ring (1) (Figure 83).
- 157. Install a 1/2 inch drive breaker bar into the SAE Fuel Pump Lock Ring Wrench.
- 158. Rotate the breaker bar clockwise until all seven notches of the lock ring (1) have engaged (Figure 83).
- 159. Secure the fuel tank onto a suitable hydraulic jack with a fuel tank adapter.
- 160. Raise and position the fuel tank leaving room to make the connections at the top of the fuel tank.
- 161. Install the fuel vent lines into the retaining clips (1) (Figure 84).
- 162. Install the fuel fill hose and securely tighten the clamp (2) (Figure 84).



**Figure 83 – Tank Connections**



**Figure 84 – Tank Connections**

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## High Pressure Fuel Pump



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- 163. Connect the fuel pump module wire harness connector (1) (Figure 85).

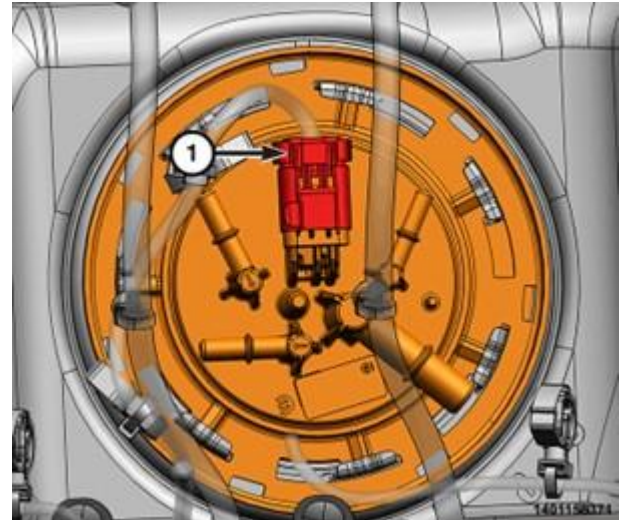
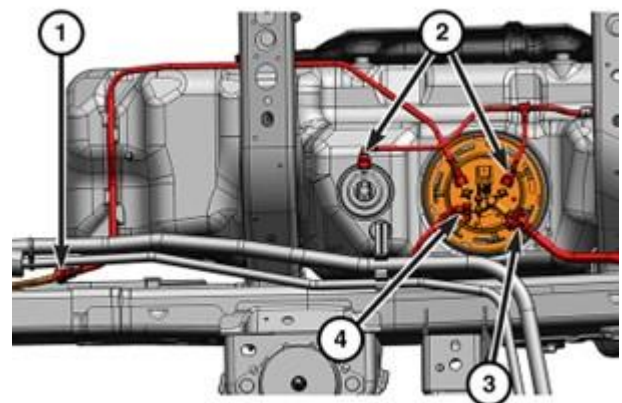


Figure 85 – Tank Module Connections

- 164. Connect the fuel filler vent line quick-connect fitting (3) to the fuel pump module (Figure 86).
- 165. Connect the fuel supply line quick-connect fitting (4) (Figure 86).
- 166. Connect the fuel vent line quick-connect fittings (2) (Figure 86).
- 167. Connect the return fuel line quick-connect fitting (1) at the front of fuel tank (Figure 86).
- 168. Raise the fuel tank until snug to the body.



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Figure 86 – Tank Connections

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## High Pressure Fuel Pump



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- 169. Install the fuel tank straps (2) and tighten the nuts (1) to 54 N·m (40 ft. lbs.) (Figure 87).
- 170. Remove the hydraulic jack.
- 171. Lower the vehicle and add 5 gallons of clean diesel fuel to the tank.
- 172. Connect a clean hose to the low-pressure fuel line at the high pressure fuel pump fitting and place the other end in a suitable clean container.
- 173. Install the negative battery cable eyelet to the IBS stud and secure using the nut. Tighten the nut to 5 N·m (44 in. lbs.).

**NOTE: Overtightening of the nut connecting the negative cable to the IBS will cause damage to the IBS or break the stud for the nut.**

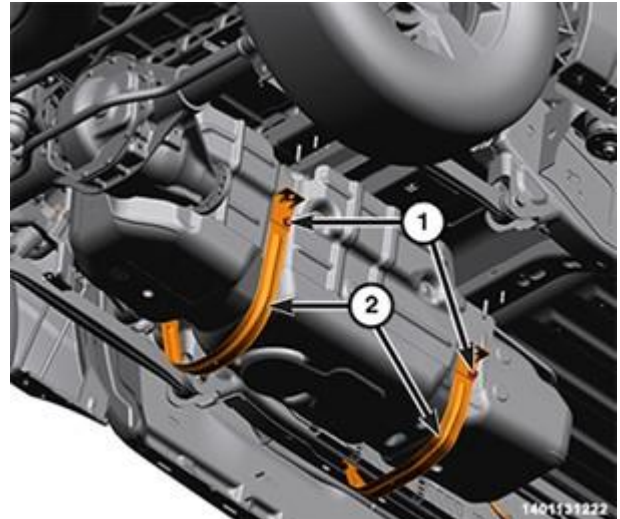


Figure 87 – Fuel Tank Straps

- 174. Connect the IBS wire harness connector if the negative battery cable clamp was removed.
- 175. Turn the ignition ON, and collect the fuel escaping from the low pressure feed into a clean container.
- 176. Connect the lower pressure supply line (2) to the high pressure pump (Figure 74).
- 177. Install the fuel injection pump silencer (1) (Figure 88).

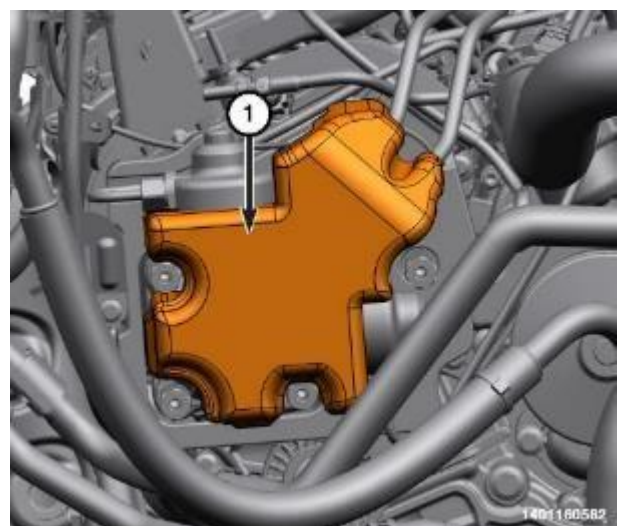


Figure 88 – Pump Silencer

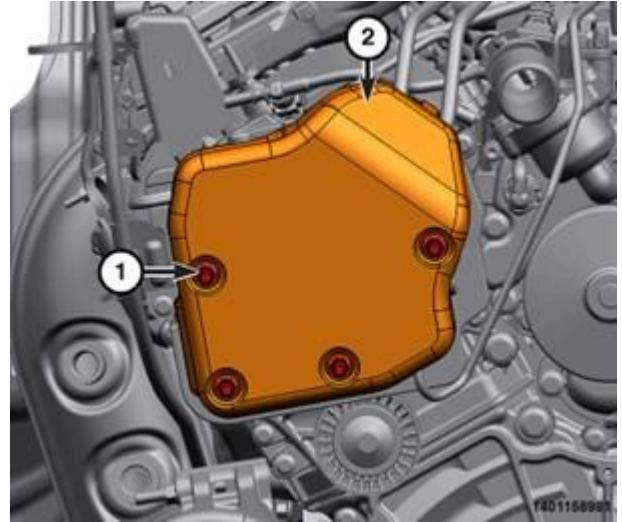
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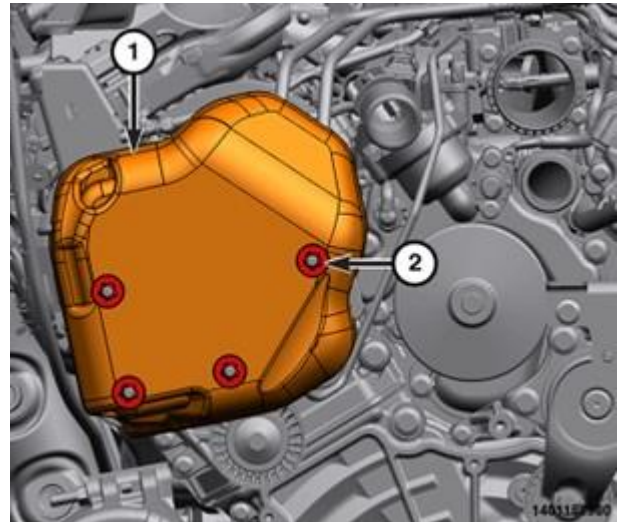
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- 178. Install the fuel injection pump blocker shield (2) and tighten the bolts (1) to 25 N-m (18 ft. lbs.) (Figure 89).



**Figure 89 – Pump Blocker Shield**

- 179. Install the fuel injection pump silencer (1) and the fasteners (2) (Figure 90).



**Figure 90 – Pump Silencer**

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180. Start the engine and check for leaks at all fuel connections.
181. Install the engine cover (2) and securely tighten the bolts (1) (Figure 91).



**Figure 91 – Engine Cover**

## **B. JL Vehicles**

For vehicles with a contaminated fuel system, use the procedure below.

### **Remove**

**WARNING:** High-pressure lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 2000 bar (29,008 psi). Use extreme caution when inspecting for high-pressure fuel leaks. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect for high-pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system.

**WARNING:** Observe the following precautions when working on fuel systems: No sparks, open flames or smoking. Avoid inhaling and swallowing fuel. Avoid eye and skin contact with fuel. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing. Failure to observe these precautions may result in fire, explosion, property damage, and serious or fatal injury.

**WARNING:** High-pressure lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 2000 bar (29,008 psi). Use extreme caution when inspecting for high-pressure fuel leaks. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect for high-pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system.

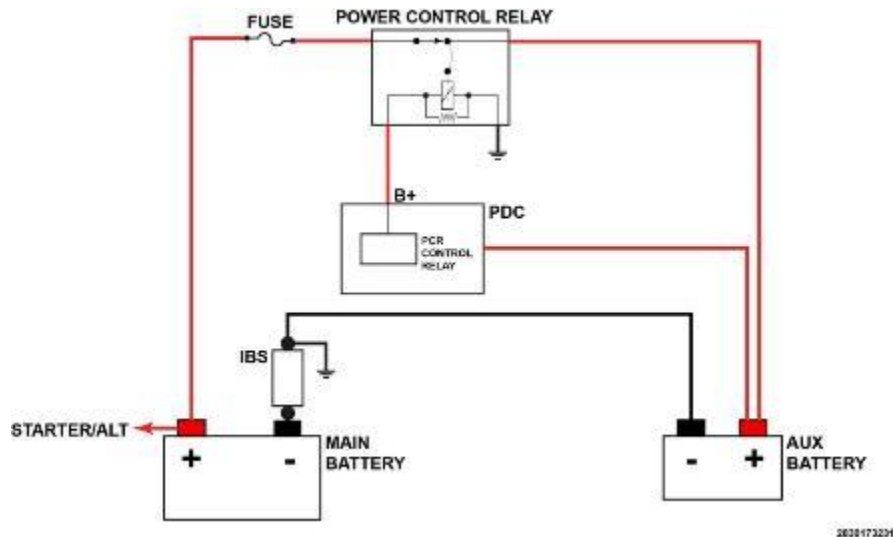
**WARNING:** Observe the following precautions when working on fuel systems: No sparks, open flames or smoking. Risk of poisoning from inhaling and swallowing fuel. Risk of injury to eyes and skin from contact with fuel. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing.

**NOTE:** When key is cycled to the off position, fuel system pressure automatically bleeds down.

**NOTE:** The fuel injection pump can be replaced without having to perform the entire base engine valve timing procedure. This procedure gives instruction on how to remove and install the new fuel injection pump without performing the base engine timing. Do not rotate the pump shaft after removing from the vehicle. The alignment of the pump shaft must be measured and recorded using a commercially available degree wheel after the pump is removed and before transferring the pump gear over to the new pump. This is done to align the pump to the same position during installation. If the base engine valve timing must be performed as part of the repair, refer to Service Library 09 - Engine/Valve Timing/Standard Procedure.

**Battery Disconnect**

1. On this dual battery system the auxiliary battery ground cable connects to the main battery cable end (shown in generic graphic) and grounds through the main battery ground cable connection to the body, chassis or engine (depending on vehicle). Therefore, simply disconnecting and isolating the main battery negative cable clamp from the main battery post will not isolate the auxiliary from the vehicle's electrical system. The auxiliary battery will still be grounded through it's connection to the main battery negative cable end. If both battery negative cables are not isolated it will result in the vehicle electrical system and Power Distribution Center (PDC) still having battery connection which can cause vehicle wiring damage or deployment of air bags on re-connection (Figure 92). In Service Library, see 08 - Electrical / 8F - Engine Systems / Battery System / Standard Procedure / Battery Disconnect - Dual 12 Volt Battery System.



**Figure 92 – Dual Battery System**

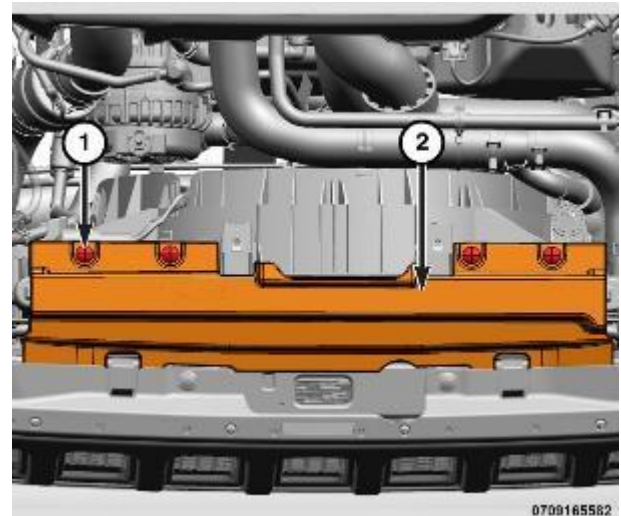
2. Turn the ignition off. Wait five minutes to allow the main modules to go to sleep.
3. Disconnect and isolate the supplemental (auxiliary) battery negative cable from the main battery negative cable end. This will disconnect and isolate the auxiliary battery ground.
4. The main battery ground can be disconnected by removing the main battery negative cable from the negative battery cable end, or by disconnecting the IBS connector, loosening the negative battery clamp nut and removing the negative battery cable end from the battery post. Either method will disconnect the main battery. Both batteries should be disconnected from the vehicle electrical system.
5. Measure the voltage at the PDC positive battery cable connection to verify the vehicle electrical system is powered down.



**NOTE: On some vehicles a small amount of voltage may be present (typically less than approximately 0.5 volts) due to capacitors in some modules still having voltage stored. Anything less than 1.0 volts should be safe.**

**Cooling Fan - Remove**

6. Remove the push pins retainers (1) and upper radiator seal (2) (Figure 93).



**Figure 93 – Upper Radiator Seal**

7. Disconnect the cooling fan wire harness connectors (1) and detach the wire harness connector from fan shroud (Figure 94).



**Figure 94 – Fan Electrical Connector**

8. Remove the left cooling fan bolt (1) (Figure 95).



**Figure 95 – Left Cooling Fan Bolt**

9. Remove the right cooling fan bolt (1) (Figure 96).



**Figure 96 – Right Cooling Fan Bolt**

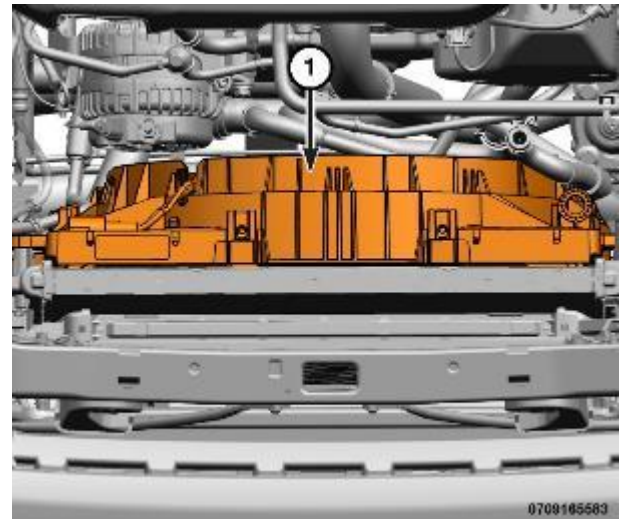
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10. Insert a piece of cardboard between the cooling fan and the radiator.
11. Remove the cooling fan (1) by pulling upwards and away from the radiator (Figure 97).



**Figure 97 – Cooling Fan**

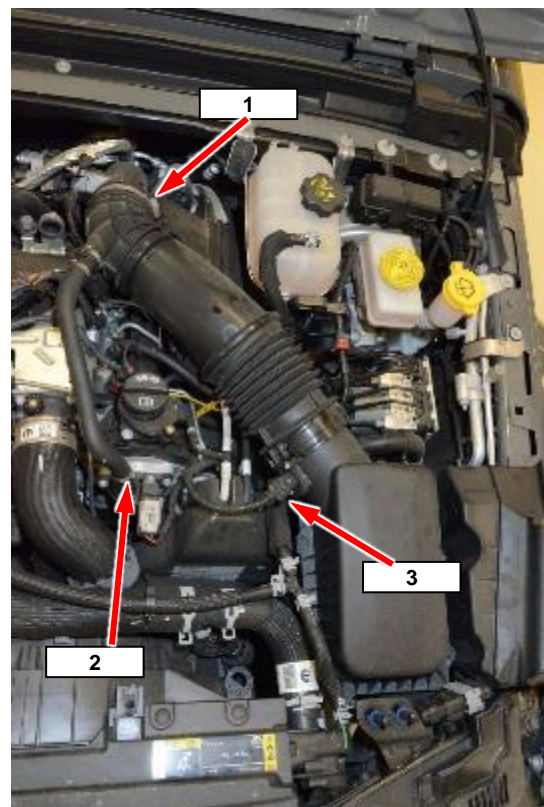
12. Remove the engine cover (Figure 98).



**Figure 98 – Engine Cover**

**PUMP COVER - Remove**

13. Remove the clamp at the turbocharger air inlet elbow (1). Slide the CCV hose (2) off at the head. Disconnect the Mass Air Flow connector (3) (Figure 99).
14. Remove the air cleaner body bolt then lift up and the air cleaner body and remove it and the clean air hose as an assembly.



**Figure 99 – Inlet Air Tube**

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15. Release the retaining lock (1) and disconnect the Charge Air Cooler (CAC) hose from the EGR air flow control valve (Figure 100).



**Figure 100 – CAC Hose from EGR Air Flow Control Valve**

16. Loosen the left CAC hose clamp and disconnect the left CAC hose from the CAC and remove it (Figure 101).



**Figure 101 – CAC Hose from Intercooler**

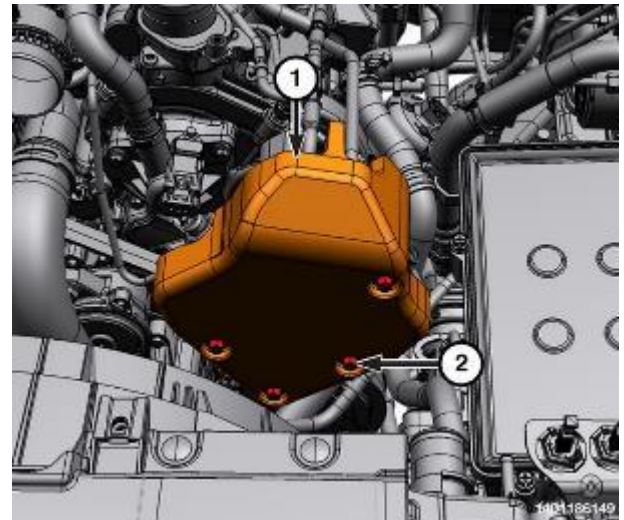
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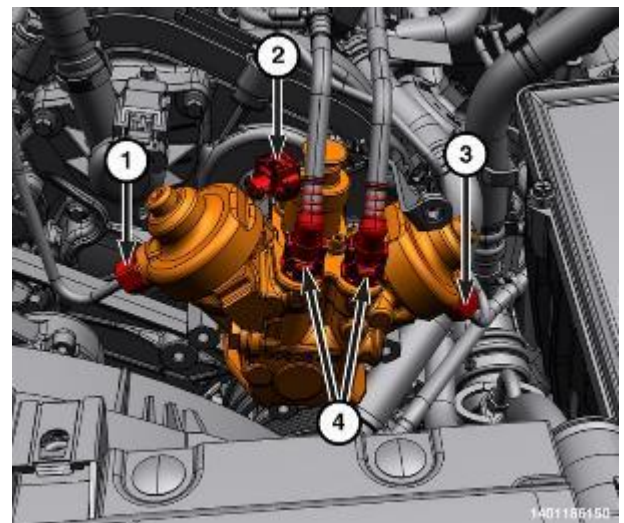
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17. Remove the fuel injection pump blocker plate bolts (2) and the fuel injection pump blocker plate (1) from the fuel injection pump (Figure 102).



**Figure 102 – Blocker Plate**

18. Disconnect the low-pressure fuel supply/return lines (4) (Figure 103).
19. Disconnect the fuel quantity solenoid wire harness connector (2) (Figure 103).
20. Remove the fuel rail supply tubes (1 and 3) from the HPFP (Figure 103).



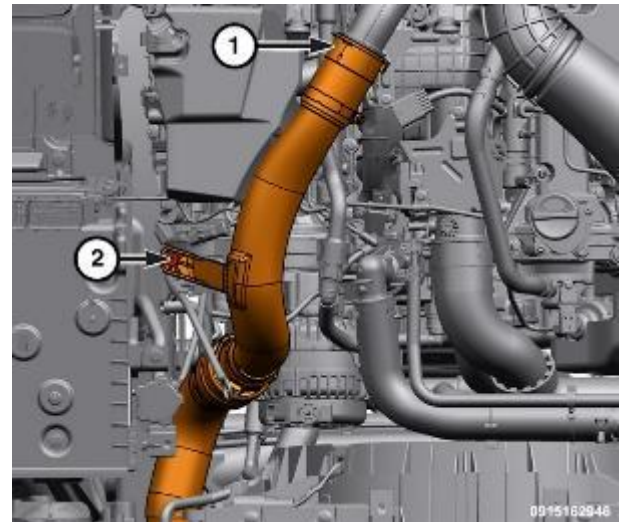
**Figure 103 – Fuel Rail Supply Tubes**

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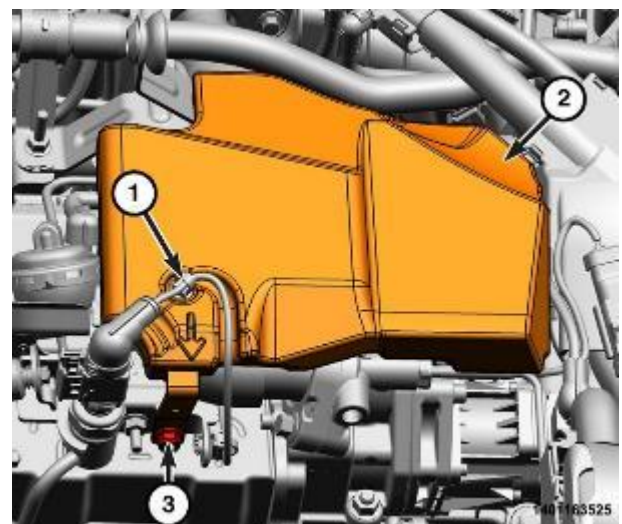
**RIGHT SIDE - Remove**

21. Remove the Charge Air Cooler (CAC) hose bolt (2) (Figure 104).
22. Release the retaining clip (1) and disconnect the CAC hose from the turbocharger elbow and position aside.



**Figure 104 – CAC Hose**

23. Loosen the fuel rail cover nut (3), detach the wire harness retainer (1) and remove the fuel rail cover (2) (Figure 105).



**Figure 105 – Fuel Rail Cover**

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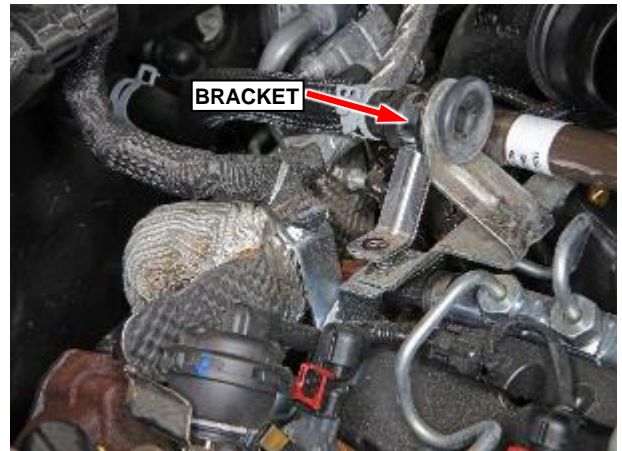
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- 24. Remove fasteners from coolant hose support brackets at the front and rear of the engine (Figure 106 and 107).



**Figure 106 – Front Coolant Hose Bracket**



**Figure 107 – Rear Coolant Hose Bracket**

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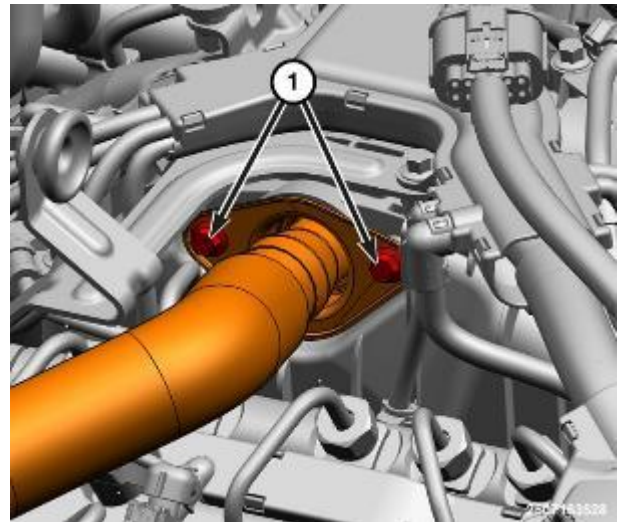
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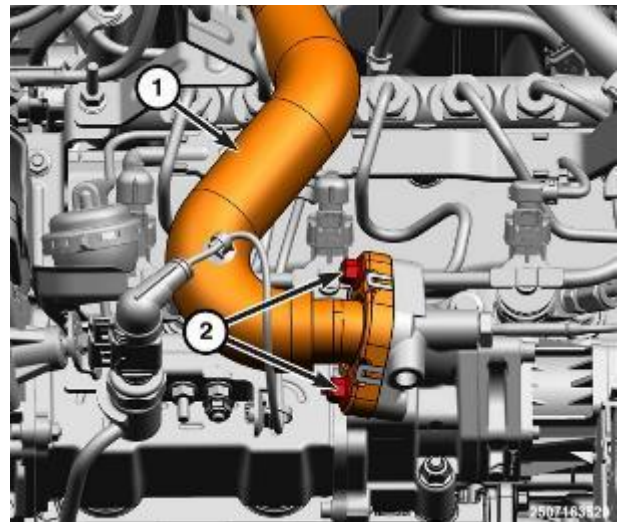
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- 25. Remove the upper Exhaust Gas Recirculation (EGR) tube bolts (1) (Figure 108).



**Figure 108 – Upper EGR Tube**

- 26. Remove the lower EGR tube bolts (2) and the EGR tube (1) (Figure 109).
- 27. Remove and discard both gaskets.



**Figure 109 – Lower EGR Tube**

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- 28. Lift up on locking tabs (1) to unlock the locks (2) on the right bank fuel return hoses on the tops of the injectors (Figure 110).
- 29. Remove the fuel return hoses (2) by wiggling hoses free from the fuel injector (Figure 110).

**NOTE: Use a backing wrench on the fuel injector when unscrewing the union nut.**

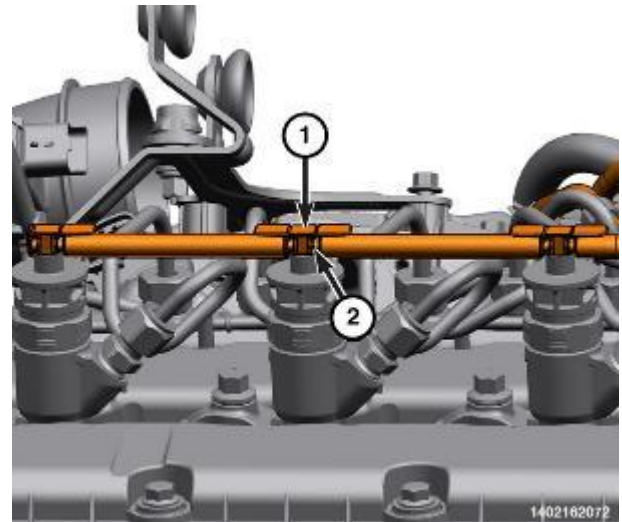


Figure 110 – Fuel Return Hoses

- 30. Unscrew the union nuts (7 and 9) and remove cylinder No. 1 fuel tube (8) and the discard fuel tube (Figure 111).
- 31. Unscrew the union nuts (4 and 6) and remove cylinder No. 2 fuel tube (5) and discard the fuel tube (Figure 111).
- 32. Unscrew the union nuts (1 and 3) and remove cylinder No. 3 fuel tube (2) and discard the fuel tube (Figure 111).

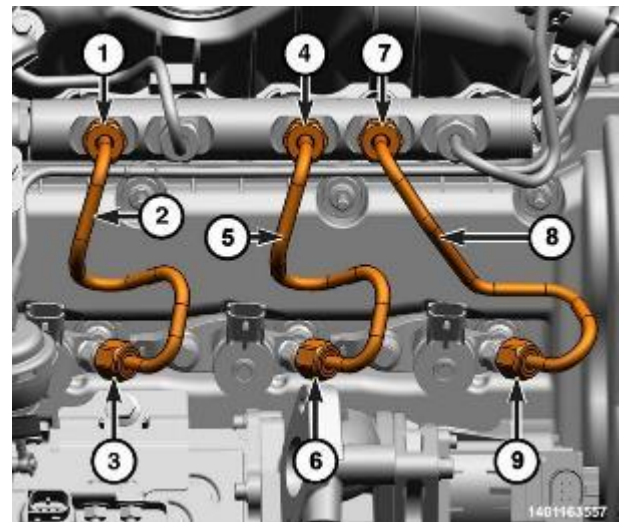


Figure 111 – Right Fuel Injector Tubes

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## High Pressure Fuel Pump



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### LEFT SIDE - Remove

33. Remove the vent hose (1) from the left fuel rail cover (Figure 112).



Figure 112 – Vent Hose

34. Remove the left fuel rail cover bolts (1) and the left fuel rail cover (2) (Figure 113).

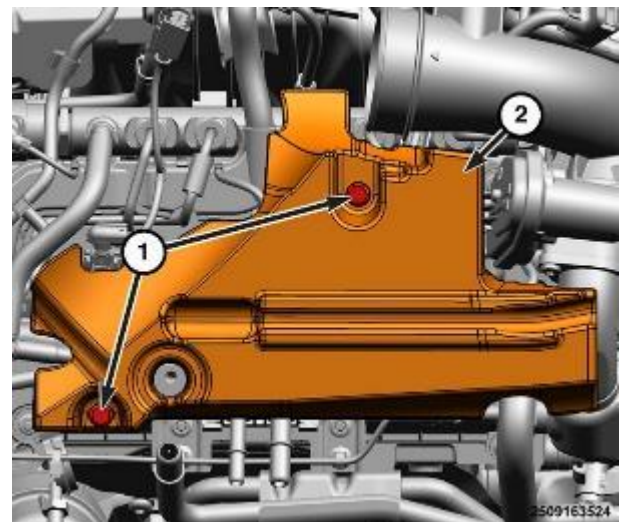


Figure 113– Fuel Rail Cover

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## High Pressure Fuel Pump

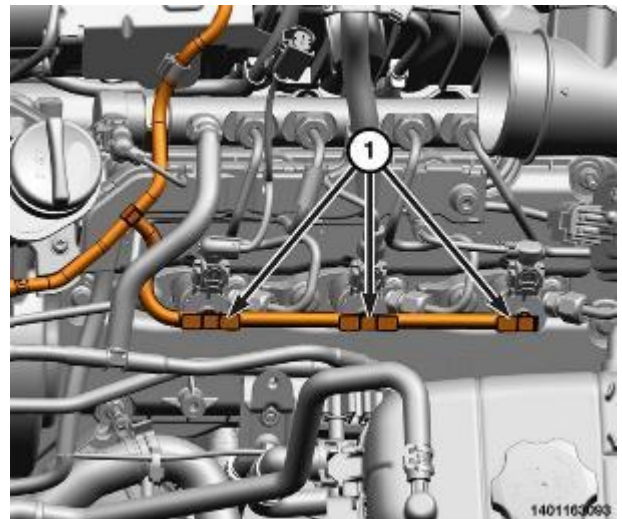


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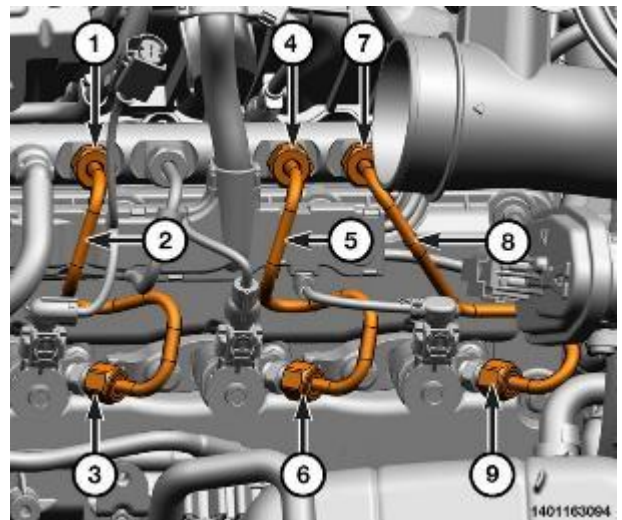
35. Lift up on locking tabs (1) to unlock the locks on the fuel return hoses on the tops of the injectors (Figure 114).
36. Disconnect the fuel return lines by wiggling the hoses free from the fuel injectors (Figure 114).

**NOTE: Use a backing wrench on the fuel injector when unscrewing the union nut.**



**Figure 114 – Fuel Return Hoses**

37. Unscrew the union nuts (1 and 3) and remove cylinder No. 4 fuel tube (2) and discard the fuel tube (Figure 115).
38. Unscrew the union nuts (4 and 6) and remove cylinder No. 5 fuel tube (5) and discard the fuel tube (Figure 115).
39. Unscrew the union nuts (7 and 9) and remove cylinder No. 6 tube (8) and discard the fuel tube (Figure 115).



**Figure 115 – Fuel Injector Tubes**

### **Crossover Tube - Remove**

40. Detach the vacuum line from the coolant bottle bracket.
41. Remove the coolant bottle bolts and position aside the coolant bottle.
42. Detach the brake booster vacuum hose from the bracket.

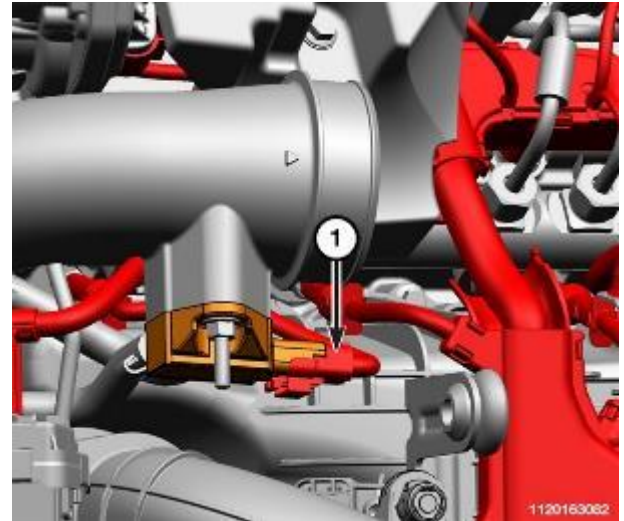
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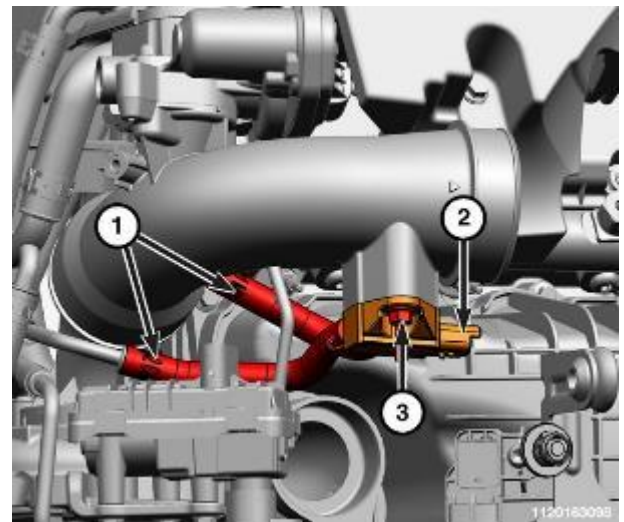
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- 43. Disconnect the differential pressure sensor wire harness connector (1) (Figure 116).



**Figure 116 – Pressure Sensor Connector**

- 44. Disconnect the differential pressure sensor hoses (1) (Figure 117).
- 45. Remove the differential pressure sensor nut (3) and the differential pressure sensor (2) (Figure 117).



**Figure 117 – Differential Pressure Sensor**

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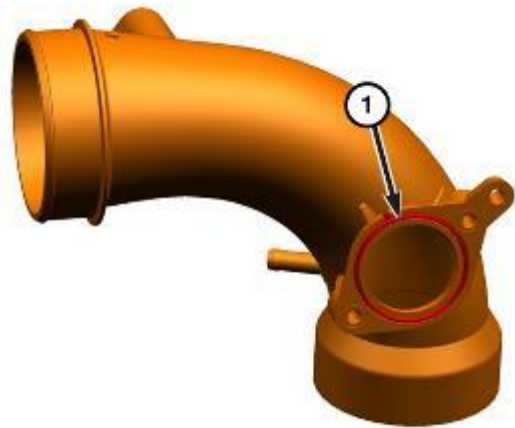
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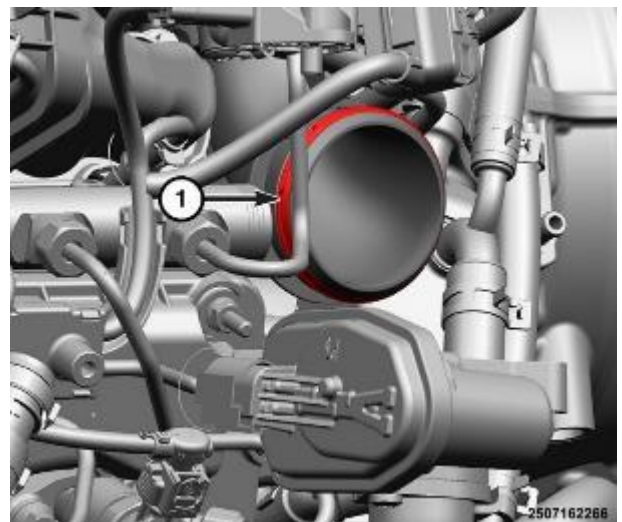
- 46. Remove the low pressure EGR valve to the upper turbocharger inlet elbow bolts and remove the upper turbocharger inlet elbow (Figure 118).
- 47. Remove and DISCARD the low pressure EGR valve gasket (1) (Figure 118).



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**Figure 118 – Upper Turbo Inlet Elbow Gasket**

- 48. Remove and DISCARD the lower turbocharger inlet elbow gasket (1) (Figure 119).
- 49. Disconnect the boost pressure sensor wire harness connector.
- 50. Disconnect the swirl valve wire harness connector.
- 51. Disconnect the fuel pressure sensor wire harness connector.



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**Figure 119 – Lower Turbo Inlet Elbow Gasket**

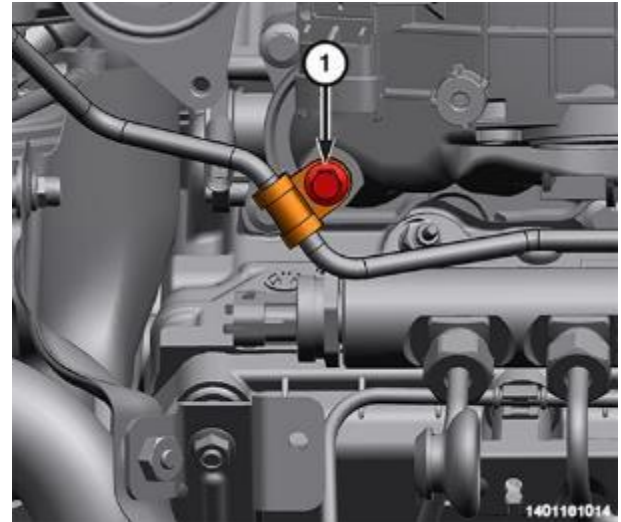
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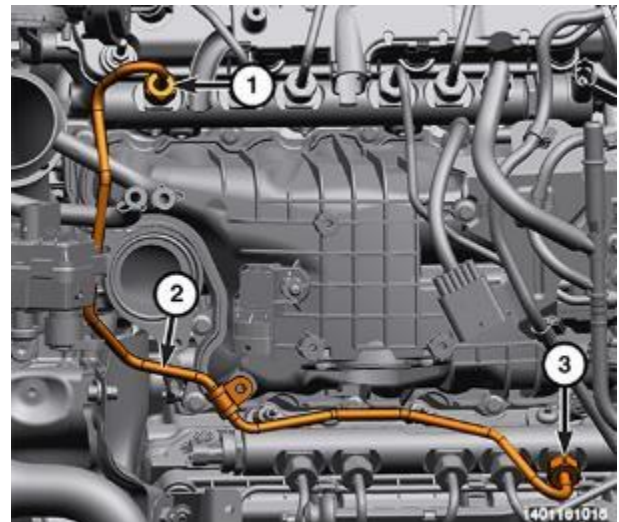
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- 52. Remove the fuel crossover tube bolt (1) (Figure 120).



**Figure 120 – Crossover Tube Bolt**

- 53. Unscrew the union nuts (1 and 3) and remove the fuel crossover tube (2) and discard (Figure 121).



**Figure 121 – Crossover Tube Bolt**

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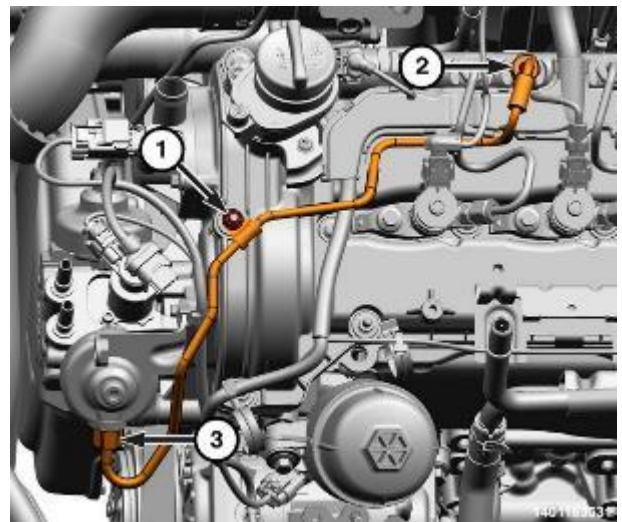


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### Left Fuel Rail Supply Tube - Remove

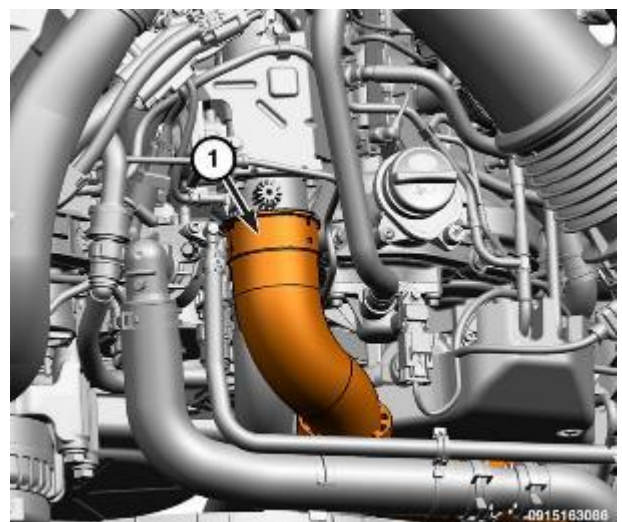
54. Remove the left fuel tube bracket nut (1) securing the fuel tube (Figure 122).
55. Unscrew the union nut (2) from the fuel rail and remove and discard the fuel tube (Figure 122).



**Figure 122 – Left High Pressure Fuel Tube Nut**

### Right Fuel Rail Supply Tube - Remove

56. Release the retaining clip (1) and disconnect the CAC hose from the EGR air flow control valve (Figure 123).



**Figure 123 – CAC Hose Clip**

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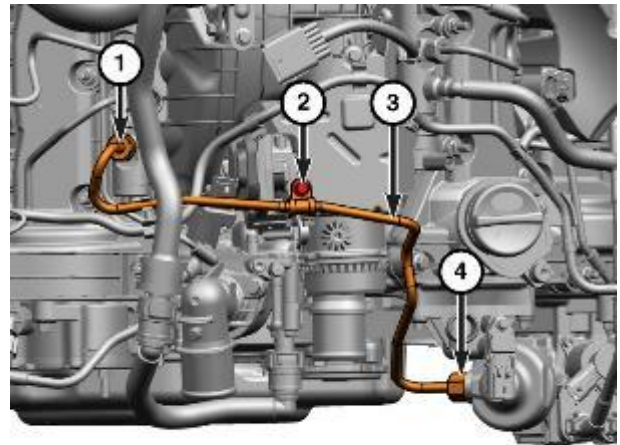
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57. Remove the fuel tube bolt (2) securing the fuel tube (Figure 124).
58. Unscrew the union nut (1) and remove and discard the fuel tube (3) (Figure 124).
59. Install protective caps over the openings.



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**Figure 124 – Right High-Pressure Fuel Tube Bolt**

### Fuel Injector Return Lines - Remove

60. Lift up on locking tabs (1 and 3) at each injector to unlock the locks (Figure 125).
61. Remove the fuel return lines by wiggling hose free from the fuel injectors (Figure 125).
62. Remove the fuel line retainers (2) and detach the fuel injector return line from the main fuel return line (4) (Figure 125).



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**Figure 125 – Injector Return Lines**

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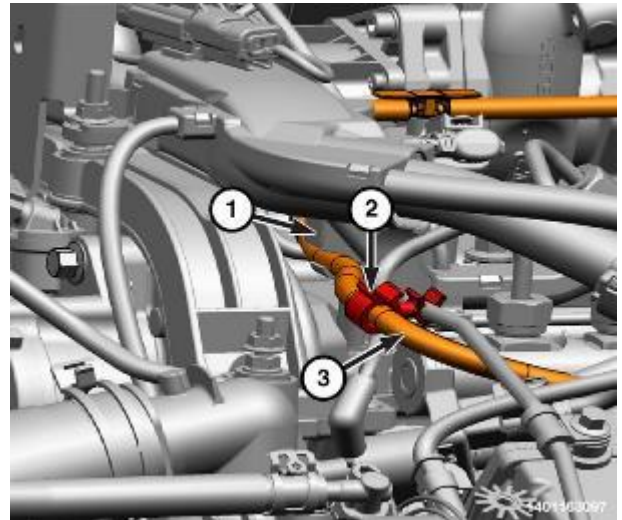
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- 63. Detach the fuel return line retainers (1 and 2) (Figure 126).
- 64. Remove the fuel injector return line assembly (3) (Figure 126).



**Figure 126 – Injector Return Line Retainers**

### **Fuel Injector Rails - Remove**

- 65. Disconnect the fuel pressure regulator wire harness connector (1) on the LEFT rail (Figure 127).



**Figure 127 – Fuel Pressure Regulator Connector (Left Rail)**

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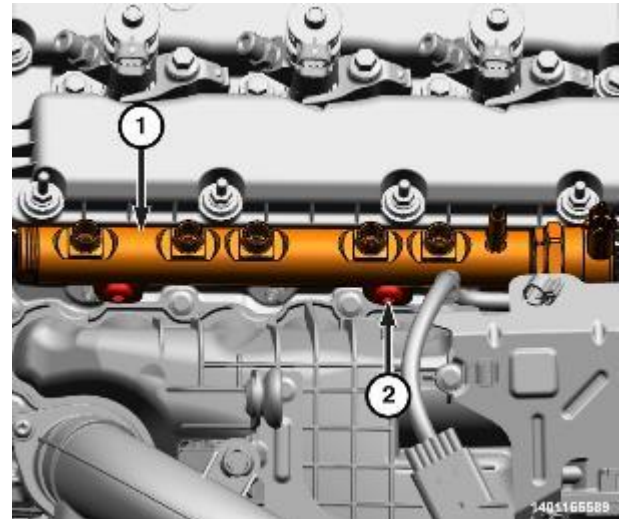
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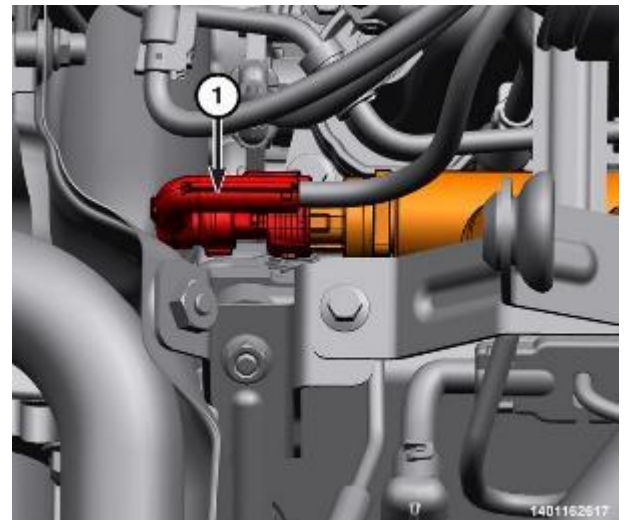
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- 66. Using the Remover-Installer, Fuel Rail Bolt 2025400090, remove the left fuel rail bolts (2) and the left fuel rail (1) (Figure 128).



**Figure 128 – Left Fuel Rail**

- 67. Disconnect the fuel pressure sensor harness connector (1) on the RIGHT rail (Figure 129).



**Figure 129 – Fuel Pressure Sensor  
Right Fuel Rail**

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- 68. Using the Remover-Installer, Fuel Rail Bolt 2025400090, remove the right fuel rail bolts (2) and the right fuel rail (1) (Figure 130).

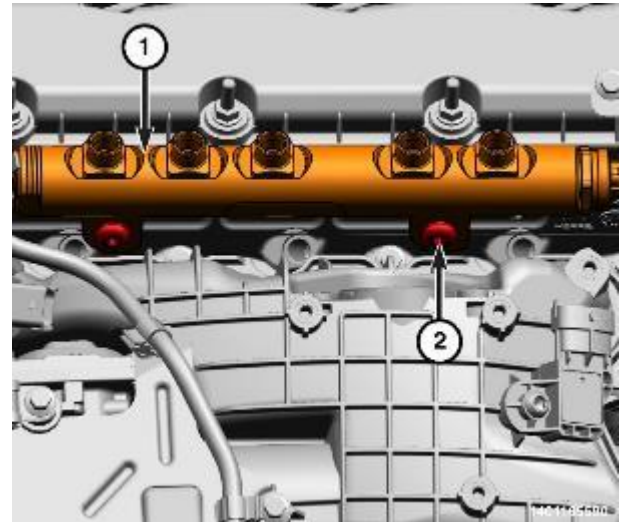


Figure 130 – Right Fuel Rail

### Fuel Injectors - Remove

- 69. Disconnect the fuel injector wire harness connectors (1) (Figure 131).
- 70. Clean the area around the fuel injectors so that no debris falls into the injector bores.

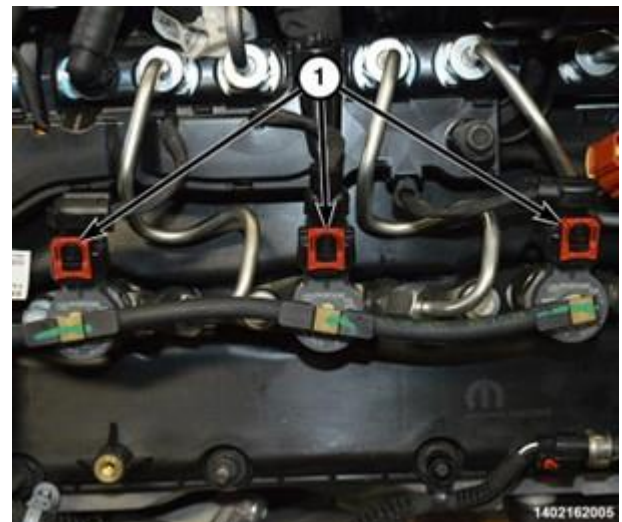


Figure 131 – Fuel Injector Wire Harness Connectors

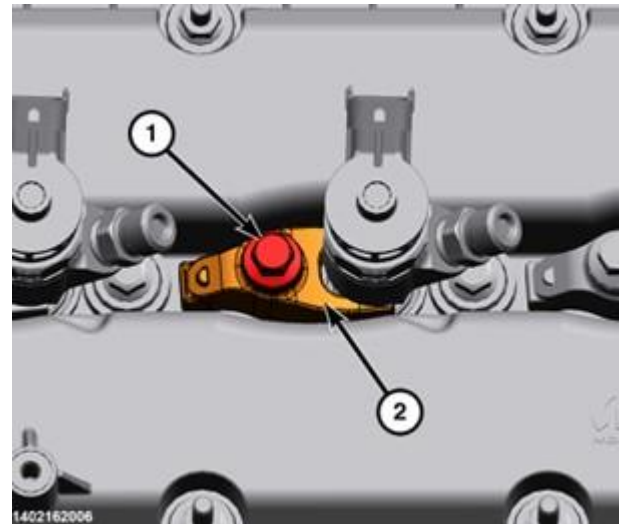
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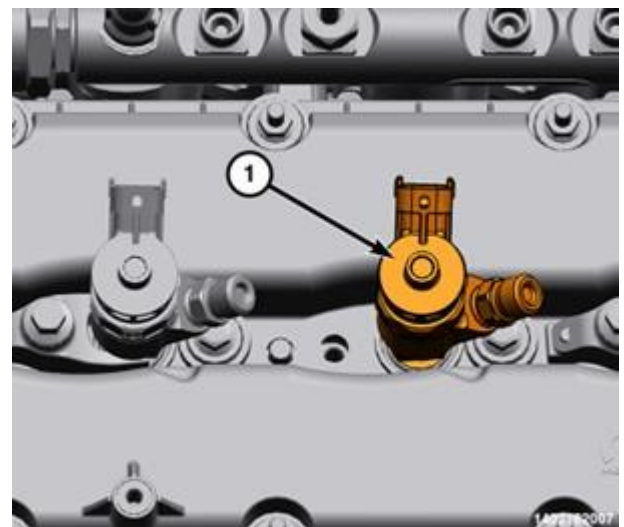
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- 71. Remove the fuel injector clamp bolts (1) and the fuel injector clamps (2) (Figure 132).



**Figure 132 – Fuel Injector Clamps**

- 72. Using your hand, pull the fuel injectors (1) straight up from the cylinder head for removal. Discard the lower sealing washer and place a protective cap over the injector bore (Figure 133).



**Figure 133 – Fuel Injectors**

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73. If an injector can't be removed by hand, install the Remover, Fuel Injector VM.10358A (1) to remove the fuel injector. Discard lower sealing washer and place a protective cap over the injector bore (Figure 134).

**NOTE:** Check and **MAKE SURE** that the copper sealing washer did not remain in the cylinder head.

**NOTE:** Steps 74 - 75 necessary for fuel injector No. 3.



**Figure 134 – Remover, Fuel Injector VM.10358A**

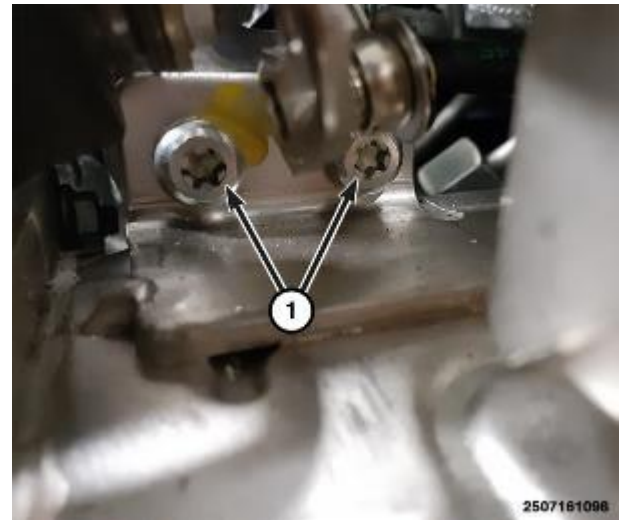
74. Disconnect the EGR cooler vacuum bypass hose (1) (Figure 137).



**Figure 137 – EGR Cooler Vacuum Bypass Hose**

75. Remove the vacuum actuator with heat shield screws (1) and position aside the vacuum actuator (Figure 138).

**NOTE: When a NEW fuel injector is being installed, or if an existing injector is installed in any location other than its original location, the injector quantity adjustment procedure must be performed (Refer to 14 - Fuel System/Fuel Injection - Standard Procedure).**



**Figure 138 – Vacuum Actuator Screws**

**HIGH PRESSURE FUEL PUMP – Remove and Replace**

**NOTE: The fuel injection pump can be replaced without having to perform the entire base engine valve timing procedure. Do not rotate the pump shaft after removing from the vehicle. The alignment of the pump shaft must be measured and recorded using a commercially available degree wheel after the pump is removed and before transferring the pump gear over to the new pump. This is done to align the pump to the same position during installation. If the base engine valve timing must be performed as part of the repair (Refer to 09 - Engine/Valve Timing/Standard Procedure).**

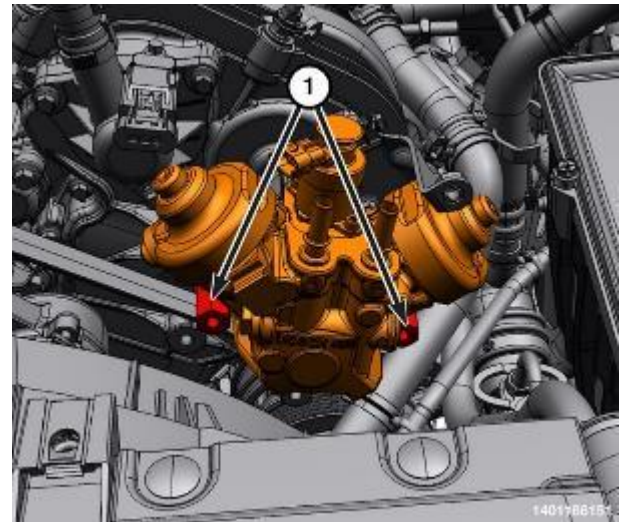
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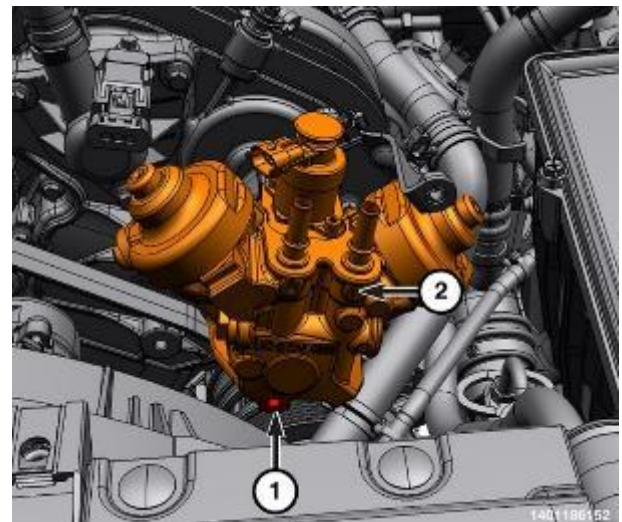
- 76. Remove the upper bolts (1) from the high-pressure pump (Figure 139).
- 77. Using Tool, High Pressure Pump Installation VM.10345 Install the studs in the upper locations.



**Figure 139 – Fuel Quantity Solenoid Connector and HPFP Upper Bolts**

- 78. Remove the lower bolt (1) from the HPFP (2) and remove it from the vehicle (Figure 140).

**NOTE: The fuel injection pump needs to be timed using a commercially available degree wheel.**



**Figure 140 – HPFP Lower Bolt**



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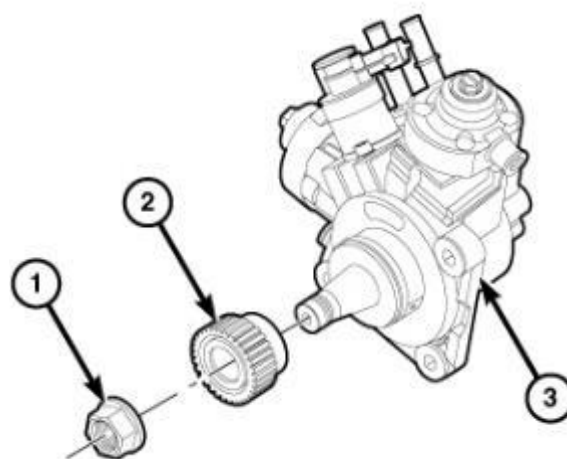
- 79. Install the degree wheel onto the pump and record the position of the hole in the gear on the degree wheel (Figure 141).
- 80. The use of Puller 1023 or a commercially available gear puller is required to remove the fuel injection pump gear (Figure 142).



Figure 141 – Degree Wheel

**NOTE:** The use of Puller 1023 or a commercially available gear puller is required to remove the fuel injection pump gear (2) (Figure 142).

**CAUTION:** Do Not Force the high-pressure pump into the right timing cover or attempt to seat it by drawing it in with the bolts. The pump gear must be properly aligned with the drive gear on the camshaft before the high-pressure pump will seat on the cylinder head mounting surface. Failure to properly align drive gears will damage the high-pressure pump or camshaft drive gear.



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Figure 142 – Gear Removal

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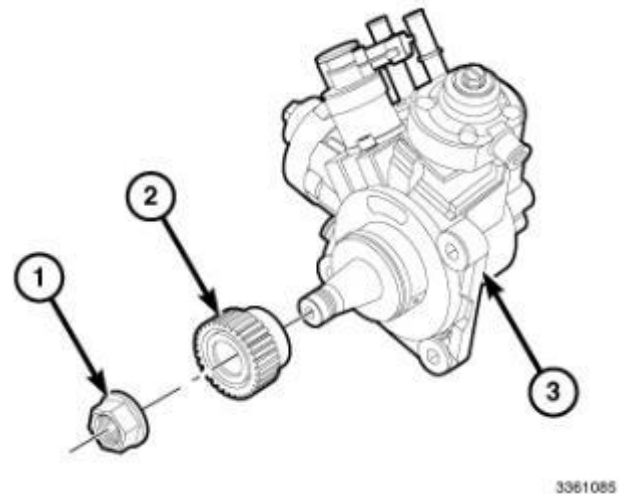
- 81. Install a **NEW** O-ring seal (1) to the fuel injection pump (Figure 143).



**Figure 143 – O-ring Seal**

- 82. Install the gear (2) and nut (1) onto the fuel injection pump (3) and tighten the nut (1) finger tight (Figure 144).

**Note: NEVER use an impact to tighten the gear nut.**



**Figure 144 – O-ring Seal**

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- 83. Using a commercially available spanner wrench (2) such as Blue Point APS35IB or equivalent, tighten the nut (1) to 50 N·m (37 ft. lbs.) (Figure 145).



Figure 145 – Nut with Spanner Wrench

- 84. Install the degree wheel and rotate the pump shaft so that the hole aligns with the reference mark on the degree wheel referenced during the removal (Figure 146).
- 85. Install the fuel injection pump onto the Tool, High Pressure Pump Installation VM.10345 in the upper timing cover.
- 86. Install the lower fuel injection pump bolt (2) and hand tighten the bolt (1) (Figure 140).
- 87. Remove the Tool, High Pressure Pump Installation VM.10345 from the upper bolts location and install the bolts.
- 88. Tighten the bolts (1) that secure the fuel injection pump to 25 N·m (18 ft. lbs.) (Figures 140 and 139).



Figure 146 – Degree Wheel

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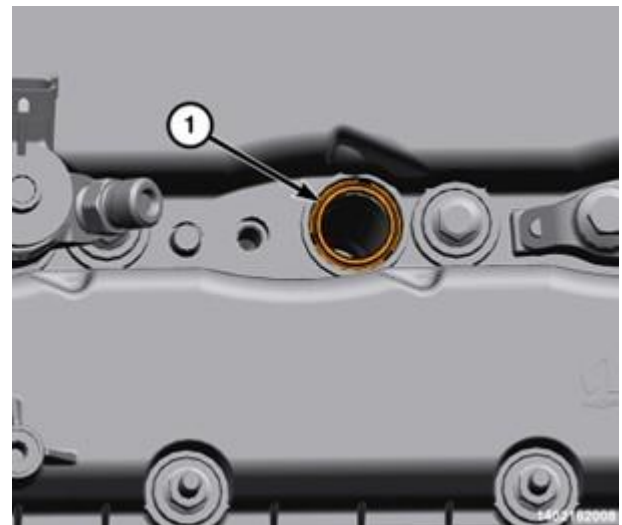
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89. Remove the protective cap from the appropriate injector bore.

**NOTE: Make sure the old copper sealing washer is not stuck in bore.**

90. Clean the fuel injector bore (Refer to 09 - Engine/Fuel Injection/INJECTORS, Fuel/Cleaning).

91. Install a **NEW** fuel injector seal (1) in the cylinder head cover (Figure 139).



**Figure 139 – Upper Sealing Washer**

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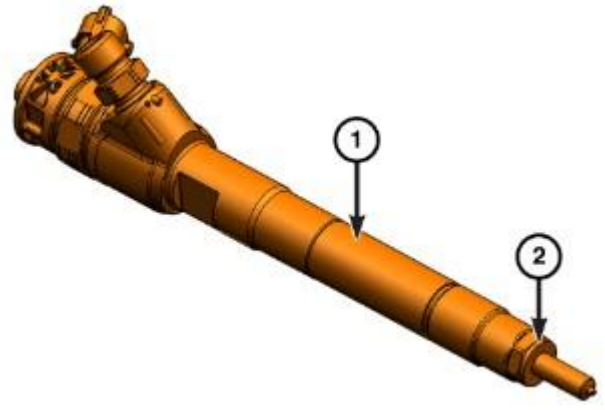


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- 92. Install a **NEW** sealing washer (2) onto the fuel injector (1) (Figure 140).

**NOTE: Do Not apply any lubricant to the fuel injector nozzle. Care must be taken not to restrict the discharge orifices in the nozzle.**



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**Figure 140 – Lower Sealing Washer**

- 93. Lubricate the **NEW** injector body with Nickel Anti-Seize Lubricant (Figure 141).



**Figure 141 – Lubricate the Fuel Injector**

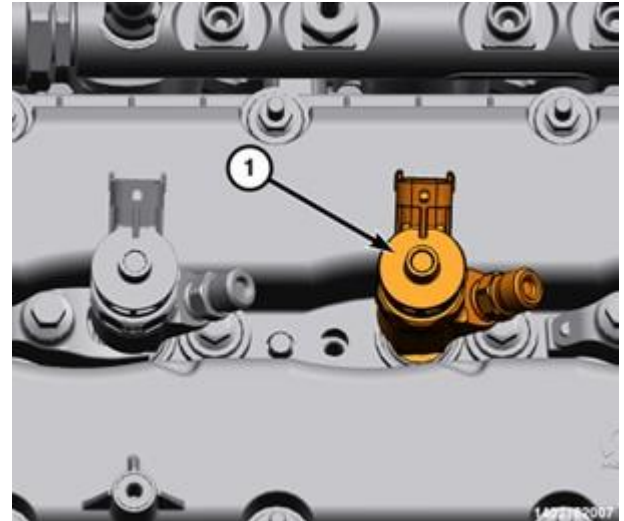
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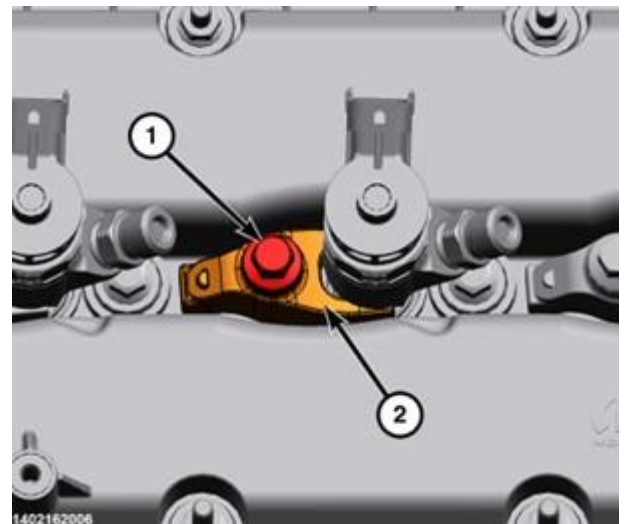
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- 94. Install the fuel injector (1) in the cylinder head (Figure 142).



**Figure 142 – Fuel Injector Bolt**

- 95. Install the fuel injector clamp (2) and tighten the bolt (1) to 33 N-m (24 ft. lbs.) (Figure 143).



**Figure 143– Fuel Injector Bolt and Clamp**

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96. Install the **NEW** fuel rails. Using the Remover-Installer, Fuel Rail Bolt 2025400090 tighten the bolts to 25 N·m (18 ft. lbs.).
97. Connect the fuel pressure sensor harness connector on the RIGHT rail (Figure 129).
98. Install the vacuum actuator with heat shield screws (1) (Figure 138).
99. Install the EGR cooler vacuum bypass hose (1). Be sure this hose is fully seated (Figure 137).
100. Install the fuel injector wire harness connectors (1) (Figure 131).
101. Install the fuel pressure regulator wire harness connector on the LEFT rail (Figure 127).
102. Install low-pressure fuel return line to the hard lines and to the return side of the pump. Leave the fuel supply side disconnected from the pump at this time.
103. Connect the fuel quantity solenoid wire harness connector (2) (Figure 103).
104. Install a **NEW** fuel crossover tube (2) and tighten the union nuts (1, 3) to 11 N·m + 75° (8 ft. lbs. + 75°) (Figure 121).
105. Install the fuel crossover tube bolt (1) and tighten securely (Figure 120).
106. Connect the fuel pressure sensor wire harness connector.
107. Connect the swirl valve wire harness connector.
108. Connect the boost pressure sensor wire harness connector.
109. Install a **NEW** lower turbocharger inlet elbow gasket (Figure 119).
110. Install a **NEW** low pressure EGR valve gasket (Figure 118).
111. Install the upper turbocharger inlet elbow and the low pressure EGR valve to the upper turbocharger inlet elbow bolts and tighten to 11 N·m (8 ft. lbs.) (Figure 118).
112. Install the differential pressure sensor and securely tighten the differential pressure sensor nut (Figure 117).
113. Connect the differential pressure sensor hoses (1) (Figure 117).
114. Connect the differential pressure sensor wire harness connector (1) (Figure 116).
115. Attach the brake booster vacuum hose from the bracket.
116. Install the coolant bottle, bracket, and nuts, and tighten the nuts to 10 N·m (89 In. Lbs.).
117. Attach the vacuum line to the coolant bottle bracket.

**NOTE: The fuel tubes are a one-time only use and must be replaced anytime they have been removed.**

**NOTE: Use a backing wrench on the fuel injector when tightening the union nut.**

118. Install the **NEW** fuel rail supply tubes (1 and 3) at the HPFP and rails. Tighten both ends to 11 N·m + 75° (8 ft. lbs. + 75°) (Figures 103, 122 and 124).

119. Connect the CAC hose from the EGR air flow control valve and secure the retaining clip (1) (Figure 123).

120. Install the fuel tube bracket bolts and securely tighten.

121. Install the **NEW** right side fuel tubes (Figure 111):

- Remove the protective caps from cylinder No. 3 fuel injector and fuel rail.
- Install the **NEW** fuel tube to cylinder No. 3 and tighten the union nuts finger tight.
- Remove the protective caps from cylinder No. 2 fuel injector and fuel rail.
- Install the **NEW** fuel tube to cylinder No. 2 and tighten the union nuts finger tight.
- Remove the protective caps from cylinder No. 1 fuel injector and fuel rail.
- Install the **NEW** fuel tube to cylinder No. 1 and tighten the union nuts finger tight.
- Tighten the fuel rail union nuts to 11 N·m + 75° (8 ft. lbs. + 75°).
- Tighten the fuel injector union nuts to 11 N·m + 75° (8 ft. lbs. + 75°).

122. Install the **NEW** left side fuel tubes (Figure 115):

- Remove the protective caps from cylinder No. 6 fuel injector and fuel rail.
- Install the **NEW** fuel tube to cylinder No. 6 and tighten the union nuts finger tight.
- Remove the protective caps from cylinder No. 5 fuel injector and fuel rail.
- Install the **NEW** fuel tube to cylinder No. 5 and tighten the union nuts finger tight.
- Remove the protective caps from cylinder No. 4 fuel injector and fuel rail.
- Install the **NEW** fuel tube to cylinder No. 4 and tighten the union nuts finger tight.
- Tighten the fuel rail union nuts to 11 N·m + 75° (8 ft. lbs. + 75°).
- Tighten the fuel injector union nuts to 11 N·m + 75° (8 ft. lbs. + 75°).

**NOTE: Do not use any type of lubrication when installing the fuel injector return hose.**

123. Install the fuel injector return hose assembly. Install the fuel injector return hose and be sure it is fully seated. Push down on the lock tab to lock in place (Figures 125 and 126).

124. Install the left fuel rail cover (2) and the left fuel rail cover bolt (1) and tighten securely (Figure 113).

125. Install the vent hose (1) to the left fuel rail cover (Figure 112).

126. Install the lower EGR tube (1) and the EGR tube bolts (2) and tighten to 25 N·m (18 Ft. Lbs.) (Figure 109).



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127. Install the upper Exhaust Gas Recirculation (EGR) tube bolts (1) and tighten to 11 N·m (8 Ft. Lbs.) (Figure 108).
128. Install fasteners to coolant hose support brackets at the front and rear of the engine and tighten securely (Figure 106 and 107).
129. Install the fuel rail cover (2), attach the wire harness retainer (1), and securely tighten the right fuel rail cover nut (3) (Figure 105).
130. Connect the CAC hose to the turbocharger elbow and fasten the retaining clip (Figure 104).
131. Install the Charge Air Cooler (CAC) hose bolt (2) and tighten to 11 N·m (8 Ft. Lbs.) (Figure 104).
132. Remove all fuel from the fuel tank. (Refer to 09 - Engine/Fuel System/Standard Procedure) Use an appropriate fuel container. Dispose of the contaminated fuel using the proper procedures.

**CAUTION: Dispose of petroleum-based products in a manner consistent with all applicable Local, State, Federal, and Provincial regulations.**

133. Remove the fuel tank (Refer to 09 - Engine/Fuel System/TANK, Fuel/Removal and Installation) .
134. Ensure the swirl pot indentation below the in-tank electric fuel pump inlet is completely drained of any contaminated fuel and thoroughly clean the fuel tank.
135. Completely drain the low-pressure fuel lines and flush with clean diesel fuel, then install a **NEW** fuel filter.
136. Install the fuel tank and fill with clean diesel fuel.
137. Install the appropriate Fuel Line Adapters / Fitting from the Decay Tool, Fuel 8978A to the low-pressure feed pipe at the HPFP. Route the opposite end of this hose into a suitable container.
138. Using a diagnostic scan tool, activate the fuel pump to fully purge the low pressure feed line from the tank to the HPFP.
139. Connect the low pressure feed line to the HPFP.
140. Connect a clean hose to the low pressure return line fitting at the tank, and place the other end in a suitable clean container.
141. Using a diagnostic scan tool, activate the fuel pump to fully purge the low pressure fuel return from the HPFP to the tank.
142. Connect the low pressure return line at the tank.
143. Install the fuel tank (Refer to 09 - Engine/Fuel System/TANK, Fuel/Removal and Installation).
144. Connect the negative battery cable(s). In Service Library, see 08 - Electrical / 8F - Engine Systems / Battery System / Standard Procedure / Battery Disconnect - Dual 12 Volt Battery System.
145. Start the engine and check for leaks.

**SAFETY RECALL – NORTH AMERICA**  
**High Pressure Fuel Pump**



Reference: 01A / NHTSA 23V-263

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146. Install the fuel injection pump blocker plate and the fuel injection pump blocker plate bolts to the fuel injection pump and tighten to 25 N·m (18 Ft. Lbs.) (Figure 102).
147. Connect the left CAC hose to the CAC and tighten the left CAC hose clamp (Figure 101).
148. Connect the Charge Air Cooler (CAC) hose to the EGR air flow control valve and secure the retaining lock (1) (Figure 100).
149. Set the air cleaner body (2) and the clean air hose (1) as an assembly into place and press down to seat it on its retainer. Install the air cleaner body bolt (3) and tighten to 5 N·m (44 In. Lbs.) (Figure 99).
150. Install the clamp at the turbocharger air inlet elbow (1). Slide the PCV hose (2) on at the head. Connect the Mass Air Flow electrical connector (3) (Figure 94).
151. Install the engine cover and engine cover bolts and tighten to 4 N·m (35 In. Lbs.) (Figure 98).
152. Install the cooling fan by pushing downwards and toward the radiator to seat it in its retainers (Figure 97).
153. Remove the piece of cardboard between the cooling fan and the radiator.
154. Install the right and left cooling fan bolts and tighten them to 8 N·m (71 In. Lbs.) (Figures 95 and 96).
155. Connect the cooling fan wire harness connectors and attach the wire harness connector to fan shroud (Figure 94).
156. Install the push pin retainers and upper radiator seal (Figure 93).
157. Close the hood and return the vehicle to the customer.

For vehicles with a non-contaminated fuel system, use the procedure below.

## **C. DT Vehicles**

### **Replace HPFP – Non-Contaminated System**

**WARNING:** High-pressure lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 2000 bar (29,008 psi). Use extreme caution when inspecting for high-pressure fuel leaks. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect for high-pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system.

**WARNING:** Observe the following precautions when working on fuel systems: No sparks, open flames or smoking. Avoid inhaling and swallowing fuel. Avoid eye and skin contact with fuel. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing. Failure to observe these precautions may result in fire, explosion, property damage, and serious or fatal injury.

**WARNING:** High-pressure lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 2000 bar (29,008 psi). Use extreme caution when inspecting for high-pressure fuel leaks. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect for high-pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system.

**WARNING:** Observe the following precautions when working on fuel systems: No sparks, open flames or smoking. Risk of poisoning from inhaling and swallowing fuel. Risk of injury to eyes and skin from contact with fuel. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing.

**NOTE:** When key is cycled to the off position, fuel system pressure automatically bleeds down.

**NOTE:** The fuel injection pump can be replaced without having to perform the entire base engine valve timing procedure. This procedure gives instruction on how to remove and install the new fuel injection pump without performing the base engine timing. Do not rotate the pump shaft after removing from the vehicle. The alignment of the pump shaft must be measured and recorded using a commercially available degree wheel after the pump is removed and before transferring the pump gear over to the new pump. This is done to align the pump to the same position during installation. If the base engine valve timing must be performed as part of the repair, refer to Service Library 09 - Engine/Valve Timing/Standard Procedure.

This procedure is for the removal and installation of the fuel injection pump only. The fuel injection pump can be replaced without needing to perform the entire base engine valve timing procedure. This procedure gives instruction on how to properly align the new fuel injection pump. If the base engine valve timing must be performed, (Refer to 09 - Engine/Valve Timing/Standard Procedure). The timing of the pump is crucial and the gear must not be moved once the pump is removed from the timing cover.

# SAFETY RECALL – NORTH AMERICA

## High Pressure Fuel Pump



Reference: 01A / NHTSA 23V-263

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1. Remove and isolate the negative battery cable eyelet from the IBS. This will isolate the 12 volt from the vehicle electrical system (Figure 144).

**NOTE: If removing the negative battery cable clamp from the battery post instead of removing the negative battery cable eyelet, the Intelligent Battery Sensor (IBS) wire harness connector must be disconnecting prior to removing the cable end. Failure to disconnect the IBS wire harness connector can lead to damage of the IBS wire harness connector.**

2. Disconnect the negative battery cable by removing the ground terminal nut (1) (Figure 144).



Figure 144 – Battery Disconnect

3. Remove the two bolts (1) securing the engine cover (2) (Figure 145).
4. Lift up and pull forward and remove the engine cover (2) (Figure 145).



Figure 145 – Engine Cover

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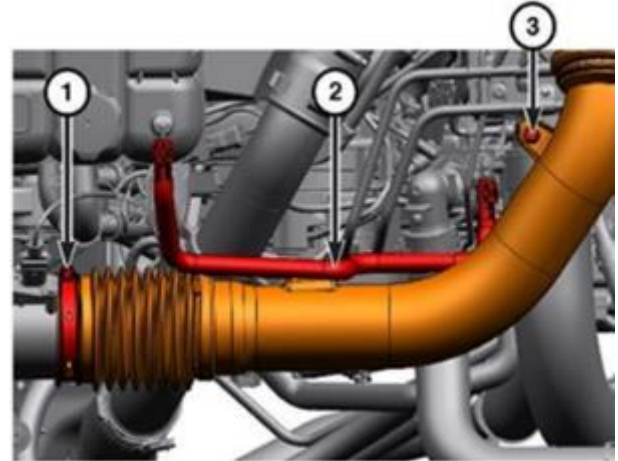
**SAFETY RECALL – NORTH AMERICA**  
**High Pressure Fuel Pump**



Reference: 01A / NHTSA 23V-263

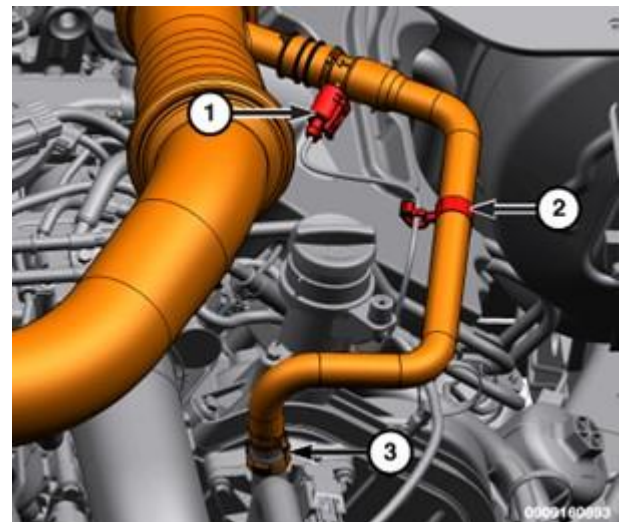
FCA US LLC

5. Loosen the clamp (1) and disconnect the clean air hose (Figure 146).
6. Detach the coolant hose retainer (2) from the clean air hose (Figure 146).
7. Remove the bolt (3) securing the clean air hose (Figure 146).



**Figure 146 – Clean Air Hose**

8. Disconnect the Closed Crankcase Heater Ventilation (CCV) heater wire harness connector (1) (Figure 147).
9. Detach the CCV heater wire harness retainer (2) (Figure 147).
10. Disconnect the crankcase breather hose.



**Figure 147 – Closed Crankcase Ventilation Connector**

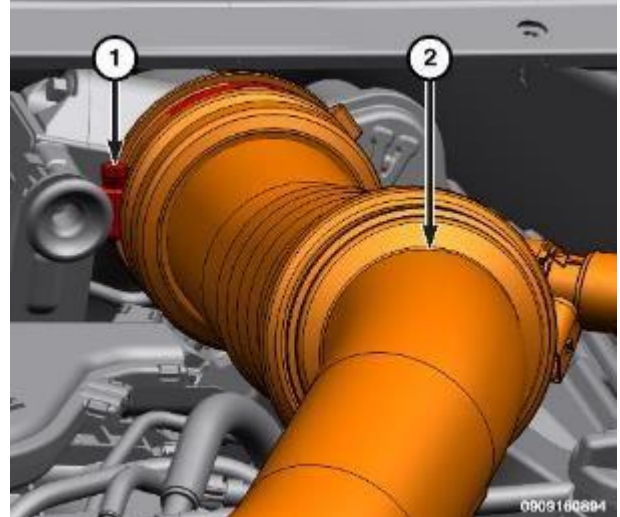
**SAFETY RECALL – NORTH AMERICA**  
**High Pressure Fuel Pump**



Reference: 01A / NHTSA 23V-263

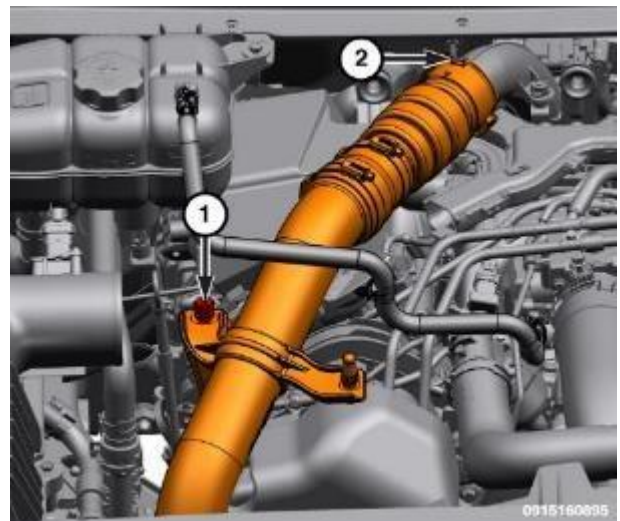
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11. Loosen clamp (1) and remove the clean air hose (2) (Figure 148).



**Figure 148 – Clean Air Hose**

12. Remove the fastener (1) securing the right Charge Air Cooler (CAC) hose (Figure 149).
13. Release the retaining lock (2) and disconnect the right CAC hose from the turbocharger (Figure 149).



**Figure 149 – CAC Hose**

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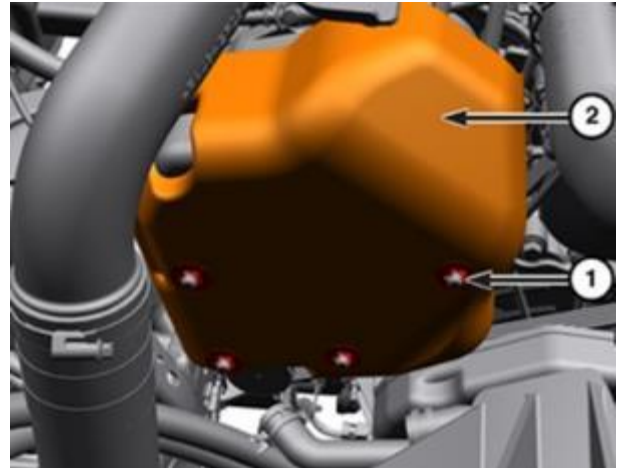
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**High Pressure Fuel Pump**



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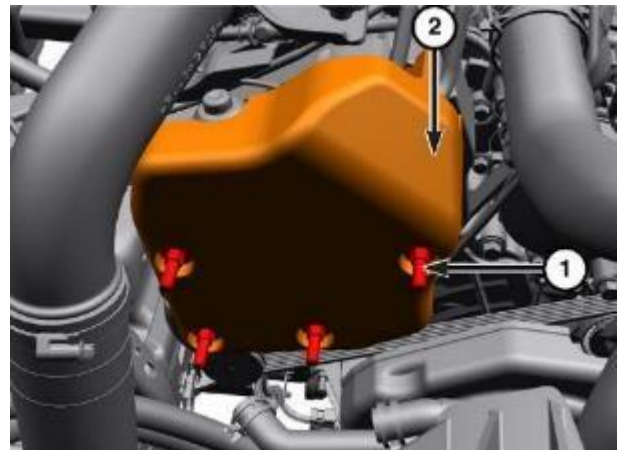
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- 14. Remove the retainers (1) that secure the cover (2) for the high-pressure fuel pump (Figure 150).



**Figure 150 – Pump Cover**

- 15. Remove the bolts (1) securing the sound proofing (2) to the fuel injection pump (Figure 151).



**Figure 151 – Pump Sound Proofing**

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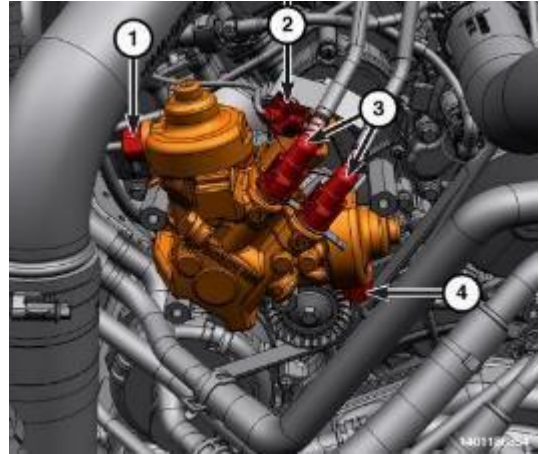
**SAFETY RECALL – NORTH AMERICA**  
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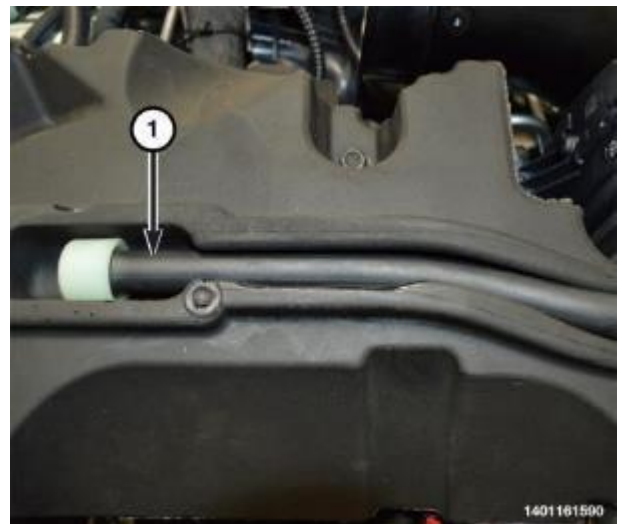
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- 16. Disconnect the fuel injection pump electrical connector (2) (Figure 152).



**Figure 152 – Pump Connections**

- 17. Remove the vent hose (1) from the left fuel rail cover (Figure 153).



**Figure 153 – Left Bank Fuel Rail Cover**

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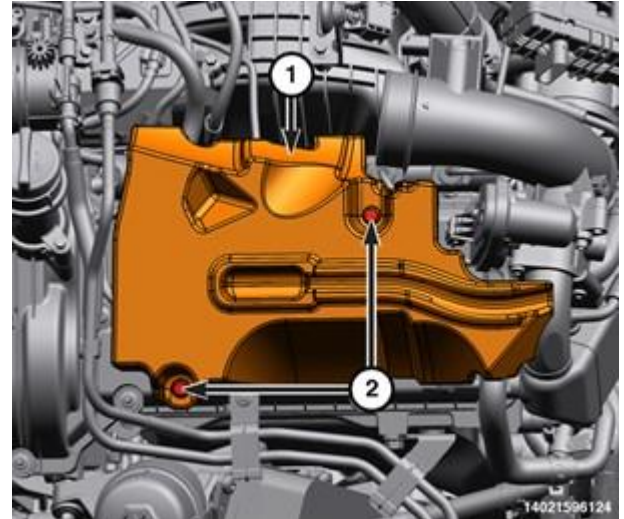
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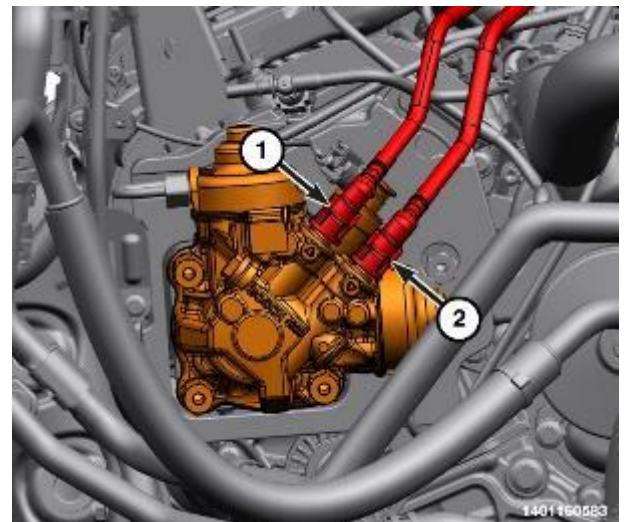
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- 18. Remove the bolts (2) and the left fuel rail cover (1) (Figure 154).



**Figure 154 – Left Bank Fuel Rail Cover Bolts**

- 19. Disconnect the low-pressure supply (2) and return (1) lines from the fuel injection pump (Figure 155).



**Figure 155 – Low Pressure Supply and Return Connections**

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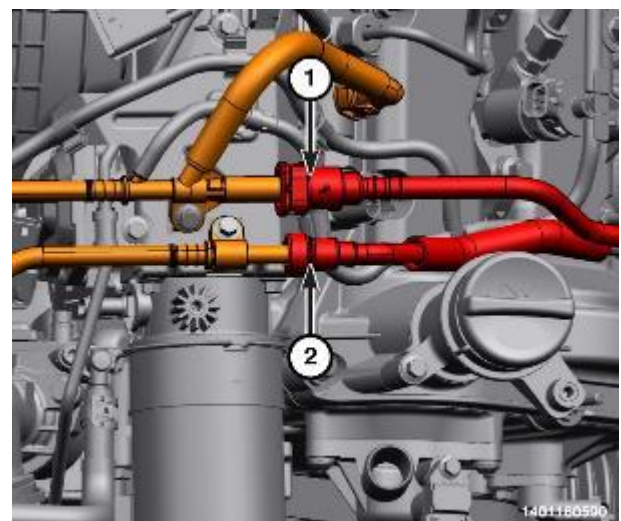
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20. Remove the fuel line supply safety clip (1) (Figure 156).



**Figure 156 – Safety Clip**

21. Disconnect the fuel supply (2) and return (1) lines (Figure 157).



**Figure 157 – Fuel Supply and Return Lines**

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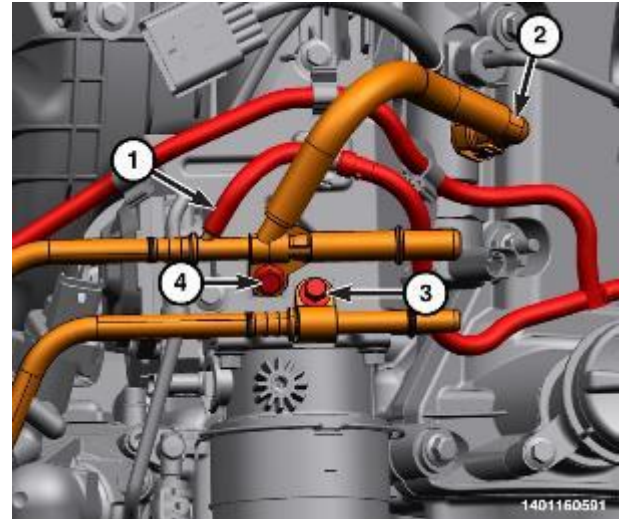
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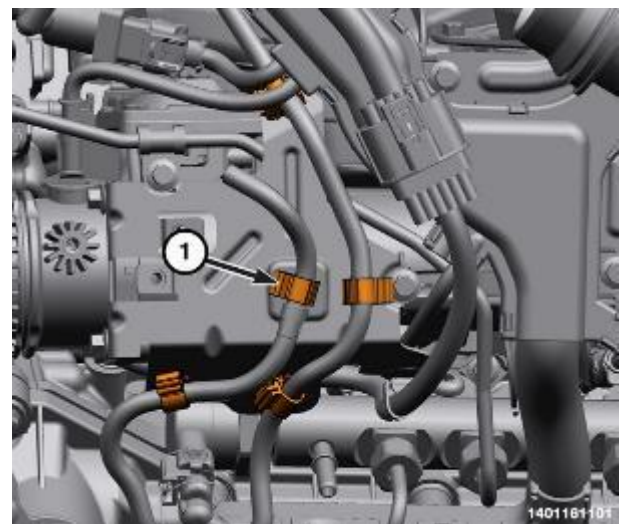
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- 22. Disconnect the fuel return lines (1, 2) (Figure 158).
- 23. Remove the fuel supply line bolt (3) and return line bolt (4) and both lines (Figure 158).



**Figure 158 – Return Lines (1,2) and Bolts (3,4)**

- 24. Detach the retainers (1) securing the fuel return hose to the fuel line support bracket (Figure 159).



**Figure 159 – Return Hose Retainers**

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# SAFETY RECALL – NORTH AMERICA

## High Pressure Fuel Pump



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- 25. Detach the wire harness retainer (3) (Figure 160).
- 26. Remove the bolts (1) fuel line support bracket (2) (Figure 160).

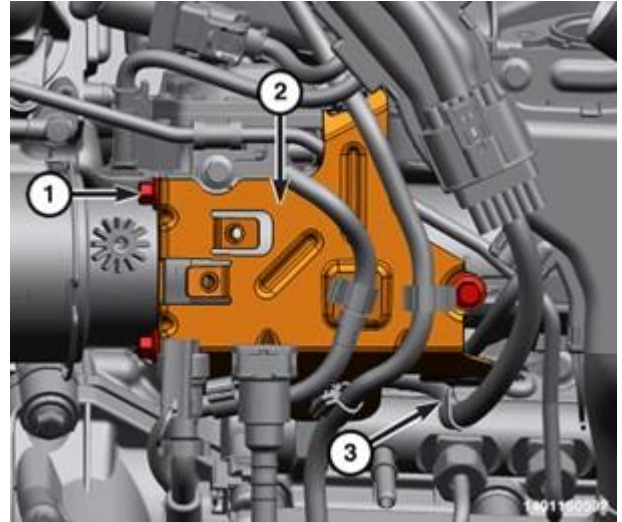


Figure 160 – Return Hose Retainers

- 27. Unscrew the union nut (1) from the fuel injection pump (Figure 161).

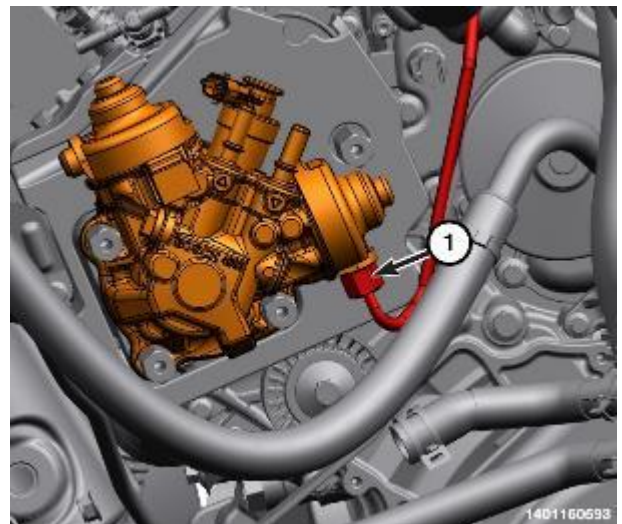


Figure 161 – Union Nut

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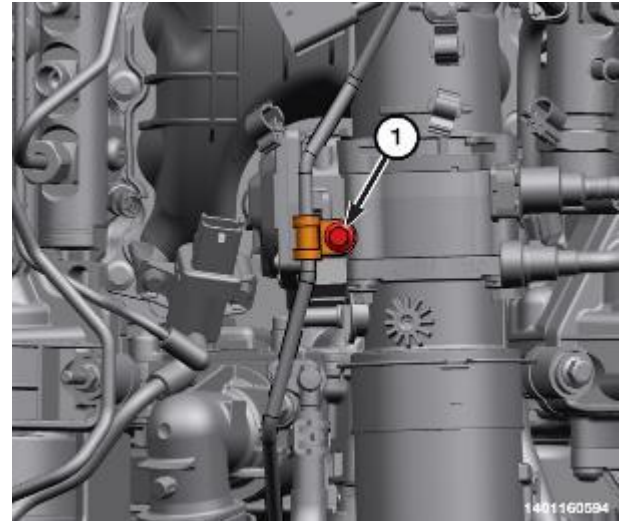
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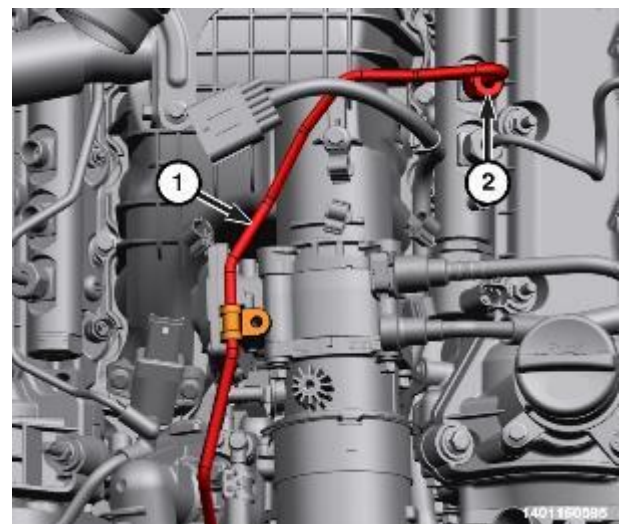
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- 28. Remove the bolt (1) securing the fuel tube (Figure 162).



**Figure 162 – Pipe Bolt**

- 29. Unscrew the union nut (2) and remove the fuel tube (1) and then discard the fuel tube (Figure 163).



**Figure 163 – Tube Union Nut**

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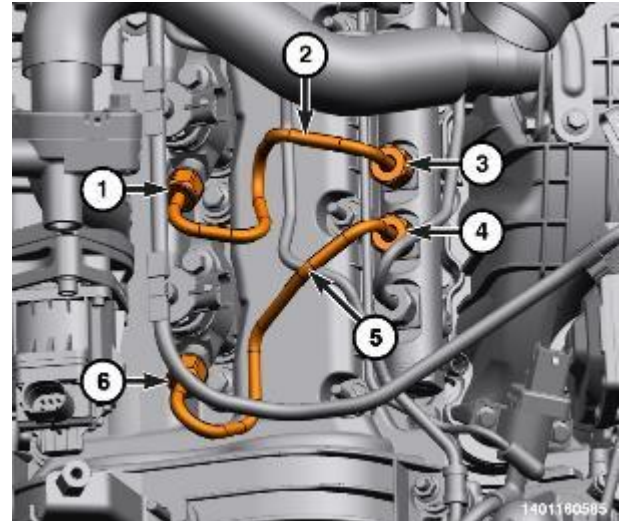
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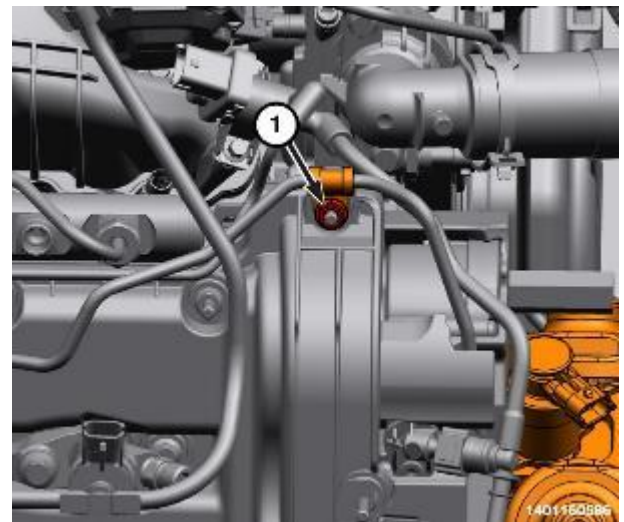
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- 30. Remove and discard the right-side fuel tubes (5, 2) from fuel injectors No. 1 and 2 (Figure 164).



**Figure 164 – Fuel Tubes**

- 31. Remove the nut (1) securing the fuel tube (Figure 165).



**Figure 165 – Pipe Nut**

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# SAFETY RECALL – NORTH AMERICA

## High Pressure Fuel Pump



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- 32. Unscrew the union nuts (1, 3) and remove and discard the fuel tube (2) (Figure 166).

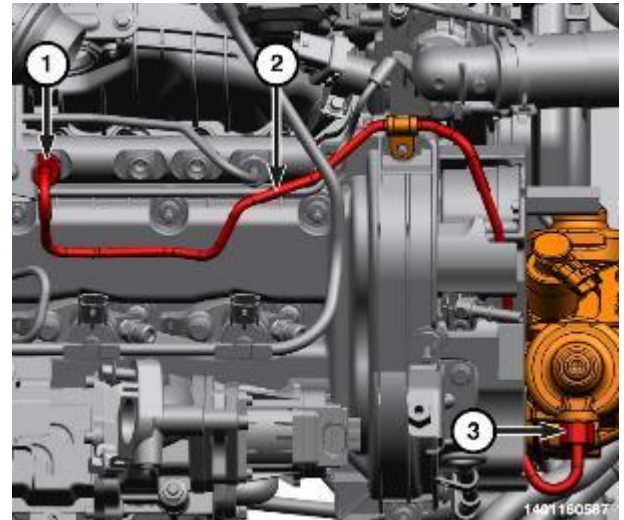


Figure 166 – Union Nuts

- 33. Remove the upper bolts (1) from the high-pressure pump (2) (Figure 167).

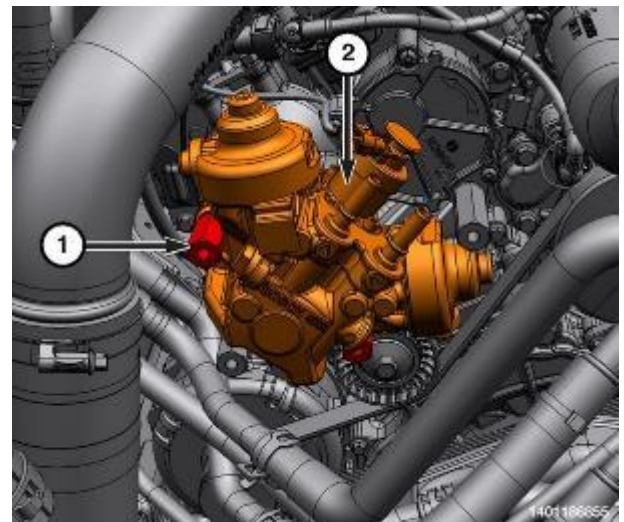


Figure 167 – Upper Bolts

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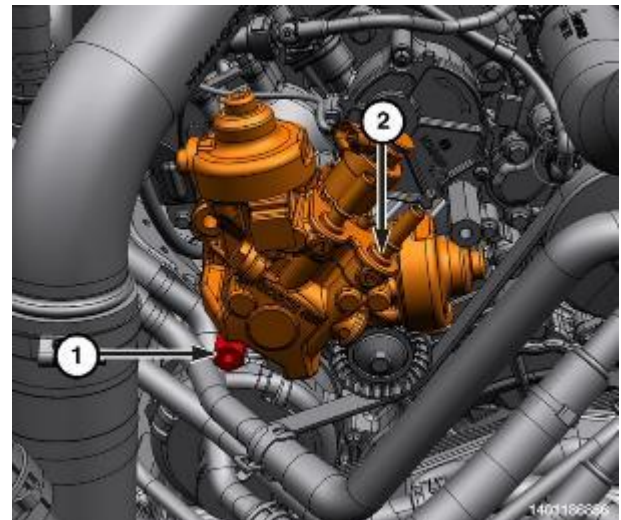
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34. Using the Tool, High Pressure Pump Installation VM.10345 install the studs in the upper locations.

**NOTE: The timing of the pump is crucial, and the gear must not be moved once the pump is removed from the timing cover.**

35. Remove the lower bolt (1) from the HPFP (2) and remove it from the vehicle (Figure 168).

**NOTE: The fuel injection pump needs to be timed using a commercially available degree wheel.**



**Figure 168 – Lower Bolt**

36. Install the degree wheel onto the pump with the zero at the fuel quantity solenoid then mark the location of the hole in the gear on the degree wheel (Figure 169).



**Figure 169 – Installing a Printed Paper Degree Wheel from the Internet**



# SAFETY RECALL – NORTH AMERICA

## High Pressure Fuel Pump



Reference: 01A / NHTSA 23V-263

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- 37. Using a commercially available spanner wrench such as Blue Point APS351B, Snap-on APS351C or equivalent to hold fuel injection pump gear. Remove the fuel injection pump gear nut (Figure 170).



Figure 170 – Installing the Drive Gear on the HPFP

- 38. The use of Puller 1023 or a commercially available gear puller is required to remove the fuel injection pump gear (2) (Figure 171).

**WARNING:** High-pressure lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 2000 bar (29,008 psi). Use extreme caution when inspecting for high-pressure fuel leaks. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect for high-pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system.

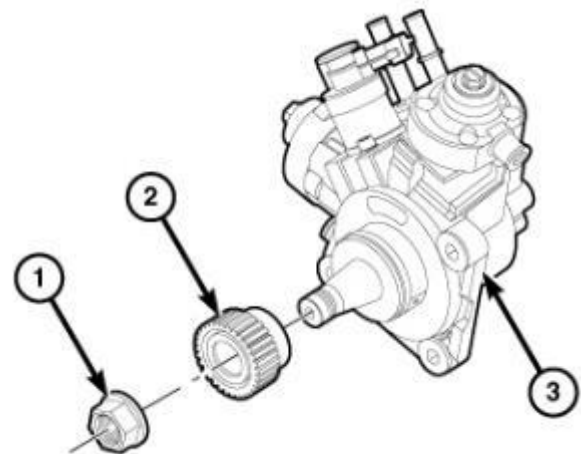


Figure 171 – Swapping the Drive Gear on the HPFP

**CAUTION:** Do Not Force the high-pressure pump into the right timing cover or attempt to seat it by drawing it in with the bolts. The pump gear must be properly aligned with the drive gear on the camshaft before the high-pressure pump will seat on the cylinder head mounting surface. Failure to properly align drive gears will damage the high-pressure pump or camshaft drive gear.

**NOTE:** The high-pressure pump needs to be timed before it can be installed. Use a commercially available degree wheel to time the high-pressure pump.

39. If removed, install the gear (2) and nut (1) onto the high-pressure pump (3) and tighten the nut (1) finger tight (Figure 171).
40. Using a commercially available spanner wrench (2) such as Blue Point APS35IB or equivalent and tighten the nut (1) to 50 N·m (37 Ft. Lbs.) (Figure 170).
41. Install the degree wheel with the zero in line with the fuel quantity solenoid and rotate the pump shaft so that the hole aligns with the reference mark on the degree wheel referenced during the removal (Figure 172).



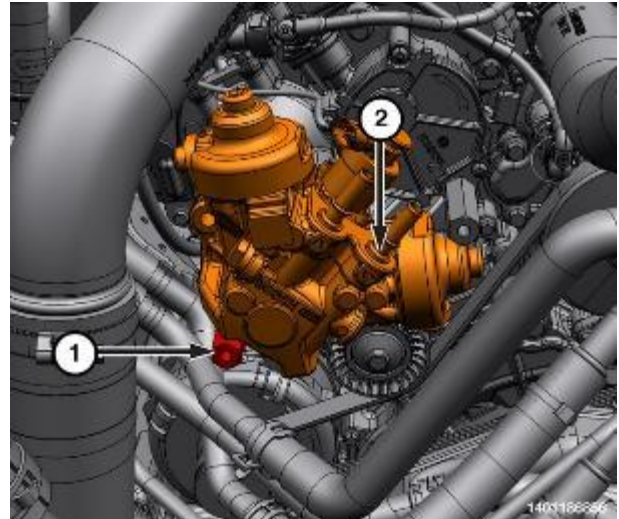
**Figure 172 – Installing a Printed Paper Degree Wheel from the Internet**

42. Install a **NEW** O-ring seal (1) to the high-pressure fuel injection pump (Figure 173).



**Figure 173 – HPFP O-ring**

43. Install the HPFP onto the Tool, High Pressure Pump Installation VM.10345 installed in the upper timing cover.
44. Install the HPFP (2) and hand tighten the bolt (1) (Figure 174).
45. Remove the Tool, High Pressure Pump Installation VM.10345 from the upper bolt locations.
46. Tighten the bolts (1) that secure the high-pressure pump to 25 N·m (18 Ft. Lbs.).
47. Connect the HPFP electrical connector (2) (Figure 152).



**Figure 174 – HPFP Bolt**

48. Connect the low-pressure fuel supply and return lines (3) (Figure 155).
49. Install a **NEW** fuel tube (2) and hand tighten the union nuts (1, 3). Tighten the union nuts (1,3) to 11 N·m + 75° (8 Ft. Lbs. + 75°) (Figure 166).
50. Install the nut (1) securing the fuel tube and tighten to 11 N·m (8 Ft. Lbs.) (Figure 165).
51. Install the **NEW** right-side fuel tubes (5, 2) to the fuel injectors No. 1 and 2 and to the fuel rail and hand tighten the nuts. Tighten the union nuts to 11 + 75° (8 + 75°) (Figure 164).
52. Install the **NEW** left-side fuel tube (1) to the fuel rail and pump and hand tighten the union nuts. Tighten the union nuts to 11 + 75° (8 + 75°) (Figures 161 and 163).
53. Install the bolt (1) securing the fuel tube and tighten to 11 N·m (8 Ft. Lbs.) (Figure 162).
54. Install the bolts (1) to the fuel line support bracket (2) and tighten to 11 N·m (8 Ft. Lbs.) (Figure 160).
55. Attach the wire harness retainer (3) (Figure 160).
56. Attach the retainers (1) securing the fuel return hose to the fuel line support bracket (Figure 159).
57. Install the fuel supply line bolt (3) and return line bolt (4) and both lines and tighten securely (Figure 158).
58. Connect the fuel return lines (1, 2) (Figure 158).
59. Connect the fuel supply (2) and return (1) lines (Figure 157).
60. Install the fuel line supply safety clip (1) (Figure 156).
61. Connect the low-pressure supply (2) and return (1) lines to the fuel injection pump (Figure 155).
62. Install the bolts (2) and the left fuel rail cover (1) and tighten securely (Figure 154).
63. Install the vent hose (1) to the left fuel rail cover (Figure 153).

64. Connect the fuel injection pump electrical connector (2) (Figure 152).
65. Install the bolts (1) securing the sound proofing (2) to the fuel injection pump and tighten to 25 N·m (18 Ft. Lbs.) (Figure 151).
66. Install the retainers (1) that secure the cover (2) for the high-pressure fuel pump (Figure 150).
67. Secure the retaining lock and connect the right CAC hose (2) to the turbocharger (Figure 149).
68. Install the fastener (1) securing the right Charge Air Cooler (CAC) hose and tighten securely (Figure 149).
69. Install the clean air hose (2) and tighten the clamp (1) (Figure 148).
70. Connect the crankcase breather hose.
71. Attach the CCV heater wire harness retainer (2) (Figure 147).
72. Connect the Closed Crankcase Heater Ventilation (CCV) heater wire harness connector (1) (Figure 147).
73. Install the bolt (3) securing the clean air hose (Figure 146).
74. Attach the coolant hose retainer (2) to the clean air hose (Figure 146).
75. Connect the clean air hose and tighten the clamp (1) (Figure 146).
76. Pull rearward and press down to install the engine cover (2) (Figure 145).
77. Install the two bolts (1) securing the engine cover (2) and tighten securely (Figure 145).
78. Connect the negative battery cable by installing the ground terminal nut (Figure 144).
79. Install the negative battery cable eyelet to the IBS (Figure 144).

For vehicles with a non-contaminated fuel system, use the procedure below.

## **D. JL/JT Vehicles**

### **Replace HPFP – Non-Contaminated System**

**WARNING:** High-pressure lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 2000 bar (29,008 psi). Use extreme caution when inspecting for high-pressure fuel leaks. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect for high-pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system.

**WARNING:** Observe the following precautions when working on fuel systems: No sparks, open flames or smoking. Avoid inhaling and swallowing fuel. Avoid eye and skin contact with fuel. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing. Failure to observe these precautions may result in fire, explosion, property damage, and serious or fatal injury.

**WARNING:** High-pressure lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 2000 bar (29,008 psi). Use extreme caution when inspecting for high-pressure fuel leaks. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect for high-pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system.

**WARNING:** Observe the following precautions when working on fuel systems: No sparks, open flames or smoking. Risk of poisoning from inhaling and swallowing fuel. Risk of injury to eyes and skin from contact with fuel. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing.

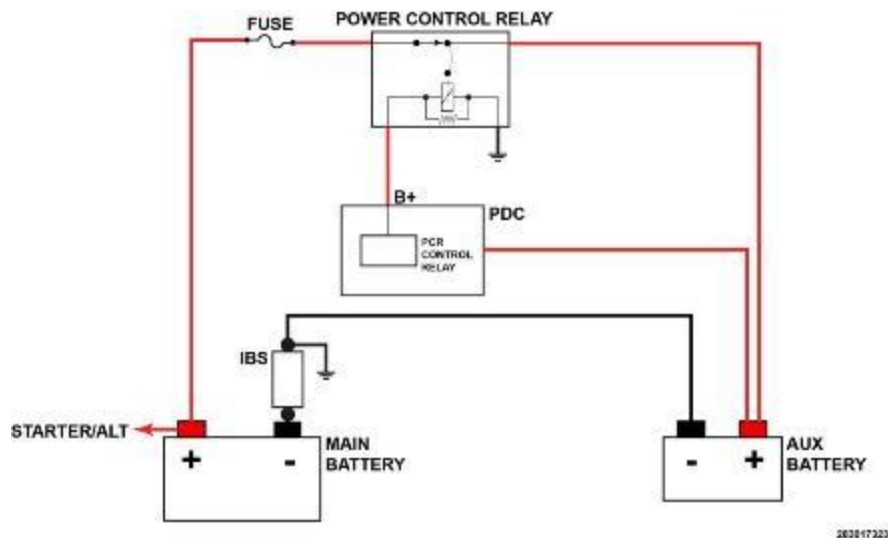
**NOTE:** When key is cycled to the off position, fuel system pressure automatically bleeds down.

**NOTE:** The fuel injection pump can be replaced without having to perform the entire base engine valve timing procedure. This procedure gives instruction on how to remove and install the new fuel injection pump without performing the base engine timing. Do not rotate the pump shaft after removing from the vehicle. The alignment of the pump shaft must be measured and recorded using a commercially available degree wheel after the pump is removed and before transferring the pump gear over to the new pump. This is done to align the pump to the same position during installation. If the base engine valve timing must be performed as part of the repair, refer to Service Library 09 - Engine/Valve Timing/Standard Procedure.

This procedure is for the removal and installation of the fuel injection pump only. The fuel injection pump can be replaced without needing to perform the entire base engine valve timing procedure. This procedure gives instruction on how to properly align the new fuel injection pump. If the base engine valve timing must be performed, (Refer to 09 - Engine/Valve Timing/Standard Procedure). The timing of the pump is crucial, and the gear must not be moved once the pump is removed from the timing cover.

**Battery Disconnect**

1. On this dual battery system, the auxiliary battery ground cable connects to the main battery cable end (shown in generic graphic) and grounds through the main battery ground cable connection to the body, chassis or engine (depending on vehicle). Therefore, simply disconnecting and isolating the main battery negative cable clamp from the main battery post will not isolate the auxiliary from the vehicle's electrical system. The auxiliary battery will still be grounded through its connection to the main battery negative cable end. If both battery negative cables are not isolated, it will result in the vehicle electrical system and Power Distribution Center (PDC) still having battery connection which can cause vehicle wiring damage or deployment of air bags on re-connection (Figure 175). In Service Library, see 08 - Electrical / 8F - Engine Systems / Battery System / Standard Procedure / Battery Disconnect - Dual 12 Volt Battery System.



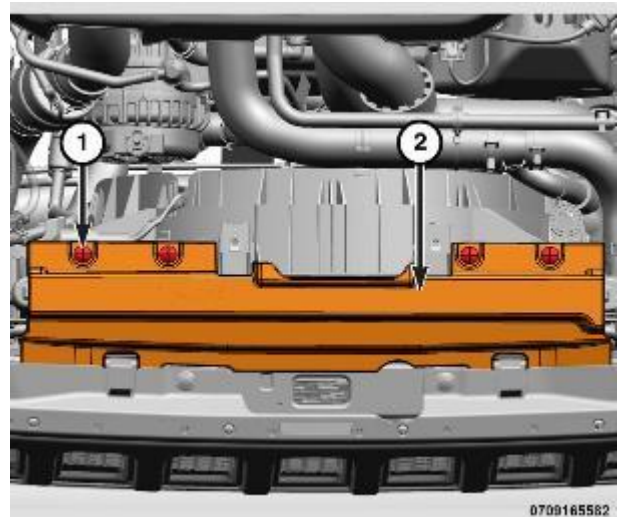
**Figure 175 – Dual Battery System**

2. Turn the ignition off. Wait five minutes to allow the main modules to go to sleep.
3. Disconnect and isolate the supplemental (auxiliary) battery negative cable from the main battery negative cable end. This will disconnect and isolate the auxiliary battery ground.
4. The main battery ground can be disconnected by removing the main battery negative cable from the negative battery cable end, or by disconnecting the IBS connector, loosening the negative battery clamp nut and removing the negative battery cable end from the battery post. Either method will disconnect the main battery. Both batteries should be disconnected from the vehicle electrical system.
5. Measure the voltage at the PDC positive battery cable connection to verify the vehicle electrical system is powered down.

**NOTE: On some vehicles a small amount of voltage may be present (typically less than approximately 0.5 volts) due to capacitors in some modules still having voltage stored. Anything less than 1.0 volts should be safe.**

**Cooling Fan - Remove**

6. Remove the push pins retainers (1) and upper radiator seal (2) (Figure 176).



**Figure 176 – Upper Radiator Seal**

7. Disconnect the cooling fan wire harness connectors and detach the wire harness connector from fan shroud (1) (Figure 177).



**Figure 177 – Fan Electrical Connector**

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8. Remove the left cooling fan bolt (1) (Figure 178).



**Figure 178 – Left Cooling Fan Bolt**

9. Remove the right cooling fan bolt (1) (Figure 179).



**Figure 179 – Right Cooling Fan Bolt**

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10. Insert a piece of cardboard between the cooling fan and the radiator.
11. Remove the cooling fan (1) by pulling upwards and away from the radiator (Figure 180).

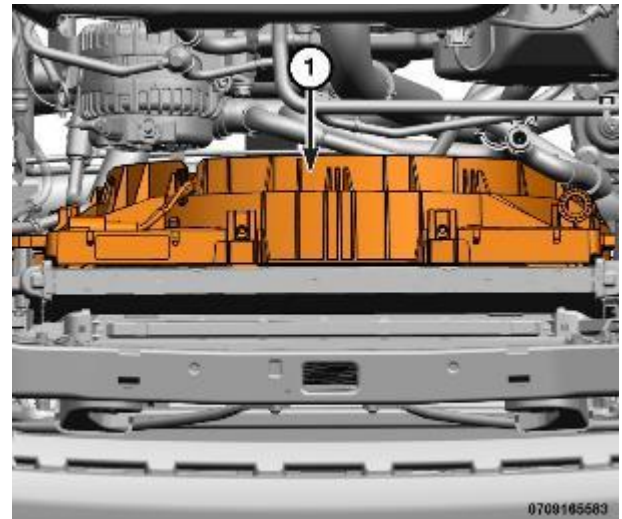


Figure 180 – Cooling Fan

# SAFETY RECALL – NORTH AMERICA

## High Pressure Fuel Pump



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12. Remove the fuel injection pump blocker plate bolts (2) and the fuel injection pump blocker plate (1) from the fuel injection pump (Figure 181).
13. Remove the fuel injection pump silencer.
14. Remove the engine cover.

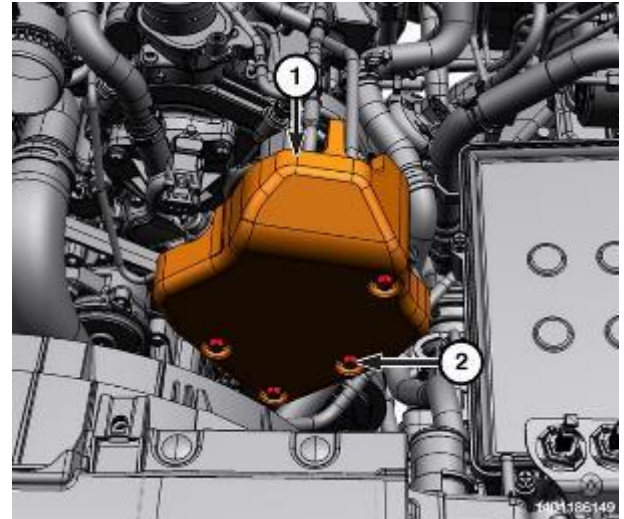


Figure 181 – HPFP Blocker Plate

15. Disconnect the crankcase breather hose (3) (Figure 182).
16. Disconnect the Closed Crankcase Ventilation (CCV) heater wire harness connector (1) and detach the wire harness retainer (2) (Figure 182).
17. Disconnect the clean air hose from the air cleaner body.

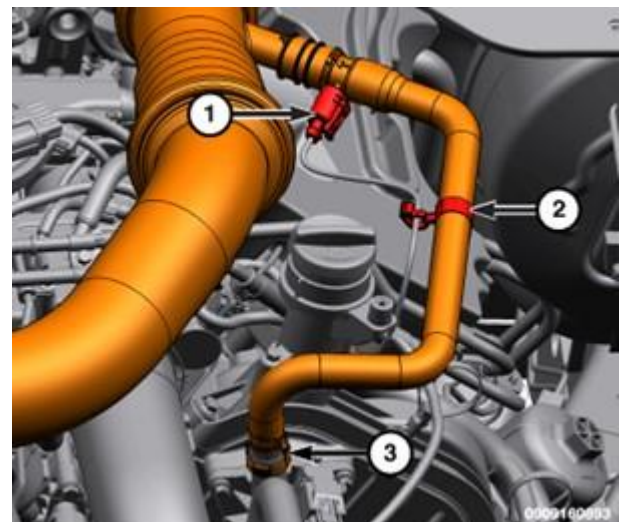


Figure 182 – Clean Air Hose

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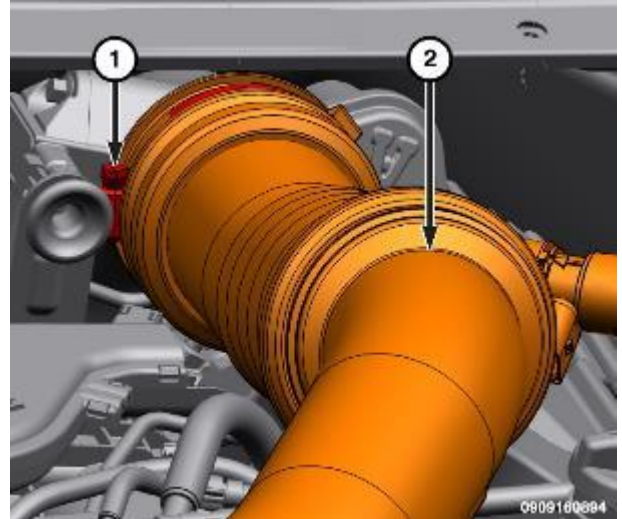
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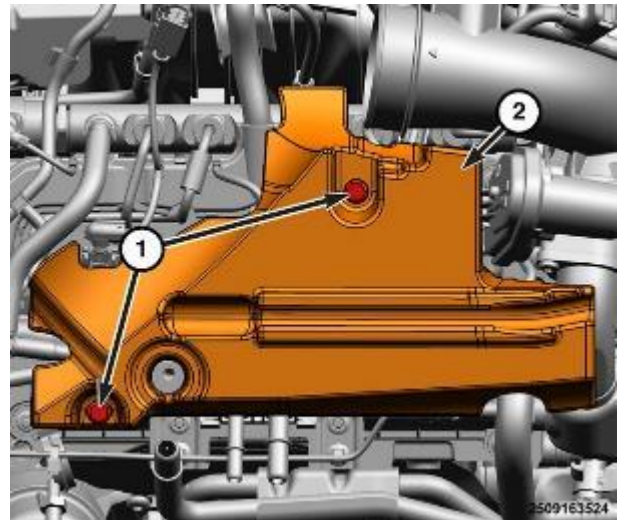
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- 18. Loosen clean air hose clamp (1) and remove the clean air hose from the turbocharger elbow (Figure 183).



**Figure 183 – Clean Air Hose at Turbo**

- 19. Remove the vent hose from the left fuel rail cover.
- 20. Remove the left fuel rail cover bolts (1) and the left fuel rail cover (2) (Figure 184).



**Figure 184 – Left Fuel Rail Cover**

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## High Pressure Fuel Pump



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21. Disconnect the low-pressure supply (2) and low pressure return lines (1) from the fuel injection pump (Figure 185).

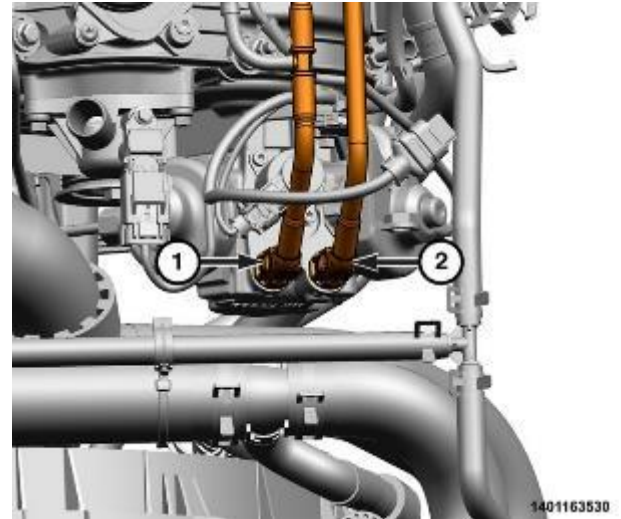


Figure 185 – Low Pressure Lines

22. Unscrew the union nuts (1 & 3) and remove cylinder No. 4 fuel tube (2) and discard the fuel tube (Figure 186).
23. Install protective caps onto the fuel injector and fuel rail.

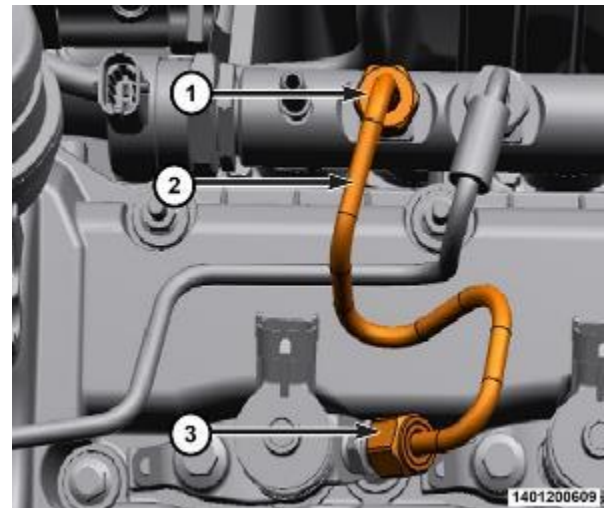


Figure 186 – No. 4 Fuel Tube

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## High Pressure Fuel Pump



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24. Unscrew the fuel tube union nut from the fuel injection pump (3) (Figure 187).
25. Remove the fuel tube bracket nut (2) securing the fuel tube (Figure 187).
26. Unscrew the union nut from the fuel rail (1) and remove and discard the fuel tube (Figure 187).
27. Install protective caps onto the fuel injection pump and fuel rail.

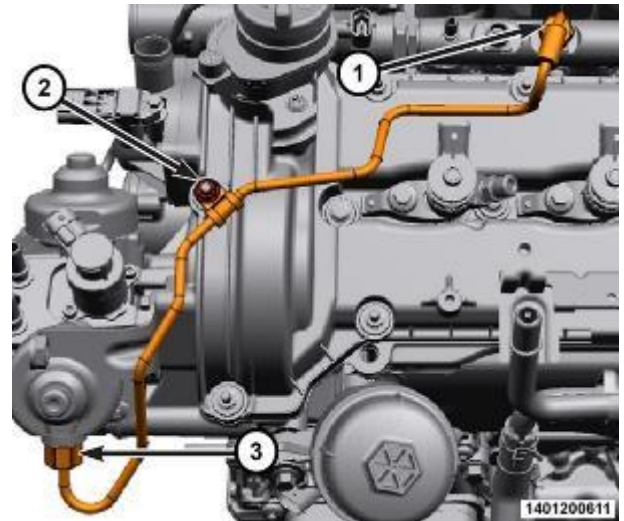


Figure 187 – Left Fuel Rail Supply Tube

28. Remove the Charge Air Cooler (CAC) hose bolt (2) securing the CAC hose to the support bracket (Figure 188).
29. Release the retaining clip (1) and disconnect the CAC hose from the turbocharger elbow and position aside (Figure 188).

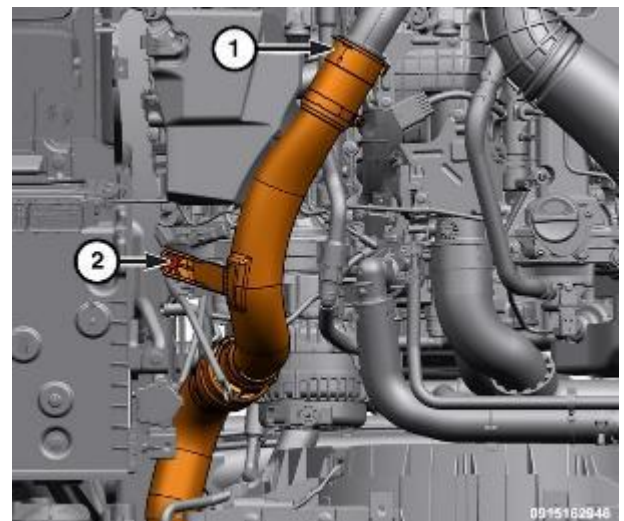


Figure 188 – Charge Air Cooler (CAC) Hose

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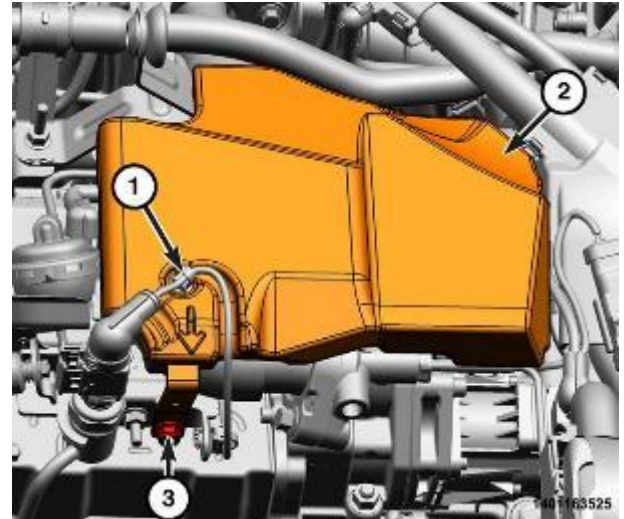
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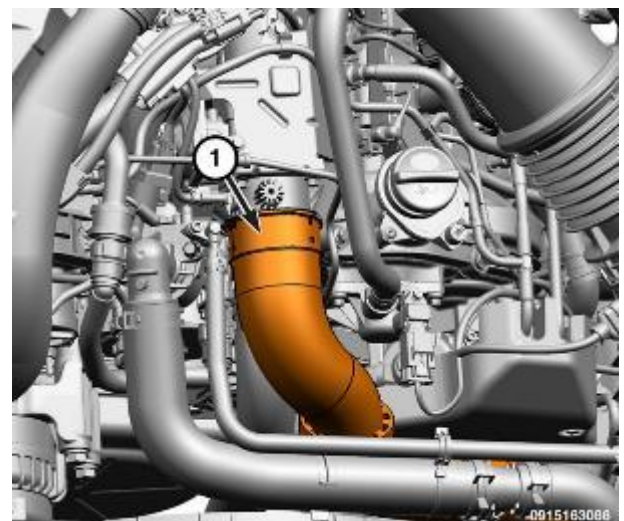
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30. Loosen the right fuel rail cover nut (3), detach the wire harness retainer (1), and remove the fuel rail cover (2) (Figure 189).



**Figure 189 – Right Fuel Rail Cover**

31. Release the retaining clip (1) and disconnect the CAC hose from the EGR air flow control valve (Figure 190).



**Figure 190 – CAC Hose**

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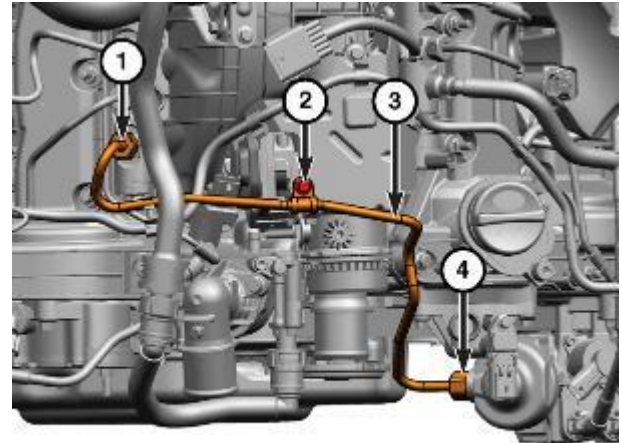
## High Pressure Fuel Pump



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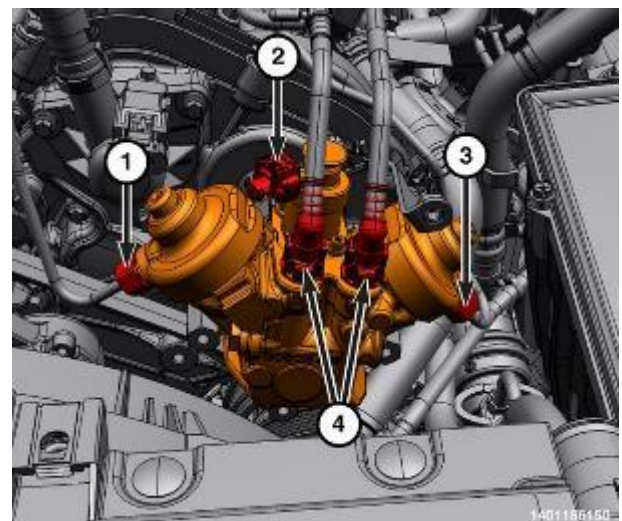
- 32. Remove the fuel tube bolt (2) securing the fuel tube (191).
- 33. Unscrew the union nuts (1 & 4) and remove and discard the fuel tube (3) (Figure 191).
- 34. Install protective caps over the openings.



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**Figure 191 – Right Fuel Rail Supply Tube**

- 35. Disconnect the fuel quantity solenoid wire harness connector (2) (Figure 192).



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**Figure 192 – Fuel Quantity Solenoid Wire Harness Connector**

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- 36. Remove the fuel injection pump upper bolts (1) from the fuel injection pump (Figure 193).
- 37. Install the Tool, High Pressure Pump Installation VM.10345 in the upper locations.

**NOTE: The timing of the pump is crucial and the gear must not be moved once the pump is removed from the timing cover.**

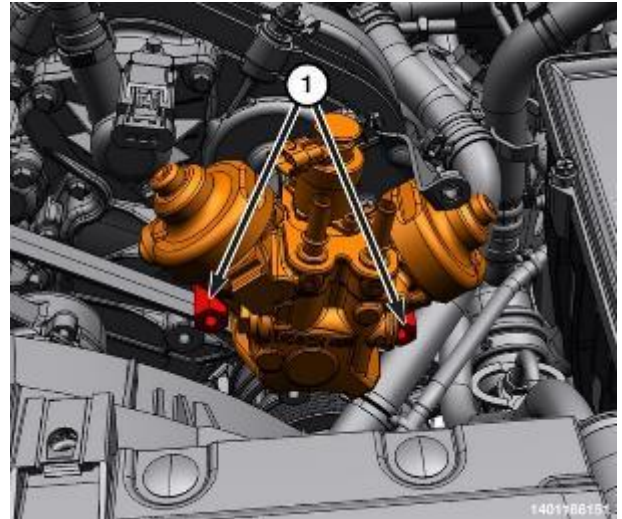


Figure 193 – HPFP Upper Bolts

- 38. Remove the fuel injection pump lower bolt (1) and the fuel injection pump (2) (Figure 194).

**NOTE: The fuel injection pump needs to be timed using a commercially available degree wheel.**

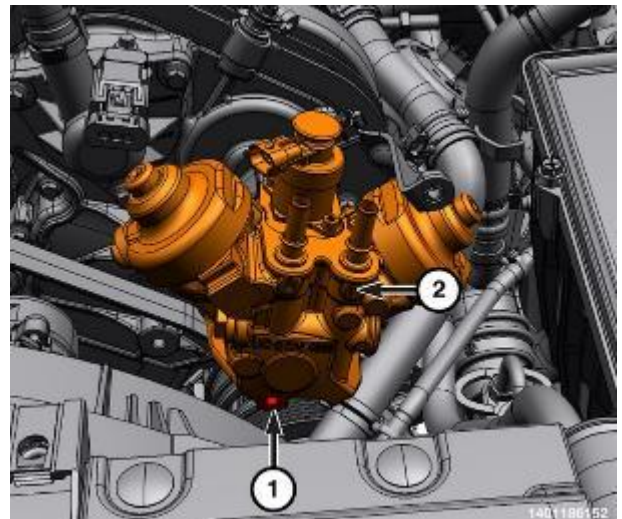


Figure 194 – HPFP Lower Bolt



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39. Install the degree wheel onto the fuel injection pump with the zero at the fuel quantity solenoid then mark the location of the hole in the gear on the degree wheel (Figure 195).



**Figure 195 – Installing a Printed Paper Degree Wheel from the Internet**

40. Using a commercially available spanner wrench such as Blue Point APS35IB, Snap-on APS351C or equivalent to hold fuel injection pump gear. Remove the fuel injection pump gear nut (Figure 196).



**Figure 196 – Gear Nut Removal**

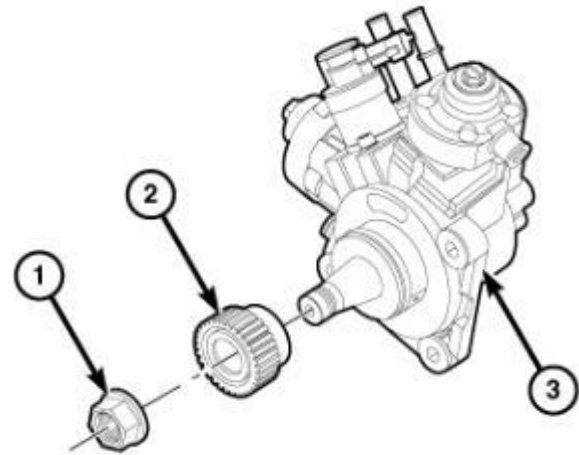
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41. The use of Puller 1023 or a commercially available gear puller is required to remove the fuel injection pump gear (2) (Figure 197).



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**Figure 197 – Swapping the Drive Gear on the HPFP**

**WARNING:** High-pressure lines deliver diesel fuel under extreme pressure from the injection pump to the fuel injectors. This may be as high as 2000 bar (29,008 psi). Use extreme caution when inspecting for high-pressure fuel leaks. Fuel under this amount of pressure can penetrate skin causing personal injury or death. Inspect for high-pressure fuel leaks with a sheet of cardboard. Wear safety goggles and adequate protective clothing when servicing fuel system.

**CAUTION:** Do Not Force the high-pressure pump into the right timing cover or attempt to seat it by drawing it in with the bolts. The pump gear must be properly aligned with the drive gear on the camshaft before the high-pressure pump will seat on the cylinder head mounting surface. Failure to properly align drive gears will damage the high-pressure pump or camshaft drive gear.

**NOTE:** The high-pressure pump needs to be timed before it can be installed. Use a commercially available degree wheel to time the high-pressure pump.

42. If removed, install the gear (2) and (1) nut onto the fuel injection pump (3) and tighten the nut finger tight (Figure 197).

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- 43. Using a commercially available spanner wrench such as Blue Point APS351B, Snap-on APS351C or equivalent (2) and tighten the fuel injection pump gear nut (1) to 50 N·m (37 Ft. Lbs.) (Figure 198).



Figure 198 – Gear Nut Removal

- 44. Install the degree wheel with the zero aligned with the fuel quantity solenoid and rotate the pump shaft so that the hole aligns with the reference mark on the degree wheel referenced during the removal (Figure 199).



Figure 199 – Installing a Printed Paper Degree Wheel from the Internet

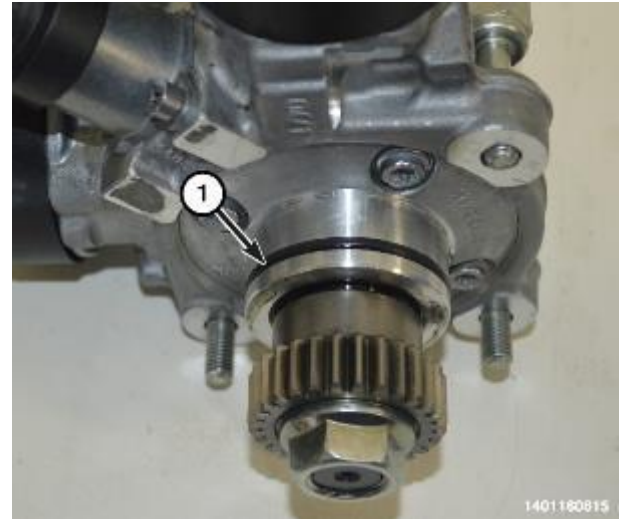
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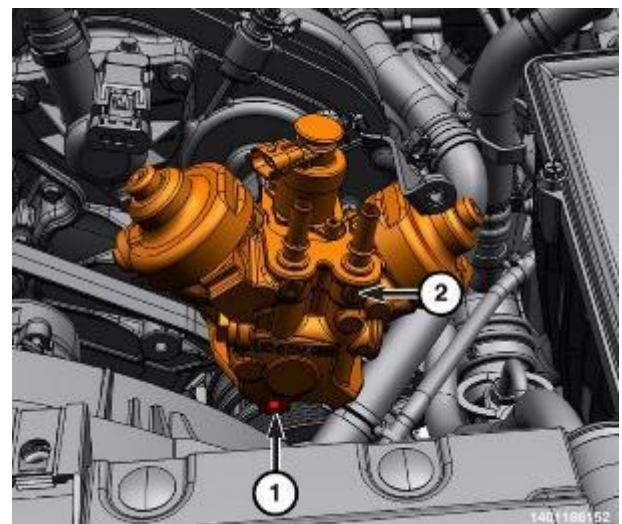
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- 45. Install a **NEW** O-ring (1) to the high-pressure fuel injection pump (Figure 200).



**Figure 200 – O-ring**

- 46. Install the fuel injection pump onto the Tool, High Pressure Pump Installation VM.10345 into the studs installed in the upper timing cover.
- 47. Install the fuel injection pump (2) and hand tighten the lower bolt (1) (Figure 201).



**Figure 201 – HPFP Lower Bolt**

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48. Remove the Tool, High Pressure Pump Installation VM.10345 and install the high-pressure fuel injection pump upper bolts (Figure 193).
49. Tighten the high-pressure fuel injection pump upper and lower bolts to 25 N·m (18 Ft. Lbs.).
50. Connect the fuel quantity solenoid wire harness connector (2) (Figure 192).
51. Connect the low-pressure fuel supply/return lines (4) (Figure 192).
52. Remove the protective caps over the openings.

**NOTE: Fuel tubes are a onetime only use and must be replaced anytime they have been removed.**

53. Start the union nuts (1 & 4) on the **NEW** fuel tube (3). Tighten the union nuts (1,3) to 11 N·m + 75° (8 Ft. Lbs. + 75°) (Figure 191).
54. Install the fuel tube bolt (2) securing the fuel tube and tighten securely (191).
55. Connect the CAC hose to the EGR air flow control valve and secure the retaining clip (1) (Figure 190).
56. Install the fuel rail cover (2), attach the wire harness retainer (1), and tighten the right fuel rail cover nut (3) to 5 N·m (44 In. Lbs.) (Figure 189).
57. Install the Charge Air Cooler (CAC) hose bolt (2) securing the CAC hose to the support bracket and tighten to 11 N·m (8 Ft. Lbs.) (Figure 188).
58. Attach the retaining clip (1) and connect the CAC hose from the turbocharger elbow (Figure 188).
59. Remove protective caps from the fuel injection pump and fuel rail.
60. Install the **NEW** fuel tube. Hand tighten the union nuts to the fuel rail (1) and tighten to 11 N·m + 75° (8 Ft. Lbs. + 75°) (Figure 187).
61. Install the fuel tube bracket nut (2) securing the fuel tube and tighten to 8 N·m (71 In. Lbs.) (Figure 187).
62. Hand tighten the fuel tube union nut to the fuel injection pump (3) and tighten to 11 N·m + 75° (8 Ft. Lbs. + 75°) (Figure 187).
63. Remove protective caps from the fuel injector and fuel rail (Figure 186).
64. Hand tighten the union nuts (1 & 3) and install a **NEW** cylinder No. 4 fuel tube (2). Tighten the union nuts to 11 N·m + 75° (8 Ft. Lbs. + 75°) (Figure 186).
65. Install the left fuel rail cover (2) and bolts (1) and tighten to 5 N·m (44 In. Lbs.) (Figure 184).
66. Install the vent hose to the left fuel rail cover.
67. Install the clean air hose to the turbocharger elbow and securely tighten the clean air hose clamp (1) (Figure 183).
68. Connect the clean air hose to the air cleaner body (Figure 182).

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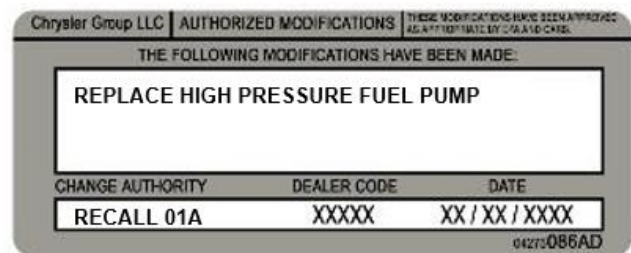
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69. Connect the Closed Crankcase Ventilation (CCV) heater wire harness connector (1) and attach the wire harness retainer (2) (Figure 182).
70. Connect the crankcase breather hose (3) (Figure 182).
71. Install the engine cover.
72. Install the fuel injection pump silencer.
73. Install the fuel injection pump blocker plate (1) to the fuel injection pump. Install the fuel injection pump blocker plate bolts (2) and tighten 25 N·m (18 Ft. Lbs.) (Figure 181).
74. Install the cooling fan (1) to the radiator (Figure 180).
75. Remove the piece of cardboard between the cooling fan and the radiator.
76. Install the right and left cooling fan bolts and tighten them to 8 N·m (71 In. Lbs.) (Figures 178 and 179).
77. Connect the cooling fan wire harness connectors and attach the wire harness connector to fan shroud (Figure 177).
78. Install the push pin retainers and upper radiator seal (Figure 176).
79. Connect the negative battery cables. In Service Library, see 08 - Electrical / 8F - Engine Systems / Battery System / Standard Procedure / Battery Disconnect - Dual 12 Volt Battery System.
80. Start engine and check for leaks.

For all platforms above (DT, JL, JT) and both contaminated and non-contaminated systems, complete step **E**.  
**Install the Authorized Modifications Label.**

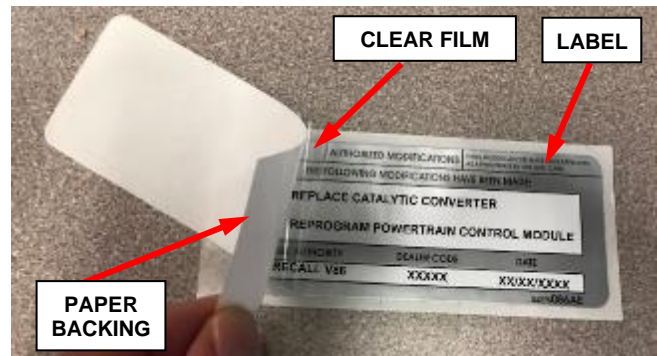
**E. Install the Authorized Modifications Label:**

1. Type or print (with a ballpoint pen) the necessary information shown in (Figure 202) onto the authorized modifications Label.



**Figure 202 – Authorized Modifications Label**

2. Remove the paper backing from the clear film on the front of the authorized modifications label then carefully apply the clear film over the front of the authorized modifications label (Figure 203).



**Figure 203 – Apply Clear Film**

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**NOTE: The Authorized Modifications Label should be located near the Vehicle Emission Control Information (VECI) label (Figure 204).**

3. Locate the VECI label on the underside of the engine compartment hood (Figure 204).

**NOTE: For vehicles missing a VECI label, locate a flat protected area on the underside of the hood to apply the authorized modifications label.**

4. Clean the surface near the VECI label with isopropyl alcohol or equivalent and a soft cloth.



**Figure 204 – Apply Authorized Modifications Label Near VECI Label  
(Specific Vehicle May Look Different)**

5. Remove the authorized modifications label from its paper backing.
6. Apply the authorized modifications label next to the VECI label (Figure 204).
7. Firmly press and smooth the authorized modifications label to ensure good adhesion.
8. Close the engine compartment hood.
9. Complete the Proof of Correction Form for California Residents, **Section F**.



**F. Complete Proof of Correction Form for California Residents:**

This recall is subject to the **State of California Registration Renewal/Emissions Recall Enforcement Program**. Complete a Vehicle Emission Recall Proof of Correction Form (**Form No. 81-016-1053**) and **supply it to vehicle owners residing in the state of California** for proof that this recall has been performed when they renew the vehicle registration.

Process Steps to obtain the California Proof of Correction form:

- a. Access the “**DealerCONNECT**” website.
- b. Select the “**Service**” tab.
- c. Under the “**Publications**” heading, select the “**ePublishing**” link.
- d. Sign in using your **Dealer Code** and **Password**.
- e. Select the “**Proof of Correction form**”.

**G. Owner’s Manual Addendum and Tip Card:**

From Campaign kit CSFP01A1AA, place the Owner’s Manual Addendum in the glovebox with the Owner’s Manual.

Place the Tip Card in a conspicuous location that will be visible to the driver so that they will review it. Suggestions would be the top of the instrument panel, in front of the instrument cluster, etc. Please review the information on the card with the owner when the vehicle is returned to them.

**H. Fuel Door Label:**

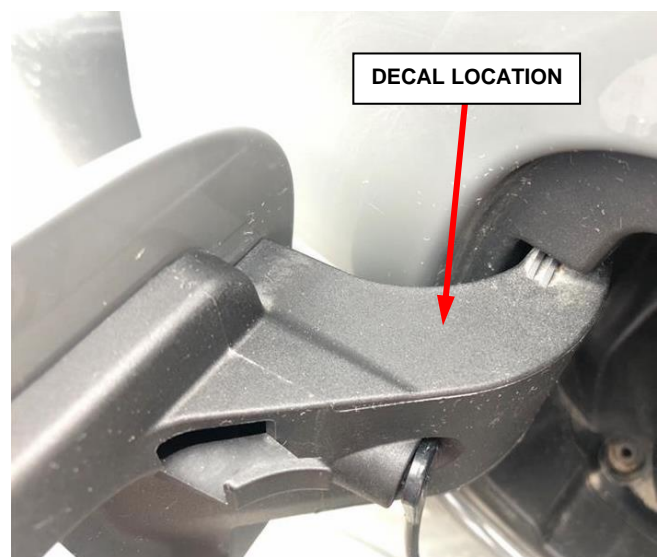
**NOTE: Do not apply the label over an existing label. Apply the label on a flat surface on the inside of the fuel door. For example, on the top of the fuel door hinge (Figure 206).**

From Campaign kit CSFP01A1AA, install the fuel door decal.

1. Open the fuel door.
2. Clean the top surface of the hinge with isopropyl alcohol or equivalent and a soft cloth. Repeat as needed until the soft cloth comes off the surface clean.
3. Remove the fuel door label from its paper backing.
4. Apply the fuel door label (Figure 205) to the top of the fuel door hinge (Figure 206).
5. Firmly press and smooth the fuel door label to ensure good adhesion.
6. Close the fuel door.



**Figure 205 – Fuel Door Label**



**Figure 206 – Fuel Door Hinge Location**