Daimler Trucks North America LLC

Field Service Campaign

December 2017
SF548AB

Subject: FCCC Chassis Rocker Arms and Intake Gaskets

Models Affected: Specific Freightliner Custom Chassis B2 school bus chassis (Thomas Built Buses Saf-T-Liner C2) and S2G chassis manufactured April 3, 2013, through June 28, 2017.

General Information

Daimler Trucks North America LLC (DTNA), on behalf of its wholly owned subsidiary, Freightliner Custom Chassis Corporation, is initiating Field Service Campaign SF548AB to modify the vehicles mentioned above.

Certain vehicles were built with rocker arms that may fail prematurely. Premature failure may be detected by abnormal engine noise and misfire. Certain vehicles may also have faulty intake gaskets which may be detected by a milky white appearance of the engine oil and on the underside of the engine oil fill cap.

Intake gaskets and rocker arms will be replaced on the corresponding suspect vehicles.

There are approximately 1,531 vehicles involved.

Additional Repairs

Dealers must complete all outstanding field service campaigns prior to the sale or delivery of a vehicle. A Dealer will be liable for any progressive damage that results from its failure to complete campaigns before sale or delivery of a vehicle.

Owners may be liable for any progressive damage that results from failure to complete campaigns within a reasonable time after receiving notification.

Please contact Warranty Campaigns for consideration of additional charges prior to performing the repair.

Work Instructions

Please refer to the attached work instructions. Prior to performing the campaign, check the vehicle for a completion sticker (Form WAR261).

Replacement Parts

Replacement parts are now available and can be obtained by ordering the kit and/or part number(s) listed below from your facing Parts Distribution Center.

If our records show your dealership has ordered any vehicle(s) involved in campaign SF548AB, a list of the customers and vehicle identification numbers will be available on AccessFreightliner.com. Please refer to this list when ordering parts for this campaign.

Table 1 - Replacement Parts for SF548

Campaign Number	Kit Number	Part Description	Part Number	Qty. per Kit
SF548A	25-SF548-000	L18 ROCKER ARMS	N/A	16 ea
		ROCKER ARM BALLS		16 ea
		ROCKER NUTS		16 ea
	25-SF548-001	INTAKE GASKETS	N/A	2 ea
		WASHERS		12 ea
	N/A	BLANK COMPLETION STICKER	WAR260	1 ea
SF548B	25-SF548-001	INTAKE GASKETS	N/A	2 ea
		WASHERS		12 ea
	N/A	BLANK COMPLETION STICKER	WAR260	1 ea

Table 1

Removed Parts

U. S. and Canadian Dealers, please follow Warranty Failed Parts Tracking shipping instructions for the disposition of all removed parts. Export distributors, please destroy removed parts unless otherwise advised.

Labor Allowance

Table 2 - Labor Allowance

Campaign Number	Procedure	Time Allowed (hours)	SRT Code	Corrective Action
SF548A	Replace the rocker arms and intake gaskets	11.6	996-F003A	12-Repair Recall/Campaign
SF548B	Replace the intake gaskets	5.2	996-F003B	

Table 2

IMPORTANT: When the campaign has been completed, locate the base completion label in the appropriate location on the vehicle, and attach the gray completion sticker provided in the field service kit (Form WAR261). If the vehicle does not have a base completion label, clean a spot on the appropriate location of the vehicle and first attach the base completion label (Form WAR259). If a field service kit is not required or there is no completion sticker in the kit, write the campaign number on a blank sticker and attach it to the base completion label.

Claims for Credit

You will be reimbursed for your parts, labor, and handling (landed cost for Export Distributors) by submitting your claim through the Warranty system within 30 days of completing this campaign. Please reference the following information in OWL:

- Claim type is **Field Service Campaign**.
- In the Campaign field, enter the campaign number and appropriate group (**SF548-A or SF548-B**).
- In the Primary Failed Part field, enter **25-SF548-000**.
- In the Parts section, enter the appropriate kit and/or part number(s) as shown in the Replacement Parts Table. NOTE: Up to $105.00 in needed shop supplies can be included on your claim without preapproval (oil, filter, coolant, sealants).
- In the Labor section, enter the appropriate SRT from the Labor Allowance Table. Administrative time will be included automatically as SRT 939-6010A for 0.3 hours.
- The VMRS Component Code is **045-008-052** and the Cause Code is **A1 - Campaign**.
- This Field Service Campaign will **terminate on December 31, 2018**. Dealers will be notified of any changes to the termination date via Important Campaign Information Letter posted on DTNAConnect.com.

IMPORTANT: OWL must be viewed prior to beginning work to ensure the vehicle is involved and the campaign has not previously been completed. Also, check for a completion sticker before beginning work.

All claims must be submitted within 30 days of the repair and within 30 days of the termination date of the campaign. U.S. and Canadian Dealers: All excess inventory to be returned to the PDC following the conclusion of the campaign must be returned in resaleable condition to the Memphis PDC within 90 days from the termination date. Please submit a PAR to request return to the Memphis PDC. (Canadian dealers should return the kits to their facing PDC.) Export Distributors: Excess inventory is not returnable.

For questions, U.S. and Canadian dealers, contact the Warranty Campaigns Department via Web inquiry at DTNAConnect.com / WSC, or the Customer Assistance Center at (800) 385-4357, after normal business hours, if you have any questions or need additional information. Export distributors submit a Web inquiry or contact your International Service Manager.

Copy of Notice to Owners

Subject: FCCC Chassis Rocker Arms and Intake Gaskets

Daimler Trucks North America LLC (DTNA), on behalf of its wholly owned subsidiary, Freightliner Custom Chassis Corporation, is initiating Field Service Campaign SF548AB to modify specific Freightliner Custom Chassis B2 school bus chassis (Thomas Built Busses Saf-T-Liner C2) and S2G chassis manufactured April 3, 2013, through June 28, 2017.

Certain vehicles were built with rocker arms that may fail prematurely. Premature failure may be detected by abnormal engine noise and misfire. Certain vehicles may also have faulty intake gaskets which may be detected by a milky white appearance of the engine oil and on the underside of the engine oil fill cap.

Intake gaskets and rocker arms will be replaced on the corresponding suspect vehicles.

Please contact an authorized Daimler Trucks North America dealer to arrange to have the campaign performed and to ensure that parts are available at the dealership. To locate an authorized dealer, search online at www.Daimler-TrucksNorthAmerica.com / Contact Us / Find a Dealer. The campaign will take approximately 6 to 12 hours, depending on the repair, and will be performed at no charge to you.

This Field Service Campaign will **terminate on December 31, 2018**. Please make sure the campaign is completed prior to this date. Work completed after this date will be done at the customer's expense.

As stated in the terms of your express limited warranty, Daimler Trucks North America LLC will not pay for any damage caused by failure to properly maintain your vehicle. Daimler Trucks North America LLC considers the work necessary under this campaign to be proper maintenance and will, therefore, not pay for any damage to your vehicle caused by your failure to have the repairs that are the subject of this campaign performed in a reasonable time.

Contact the Warranty Campaigns Department at (800) 547-0712, from 7:00 a.m. to 4:00 p.m. Pacific Time, Monday through Friday, e-mail address DTNA.Warranty.Campaigns@Daimler.com, or the Customer Assistance Center at (800) 385-4357, after normal business hours, if you have any questions or need additional information.

WARRANTY CAMPAIGNS DEPARTMENT

Enclosure

Work Instructions

Subject: FCCC Chassis Rocker Arms and Intake Gaskets

Models Affected: Specific Freightliner Custom Chassis B2 school bus chassis (Thomas Built Buses Saf-T-Liner C2) and S2G chassis manufactured April 3, 2013, through June 28, 2017.

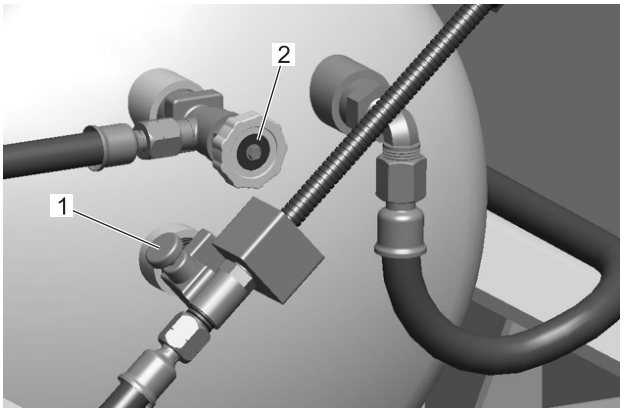
Rocker Arm and Gasket Replacement

1. Check the base label (Form WAR259) for a completion sticker for SF548 (Form WAR261) indicating this work has been done. The base label is usually located on the passenger-side door, about 12 inches (30 cm) below the door latch. On school buses, the base label is usually located over the driver's window. If a sticker is present, no work is needed. If there is no sticker, proceed with the next step.
2. Park the vehicle on a level surface, shut down the engine, and set the parking brake. Chock the tires.
3. Disconnect the battery.

⚠ WARNING

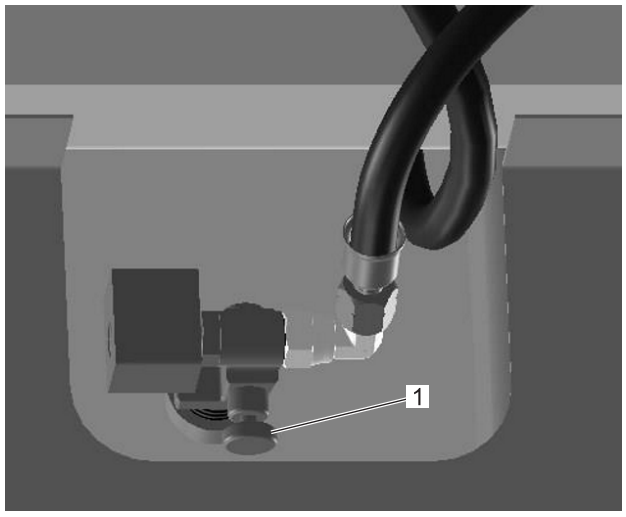
Do not release propane inside a garage or building. Eliminate all sources of ignition prior to depressurizing a fuel line. Ignition of propane vapors can cause property damage and or serious personal injury. Fuel line depressurization must be performed outdoors unless the fuel line has already been depressurized outside prior to pulling vehicle into the garage. Always wear gloves and eye protection when opening a propane line that may contain liquid propane. Liquid propane escaping from a fuel line can cause severe freeze burns much like frostbite.

4. Shut off the supply of fuel to the engine, both the supply and return valves need to be closed.
   4.1 Locate the supply valve. See **Fig. 1**, Item 1, for Saf-T-Liner C2 School Bus and **Fig. 2** for S2G delivery truck.



1. Supply Valve
2. Return Valve

Fig. 1, School Bus Fuel Line Valves



1. Supply Valve

Fig. 2, S2G Delivery Truck, Supply Valve

4.2 To shut off the supply valve, turn the valve handle clockwise until it reaches its stop (roughly three and a half turns).

NOTICE

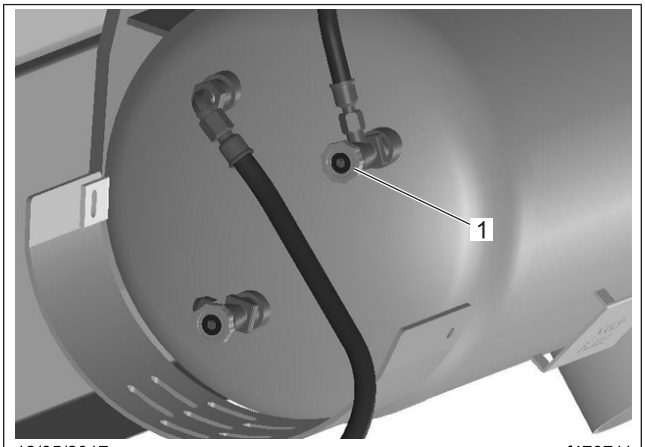
Damage may occur to the fuel tank valve(s) if the valve(s) are overtightened.

4.3 Locate the return valve. See **Fig. 3**. To shut off the return valve, turn the valve handle clockwise until it reaches its stop (roughly two and a quarter turns).

⚠ WARNING

Do not release propane inside a garage or building. Eliminate all sources of ignition prior to depressurizing a fuel line. Ignition of propane vapors can cause property damage and or serious personal injury.

5. Drain the fuel lines.
   - 5.1 Slowly loosen the engine supply hose until a white fog is released from the hose.
   - 5.2 Once the white fog dissipates, loosen the line 1/4 turn more to ensure all the propane pressure has been released from the supply line.
   - 5.3 Slowly loosen the tank return hose until a white fog is released from the return hose.
   - 5.4 Once the white fog dissipates from the return line, loosen the return line 1/4 turn more to ensure all the propane pressure has been released from the system.
6. Drain the coolant from the engine.
7. Remove the two 3/8-inch coolant hoses from the coolant surge tank as well as the P-clamp that attaches one of the hoses to the upper intake manifold. Move the hoses out of the way.
8. Disconnect the electrical wiring from the alternator.
9. Remove the four bolts retaining the alternator to the bracket.
10. Remove the serpentine belt and alternator.
11. Disengage the locking device and remove the electrical connector at the torque security module (TSM). See **Fig. 4**.



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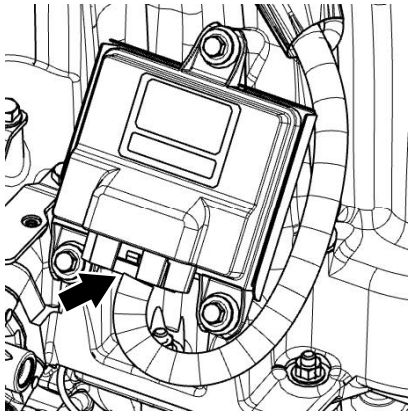
1. Return Valve

Fig. 3, S2 Delivery Truck, Return Valve



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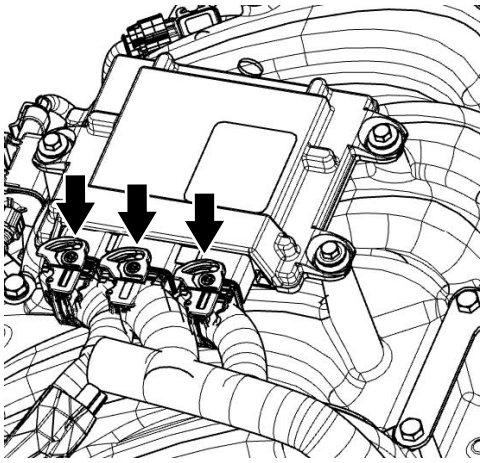
Disengage the locking device and remove the electrical connector.

Fig. 4, Torque Security Module

12. Remove the three TSM mounting bolts, then remove the TSM and shield.
13. Disengage the locking devices and remove the three electronic control module (ECM) connectors at the ECM. See **Fig. 5**. Move the harness out of the way.
14. Remove the wire ties retaining the wire harness to the upper intake and move the harness out of the way.
15. Remove the three ECM mounting bolts and remove the ECM.

NOTE: Do not drop the ECM or TSM. Store both components in a safe location. The ECM and TSM should not be exposed to, or immersed in, solvents or cleaners.

16. Disconnect the P-clamp that attaches the transmission dipstick on the L-shaped bracket, bolted on the upper intake (left-hand side).
17. Disconnect the electrical connector from the MAP sensor (rear right-hand corner of the upper intake). See **Fig. 6**. Gently pry the blue tab away from the connector body to unlock it.
18. Remove the electrical connector from the throttle body.
19. Disconnect the electrical connector from the purge valve (right-rear side of the intake).
20. Press the locking feature on the fitting and remove the post crankcase ventilation (PCV) hose from the PCV valve on the right-hand rocker cover, and then remove the hose from the rear of the upper intake manifold.
21. Disengage the locking feature from the mass airflow sensor connector and remove the connector from the mass airflow sensor.



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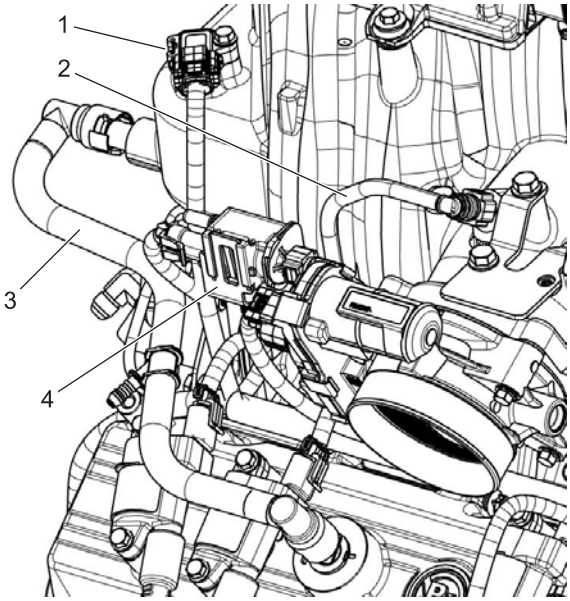
Disengage the locking devices and remove the three ECM connectors.

Fig. 5, Electronic Control Module



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1. MAP Sensor
2. Purge Hose
3. Post Crankcase Ventilation Hose
4. Purge Solenoid

Fig. 6, Upper Intake Manifold Components

22. Press the locking feature on the PCV hose connected to the rear side of the air intake tube and remove the PCV hose from the air intake tube.
23. Remove the air intake tube from the throttle body and air cleaner.

NOTE: Remove the air filter housing bracket (along with the filter housing and hose) from the firewall by removing the four T40 torx bolts.

24. Remove the eight upper intake manifold securing nuts and four bolts along with any brackets secured by the fasteners.
25. If necessary, disconnect the metal tubing from the top of the air compressor and move it out of the way.
26. Remove the purge hose from the upper intake manifold. See **Fig. 6**.
27. Remove the purge solenoid and bracket.
28. Remove the top radiator hose at the thermostat housing.
29. Remove the thermostat housing and thermostats.

NOTICE

Never pry the upper intake manifold to remove it. The use of prying tools may cause damage to the sealing surfaces of the lower and upper manifold and studs. If the O-rings are not damaged they may be used again.

30. Remove the upper intake manifold from the lower intake manifold by lifting straight up over the studs.

IMPORTANT: Cover all the openings in the lower intake manifold to prevent foreign objects from entering the engine.

31. Reposition the spring clamp on the 1-inch bypass hose by moving it up and off the tube in the water pump. When the front of the intake is pried upward and removed, the bypass hose should remain on the lower intake.
32. Move the air compressor hose clamp out of the way and remove the ½-inch coolant hose from the rear of the air compressor.
33. Remove the wire ties retaining the engine harness to the intake near the thermostat housing and on the top-left side at the coolant crossover.
34. Remove the electrical connector from the fuel bypass solenoid at the rear of the intake manifold.

⚠ WARNING

Liquid propane can cause serious burns should it contact the skin or eyes. When handling propane, always wear protective gloves and eye protection to prevent contact.

Propane is extremely flammable, and can ignite if an ignition source is present, causing burns and other serious injuries. Keep sparks and flames away from propane, as well as the fuel lines. Keep the work area well ventilated.

⚠ CAUTION

Use caution when removing the fuel lines. Residual liquid propane may be present in the lines and under pressure. Carefully loosen the connections to allow any reside to escape before removing the fuel lines.

35. Slightly open the fuel supply and return lines to relieve residual pressure. The supply line is on the driver-side and is the larger of the two lines that connect to the rear of the intake manifold.
36. When the pressure has been relieved, disconnect the fuel system supply and return lines.
37. Disconnect the chassis harness from the engine harness by rotating the retaining ring and move the chassis harness out of the way.
38. Remove the coolant hose from the tube on the passenger-side of the intake.
39. Remove the bolts retaining the engine harness connector support bracket to the lower intake manifold and move the bracket out of the way.
40. Disconnect the ten-way liquid propane gas (LPG) injector electrical connector from the engine harness (left side of the lower intake in the middle).
41. Remove the twelve manifold securing bolts from both sides of the lower intake manifold and set them aside for length measurement.

NOTICE

Use caution and work slowly when using the pry tool on the lower intake manifold. Otherwise, the sealing surfaces may be damaged.

42. Using a suitable pry tool, gently pry up the front of the lower intake manifold.
43. If needed, use a utility knife to cut through the sealant at the front of the lower intake manifold. One or more of the front-end accessory brackets must be removed to do this.
44. Once the seal at the front of the lower intake manifold is released, continue to lift until the seal at the rear of the intake is released.
45. Remove the lower intake manifold from the engine.
46. Wipe up any coolant or debris that spilled into the valley of the engine block.
47. Place a protective covering in the valley of the engine block to prevent debris from entering the engine.
48. Block all of the openings on the cylinder heads to prevent debris from entering the engine.
49. Remove and discard the lower intake manifold gaskets.
50. Using a razor blade, clean all of the mounting surfaces to remove any residual sealant, gasket material and debris from the sealing surfaces of the lower intake, cylinder heads and engine block china walls. Any oil or grease residue on the mounting surfaces could create a leak path.
51. Clean any debris out of the bolt holes in the cylinder heads.
52. Using a clean lint-free cloth and alcohol, clean the sealing surfaces of the engine block, cylinder heads, and intake manifold. Any oil or grease residue on the mounting surfaces could create a leak path.
53. Inspect all of the sealing surfaces for damage or imperfections.

IMPORTANT: Bolts verified to be 1-1/2 inches (38 mm) under-head length can be used again. Any bolts shorter than 1-1/2 inches (38 mm) under-head length must be discarded and replaced with new bolts.

54. Measure each inlet manifold bolt removed earlier. The under-head length must be 1-1/2 inches (38 mm). See **Fig. 7**. Any bolts shorter than 1-1/2 inches (38 mm) under-head length must be discarded and replaced with new bolts.

    Vehicles in SF548-A, proceed to the next step.

    Vehicles in SF548-B, proceed to step 83 on page 12.

55. Number the spark plug wires on the right-hand side and remove them.
56. Remove the spark plugs.
57. Number the spark plug wires on the left-hand side and remove them.
58. Remove the spark plugs.
59. If the vehicle is not equipped with an air compressor, remove the fourteen rocker arm cover bolts from both sides of the rocker arm cover, then remove the cover and set the bolts and cover aside.

    If the vehicle is equipped with an air compressor, remove the seven rocker arm cover bolts from the right-hand side and four rocker arm cover bolts from the left-hand side of the rocker arm cover.

60. Remove the two 1/4-inch hex flange nuts, then remove the cover. Set the nuts, bolts, and cover aside.
61. Rotate the engine crankshaft clockwise to top-dead-center at cylinder 1 (driver-side at the front of the engine).

    This position is found by observing that the cylinder 1 intake pushrod has finished downward travel, then rotate the crankshaft approximately 109 degrees clockwise (approximately 7.6 inches [193 mm] on damper circumference). See **Fig. 8**.

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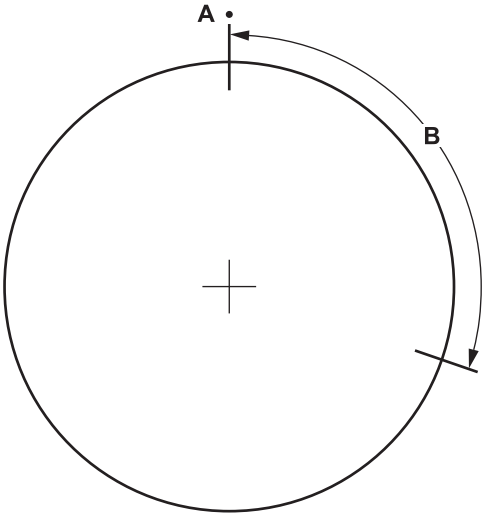
Fig. 7, Measuring Under-Head Bolt Length



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A. Rotate the engine crankshaft clockwise to top-dead-center at cylinder 1.
B. Rotate the crankshaft approximately 109° clockwise (approximately 7.6 inches [193 mm] on damper circumference).

Fig. 8, Rotating the Engine Crankshaft Clockwise

62. Mark the damper and block it at a convenient location to establish a top-dead-center reference point.
63. Remove and discard all sixteen rocker arm nuts, rocker arms, and rocker arm pivot balls from both sides.
64. The rocker arm stud may have been loosened or removed in the previous step. If it was removed, separate the stud from the rocker arm nut, arm, and ball assembly and perform the following inspections.
    - 64.1 Inspect each pushrod guide plate for excess wear and replace if needed.
    - 64.2 Inspect each rocker arm stud for wear. If worn or gouged, replace the stud(s).
    - 64.3 Inspect the upper ball ends of each pushrod for excess wear and replace if needed.
    - 64.4 Inspect each rocker arm stud for the correct torque–37 lbf·ft (50 N·m). Tighten if needed.

IMPORTANT: Prior to installation, coat the load-bearing surfaces of the rocker arm and rocker arm ball with lubricant (part number GM 1052367 or equivalent).

Do not use the rocker arm nuts that were removed earlier.

65. Using a new rocker arm nut, install a new rocker arm and rocker arm pivot ball on each rocker arm stud. Do not tighten the nut at this point.
66. Set the valve lash on the following valve positions:
    - intake valves for cylinders 1, 3, 4, and 5
    - exhaust valves for cylinders 1, 2, 7, and 8

NOTICE

Do not allow the socket to contact the rocker arm body when tightening, as contact pressure developed will result in premature rotational resistance and insufficient lash adjustment, and eventual component damage.

- 66.1 For each valve position, tighten the rocker arm nut while rotating the respective pushrod tube by hand until light rotational resistance is felt. Stop tightening the rocker arm when resistance is felt, then perform one full turn of the rocker arm nut. The rocker arm must remain seated on the push rod ball and valve tip when tightening the rocker arm nut.
- 66.2 Mark the top of the rocker stud with a paint or wax marker for visual confirmation, immediately after completing each valve position lash adjustment.

67. Rotate the engine crankshaft one turn (360 degrees) clockwise to top-dead-center at cylinder 6.
68. Using the instructions in steps 66.1 and 66.2, set the valve lash on the following valve positions:
    - intake valves for cylinders 2, 6, 7, and 8
    - exhaust valves for cylinders 3, 4, 5, and 6
69. For the left-hand side inspect the bolts and nuts removed from the rocker covers for damage (such as thread issues) and replace as needed.

70. Apply several drops of medium strength thread locker (Loctite Blue 242, or equivalent) down the internal threads of the four threaded holes. See **Fig. 9**.
71. Apply several drops of medium strength thread locker (Loctite Blue 242, or equivalent) onto the two 1/4-20 studs. See **Fig. 10**.

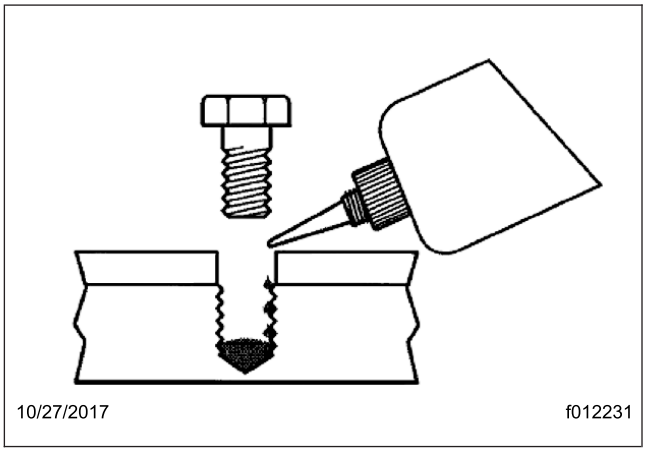


Fig. 9, Applying Thread Locker on the Internal Threads

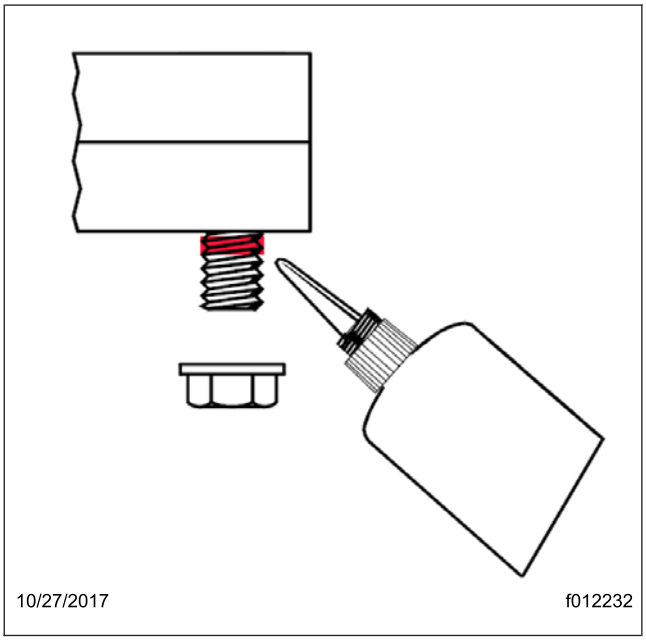


Fig. 10, Applying Thread Locker on the 1/4-20 Studs

72. Prior to installation of the rocker cover on the left-hand side, inspect for a rolled gasket and ensure the rocker cover gasket is firmly seated in the rocker cover seal groove. Carefully install the left-hand rocker cover.
73. Hand tighten the four bolts into the threads and the two flange nuts onto the studs.
74. Starting from the center of the rocker cover and working outward, tighten the bolts 106 lbf·ft (1198 N·m).
75. Repeat the tightening process a second time and use a paint marker to mark each bolt head as it is tightened.
76. For the right-hand side, inspect the bolts removed from the rocker covers for damage (such as thread issues) and replace as needed.
77. Apply several drops of medium strength thread locker (Loctite Blue 242, or equivalent) down the internal threads of the four threaded holes.
78. Prior to installation of the rocker cover on the right-hand side, inspect for a rolled gasket and ensure the rocker cover gasket is firmly seated in the rocker cover seal groove. Carefully install the right-hand side rocker cover.
79. Hand tighten the seven bolts into the threads.
80. Starting from the center of the rocker cover and working outward, tighten the bolts 106 lbf·ft (12 N·m).
81. Repeat the tightening process a second time and use a paint marker to mark each bolt head as it is tightened.
82. Install the spark plugs and wires as previously numbered.

83. Remove the protective covering from the cylinder head intake ports.

84 Starting at the joint where the cylinder heads, intake gaskets and engine block meet, apply sealant (Ultra Grey Permatex Gasket Maker #82194) on the top of the engine block wall. See **Fig. 11**. Apply enough sealant to cover the gasket; this will ensure proper sealing of the joint.

NOTE: Two technicians may be needed for this step.

85. Use the bolt holes to align the lower intake and install it on the engine block. Take care not to damage the sealant.

86. Install one flatwasher from the gasket kit on each intake manifold bolt. Apply thread sealant (Loctite Blue 242, or equivalent) to the bolt threads.

87. Hand-start bolts 10 and 12, shown in **Fig. 12**, then tighten the bolts by hand until the manifold is lightly seated on the inlet gaskets. Hand-start the remaining bolts (two turns for each bolt) to ensure the bolts are engaged.

88. Using the tightening sequence, shown in **Fig. 12**, hand tighten the remaining bolts on the lower intake.

IMPORTANT: Four tightening passes are required to properly tighten the lower intake manifold bolts.

89. Using four passes, tighten the intake manifold bolts (1-12), shown in **Fig. 12** in sequence as follows:
    - On the first pass, tighten the intake manifold bolts (1-12) in sequence 15 lbf·ft (20 N·m).
    - On the second pass, tighten the intake manifold bolts (1-12) in sequence 25 lbf·ft (34 N·m).
    - On the third pass, tighten the intake manifold bolts (1-12) in sequence 35 lbf·ft (47 N·m).
    - On the fourth and final pass, once again tighten the intake manifold bolts (1-12) in sequence 35 lbf·ft (47 N·m).

90. Remove the protective coverings from the lower intake manifold.

91. Make sure the O-rings are properly seated in the four grooves of the lower intake manifold.

92. Using the mounting studs as a guide, install the upper intake manifold on the lower intake manifold.

93. Install the purge solenoid and bracket on the studs on the right side of the intake manifold.

94. Install the purge solenoid hose on the upper intake manifold.

95. Loosely install the nuts and bolts and any brackets that retain the upper intake manifold on the lower intake manifold but do not tighten.

96. Starting at the center bolts, run the fasteners down until they contact the upper intake manifold surface, but do not tighten.

97. Starting from the center and working to the ends and alternating from side-to-side, tighten the fasteners 22 lbf·ft (30 N·m).

98. Install the throttle body connector on the throttle body.

99. Install the air intake tube on the throttle body and air cleaner.

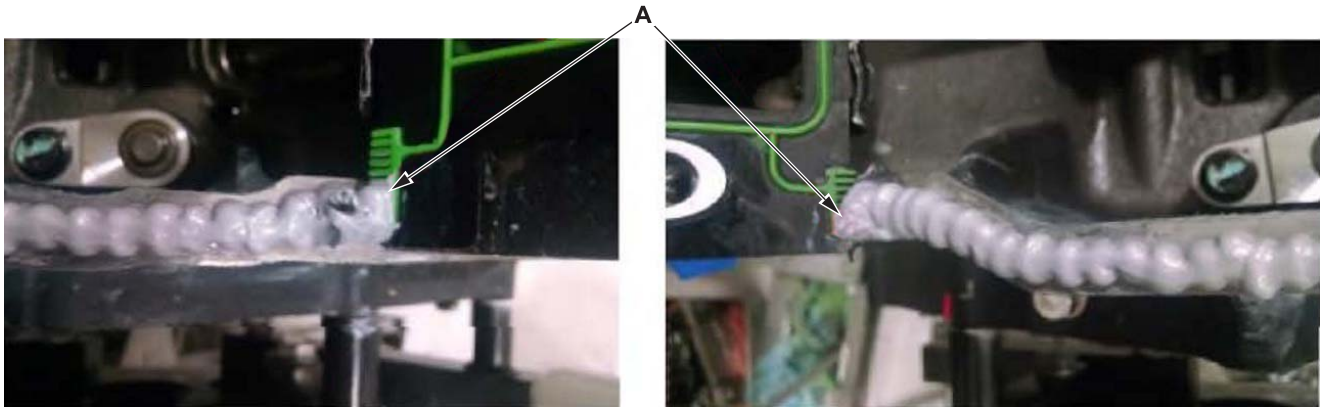
100. Install the transmission dipstick and P-clamp, along with the air compressor discharge tube and P-clamp (if applicable), on the bracket on the driver-side of the upper intake.

101. Install the PCV hose on the air intake tube.

102. Connect the mass airflow sensor connector to the mass airflow sensor.

103. Install the PCV hose on the rear of the upper intake manifold.

104. Connect the purge solenoid connector to the purge solenoid.



A. Make certain to apply enough sealant to cover the gasket and ensure proper sealing of the joint.

Fig. 11, Applying Sealant

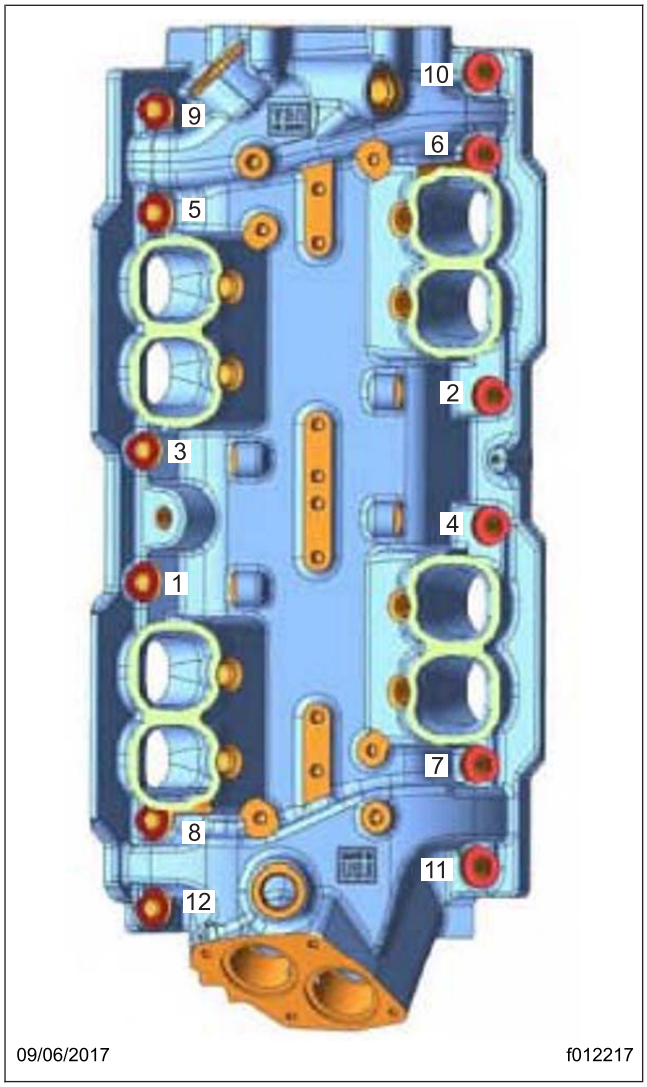


Fig. 12, Manifold Bolt Tightening Sequence

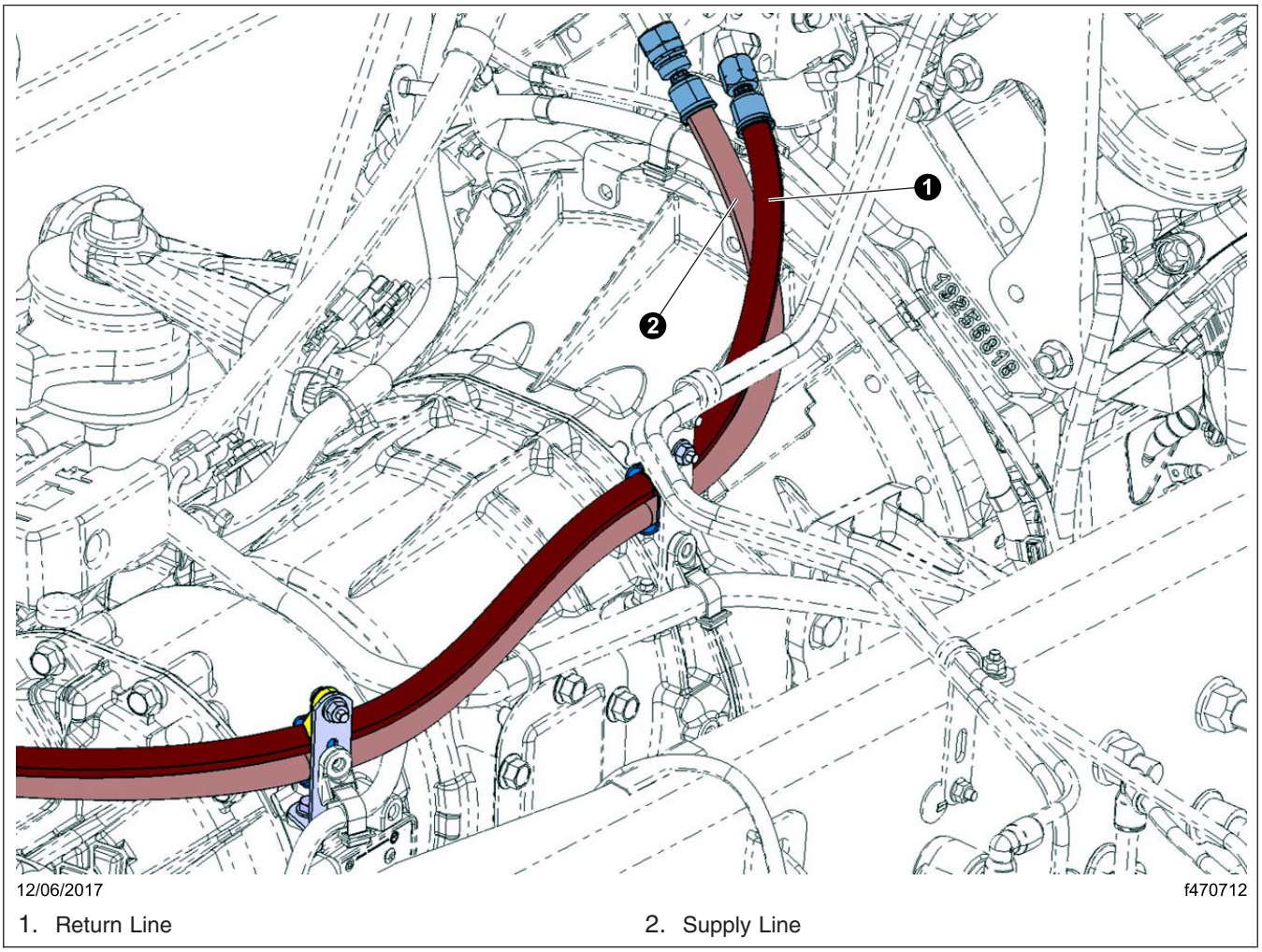
105. Connect the MAP sensor connector to the MAP sensor.
106. Using the three mounting bolts, install the ECM on the manifold. Tighten the bolts 97 lbf·in (11 N·m).
107. Connect the three ECM connectors to the ECM. Push each of the connectors until they are fully seated and engage the locking device.
108. Using the three retaining bolts, install the TSM and shield on the manifold. Tighten the bolts 97 lbf·in (11 N·m).
109. Connect the TSM electrical connector. Push the connector until it is fully seated and engages the locking device.
110. Connect the ten-way LPG injector electrical connector to the engine harness (left side of the manifold).
111. Align the engine harness connector support bracket with the lower intake manifold and install the retaining bolts. Tighten 21 lbf·ft (28 N·m).
112. Attach the coolant hose to the tube on the left side of the intake manifold.
113. Align the chassis harness connector to the engine harness connector and connect them to the engine harness by rotating the retaining ring.

⚠ WARNING

Liquid propane can cause serious burns should it contact the skin or eyes. When handling propane, always wear protective gloves and eye protection to prevent contact.

Propane is extremely flammable, and can ignite if an ignition source is present, causing burns and other serious injuries. Keep sparks and flames away from propane, as well as the fuel lines. Keep the work area well ventilated.

114. Connect the fuel supply and return lines on the engine, as shown in **Fig 13**.
115. Slowly open the supply and return valves. In order to check the fuel system for leaks, the supply solenoid needs to be energized to allow the fuel to flow and pressurize the fuel system.
    115.1 Disconnect the supply valve electrical solenoid connector and energize the solenoid with 12V using a power probe or similar tool.
    115.2 An audible click should be heard indicating the solenoid has opened. If an audible click is not heard, check the 12V power supply to make sure there is a good connection to repower the solenoid and listen for the audible click.
    115.3 Once the system is pressurized, spray each hose connector with an approved LPG leak check solution and look for any bubbling around the hose connections.
    115.4 When the leak test has been completed and there are no leaks present, the upper intake manifold can be reinstalled.
116. Install the electrical connector on the bypass solenoid at the rear of the intake manifold.
117. Install the wire ties retaining the engine harness on the intake near the thermostat housing and on the top-left side at the coolant crossover.
118. Install the wire harness retainer on the upper intake and secure with a wire tie.
119. Attach the two 3/8 inch hoses on the surge tank along with the P-clamp that holds the hose on the upper intake. The hose from the radiator attaches to the higher location of the surge tank.
120. Install the bypass hose on the water pump and intake manifold. Ensure the spring clamps are over the tube sealing beads and will not interfere with the accessory belt.



1. Return Line
2. Supply Line

Fig. 13, Fuel Line Connections at the Engine

121. Install the thermostat housing and thermostats. Tighten the four bolts 100 lbf·in (11 N·m).
122. Install the top radiator hose at the thermostat housing.
123. Using the four bolts removed earlier, install the alternator on the mounting bracket. Tighten the bolts 42 lbf·ft (57 N·m).
124. Connect the electrical wiring to the alternator.
125. Connect the air discharge tube at the top of the air compressor, if necessary.
126. Fill the engine with coolant.
127. Close the air tank drain valves if necessary.

NOTICE

Failure to turn both the supply and return valves on will cause fuel pump failure.

128. Ensure both fuel line valves (supply and return) are open before starting the vehicle.

129. Connect the battery.
130. Start the engine and let it run for 10 minutes. Check for leaks and verify that there is no valve noise.
131. Drive the vehicle for 30 minutes and check for leaks again.

NOTE: Since the engine and components were exposed to air and possible contaminants, an oil and filter change is recommended after test driving the vehicle.

132. Perform an oil and filter change.
133. Once the engine has cooled down, check the coolant level. Top off the coolant as needed.
134. Record the General Motors serial number for the campaign claim. The number is located on the lower right-side of the engine just above the oil pan. See **Fig. 14**.

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Fig. 14, General Motors Serial Number

135. Clean a spot on the base label (Form WAR259). Write the campaign number, SF548, on a blank grey completion sticker (Form WAR261), and attach it to the base label to indicate this campaign has been completed.