CAT® Lift Trucks

# Service Manual

# 1204F Diesel Engine

## Disassembly and Assembly



**For use with DP100N2 - DP160N2 Chassis Service Manuals.**

**99799-67102**

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# Flexible Exhaust Pipe

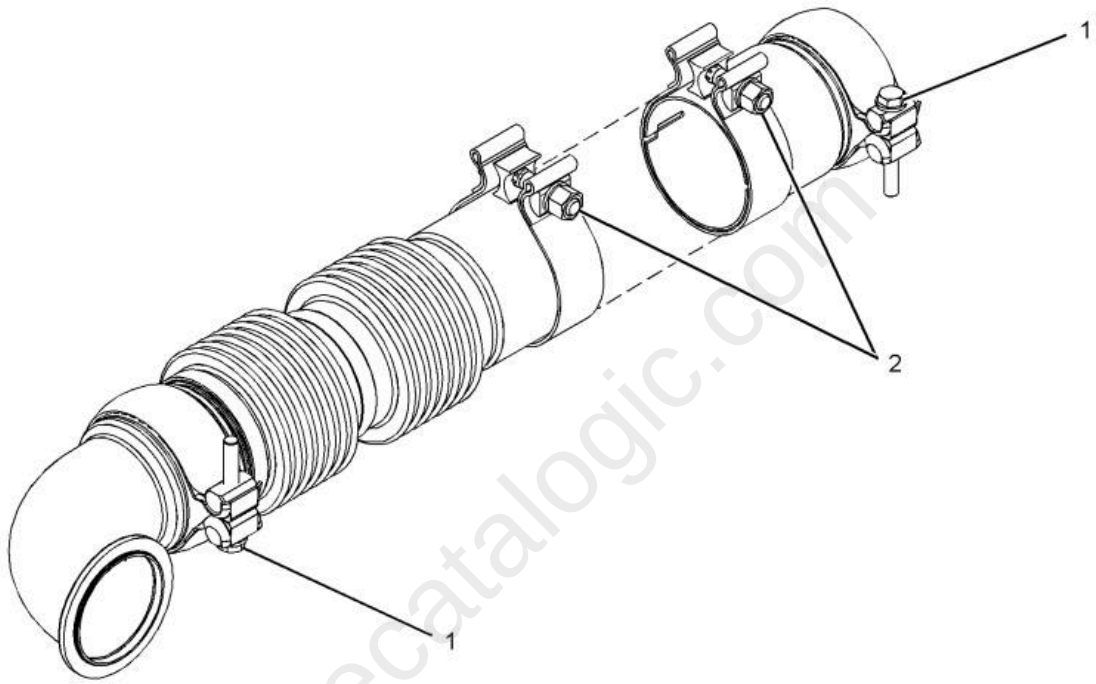


Illustration 47 g02155429

Typical example

(1) Tighten the clamp to the following torque.
.....35 N·m (26 lb ft)

(2) Tighten the clamp to the following torque.
.....55 N·m (41 lb ft)

Refer to Disassembly and Assembly for the correct procedure to install the flexible exhaust pipe.

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# Camshaft

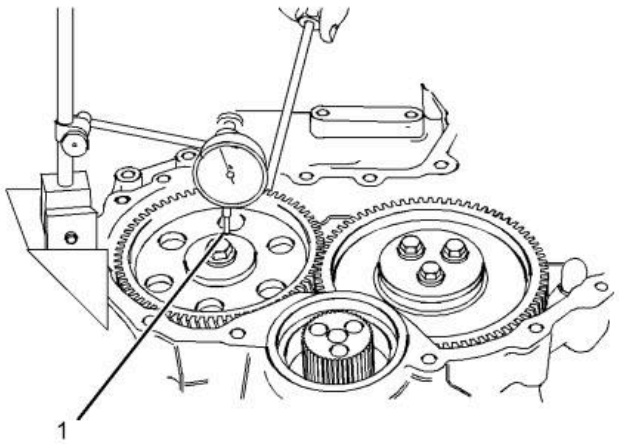


Illustration 48 g01927854

Checking the end play of the camshaft

## Sensor Locations for the Clean Emissions Module

(Table 23, contd)

| Troubleshooting Test Steps | Values | Results |
|---|---|---|
| **10. NRS Cooler**<br><br>**A.** Switch off the engine and allow the engine to cool to below normal working temperature. Remove the pressure cap for the coolant system. Perform a leak test on the cooling system and the NRS cooler. Refer to Systems Operation, Testing, and Adjusting, “Cooling System - Test”. Refer to the subsection “Testing The Radiator And Cooling System For Leaks” . | NRS cooler | **Result:** The leak test fails.<br><br>**Repair:** Check the NRS cooler. Perform a leak test on the NRS cooler. Refer to Systems Operation, Testing, and Adjusting, “Exhaust Cooler (NRS) - Test”.<br><br>If necessary, install a replacement NRS cooler. Confirm that the fault has been eliminated.<br><br>**Result:** The leak test is passed.<br><br>Proceed to Test Step 11. |
| **11. Cylinder Head Gasket**<br><br>**A.** Switch off the engine and allow the engine to cool to below normal working temperature. Remove the pressure cap for the coolant system. Perform a leak test on the cooling system and the NRS cooler. Refer to Systems Operation, Testing, and Adjusting, “Cooling System - Test”. Refer to the subsection “Testing The Radiator And Cooling System For Leaks” . | Cylinder Head gasket | **Result:** The leak test fails.<br><br>**Repair:** Check the cylinder head gasket. Refer to the recommended action for the cylinder head gasket within Troubleshooting, “Oil Contains Coolant”.<br><br>Check the cylinder head for flatness. Refer to the recommended action for checking flatness of the cylinder head within Systems Operation, Testing, and Adjusting, “Cylinder Head - Inspect”.<br><br>**Result:** The leak test is passed.<br><br>Contact the Dealer Solutions Network (DSN). |

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# Coolant Temperature Is Low

Use this procedure in order to troubleshoot a low coolant temperature.

## Probable Causes

- Extreme ambient temperatures
- Cooling system fault
- Coolant temperature sensor
- Water temperature regulator

## Recommended Actions

**Note:** The procedures have been listed in order of probability. Complete the procedures in order.

**⚠ WARNING**

**Personal injury can result from hot coolant, steam and alkali.**

**At operating temperature, engine coolant is hot and under pressure. The radiator and all lines to heaters or the engine contain hot coolant or steam. Any contact can cause severe burns.**

**Remove filler cap slowly to relieve pressure only when engine is stopped and radiator cap is cool enough to touch with your bare hand.**

**Cooling System Conditioner contains alkali. Avoid contact with skin and eyes.**

(Table 176, contd)

| Troubleshooting Test Steps | Values | Results |
|---|---|---|
| **3. Check the Harness between the ECM and the Cylinder Head for an Open Circuit**<br><br>**A.** Turn the keyswitch to the OFF position. A strong electrical shock hazard is present if the keyswitch is not turned OFF.<br><br>**B.** Disconnect the connector for the suspect injector from the cylinder head.<br><br>**C.** Fabricate a jumper wire 100 mm (4 inch) long with terminals on both ends of the wire.<br><br>**D.** Insert one end of the jumper wire into the terminal for the supply to the suspect injector. Insert the other end of the jumper wire into the terminal for the return circuit for the suspect injector.<br><br>**E.** Turn the keyswitch to the ON position.<br><br>**F.** Perform the “Injector Solenoid Test” at least two times.<br><br>**G.** Repeat this test for each suspect injector. Stop the “Injector Solenoid Test” before handling the jumper wires. | Suspect injector indicates “SHORT” | **Result:** The electronic service tool displays “SHORT” for the cylinder with the jumper wire.<br><br>Proceed to Test Step 5.<br><br>**Result:** The electronic service tool does not display “SHORT” for the cylinder with the jumper wire.<br><br>Proceed to Test Step 6. |
| **4. Check the Harness between the ECM and the Cylinder Head for a Short Circuit**<br><br>**A.** Turn the keyswitch to the OFF position. A strong electrical shock hazard is present if the keyswitch is not turned OFF.<br><br>**B.** Disconnect the connector for the suspect injector from the cylinder head.<br><br>**C.** Turn the keyswitch to the ON position.<br><br>**D.** Perform the “Injector Solenoid Test” at least two times.<br><br>**E.** Repeat this test for each suspect injector. Stop the “Injector Solenoid Test” before handling the jumper wires. | Suspect injector indicates “OPEN” | **Result:** The electronic service tool displays “OPEN” for the suspect cylinder and the cylinder that shares the same connector.<br><br>Proceed to Test Step 5.<br><br>**Result:** The electronic service tool does not display “OPEN” for the suspect cylinder<br><br>Proceed to Test Step 7. |



(continued)

# Engine Starting

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## Before Starting Engine

Perform the required daily maintenance and other periodic maintenance before the engine is started. Inspect the engine compartment. This inspection can help prevent major repairs at a later date. Refer to the Operation and Maintenance Manual, “Maintenance Interval Schedule” for more information.

- Ensure that the engine has an adequate fuel supply.
- Ensure that the engine has an adequate diesel exhaust fluid supply
- Open the fuel supply valve (if equipped).

NOTICE
All valves in the fuel return line must be open and fuel supply lines must be open. Damage to the fuel system can occur if fuel lines are closed with the engine in operation.

If the engine has not been started for several weeks, fuel may have drained from the fuel system. Air may have entered the filter housing. Also, when fuel filters have been changed, some air pockets will be trapped in the engine. In these instances, prime the fuel system. Refer to the Operation and Maintenance Manual, “Fuel System - Prime” for more information on priming the fuel system. Also, check that the fuel specification is correct and that the fuel condition is correct. Refer to the Operation and Maintenance Manual, “Fuel Recommendations”.

**⚠ WARNING**

**Engine exhaust contains products of combustion which may be harmful to your health. Always start and operate the engine in a well ventilated area and, if in an enclosed area, vent the exhaust to the outside.**

- Do not start the engine or move any of the controls if there is a “DO NOT OPERATE” warning tag or similar warning tag attached to the start switch or to the controls.
- Reset all of the shutoffs or alarm components.
- Ensure that any driven equipment has been disengaged. Minimize electrical loads or remove any electrical loads.

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## Cold Weather Starting

**⚠ WARNING**

**Do not use aerosol types of starting aids such as ether. Such use could result in an explosion and personal injury.**

The ability to start the engine will be improved at temperatures below −18 °C (0 °F) from the use of a jacket water heater or extra battery capacity.

The following items provide a means of minimizing starting problems and fuel problems in cold weather: Engine oil pan heaters, jacket water heaters, fuel heaters and fuel line insulation.

Use the procedure that follows for cold weather starting.

**Note:** Do not adjust the engine speed control during start-up. The electronic control module (ECM) will control the engine speed during start-up.

**1.** Disengage any driven equipment.

**Note:** During key ON, the indicator lamps will be illuminated for 2 seconds in order to check the lamp operation. If any of the indicator lamps do not illuminate check the bulb. If any indicator lamps stay illuminated or flash, refer to Troubleshooting, “Indicator Lamp Circuit - Test”.

**2.** Turn the keyswitch to the RUN position. Leave the keyswitch in the RUN position until the warning light for the glow plugs is extinguished.

**3.** When the warning light for the glow plugs is extinguished cycle the keyswitch. Turn the keyswitch to the OFF position and then to the START position in order to engage the electric starting motor and crank the engine.

**Note:** The operating period of the warning light for the glow plugs will change due to the ambient air temperature.

NOTICE
Do not engage the starting motor when flywheel is turning. Do not start the engine under load.

If the engine fails to start within 30 seconds, release the starter switch or button and wait two minutes to allow the starting motor to cool before attempting to start the engine again.

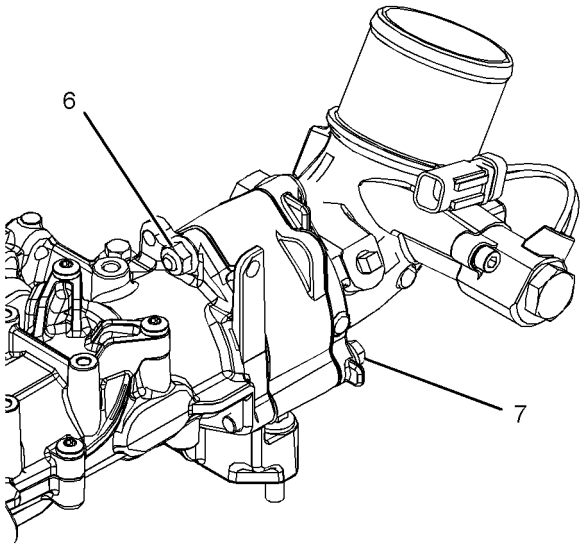


Illustration 37 g02337118

Typical example

(6) Tighten the nut to the following torque. .....18 N·m (13 lb ft)

(7) Tighten the bolts to the following torque.....18 N·m (13 lb ft)

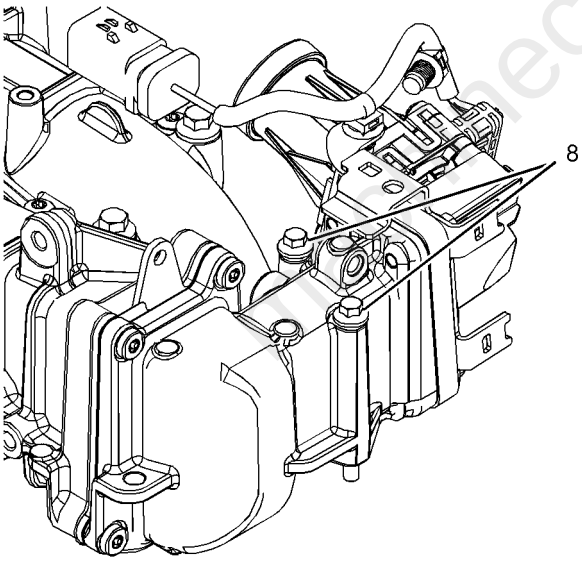


Illustration 38 g02337119

Typical example

(8) Tighten the bolts to the following torque.....9 N·m (80 lb in)

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# Injector (Diesel Exhaust Fluid)

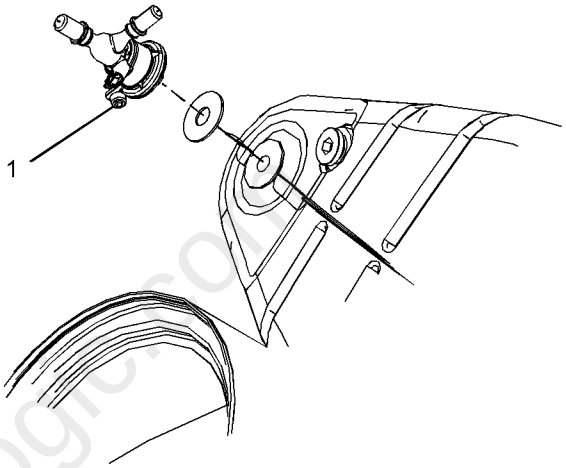


Illustration 39 g03729126

Typical example

(1) Tighten the bolt for the clamp to the following torque.....4 N·m (35 lb in)

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# Manifold (Diesel Exhaust Fluid)

The minimum oil pressure at a maximum engine speed of 2200 rpm and at normal operating temperature is the following value..... 280 kPa (40 psi)

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# Engine Oil Pan

Table 5

| Required Tools | | | |
|---|---|---|---|
| **Tool** | **Part Number** | **Part Description** | **Qty** |
| A | - | Loctite 5900 | 1 |

## Front sealant

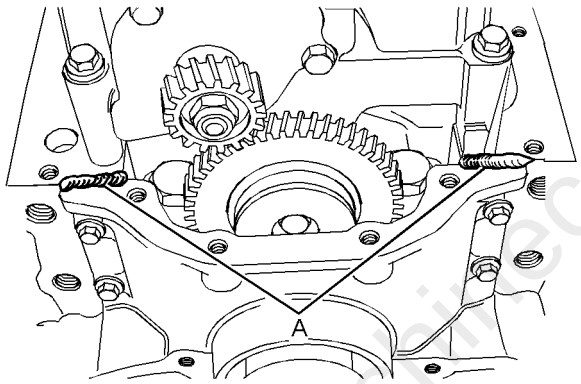


Illustration 59 g01254690

Applying sealant

Apply Tooling (A) to the cylinder block and to the timing case.

**Note:** Apply a sealant bead of 3.5 mm (0.1378 inch) that is shown in illustration 59 .

## Rear sealant

**Note:** Install the rear oil seal before sealant is applied to the bridge.

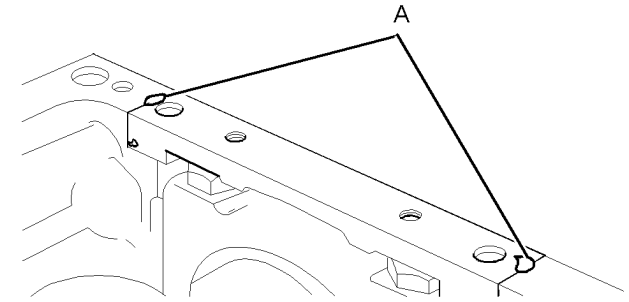


Illustration 60 g01254887

Applying sealant

ApplyTooling (A) to the bridge. The sealant must not protrude more than 5 mm (0.1969 inch) above the bridge.

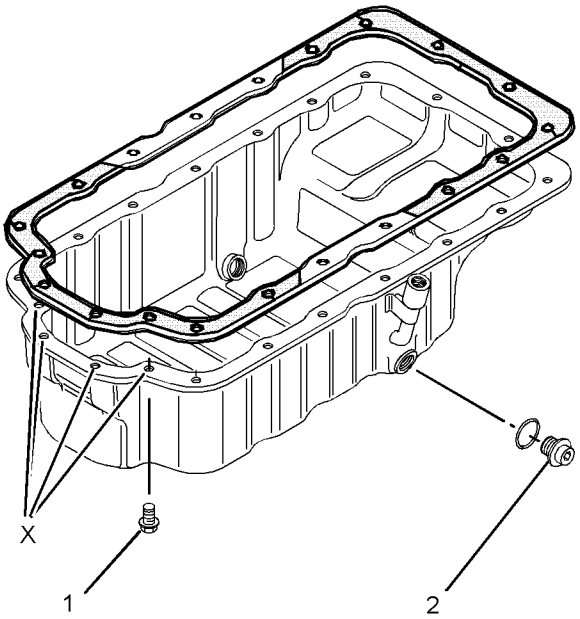


Illustration 61 g01255016

Typical example

(1) Tighten the four front bolts in position (X) to the following torque.....22 N·m (16 lb ft)

**3.** The position of the rod (3) must be within dimension (C). Dimension (C) is 14 mm (0.5512 inch).

**Note:** Ensure that the rod (3) can not damage the piston cooling jet when the alignment is checked. The piston cooling jets can not be adjusted. If a piston cooling jet is not in alignment the piston cooling jet must be replaced.

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# Balancer

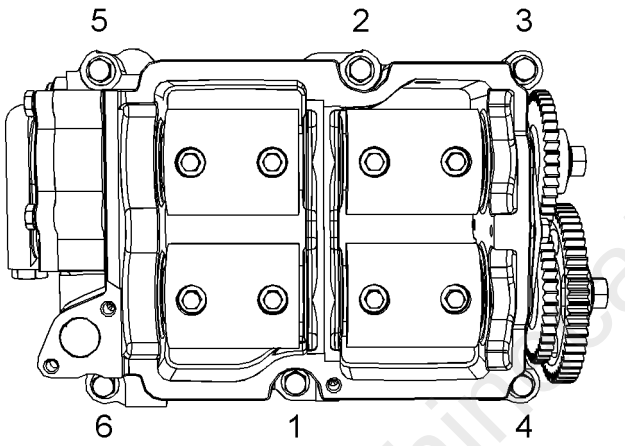


Illustration 77 g02150753

Typical example

Tighten the bolts in the sequence that is shown in illustration 77 to the following torque. .....54 N·m (40 lb ft)

Backlash values

Backlash between crankshaft ring gear and the balancer intermediate gear ..... 0.020 to 0.240 mm (0.0008 to 0.009 inch)

Backlash between the balancer shaft gears .....0.020 to 0.160 mm (0.0008 to 0.0063 inch)

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# Accessory Drive (SAE "B" )

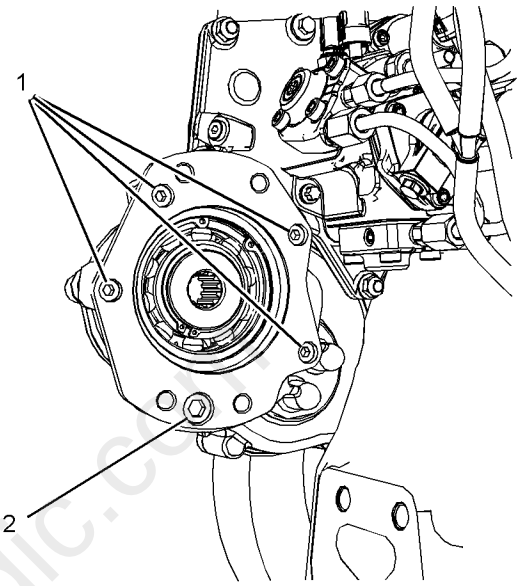


Illustration 78 g02148374

Typical example

(1) Tighten allen head screws to the following torque. .....22 N·m (16 lb ft)

(2) Tighten the allen head screw to the following torque.....78 N·m (58 lb ft)

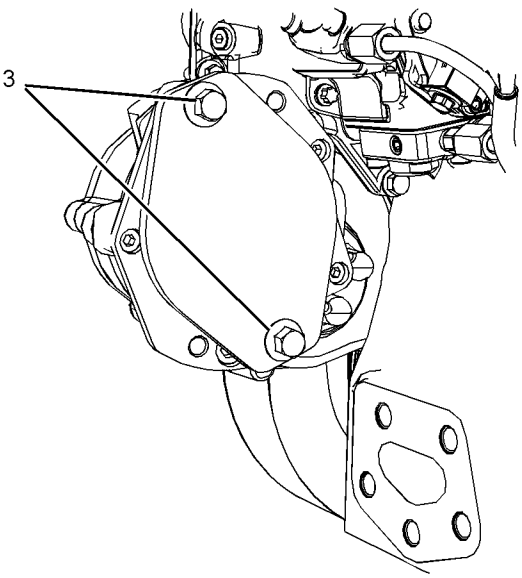


Illustration 79 g02148375

Typical example

(3) Tighten bolts to the following torque.....44 N·m (33 lb ft)

# Full Version Available

**Caterpillar DP160N2 Forklift Engine Service and Operator Manual (99799-67102)**

Caterpillar DP160N2 forklift engine service manual, covers diesel testing, adjustment, teardown, and rebuild procedures. PDF download.