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Service Information Bulletin

SUBJECT	DATE
Air Compressor	August 2012

Additions, Revisions, or Updates

Publication Number / Title	Platform	Section Title	Change
DDC-SVC-MAN-0081	DD Platform	Description and Operation of the Air Compressor	Changed graphics and updated troubleshooting
		Removal of the Air Compressor	
		Inspection of the Air Compressor	
		Inspection of the Diesel Exhaust Fluid Compressed Air Flow System After Air Compressor Failure	
		Installation of the Air Compressor	
		Removal of the Air Compressor Unloader Valve	
		Inspection of the Air Compressor Unloader Valve	
		Installation of the Air Compressor Unloader Valve	



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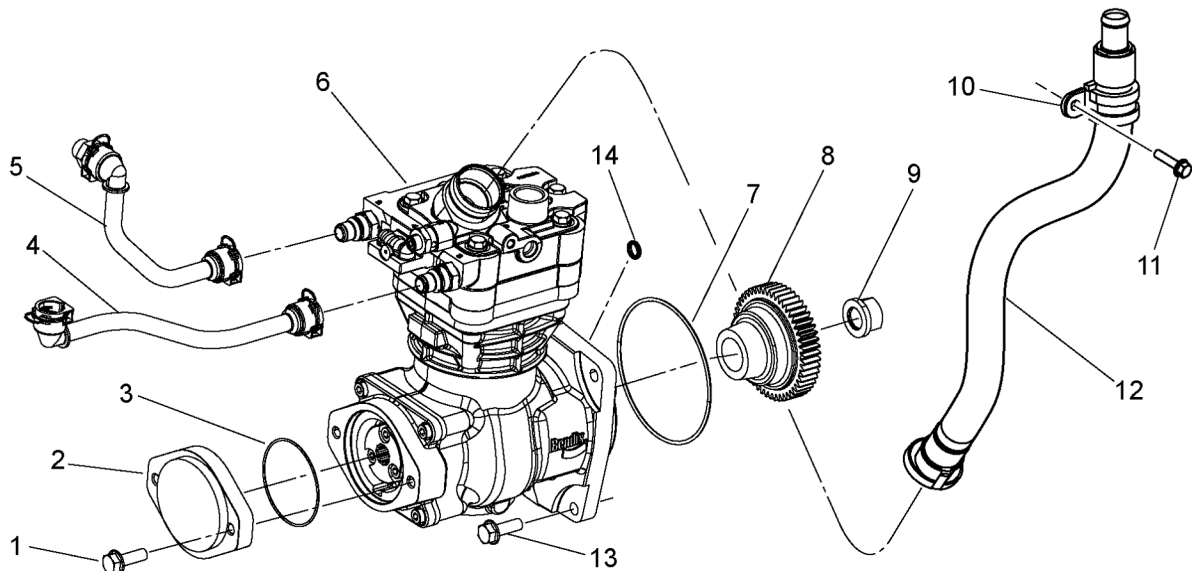
2 Description and Operation of the Air Compressor

The function of the air compressor is to provide and maintain air under pressure to operate devices in air brake systems. Detroit™ offers two sizes of air compressors. The single-cylinder compressor has a displacement 360 cm³ and the two-cylinder compressor has a displacement 650 cm³. Both compressors are installed with an Energy Saving System (ESS) to save fuel.

The air compressor is mounted to the rear of the cylinder block on the left side of the engine.

The engine provides a continuous supply of oil to the compressor. Oil is routed from the oil passage in the gear case to the compressor oil inlet. The air compressor is designed to permit direct installation of the compressor onto the gear case. The compressor consists of a water-cooled cylinder head assembly and an integral air-cooled crankcase assembly. The cylinder head assembly is made up of the cylinder head, cooling plate and valve plate assembly and uses two sealing gaskets. The cylinder head contains air and water ports as well as an unloader assembly. A cooling plate is located between the cylinder head and valve plate assemblies and assists in cooling. The valve plate assembly consists of brazed steel plates which have valve openings and passages for air and engine coolant to flow into and out of the cylinder head.

Description and Operation of the Single-Cylinder Air Compressor and Related Parts

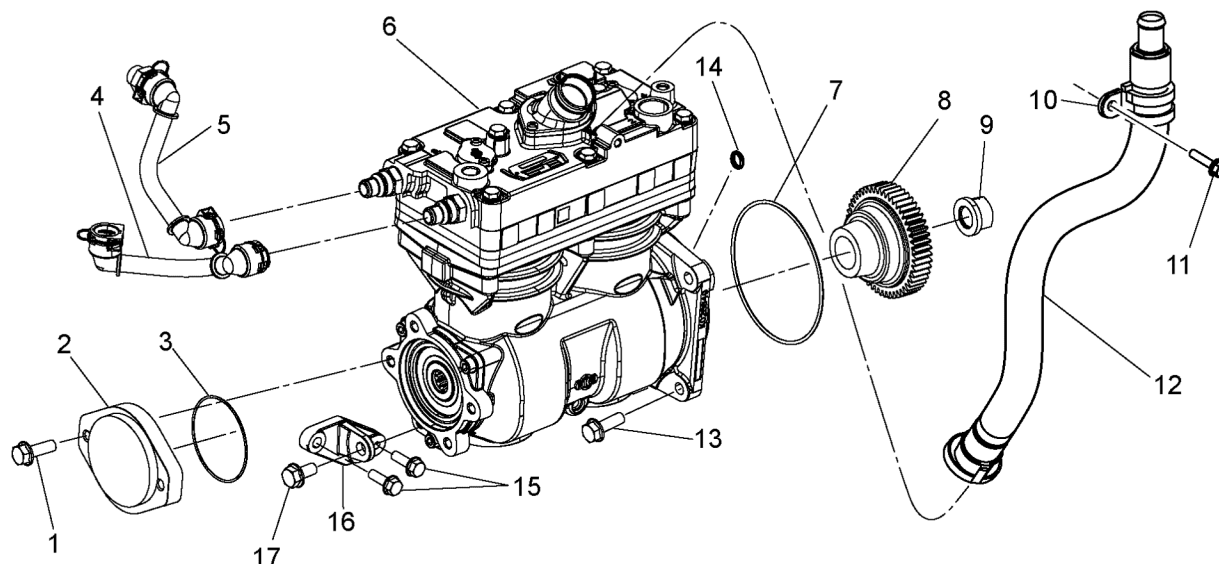


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- | | |
|-----------------------------------|--------------------------------|
| 1. Bolt | 8. Gear |
| 2. Cover | 9. Nut |
| 3. O-ring | 10. Clamp (OEM provided) |
| 4. Coolant Return Line Assembly | 11. Bolt (OEM provided) |
| 5. Coolant Inlet Line Assembly | 12. Intake Line (OEM provided) |
| 6. Single Cylinder Air Compressor | 13. Bolt |
| 7. O-ring | 14. Oil Supply O-ring |

Figure 1. Single Cylinder Air Compressor and Related Parts

Description and Operation of the Two-Cylinder Air Compressor and Related Parts



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- | | |
|---------------------------------|--------------------------------|
| 1. Bolt | 10. Clamp (OEM provided) |
| 2. Cover | 11. Bolt (OEM provided) |
| 3. O-ring | 12. Intake Line (OEM provided) |
| 4. Coolant Return Line Assembly | 13. Bolt |
| 5. Coolant Inlet Line Assembly | 14. Oil Supply O-Ring |
| 6. Two Cylinder Air Compressor | 15. Bolt |
| 7. O-ring | 16. Bracket |
| 8. Gear | 17. Bolt |
| 9. Nut | |

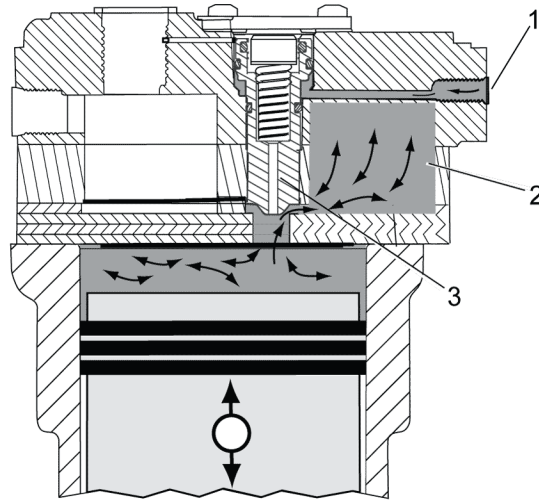
Figure 2. Two Cylinder Air Compressor and Related Parts

Description and Operation of the Unloader Valve

The air compressor is driven by the engine and functions continuously when the engine is in operation. The function of the unloader valve allows the air compressor to operate in an unloaded state, where the compressor piston continues to reciprocate, but does not build additional air pressure in the vehicle's compressed air system. Located within the cylinder head, the unloader valve assembly (in conjunction with the governor) controls whether the air compressor operates in a loaded or unloaded state.

When the vehicle air pressure system is above the minimum threshold, air pressure from the governor acts on the unloader piston, lifting it off its seat. With the unloader valve unseated, air from the cylinder flows into a small chamber in the head, instead of into the vehicle's compressed air system. Air then cycles between the cylinder and chamber in the head until the unloader valve is seated once again.

NOTE: Air in piston shuttles back and forth from the piston to the closed chamber during unloaded operation.



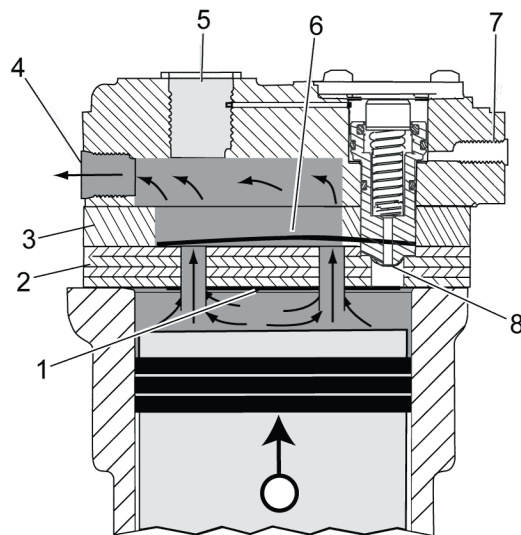
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1. Air from Governor Unloader Port
2. Closed Chamber

3. Unloader Piston Up and Unseated

Figure 3. Piston and Closed Chamber

When the vehicle air pressure system is below the minimum threshold, no air pressure is sent to the unloader valve. With the unloader valve seated, the air compressor will build air pressure in the vehicle's compressed air system.



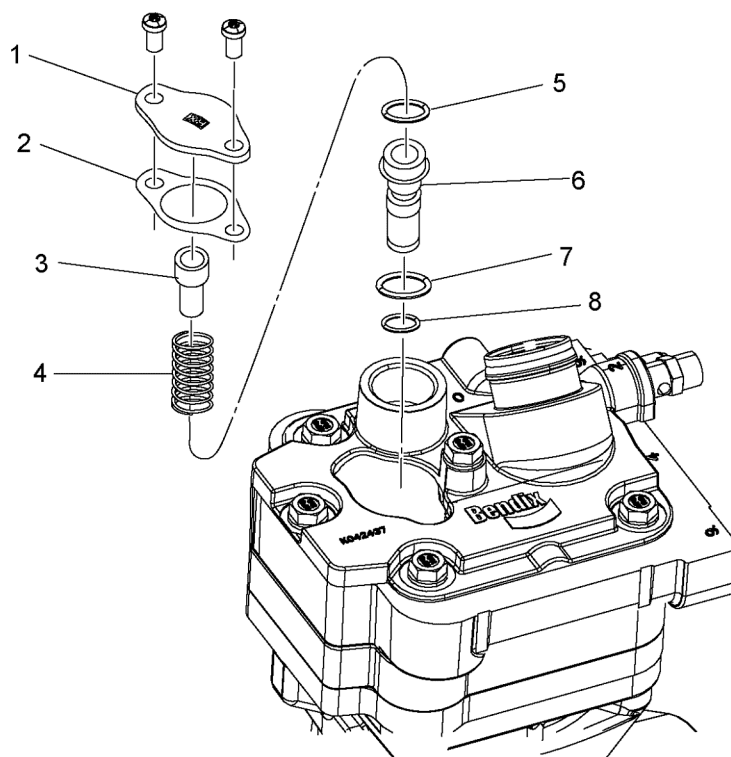
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1. Inlet Valve Closed
2. Valve Plate
3. Cooling Plate
4. Air Discharge Port

5. Air Inlet Port
6. Discharge Valve Open
7. Unloader Port
8. Piston Down and Sealed

Figure 4. Air Pressure Discharge to Vehicle

NOTE: The two-cylinder compressor requires two Unloader Valve Service Kits-- one for each cylinder.



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1. Unloader Cap
2. Gasket
3. Balance Piston
4. Spring

5. O-ring
6. Unloader Piston
7. O-ring
8. O-ring

Figure 5. Unloader Valve and Related Parts

3 Removal of the Air Compressor

Remove as follows:

1. Disconnect the batteries.
2. Drain the coolant.

NOTICE: Ensure the air pressure has been released from the air lines before removing the lines from the air compressor.

3. Relieve air pressure from tanks.
4. Disconnect the air lines to and from the compressor.
5. Disconnect and drain the coolant supply and return lines at the air compressor.
6. If the compressor is the two-cylinder version, remove the bracket and the three bolts that secure it to the engine and compressor.
7. Remove the four bolts that secure the air compressor to the cylinder block.

NOTICE: Do not contact the drive gear to the engine block during removal; damage to the seal surface will cause oil leaks.

8. Slide the air compressor forward and remove from engine.
9. Discard the air compressor mounting O-ring and oil supply O-ring.

4 Inspection of the Air Compressor

Advanced troubleshooting information for the Bendix® air compressor can be found on the Bendix web site at <http://www.bendix.com> (see technical bulletin SD-01-690) or call the Bendix Technical Assistance Center at 1-800-AIR-BRAKE, (1-800-247-2725).

It is important to consider that symptoms of poor performance of the air compressor may be caused by faults elsewhere within the air brake system, particularly in the air pressure governor, the air dryer, and in the air lines and fittings.

Symptoms of failure to load or to unload the air compressor, or excessive purge frequency at the air dryer, are often caused by significant air leaks in the governor air lines, or leaks caused by broken, deteriorated or loose governor line fittings, a faulty air pressure governor. These symptoms may also be caused by deteriorated o-rings on the unloader valve.

Use a pressure gauge to check the governor line pressure at the unloader port of the air compressor. The pressure should be tank pressure in unloaded state, and no pressure in the loaded state. If this is not the case, then the governor lines and fittings should be checked for leaks, the governor should be inspected, and the air compressor unloader valve should be inspected.

1. Inspect the intake hose adapters for physical damage; make certain to check the adapters at both ends of the intake hose or tubing.
2. Inspect the intake hose clamps and tighten them if needed.
3. Inspect the intake hose or line for signs of drying, cracking, chafing and ruptures; replace if necessary.
4. Ensure all metal tubes are tight to the mating fitting.
5. Inspect the metal tubes for any cracks or breaks; replace as necessary.
6. Check the exterior of the compressor for signs of oil seepage. Refer to the troubleshooting manual for appropriate tests and corrective action. Check for cylinder head gasket air leakage. Refer to the Bendix web site for procedure and repair components.

5 Inspection of the Diesel Exhaust Fluid Compressed Air Flow System after Air Compressor Failure

If the air compressor has failed, inspect the following Diesel Exhaust Fluid (DEF) compressed air flow systems components as follows:

1. Inspect the air compressor air discharge line. If the line is contaminated with oil or water, the air dryer/oil coalescing filter must be replaced. Refer to the Original Equipment Manufacturer (OEM) procedures.
 - a. Drain all air tanks and inspect for contamination. If contamination is found, fill air tanks to operating pressure and drain at least two times, or until all contamination is removed from the air tanks. Refer to OEM procedures.
 - b. Replace the air lines between the air compressor and the air dryer. Refer to OEM procedures.
 - c. Replace the air lines between the air dryer to the air tank. Refer to OEM procedures.
2. Check for oil at the Pressure Limiting Unit (PLU). If oil is found, the DEF air system will have to be replaced. Replace the following:
 - a. DEF pneumatic switching valve. Refer to section "Removal of the Diesel Exhaust Fluid Pump Module Pneumatic Switching Valve"
 - b. Air screen in the metering unit. Refer to section "Removal of the Diesel Exhaust Fluid Pump Module Filter Screen"
 - c. Air lines between the air tank and the PLU. Refer to OEM procedures.
 - d. Air lines between the PLU and the DEF supply unit and the metering unit. Refer to OEM procedures.

6 Installation of the Air Compressor

Install as follows:

1. If removed, install the air compressor gear to the air compressor shaft and secure with nut. Thread is left-handed; torque nut to 210-250 N·m (155-185 lb·ft).
2. Clean all foreign material from the mating surfaces of the air compressor and the cylinder block.

NOTICE: Ensure the correct bolt length is used when the air compressor is installed. If an incorrect bolt length (too long) is used, the cup plugs installed in the cylinder block can be pushed out into the gear train causing severe damage to the gear train. The correct bolt length is 35 mm (1.37 in.).

NOTICE: Ensure when the air compressor coolant lines are installed that there is an O-ring and an O-ring retainer installed on both ends of the coolant lines. Ensure that the coolant line retainer is installed on the coolant line and is pushed down to lock the lines onto the inlet and outlet ports to the cylinder block, fuel filter module and air compressor. A leak will occur if the lines are incorrectly installed and the coolant line retainer is not engaged in the locked position. If the O-ring or the coolant line retainers are missing or removed, replace the coolant line.

3. Install a new O-ring on the air compressor hub and a new O-ring on the oil supply, and then install the air compressor on the cylinder block. Torque the four bolts to 60 N·m (44 lb·ft).
4. Install the coolant supply and return lines to the air compressor.
5. Install bracket if two-cylinder compressor-hand-tighten all bolts first so that the bracket touches the engine block and compressor, then torque the bolt to the compressor to 50 N·m (37 lb·ft) and the two bolts to the cylinder block to 30 N·m (44 lb·ft).

NOTICE: Ensure the correct pipe thread fitting is being used before installing the air lines to and from the air compressor. The new air compressor will require an M10 fitting on the air lines -- NOT a 3/8" fitting. Failure to install the correct fitting will result in air leaks and permanent damage to the air compressor.

6. Install the air lines to and from the air compressor. Refer to OEM specifications.

NOTICE: Ensure that the quick-connect fitting of the intake hose is securely fastened to the compressor intake port. There are two latch points on the plastic quick-connect fitting. To engage the latches, press the quick-connect fitting all the way to the stop on the intake port.

7. Fill the cooling system. Refer to OEM specifications.



WARNING: ENGINE EXHAUST

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



WARNING: PERSONAL INJURY

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

8. Start the engine and check for leaks.

7 Removal of the Air Compressor Unloader Valve

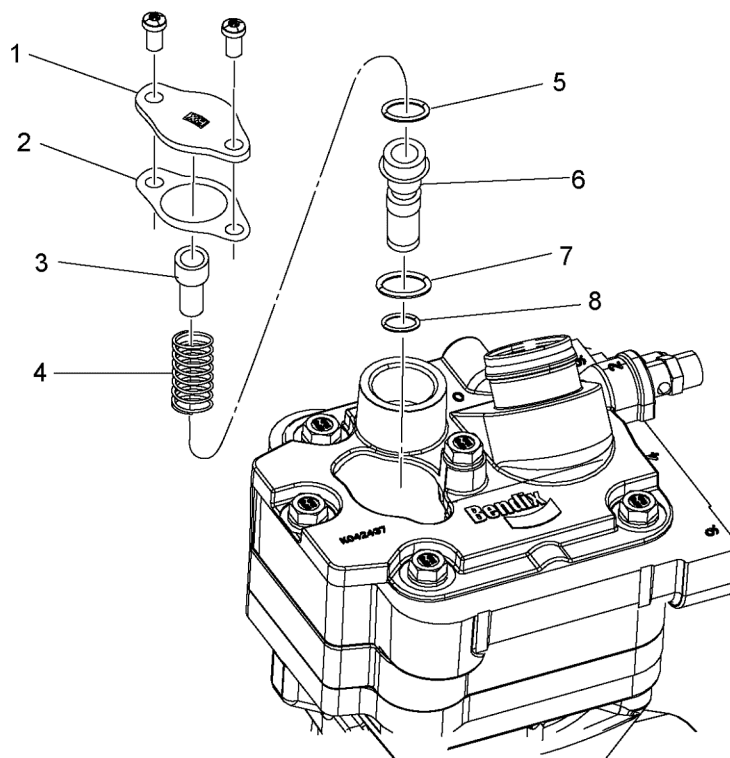
Remove as follows:

NOTICE: Do not allow dirt or debris to fall into the unloader valve bore as damage can occur.

1. Clean the area surrounding the unloader valve assembly.

NOTE: For two-cylinder compressors, retain the original caps for re-assembly. For single-cylinder compressors, discard cap.

2. Hold the unloader cap (1) in place to restrain the spring pressure and remove the two unloader cap screws. Remove and discard the unloader cap (1) and gasket (2).



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NOTICE: Do not allow dirt or debris to fall into the unloader valve bore as damage can occur.

3. Remove and discard the balance piston (3) and spring (4) from the cylinder head. Then remove and discard the unloader piston (6) along with its three O-rings (5, 7, 8).
4. Inspect the cylinder head bore for any scoring or damage. If damage is found, replace the compressor.

8 Inspection of the Air Compressor Unloader Valve

Inspect as follows:

1. Check for leaks at the unloader port. Replace leaking or worn O-rings.
2. Make certain that the unloader system lines and fittings are connected properly and free of leaks.
3. Cycle the compressor through the loaded and unloaded cycle several times. Make certain that the governor cuts-in (compressor resumes compressing air) at a minimum of 105 psi (cut-out should be approximately 15-20 psi greater than cut-in pressure. Adjust or replace the governor as required.

NOTE: Some governor variants are non-adjustable.

4. Note that the compressor cycles to the loaded and unloaded conditions promptly. If prompt action is not noted, repair or replace the governor and/or repair the compressor unloader.

9 Installation of the Air Compressor Unloader Valve

Install as follows:

NOTICE: Do not allow dirt or debris to fall into the unloader valve bore as damage can occur.

1. Clean the unloader piston bore in the cylinder head.

NOTE: Install the largest and smallest O-rings to the outside of the piston.

2. Using the lubricant provided, thoroughly lubricate and install the O-rings on the unloader piston and lubricate the unloader piston bore in the cylinder head. It is recommended to utilize the entire grease cartridge for each unloader valve assembly being installed.
3. Insert the spring into the unloader piston.
4. Lubricate the balance piston and insert the piston (smaller diameter first) into the spring previously installed in the unloader piston.

NOTE: For the two-cylinder compressor, install the original unloader caps and discard the caps supplied with the service kit. For the single-cylinder compressor, install the cap supplied in the kit.

5. Position the unloader cap gasket on the cylinder head. Position the unloader cap on top of the balance piston, making certain the cap is oriented properly.
6. Using manual pressure, gently push the balance piston into the unloader piston until the unloader cap rests against the cylinder head.
7. Install and torque the unloader cap screws to 7-8 N·m (62-71 lb·in.).