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General Description

The Bendix AirMaster air compressor is an engine-driven, single-piston compressor which supplies compressed air to the vehicle air system.

The compressor draws air from the air intake pipe, compresses the air, and delivers it to the air system supply reservoir. The compressor runs continuously but has "loaded" and "unloaded" modes, which are regulated by the air governor and the compressor loading assembly. When the air system reaches 825 kPa (120 psi), the governor sends an air signal to the unloader assembly. The unloader assembly then holds the compressor air intake valve open so that no more compressed air is forced into the air system. As air in the system is used, its pressure drops, and at 620 kPa (90 psi), the air governor stops the signal to the compressor. Without the signal, the unloader assembly automatically closes the compressor air intake valve to force more air into the system.

On vehicles with air dryers, when the system reaches the cut-out pressure of 825 kPa (120 psi), the air governor also sends an air signal to open the sludge ejector in the air dryer.

Removal and Installation, Mercedes-Benz OM 366LA Engine

Removal (Refer to Fig. 1)

1. Apply the parking brakes, chock the tires, and drain the air system.
2. Tilt the hood.
3. Disconnect the air and oil lines from the air compressor.
   - 3.1 Disconnect the air inlet hose (Ref. 5) from the rear of the compressor head.
   - 3.2 Disconnect the air outlet pipe (Ref. 6) from the fitting at the top of the compressor.
   - 3.3 Disconnect the air signal lines (Refs. 11 and 14) from the air governor.
   - 3.4 Disconnect the oil supply line (Ref. 16) from the air compressor.
4. Remove the drive belts from the air compressor.
   - 4.1 Remove the clamp bolt (Ref. 25).
   - 4.2 Loosen the bolt (Ref. 27) in the threaded block (Ref. 31).
   - 4.3 Turn the nut at the top of the clamp (Ref. 24) to raise the adjusting assembly (Ref. 26) off the drive belts.
   - 4.4 Loop the drive belts off the adjusting assembly pulleys. Then, loop the belts off the air compressor pulleys.
5. Remove the air compressor from the engine.
   - 5.1 Remove the four air compressor mounting bolts (Ref. 17).
   - 5.2 Lift the compressor (Ref. 1) from its mounting bracket (Ref. 32).

Installation (Refer to Fig. 1)

1. Install the air compressor on the engine.
   - 1.1 Position the air compressor (Ref. 1) on its mounting bracket (Ref. 32). If necessary, hold the O-ring (Ref. 22) in place over the oil return port with white grease or petroleum jelly.
   - 1.2 Install the four air compressor mounting bolts (Ref. 17), and tighten the bolts 16 N·m (12 lbf·ft).
2. Install the drive belts on the air compressor.
   - 2.1 Loop the drive belts around the air compressor pulleys and the adjusting assembly (Ref. 26) pulleys.
   - 2.2 Turn the nut at the top of the clamp (Ref. 24) to lower the adjusting assembly (Ref. 26) onto the belts. Lower the assembly until the belts are tightened to 23 kg (50 lbs).
   - 2.3 Tighten the clamp bolt 85 N·m (63 lbf·ft).
   - 2.4 Tighten the bolt (Ref. 27) into the threaded block (Ref. 31) 100 N·m (74 lbf·ft).
3. Connect the air and oil lines to the air compressor.
   - 3.1 Connect the air signal lines (Refs. 11 and 14) to the air governor.
   - 3.2 Connect the air outlet pipe (Ref. 6) to the air compressor.
   - 3.3 Connect the air inlet hose (Ref. 5) to the air compressor.
   - 3.4 Connect the oil supply line (Ref. 16) to the air compressor.
4. Start the engine and check for leaks. Repair any leaks.
5. Lower the hood, and remove the chocks from the tires.

Removal and Installation, Mercedes-Benz OM 366LA Engine

1. Air Compressor
2. Seal Ring
3. Fitting
4. Hose Clamp
5. Compressor Air Inlet Hose
6. Compressor Air Outlet Pipe
7. Elbow Fitting
8. Nut
9. Compression Ring
10. O–Ring
11. Air Dryer Signal Line
12. Air Governor
13. Air Governor Mounting Bolts (2 qty)
14. Supply Tank Signal Tank
15. Elbow Fitting
16. Air Compressor Oil Supply Line
17. Air Compressor Mounting Bolt (4 qty)
18. Lockwasher (4 qty)
19. Air Compressor Pulley
20. Lockwasher
21. Nut
22. O–Ring
23. Fuel Filter
24. Clamp
25. Clamp Bolt
26. Adjusting Assembly
27. Bolt
28. Bolt
29. Washer
30. Adjusting Assembly Bracket
31. Threaded Block
32. Air Compressor Mounting Bracket
33. Oil Return Line

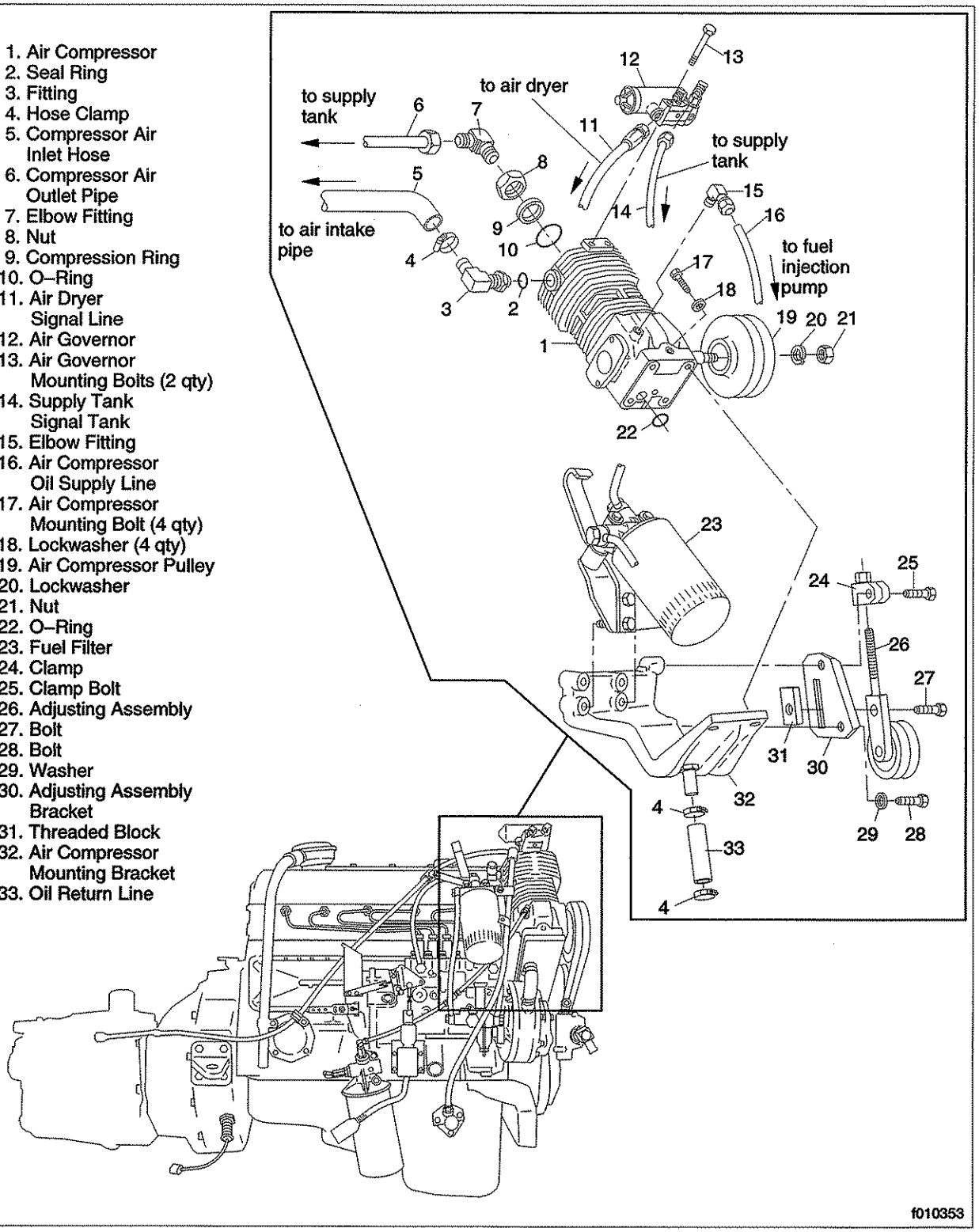


Fig. 1

Cylinder Head Disassembly, Inspection and Cleaning, and Assembly

Disassembly (Refer to Fig. 1)

1. Remove the compressor from the vehicle, and place it on a suitable work surface. For instructions, **refer to "Removal and Installation from Mercedes-Benz OM 366LA Engine, 100."**
2. Remove the air governor.
3. Remove the cylinder head cover (Ref. 2).
4. Remove and discard the gasket (Ref. 9). Note the position of the gasket ear. **See Fig. 2.**
5. Remove the cylinder head (Ref. 10) from the valve plate (Ref. 17).
6. Note the position of the gasket ear. **See Fig. 2.** Then, remove and discard the gasket (Ref. 16).
7. Note the position of the gasket ears. **See Fig. 2.** Then, remove and discard the gaskets (Ref. 18).
8. If present, remove the unloader cap (Ref. 3) from the cylinder head cover.
9. Remove the unloader piston (Ref. 4), and remove the four O-rings (Refs. 5 through 8) from the piston. Discard the O-rings.
10. Depress the spring guide (Ref. 12), and remove the C-clip (Ref. 11) from the unloader valve (Ref. 15). Discard the C-clip.
11. Remove and discard the spring guide (Ref. 12), unloader spring (Ref. 13), and unloader valve (Ref. 15) from the cylinder head.

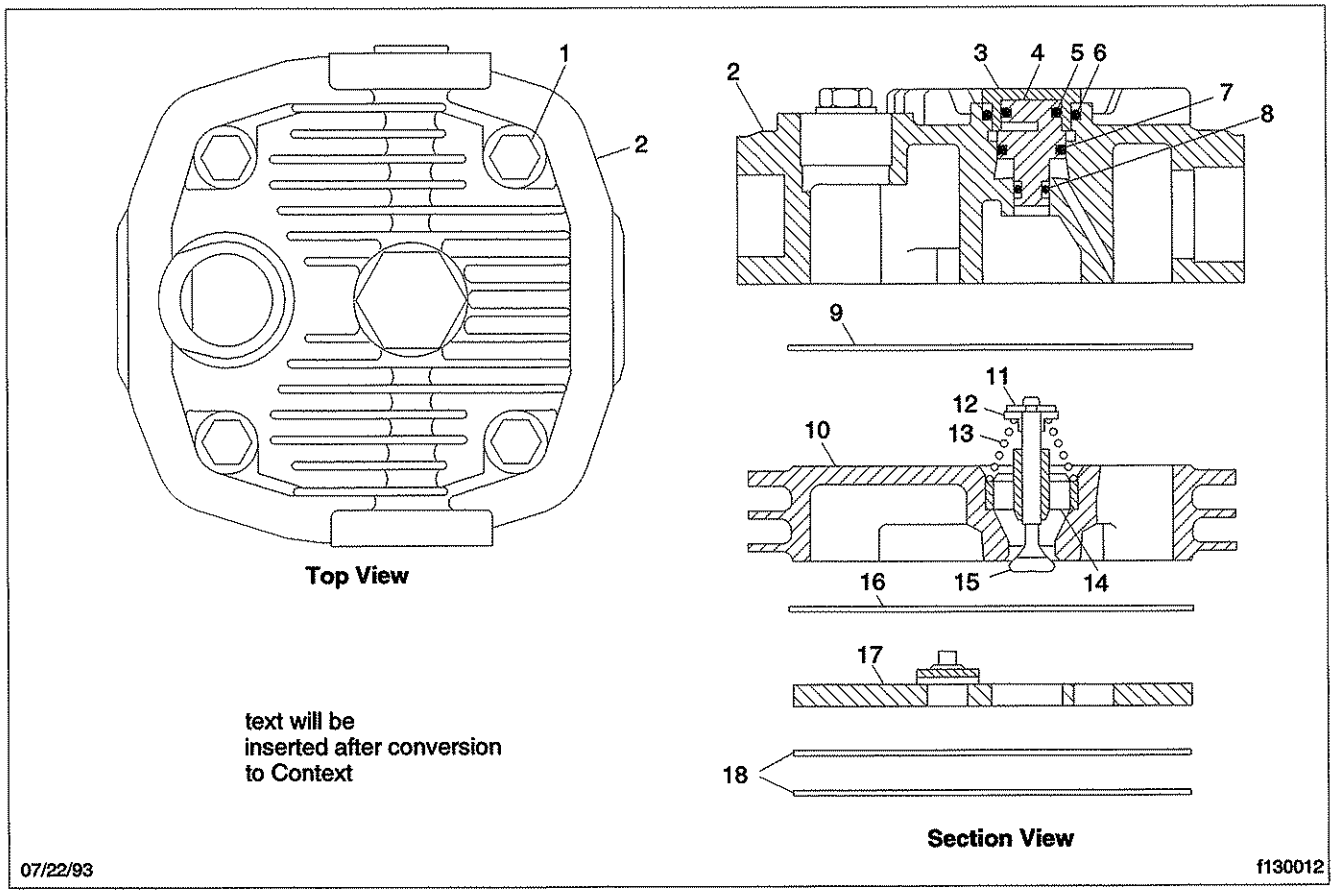


Fig. 1, Compressor Head Assembly

Cylinder Head Disassembly, Inspection and Cleaning, and Assembly

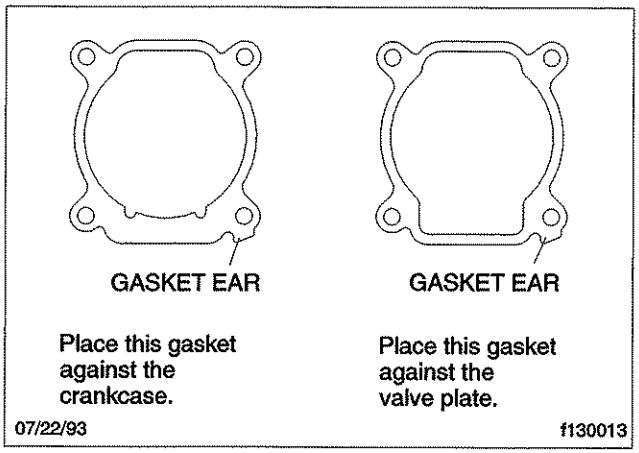


Fig. 2

Inspection and Cleaning

⚠ WARNING

WARNING: Commercial cleaning solvents are toxic, can cause severe skin irritation, and may be fire hazards. When using solvents, follow the safety precautions recommended by the solvent manufacturer.

1. Using a solvent, thoroughly clean all metal parts removed from the compressor.
2. Check that all air passages are clear, including the small drilling in the unloader piston. **See Fig. 1, Ref. 4.**
3. Check that all mating surfaces are clean of old gasket material. Remove any old material.
4. With the piston at the top of its stroke, clean any carbon from the piston crown and the crankcase head face.

Assembly (Refer to Fig. 1)

1. Using silicon fluid grease, lubricate the unloader piston (Ref. 4) and the O-rings (Refs. 5, 7, and 8). Fit the O-rings around the piston.
2. Lubricate the unloader cap O-ring (Ref. 6), and fit it around the cap. Lubricate the unloader bore in the cylinder head cover, and assemble the unloader piston and the unloader cap into the cover. Tighten the cap 27 N·m (20 lbf·ft).
3. Place a new unloader valve (Ref. 15) into the cylinder head (Ref. 10), and carefully thread the valve guide (Ref. 14)— with the small, tapered end down— over the unloader valve stem.
4. Place a new unloader spring (Ref. 13) and spring guide (Ref. 12) onto the valve guide. Depress the spring guide and place a new C-clip (Ref. 11) on the unloader valve stem. Release the spring and ensure the clip is securely in place.
5. Assemble the valve plate, cylinder head, cylinder head cover, and gaskets (Refs. 9 and 16), **as shown in Fig. 1.**
6. Install the cylinder head assembly on the crankcase with the two gaskets (Ref. 18). For the correct placement of the gaskets, **refer to Fig. 2.**
7. Install the four cylinder head bolts. Tighten the bolts diagonally, 27 N·m (20 lbf·ft).
8. Install the compressor on the engine. For instructions, **refer to "Removal and Installation from Mercedes-Benz OM 366LA Engine, 100."**
9. Install the air governor.
10. Start the engine, and check the compressor for air and oil leaks.

Specifications

Description	Class/Grade	Size	Torque N·m (lbf·ft)
Bolt to Threaded Block	8.8	M10 x 40	100 (74)
Air Compressor Tensioning Assembly Clamp Bolt	8	1/2–12	85 (63)
Air Compressor Mounting Bolts	10.9	8 mm	16 (12)
Compressor Cylinder Head Bolts	10.9	8 mm	27 (20)

Table 1, Fastener Torques

Description	Tension kg (lbs)
Air Compressor Belts	23 (50)

Table 2, Drive Belt Tension

Holset SS191B Air Compressor 13.01

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NOTE: Refer to the Cummins SS191B Air Compressor Shop Manual or *Cummins Single Cylinder Air Compressor Shop Manual,* for additional information on SS191B air compressor service operations.

General Description

Cummins B Series engines use the Holset SS191B air-cooled air compressor, an engine-driven, single-piston compressor which supplies compressed air to the vehicle air system. The compressor draws turbocharged, aftercooled air from the engine manifold. It compresses the air further, and delivers it to the air system supply reservoir.

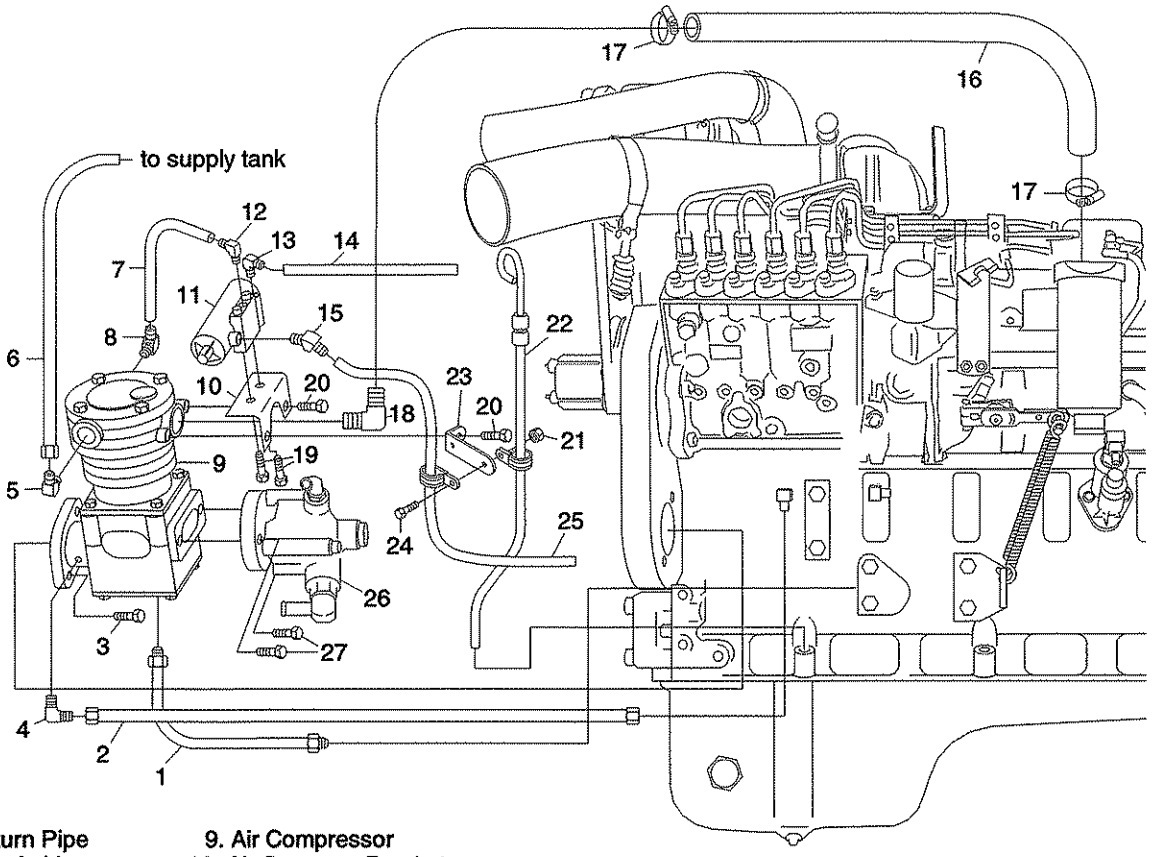
The compressor runs continuously but has "loaded" and "unloaded" modes, which are regulated by the air governor and the compressor loading assembly. When the air system reaches 825 kPa (120 psi), the governor sends an air signal to the unloader assembly. The unloader assembly then holds the compressor air intake valve open so that no more compressed air is forced into the air system. As air in the system is used, its pressure drops, and at 620 kPa (90 psi), the air governor stops the signal to the compressor. Without the signal, the unloader assembly automatically closes the compressor air intake valve to force more air into the system.

On vehicles with air dryers, when the system reaches the cut-out pressure of 825 kPa (120 psi), the air governor also sends an air signal to open the sludge ejector in the air dryer.

For detailed repair procedures and other engine service not covered in this section, refer to the *Cummins SS191B Air Compressor Shop Manual* or *Cummins Single Cylinder Air Compressor Shop Manual.*

Removal (Refer to Fig. 1)

1. Park the vehicle, apply the parking brakes, and chock the tires.
2. Drain the air reservoirs.
3. Tilt the hood.
4. Carefully disconnect the air lines.
   - 4.1 Disconnect the air inlet line (Ref. 16) at the rear of the compressor head.
   - 4.2 Disconnect the air outlet line (Ref. 6) from the side of the compressor head.
   - 4.3 Disconnect the air signal line (Ref. 7) between the compressor and the air governor.



1. Oil Return Pipe
2. Oil Supply Line
3. Air Compressor Mounting Bolt
4. Elbow Fitting
5. Elbow Fitting
6. Air Compressor Outlet Line
7. Air Compressor Signal Line
8. Elbow Fitting
9. Air Compressor
10. Air Governor Bracket
11. Air Governor
12. Elbow Fitting
13. Elbow Fitting
14. Air Governor Signal Line
15. Elbow Fitting
16. Air Compressor Input Line
17. Hose Clamp
18. Elbow Fitting
19. Air Governor Mounting Bolt
20. Air Governor Bracket Bolt
21. Nut
22. Dipstick
23. Stand–Off Bracket
24. Bolt
25. Air Governor Signal Line
26. Power Steering Pump
27. Power Steering Pump Mounting Bolt

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Fig. 1

Removal and Installation

4.4 Disconnect the air signal lines (Refs. 14 and 25) between the air governor and the chassis air system.

5. Remove the power steering pump.

5.1 Remove the butterfly clamps holding the power steering lines together.

5.2 Remove the power steering pump mounting bolts (Ref. 27).

5.3 Remove the pump from the compressor.

6. Remove the dipstick (Ref. 22) and air signal line (Ref. 25) clamps from the stand-off bracket (Ref. 23) at the rear of the air governor.

7. Remove the left air governor bracket bolt (Ref. 20) to free the stand-off bracket. Remove the bracket.

8. Disconnect the oil lines.

8.1 Disconnect the compressor oil return pipe (Ref. 1) from the engine.

8.2 Disconnect the compressor oil supply line (Ref. 2) from the air compressor.

8.3 Remove the two compressor mounting bolts (Ref. 3), then lift the compressor from the engine.

Installation (Refer to Fig. 1)

1. Install the air compressor.

1.1 Position the compressor on the engine, and secure it with the air compressor mounting bolts (Ref. 3). Tighten the bolts 73 N·m (54 lbf·ft).

1.2 If removed, install the air governor on the compressor. Install the stand-off (Ref. 23) with the left bracket bolt, and tighten both bolts 20 N·m (15 lbf·ft).

2. Connect the air compressor oil lines.

2.1 Connect the oil supply line (Ref. 2) to the compressor.

2.2 Connect the oil return pipe (Ref. 1) to the engine.

3. Install the power steering pump.

3.1 Position the pump on the air compressor, and secure it with the power steering pump mounting bolts (Ref. 27). Tighten the bolts 38 N·m (28 lbf·ft).

3.2 Clamp the power steering pump inlet and outlet lines together.

4. Connect the air compressor and air governor air lines.

4.1 Connect the air signal lines (Refs. 14 and 25) between the air governor and the chassis air system.

4.2 Connect the air signal line (Ref. 7) between the compressor and the air governor.

4.3 Connect the air outlet line (Ref. 6) to the side of the compressor head.

4.4 Connect the air inlet line (Ref. 16) at the rear of the compressor head.

5. Clamp the air signal line (Ref. 25) and the dipstick (Ref. 22) to the stand-off bracket (Ref. 23).

6. Start the engine, and check for leaks in the compressor mounting. Repair any leaks as necessary.

7. Lower the hood, and remove the chocks from the tires.

Specifications

This subject contains the following table: •Fastener Torques

Description	Grade	Size	Torque N·m (lbf·ft)
Air Governor Bracket Bolts	5	5/16–18	20 (15)
Air Compressor Mounting Bolts	8.8	M12 x 1.75	73 (54)
Power Steering Pump Mounting Bolts	5	3/8–16	38 (28)

Table 1, Fastener Torques

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NOTE: Refer to the *Cummins SS296 Air Compressor Shop Manual* or the *Cummins Troubleshooting and Repair Manual C Series Engines* for additional information on SS296 air compressor service operations.

General Description (See Fig. 1)

Cummins C Series engines use the Holset SS296 water-cooled air compressor, an engine-driven, piston-type compressor which supplies

compressed air to the vehicle air system. The compressor draws turbocharged, aftercooled air from the engine intake manifold. It compresses the air further, and delivers it to the air system supply reservoir.

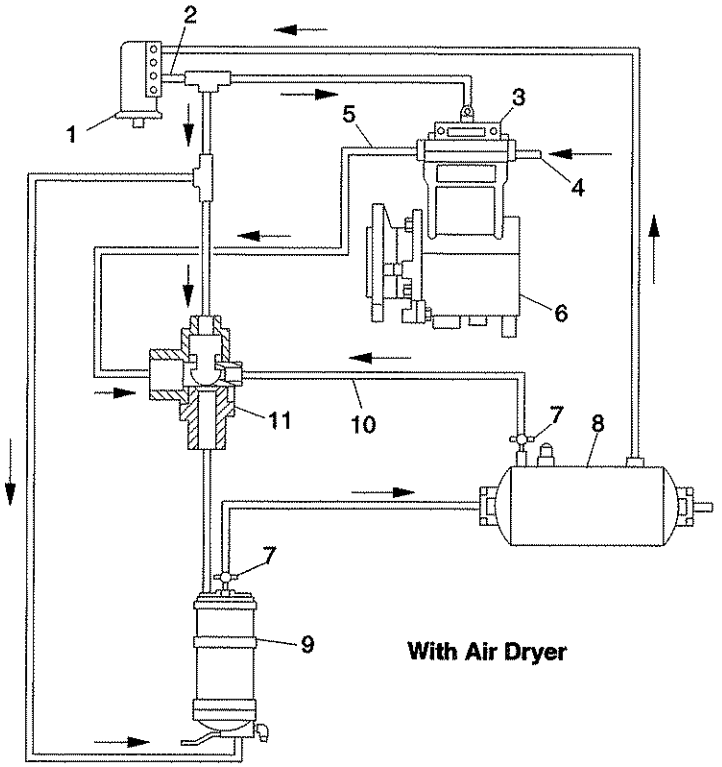
The compressor runs continuously but has "loaded" and "unloaded" modes, which are regulated by the air governor and the compressor loading assembly. The compressor also uses an Economy (E-type) unloader system to reduce pumping and engine boost pressure losses through the compressor intake valve while operating in the unloaded mode. If equipped with an air dryer, an Econ valve must be installed to prevent excessive oil consumption. When the air system reaches 825 kPa (120 psi), the governor sends an air signal to the unloader assembly. The unloader assembly then seals off incoming air at the intake valve so that no more compressed air enters the air system. As air in the system is used, its pressure drops, and at 620 kPa (90 psi), the air governor stops the signal to the compressor. Without the signal, the compressor again pumps more compressed air into the system.

On vehicles with air dryers, when the system reaches the cut-out pressure of 825 kPa (120 psi), the air governor also sends an air signal to open the sludge ejector in the air dryer.

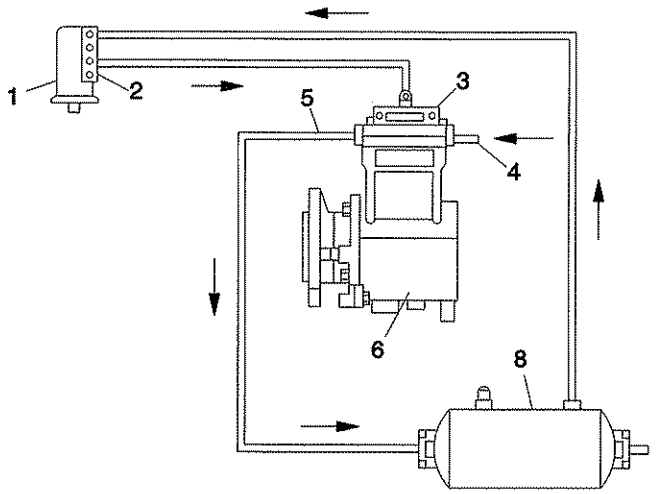
For detailed repair procedures and other engine service not covered in this section, refer to the *Cummins SS296 Air Compressor Shop Manual* or the *Cummins Troubleshooting and Repair Manual C Series Engines*

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General Description



With Air Dryer



Without Air Dryer

1. Air Governor
2. Unloader Port
3. E–Type Unloader Valve
4. Air Inlet Line
5. Air Outlet Line
6. Compressor
7. Check Valve
8. Air Reservoir (Wet Tank)
9. Air Dryer
10. Secondary Pressure Line
11. Econ Valve

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Fig. 1

Removal

1. Park the vehicle, apply the parking brakes, and chock the tires.
2. Tilt the hood.

⚠ WARNING

WARNING: Drain the coolant only when the coolant and engine are cool. Draining it when these are hot could cause severe personal injury due to scalding.

3. Drain the coolant and the air reservoirs.
4. Carefully disconnect the air lines, coolant lines, and the oil supply line.
   - 4.1 Disconnect the air inlet line **(Fig. 1)** at the rear of the compressor head and at the engine.
   - 4.2 Disconnect the air outlet line **(Fig. 1)** from the front of the compressor head.
   - 4.3 Disconnect the coolant lines **(Fig. 2)** at the rear of the compressor head and at the cylinder head and engine block.
   - 4.4 Disconnect the two air signal lines between the air governor and the chassis air system.
   - 4.5 Disconnect the compressor oil supply line **(Fig. 3)** from the air compressor.
5. Remove the power steering pump.
   - 5.1 Remove the power steering pump mounting bolts.
   - 5.2 Remove the pump from the compressor.
6. Remove the air compressor. **Refer to Fig. 4.**
   - 6.1 Remove the compressor support-bracket capscrews, then remove the bracket.
   - 6.2 Remove the compressor mounting nuts, then lift or lower the compressor out of the engine compartment.

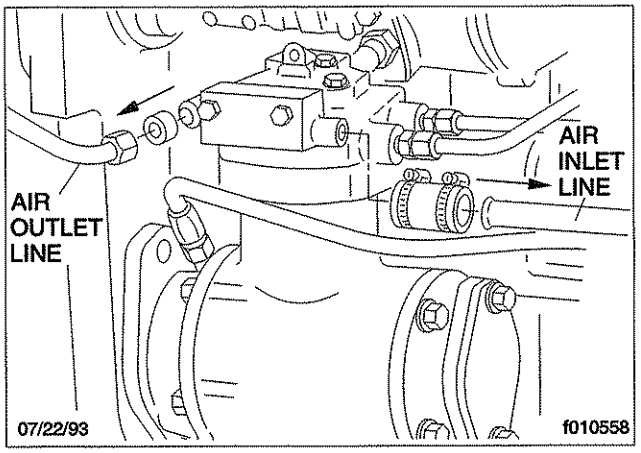


Fig. 1

Installation

1. Install the compressor.

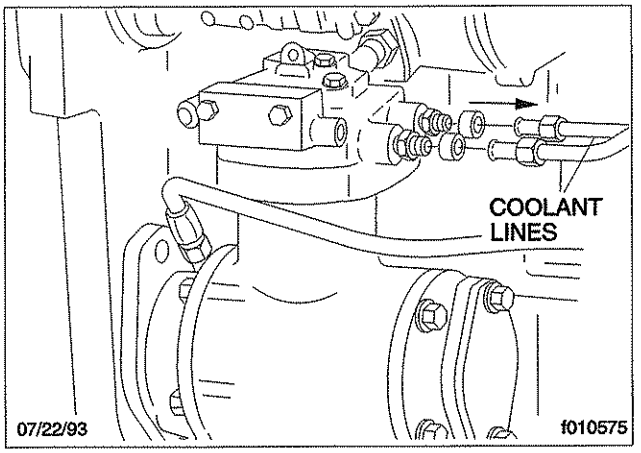


Fig. 2

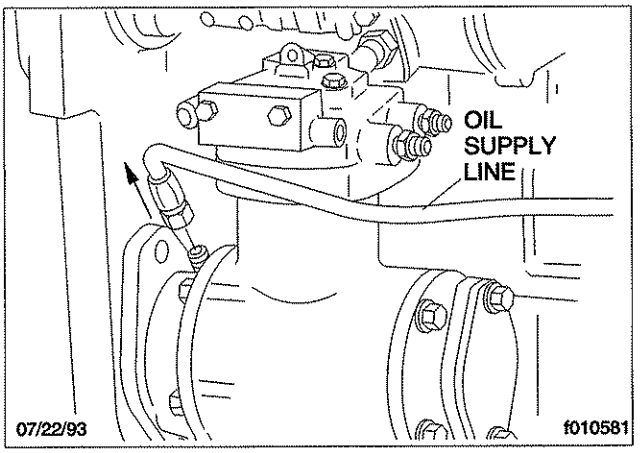
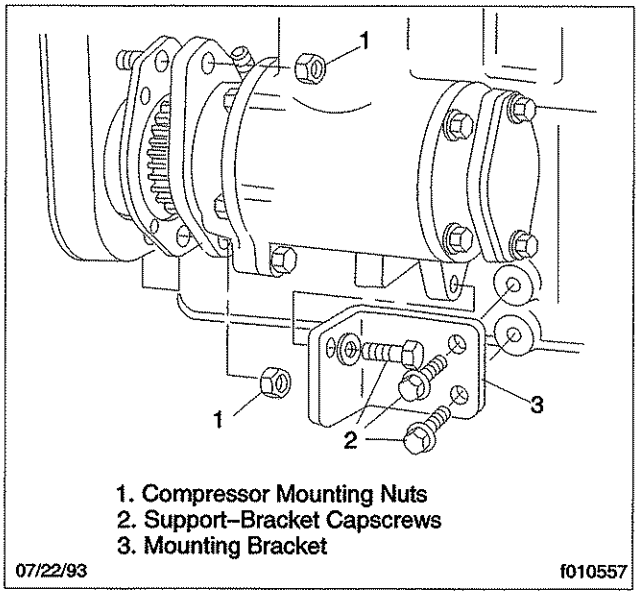


Fig. 3

Removal and Installation



1. Compressor Mounting Nuts
2. Support–Bracket Capscrews
3. Mounting Bracket

Fig. 4

1.1 Position the compressor and a new gasket on the engine.

1.2 Install the mounting nuts and tighten them 77 N·m (57 lbf·ft).

1.3 Install the compressor support bracket and tighten the capscrews 47 N·m (35 lbf·ft).

2. Install the power steering pump.

   Position the pump on the air compressor, and secure it with the power steering pump mounting bolts. Tighten the bolts 47 N·m (35 lbf·ft).

3. Connect the air lines, coolant lines, and the oil supply line.

   3.1 Connect the air inlet line **(Fig. 1)** to the rear of the compressor head and to the engine.

   3.2 Connect the air outlet line **(Fig. 1)** to the front of the compressor head.

   3.3 Connect the coolant lines **(Fig. 2)** to the rear of the compressor head and to the cylinder head and engine block.

   3.4 Connect the two air signal lines between the air governor and the chassis air system.

   3.5 Connect the compressor oil supply line **(Fig. 3)** to the air compressor.

4. Fill the cooling system with approved coolant. Refer to the vehicle maintenance manual.

5. Start the engine, and check for leaks in the air lines, coolant lines, and the oil supply line. Repair any leaks as necessary.

6. Lower the hood, and remove the chocks from the tires.

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General Description

The governor **(see Fig. 1),** together with the compressor unloading mechanism, automatically controls air pressure in the air brake system. It keeps the pressure between 655 and 862 kPa (95 to 125 psi), which is a preset range for all Freightliner vehicles.

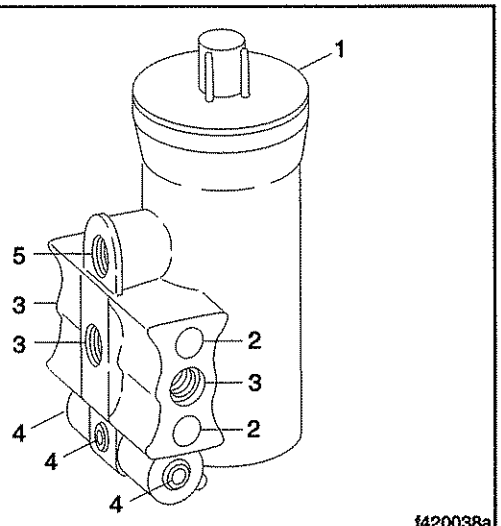
The compressor runs continuously while the engine runs, but actual air compression is controlled by the D–2 governor, working with the compressor unloading mechanism.

The D–2 governor is mounted on the compressor. There are three reservoir ports, three unloader ports, and one exhaust port (all 1/8-inch NPT) on the governor.

Principles of Operation

Pressurized air enters the D–2 governor at one of its reservoir ports, and acts on the area of the piston and beneath the inlet and exhaust valve. **See Fig. 2.** As air pressure builds up, the piston moves against the resistance of the pressure-setting spring. The piston and inlet and exhaust valve move up when the reservoir air pressure reaches the cut-out setting of the governor. The exhaust stem seats on the inlet and exhaust valve, and then the inlet passage opens. Reservoir air then flows by the open inlet valve, through the passage in the piston, and out the unloader port to the compressor unloading mechanism. Air also flows around the piston, and acts upon the additional area of the piston. This added force, which results from a larger area on the piston, ensures a positive action and fully opens the inlet valve.

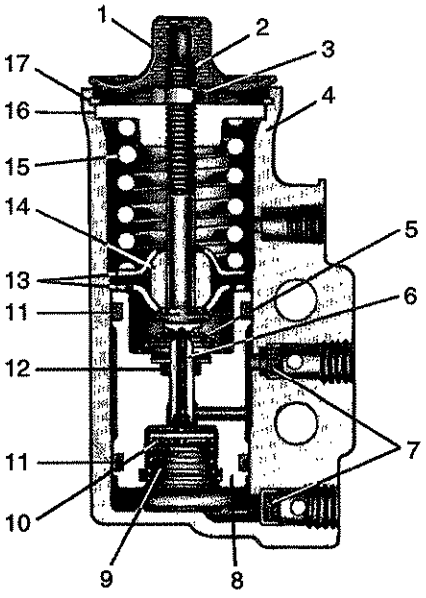
As the system reservoir air pressure drops to the cut-in setting of the governor, the force exerted on the piston is reduced so that the pressure-setting spring moves the piston down. The inlet valve closes and the exhaust opens. With the exhaust open, the air in the unloader line escapes back through the piston, through the exhaust stem and out the exhaust port.



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1. Top Cover
2. Mounting Hole
3. Unloader Port
4. Reservoir Port
5. Exhaust Port

Fig. 1



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1. Cover
2. Adjusting Screw
3. Adjusting Screw Locknut
4. Body
5. Exhaust Stem Spring
6. Exhaust Stem
7. Filters
8. Piston
9. Inlet and Exhaust Valve Spring
10. Inlet and Exhaust Valve
11. O-Rings
12. Lower Spring Seats
13. Spring Guide
14. Pressure-Setting Spring
15. Upper Spring Seat
16. Retaining Ring

Fig. 2

Tests

The following test should be done whenever the vehicle air pressure is incorrect and the causes are unknown.

If the air governor doesn't work correctly or if leakage is excessive, replace it with a new or rebuilt unit, or repair it using genuine Bendix parts and the instructions in this section.

1. Apply the parking brakes and chock the tires. Tilt the hood.
2. Start the engine and build up air pressure in the air brake system.

IMPORTANT: Make sure the test gauge is registering accurately before using it to check or adjust the air governor.

3. Using a test gauge attached to the supply reservoir, check the pressure at the time the air governor cuts out. The cut-out pressure should be 120 to 130 psi (827 to 896 kPa).
4. With the engine still running, apply the brakes a few times to reduce the air pressure and observe at what pressure the air governor cuts in the compressor. The minimum cut-in pressure should be 100 psi (689 kPa).
5. If either the cut-out or cut-in pressure is incorrect, proceed to **Subject 130**.
6. Test the leakage on the air governor in both the cut-in and cut-out positions.
   - 6.1 With the compressor in the cut-in position, apply a soap solution to the air governor exhaust port. See **Fig. 1**. A slight bubble leakage is permitted. More leakage indicates that the inlet valve or lower piston O-ring is worn out.
   - 6.2 With the compressor in the cut-out position, apply a soap solution to the air governor exhaust port. See **Fig. 1**. A slight bubble leakage is permitted. More leakage indicates that the exhaust valve seat, stem, O-ring, or upper piston O-ring is worn out.
7. Lower the hood and remove the chocks from the tires.

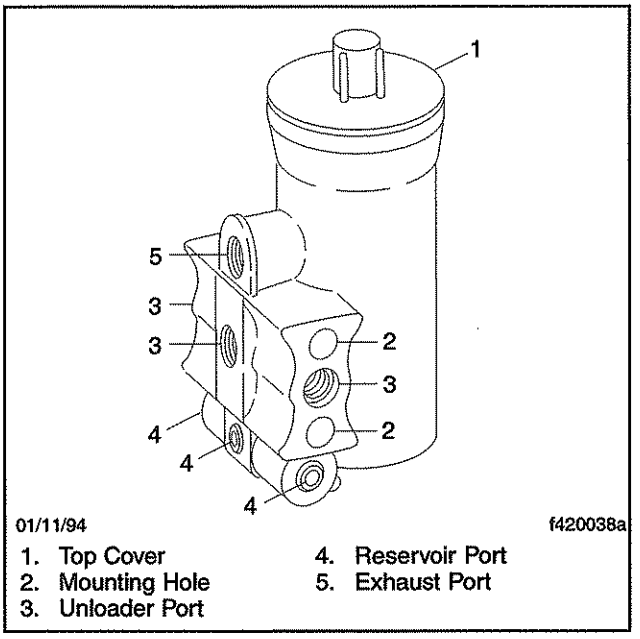


Fig. 1, Air Governor

Removal (See Fig. 1)

1. Chock the tires, then drain the air brake system. Tilt the hood.
2. Disconnect the reservoir and unloader port air lines. Mark the lines for later reference. Cap the air lines tightly to keep out dirt and moisture.
3. Remove the governor mounting bolts, then remove the governor.

Installation

1. Clean the mounting pad on both the compressor and the governor block, and be sure the compressor unloading port is clear and clean.
2. Using a new governor mounting gasket, install the governor and its mounting bolts. Tighten the bolts 15 to 20 N·m (11 to 15 lbf·ft).
3. Clean the connecting lines after removing the caps, and apply Loctite® 242, or equivalent sealant in small quantities, to the reservoir and unloader fittings.

⚠ CAUTION

CAUTION: Make sure sealant doesn't get inside the fittings. Loose material inside the plumbing may clog the governor or other components, causing damage.

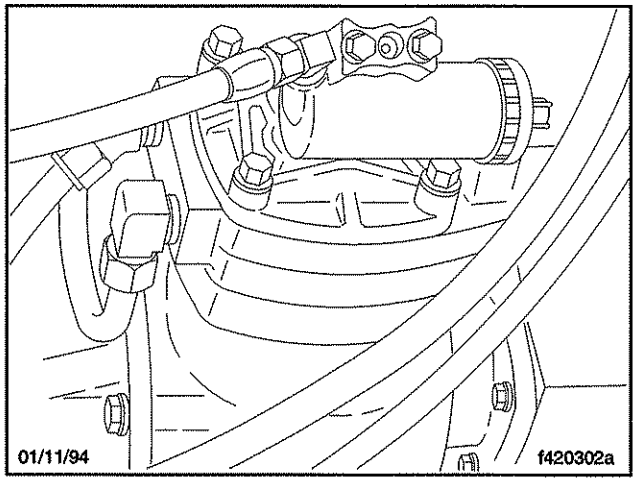
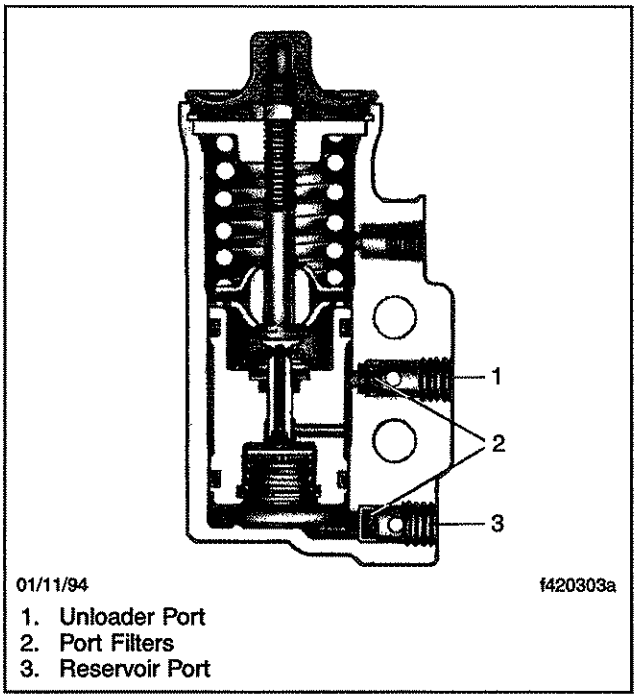


Fig. 1

4. Connect the reservoir and unloader port air lines as referenced earlier. Tighten the fittings 15 to 18 N·m (11 to 13 lbf·ft).
5. Do the operating and leakage tests under **Subject 100**.
6. After the tests have been completed and the governor is operating correctly, screw the top cover on tightly until it seals the body, preventing the entry of any foreign matter.
7. If necessary, install new filters **(see Fig. 2)** in the reservoir and unloader ports. These cup-shaped filters can be installed with the head of a pencil.
8. Lower the hood. Then remove the chocks from the tires.



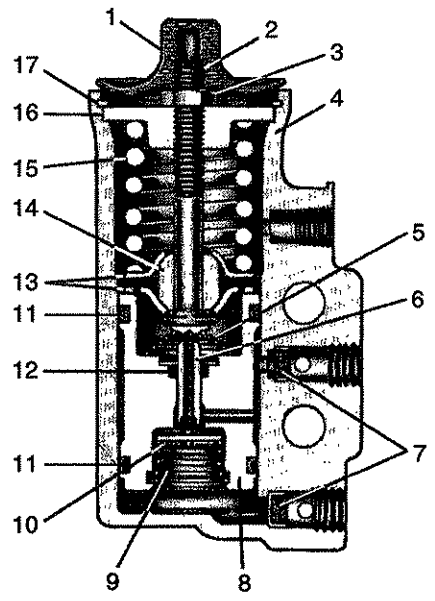
1. Unloader Port
2. Port Filters
3. Reservoir Port

Fig. 2

Disassembly, Cleaning and Inspection, and Assembly

Disassembly (See Fig. 1)

1. Remove the governor from the vehicle, using the instructions under **Subject 110.**
2. Clean the governor exterior of road dirt and grease.
3. Unscrew the top cover (Ref. 1).
4. Using a pair of retaining ring pliers, remove the spring assembly retaining ring (Ref. 16).
5. Remove the adjusting screw (Ref. 2) and spring assembly.
6. Remove the locknut (Ref. 3), then the hex-shaped upper spring seat (Ref. 15) from the adjusting screw.



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1. Cover
2. Adjusting Screw
3. Adjusting Screw Locknut
4. Body
5. Exhaust Stem Spring
6. Exhaust Stem
7. Filters
8. Piston
9. Inlet and Exhaust Valve Spring
10. Inlet and Exhaust Valve
11. O-Rings
12. Lower Spring Seats
13. Spring Guide
14. Pressure-Setting Spring
15. Upper Spring Seat
16. Retaining Ring

Fig. 1

7. Remove the pressure-setting spring (Ref. 14), lower spring seat (Ref. 12), spring guide (Ref. 13), and the other lower spring seat (Ref. 12) from the adjusting screw.
8. Remove the exhaust stem and its spring from the top of the piston. With the body in the inverted position, tap lightly and remove the piston.
9. Remove the inlet and exhaust valve spring (Ref. 9) and the valve (Ref. 10) from the piston.
10. Remove the two piston O-rings (Ref. 11), and with a hooked wire, remove the exhaust stem O-ring.
11. Clean or remove the unloader and reservoir port filters (Ref. 7).

Cleaning and Inspecting

⚠ WARNING

WARNING: Commercial cleaning solvents are toxic, can cause severe skin irritation, and may be fire hazards. When using solvents, follow the safety precautions recommended by the solvent manufacturer.

1. Clean all metal parts in mineral spirits.
2. Wipe all rubber parts dry, using a clean cloth.
3. Inspect the governor body for cracks or other damage. Be particularly careful that all air passages in the body, filters, exhaust stem, and piston are not obstructed.
4. Check the springs for cracks, distortion, or corrosion.
5. Replace all worn or damaged parts.

Assembly (See Fig. 1)

Before assembly, lubricate the lower body bore, the top of the piston, the piston grooves, piston O-rings, and the spring guide and adjusting screw with Dow Corning 55-M pneumatic grease, or equivalent.

1. Install the exhaust stem O-ring (Ref. 11) in its groove in the stem bore of the piston.
2. Install the upper and lower piston O-rings (Ref. 11).

Disassembly, Cleaning and Inspection, and Assembly

3. Drop the inlet and exhaust valve (Ref. 10) into place at the bottom of the piston.
4. Install the inlet and exhaust valve spring (Ref. 9) with the small end against the valve. Press the spring down until the larger coiled end snaps into the groove inside the piston.
5. Place the exhaust stem spring (Ref. 5) over the exhaust stem. Carefully press the stem into the stem bore of the piston.
6. Install the piston in the body.
7. Install one lower spring seat (Ref. 12), spring guide (Ref. 13), the other lower spring seat (Ref. 12), pressure-setting spring (Ref. 14), and the hex-shaped upper spring seat (Ref. 15) on the adjusting screw, in that order. Screw the upper spring seat (Ref. 15) down until the distance from the top of the seat to the bottom of the stem head is about 48 mm (1-7/8 inches).
8. Install the locknut (Ref. 3).
9. Before placing the adjusting screw and stem assembly in the governor body, check that the exhaust stem (Ref. 6) and its spring are in place in the piston.
10. Install the adjusting screw (Ref. 2) and spring assembly, and the retaining ring (Ref. 16).
11. Install the governor on the vehicle, following the instructions under **Subject 110**.

Adjustment

NOTE: An air governor with a dryer reservoir module (DRM) is not adjustable.

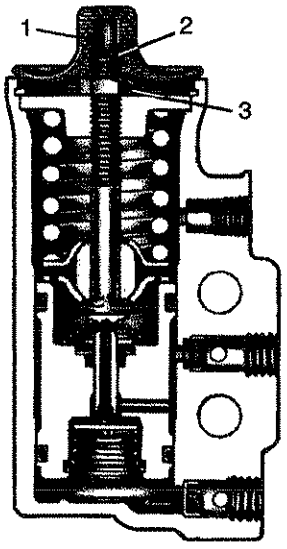
If the pressure settings of the governor are inaccurate or if they need to be changed, do the following:

1. Apply the parking brakes and chock the tires. Tilt the hood.
2. Remove the top cover from the governor and loosen the adjusting screw locknut. See **Fig. 1.**
3. To raise the pressure settings, turn the adjusting screw counterclockwise. To lower the pressure setting, turn the adjusting screw clockwise.

NOTE: The pressure range between cut in and cut out is not adjustable.

If these adjustments do not correct the pressure settings, repair or replace the governor using the instructions in this section.

4. Tighten the adjusting screw locknut and install the top cover.



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1. Top Cover
2. Adjusting Screw
3. Adjusting Screw Locknut

Fig. 1, Air Governor

5. Lower the hood, then remove the chocks from the tires.

Contents

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General Information

The Cummins 15.2 cfm compressor is used on the ISB engine. The 18.7 cfm compressor is used on the ISC engine. Both compressors are single cylinder engine-driven, piston-type compressors which supply compressed air to operate air powered actuators on vehicles. These compressors are geared directly to the engine which serves to operate the compressor and any accessory that is connected on the rear flange. These compressors will deliver air out of the exhaust port when the unloader port is at atmospheric pressure and will stop air delivery when the unloader port is pressurized to the system pressure between 100 to 125 psi (689 to 862 kPa). A governor determines the "cut-in" (start of pumping) and "cut-out" (termination of pumping) of the compressor by supplying the proper control signal to the unloader port. The governor is sensing the pressure in the air supply tank or "wet tank." If the output air pressure is inadvertently blocked or required to exceed 250 psi (1724 kPa), the compressor will stop air delivery. The air will be recycled within the compressor and no mechanical harm will be done.

Air Compressor Removal and Installation

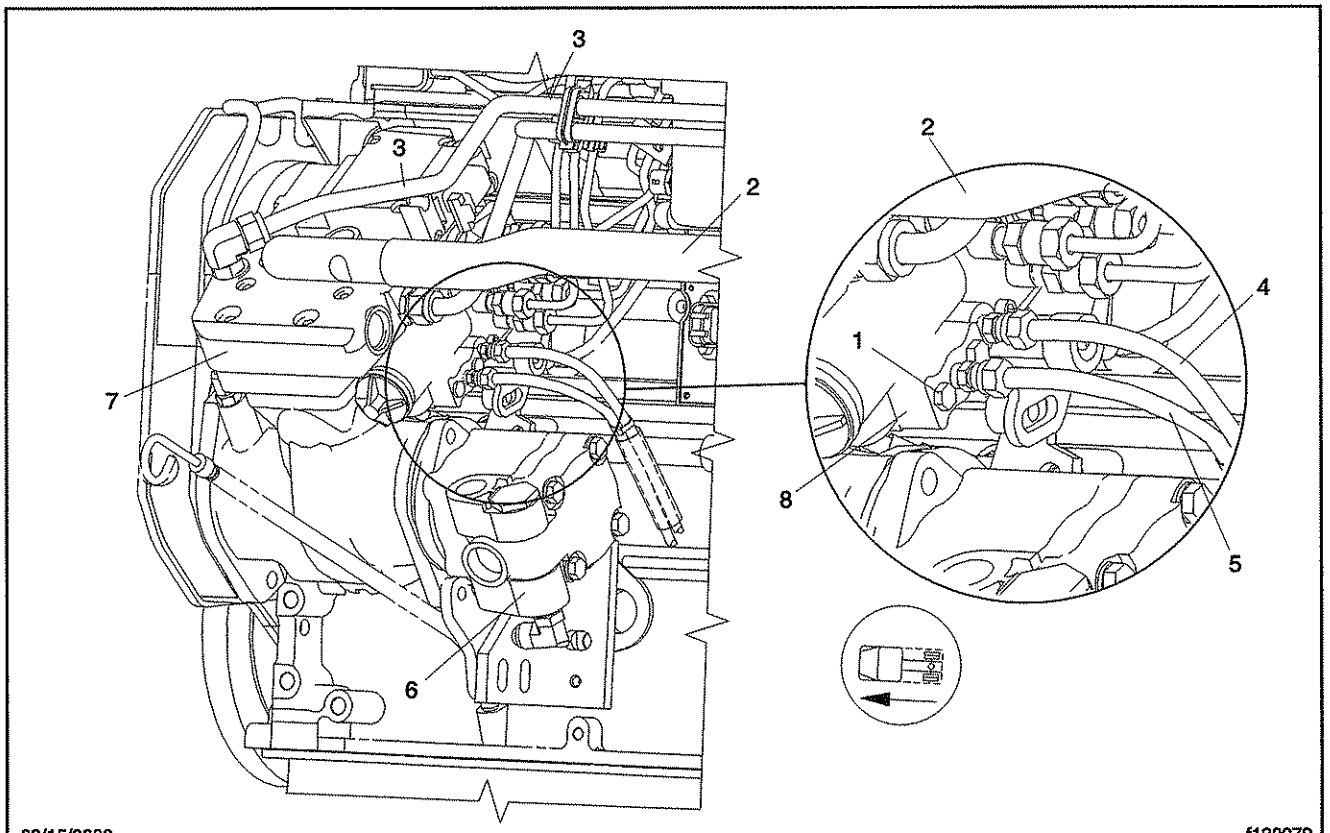
Removal

1. Park the vehicle on a level surface and apply the parking brakes. Shut down the engine. Chock the rear tires.
2. Tilt the hood.
3. Drain the air reservoirs.
4. Drain the radiator coolant below the level of the air compressor. See **Group 20** in this manual for instructions.

⚠ WARNING

Wear goggles when using compressed air to clean or dry parts, as permanent harm to eyes could result from flying debris.

5. Using a cleaning solvent, remove road dirt and grease from the outside of the air compressor, then dry the air compressor with compressed air.
6. Marking their locations and positions, disconnect all air, coolant, and oil lines attached to the air compressor and governor. Remove cushion clamps and tie straps as needed to move the lines out of the way. See **Fig. 1** and **Fig. 2**.
7. Remove the power steering pump.

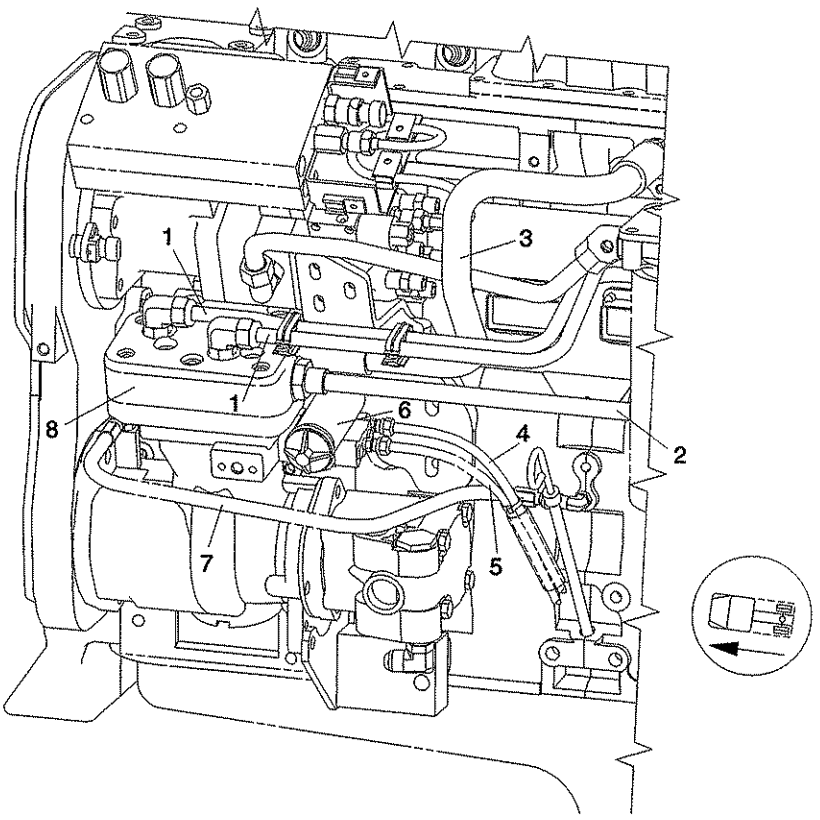


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1. Governor Mounting Capscrew
2. Compressor Air Inlet Hose
3. Coolant Line
4. Air Reservoir Line
5. Air Dryer Line
6. Steering Pump
7. Cylinder Head
8. Air Governor

Fig. 1, Air Compressor Removal, ISB

Air Compressor Removal and Installation



02/15/2000 f130078

1. Coolant Line
2. Air Dryer/Wet Tank Line
3. Compressor Air Inlet Hose
4. Air Reservoir Line
5. Air Dryer Line
6. Air Governor
7. Oil Feed Line
8. Cylinder Head

Fig. 2, Air Compressor Removal, ISC

7.1 Remove the power steering pump mounting capscrews.

7.2 Remove the power steering pump from the air compressor.

8. Remove the air compressor.

8.1 Remove the air compressor support bracket. See **Fig. 3** and **Fig. 4**.

8.2 Support the air compressor, and remove the nuts and washers from the front gear cover studs.

8.3 Lift or lower the air compressor out of the engine compartment.

8.4 Remove and discard the air compressor mounting gasket, and clean the mating surfaces.

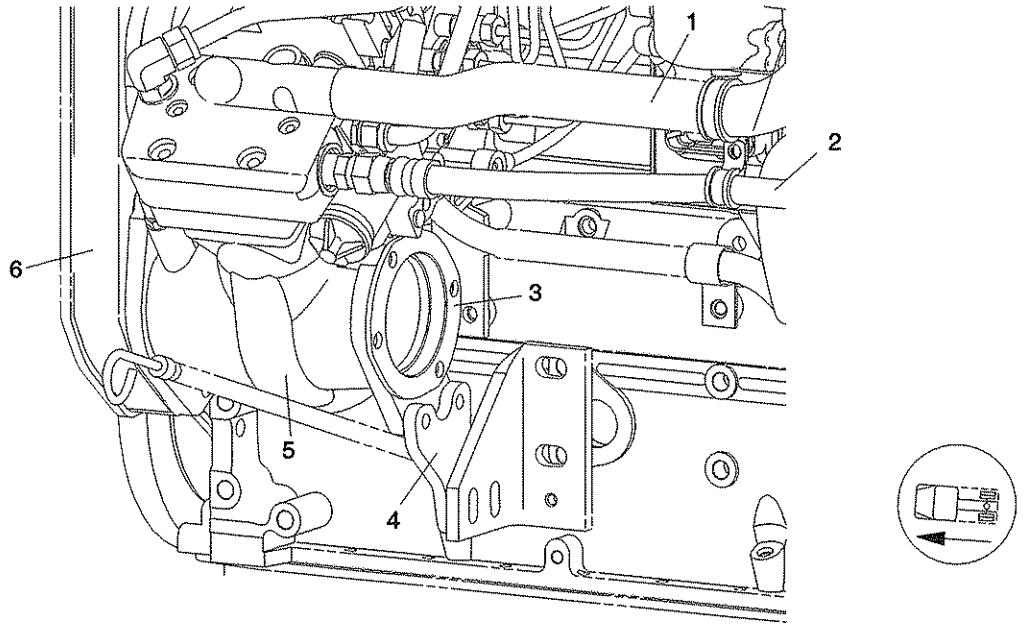
Installation

IMPORTANT: Be sure the gasket surfaces are cleaned and not damaged.

1. Install the air compressor.

1.1 Install a new gasket on the front gear cover.

1.2 Position the air compressor on the front gear cover studs while aligning the compressor drive gear.



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1. Compressor Air Inlet Hose
2. Air Dryer/Wet Tank Line
3. Rear Flange
4. Mounting Bracket
5. Compressor Crankcase
6. Front Gear Cover

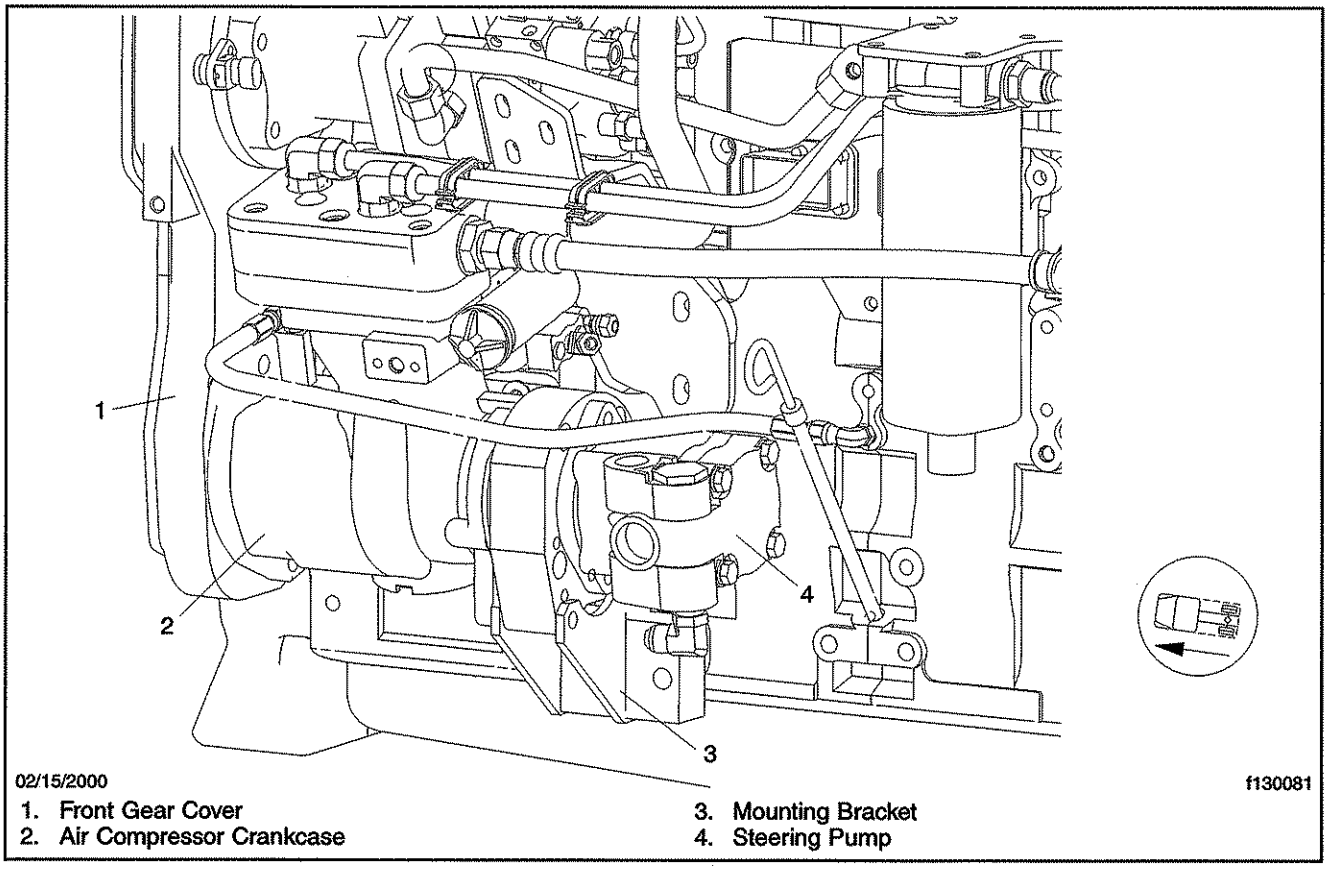
Fig. 3, Air Compressor Rear Support, ISB

1.3 Install the washers and nuts to the mounting studs and tighten 57 lbf·ft (77 N·m).

1.4 Install the compressor support bracket and tighten the capscrews 35 lbf·ft (47 N·m).

2. Position the steering pump on the air compressor, and secure it with the mounting capscrews. Tighten the capscrews 35 lbf·ft (47 N·m).
3. Identify and connect all air, coolant, and oil lines to the compressor and governor. Secure the lines as needed with cushion clamps and tie straps.
4. Fill the engine cooling system. See **Group 20** for instructions.
5. Operate the engine and check for leaks.
6. Remove the chocks from the rear tires and close the hood.

Air Compressor Removal and Installation



1. Front Gear Cover
2. Air Compressor Crankcase
3. Mounting Bracket
4. Steering Pump

Fig. 4, Air Compressor Rear Support, ISC

Cylinder Head Replacement, 15.4 Compressor

Replacement

1. Park the vehicle on a level surface and apply the parking brake. Shut down the engine. Chock the rear tires.
2. Drain the air from all air reservoirs.
3. Remove the compressor from the vehicle. See **Subject 100** for instructions.
4. Mount the compressor on a suitable holding fixture.

⚠ WARNING

Wear goggles when using compressed air to clean or dry parts, as permanent harm to eyes could result from flying debris.

5. Using a cleaning solvent, remove road dirt and grease from the outside of the compressor, then dry the compressor with compressed air.
6. Remove the cylinder head assembly, from the crankcase.

   6.1 Scribe an alignment mark across the cylinder head and upper crankcase, for assembly alignment.

   IMPORTANT: Do not use a marking method, such as chalk, that can be wiped off during assembling.

   NOTE: There is no need to remove the smaller screws.

   6.2 Note the positions of any attached components, then remove the four M8 cylinder head capscrews. Discard the capscrews. See **Fig. 1**.

   6.3 Tap the cylinder head with a soft mallet to break the gasket seal. Remove the cylinder head assembly and discard the gasket. See **Fig. 2**. Note the position of the ports with respect to the crankcase for reassembly.

   6.4 Remove the coolant and air fittings for reuse.

7. Clean the upper crankcase.

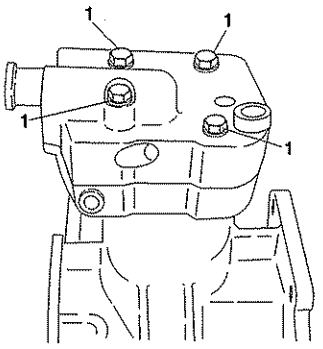
   7.1 Rotate the crankshaft until the piston is at the top of the cylinder bore.

   NOTE: Avoid the use of abrasive products similar to Scotch Brite® because of damage and abrasive grit left behind.

   7.2 Remove any accumulated carbon and varnish by carefully scraping, and light application of solvents. Avoid getting debris and solvents into the clearance between the piston and bore. Avoid the use of abrasive products similar to Scotch Brite because of damage and abrasive grit left behind.

⚠ WARNING

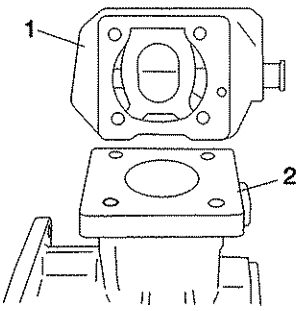
Wear goggles when using compressed air to clean or dry parts, as permanent harm to eyes could result from flying debris.



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1. Cylinder Head Capscrew

Fig. 1, Cylinder Head Capscrews



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1. Cylinder Head Assembly
2. Upper Crankcase

Fig. 2, Cylinder Head Removal

Cylinder Head Replacement, 15.4 Compressor

7.3 Using compressed air, blow dirt particles or gasket material from all cylinder cavities.

8. Inspect the top crankcase surface. It should be smooth and free of scratches to enable resealing on assembly.
9. Transfer the original cylinder head alignment marks to the replacement cylinder head.
10. Install the coolant and air fittings on the replacement cylinder head assembly.
11. Install the cylinder head assembly on the compressor upper crankcase.

    11.1 Position the sliding valve and the guide pins in the correct direction to enter the larger diameters in the valve body and crankcase.

    11.2 Align the marks on the cylinder head and crankcase.

    11.3 Using a new cylinder head gasket, position the gasket and head assembly on the crankcase.

    Note: You should find two cover bolts loosely holding the head assembly together.

    11.4 Install new capscrews.

⚠ CAUTION

A torque angle gauge and inch pound torque wrench must be used to perform the torque-turn capscrew tightening sequence. The tightening sequence listed in Table 1 must be followed to prevent damage to the cylinder head assembly.

12. Tighten the capscrews using the bolt tightening sequence in **Table 1**.
13. Install the compressor. See **Subject 100** for instructions.
14. Fill the engine cooling system. See **Group 20** for instructions.
15. Operate the engine and check the compressor operation. Make sure there are no coolant or air leaks.
16. Remove the chocks from the rear tires.

Bolt Tightening Sequence			
Step	**Bolt**	**Torque: lbf·in (N·cm)**	**Rotation Degrees**
1	A	119 to 145 (1350 to 1650)	—
2	B	119 to 145 (1350 to 1650)	—
3	C	119 to 145 (1350 to 1650)	—
4	D	119 to 145 (1350 to 1650)	—
5	A	203 to 239 (2300 to 2700)	—
6	B	203 to 239 (2300 to 2700)	—
7	C	203 to 239 (2300 to 2700)	—
8	D	203 to 239 (2300 to 2700)	—
9	A	—	170 to 190
10	B	—	260 to 280
11	C	—	170 to 190
12	D	—	170 to 190
13	E	48 to 58 (540 to 660)	—
14	F	48 to 58 (540 to 660)	—
15	E	—	85 to 105
16	F	—	85 to 105

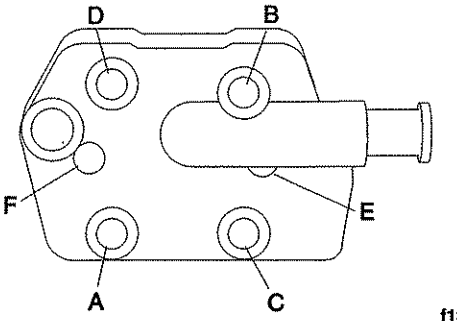


Table 1, Bolt Tightening Sequence

Cylinder Head Replacement, 18.7 CFM Compressor

Replacement

1. Park the vehicle on a level surface and apply the parking brake. Shut down the engine. Chock the rear tires.
2. Drain the air from all air reservoirs.
3. Remove the compressor from the vehicle. See **Subject 100** for instructions.
4. Mount the compressor on a suitable holding fixture.

⚠ WARNING

Wear goggles when using compressed air to clean or dry parts, as permanent harm to eyes could result from flying debris.

5. Using a cleaning solvent, remove road dirt and grease from the outside of the compressor, then dry the compressor with compressed air.
6. Remove the cylinder head assembly, from the crankcase.

   6.1 Scribe an alignment mark across the cylinder head and upper crankcase, for assembly alignment.

   IMPORTANT: Do not use a marking method, such as chalk, that can be wiped off during assembling.

   NOTE: There is no need to remove the smaller screws.

   6.2 Note the positions of any attached components, then remove the four M8 cylinder head capscrews. Discard the capscrews. See **Fig. 1.**

   6.3 Tap the cylinder head with a soft mallet to break the gasket seal. Remove the cylinder head valve assembly and gasket. See **Fig. 2.** Note the position of the ports with respect to the crankcase for reassembly.

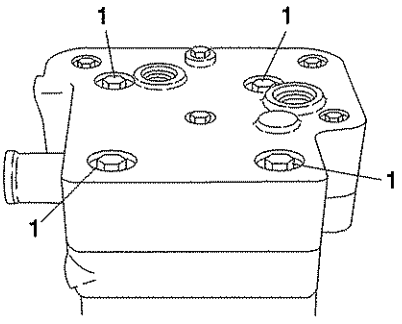
   6.4 Remove the coolant and air fittings for reuse. Discard the original cylinder head.

7. Clean the upper crankcase.

   7.1 Rotate the crankshaft until the piston is at the top of the cylinder bore.

   NOTE: Avoid the use of abrasive products similar to Scotch Brite® because of damage and abrasive grit left behind.

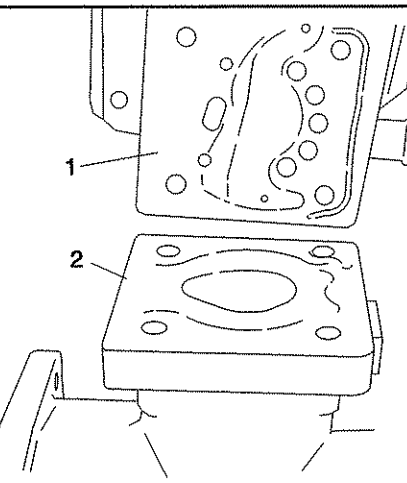
   7.2 Remove any accumulated carbon and varnish by carefully scraping and light application of solvents. Avoid getting debris and solvents into the clearance between the piston and bore. Avoid the use of abrasive products similar to Scotch Brite because of damage and abrasive grit left behind.



03/06/2000 f130088

1. Cylinder Head Capscrew

Fig. 1, Cylinder Head Capscrews



03/06/2000 f130084

1. Cylinder Head Assembly
2. Upper Crankcase

Fig. 2, Cylinder Head Removal

Cylinder Head Replacement, 18.7 CFM Compressor

⚠ WARNING

Wear goggles when using compressed air to clean or dry parts, as permanent harm to eyes could result from flying debris.

7.3 Using compressed air, blow dirt particles or gasket material from all cylinder cavities.

8. Inspect the top crankcase surface. It should be smooth and free of scratches to enable resealing on assembly.
9. Transfer the alignment marks from the original cylinder head to the replacement cylinder head.
10. Install the coolant and air fittings on the new cylinder head assembly.
11. Install the cylinder head on the compressor crankcase.

11.1 Position the sliding valve and the guide pins in the correct direction to enter the larger diameters in the valve body and crankcase.

11.2 Align the marks on the cylinder head and crankcase.

11.3 Using a new cylinder head gasket, position the gasket and head assembly on the crankcase.

NOTE: You should find five cover bolts loosely holding the head assembly together.

11.4 Install new capscrews.

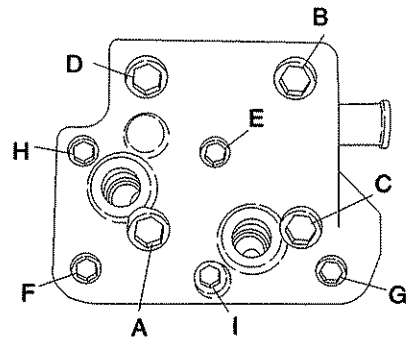
⚠ CAUTION

A torque angle gauge and inch pound torque wrench must be used to perform the torque-turn capscrew tightening sequence. The tightening sequence listed in Table 1 must be followed to prevent damage to the cylinder head assembly.

11.5 Tighten the capscrews using the bolt tightening sequence in **Table 1**.

12. Install the compressor. See **Subject 100** for instructions.
13. Fill the engine cooling system. See **Group 20** for instructions.

Bolt Tightening Sequence			
Step	Bolt	Torque: lbf·in (N·cm)	Rotation Degrees
1	A	177 to 221 (2000 to 2500)	—
2	B	177 to 221 (2000 to 2500)	—
3	C	177 to 221 (2000 to 2500)	—
4	D	177 to 221 (2000 to 2500)	—
5	A	—	85 to 105
6	B	—	85 to 105
7	C	—	85 to 105
8	D	—	55 to 75
9	E	48 to 58 (540 to 660)	—
10	F	48 to 58 (540 to 660)	—
11	G	48 to 58 (540 to 660)	—
12	H	48 to 58 (540 to 660)	—
13	I	48 to 58 (540 to 660)	—
14	E	—	85 to 105
15	F	—	85 to 105
16	G	—	85 to 105
17	H	—	85 to 105
18	I	—	85 to 105



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Table 1, Bolt Tightening Sequence

14. Operate the engine and check the compressor operation. Make sure there are no coolant or air leaks.
15. Remove the chocks from the rear tires.

Troubleshooting Tables

Problem—Excessive Oil Passage

Problem—Excessive Oil Passage	
Possible Cause	**Remedy**
Restricted air intake.	Check engine air filter and replace if necessary. Check compressor air inlet for kinks and excessive bends. Repair as needed.
Restricted oil return hole in front of compressor.	Remove compressor and check the oil return hole for restrictions. Repair as needed.
Defective or worn seal in the rear bearing cap.	Replace seal.
Compressor runs loaded an excessive amount of time.	Check air lines and connections for leakage. Check for a defective governor or restricted line. Replace the governor if necessary. Repair or replace lines and connections until leakage is eliminated.
Back pressure from the engine crankcase.	Check for excessive engine crankcase pressure. Repair or replace ventilation components as necessary. NOTE: An indication of crankcase pressure is a loose or partially lifted dipstick.
Excessive engine oil pressure.	Check the engine oil pressure with a test gauge, and compare the reading to the engine specification. Do not restrict the compressor oil supply line.
Malfunctioning compressor.	Replace the compressor after making certain none of the preceding conditions exist.

Problem—Noisy Compressor Operation

Problem—Noisy Compressor Operation	
Possible Cause	**Remedy**
Loose drive coupling or gear (as indicated).	Inspect the fit of the drive coupling and gear on the compressor crankshaft. Tighten or replace the components. If the crankshaft keyway is damaged, replace the compressor.
Compressor cylinder head or discharge line restrictions.	Inspect the compressor discharge port and discharge line for carbon build-up. If carbon is detected, remove the carbon and check for proper coolant flow to the compressor. Inspect the discharge line for kinks and restrictions. Replace the discharge line as necessary.
Compressor internal engine components damaged or worn.	Replace the compressor.

Problem—Excessive Build-Up and Recovery Time

Problem—Excessive Build-Up and Recovery Time	
Possible Cause	**Remedy**
Restricted air intake.	Check engine air filter and replace if necessary. Check compressor air inlet for kinks and excessive bends. Repair as needed.
Restricted discharge or compressor discharge cavity.	Inspect the compressor discharge port and line for restrictions and carbon build-up. If carbon is detected, remove the carbon. Check for proper cooling to the compressor. Inspect the discharge line for kinks and restrictions. Replace the discharge line as necessary.
Slipping drive components.	Check for faulty drive gears and coupling, and replace as necessary.

Troubleshooting

Problem—Excessive Build-Up and Recovery Time	
Possible Cause	**Remedy**
Excessive air system leakage (not including the air compressor).	Check all valves, air lines, and connections for leakage. Repair or replace valves and lines until leakage is eliminated.
Unloader piston seized.	Check the operation of the unloading mechanism. Check for corrosion and contamination of unloader pistons. Check for correct operation of the compressor air governor. If the governor is operating properly, replace the compressor.
Damaged compressor rings, valves, and gaskets.	Replace the compressor.

Problem—Compressor Fails to Unload

Problem—Compressor Fails to Unload	
Possible Cause	**Remedy**
Malfunctioning governor.	Check the setting with an accurate test gauge. Repair or replace the air governor.
Unloader air lines from governor damaged.	Inspect the air lines to and from the governor for kinks or restrictions. Repair or replace the air lines.
Faulty or worn unloader piston or bore.	Replace the compressor.

Problem—Air in Water System/Water in Air System

Problem—Air in Water System/Water in Air System	
Possible Cause	**Remedy**
Internal gasket leakage.	Replace the compressor.
Internal casting porosity.	Replace the compressor.