

## BA-921 BENDIX AIR POWER COMPRESSOR

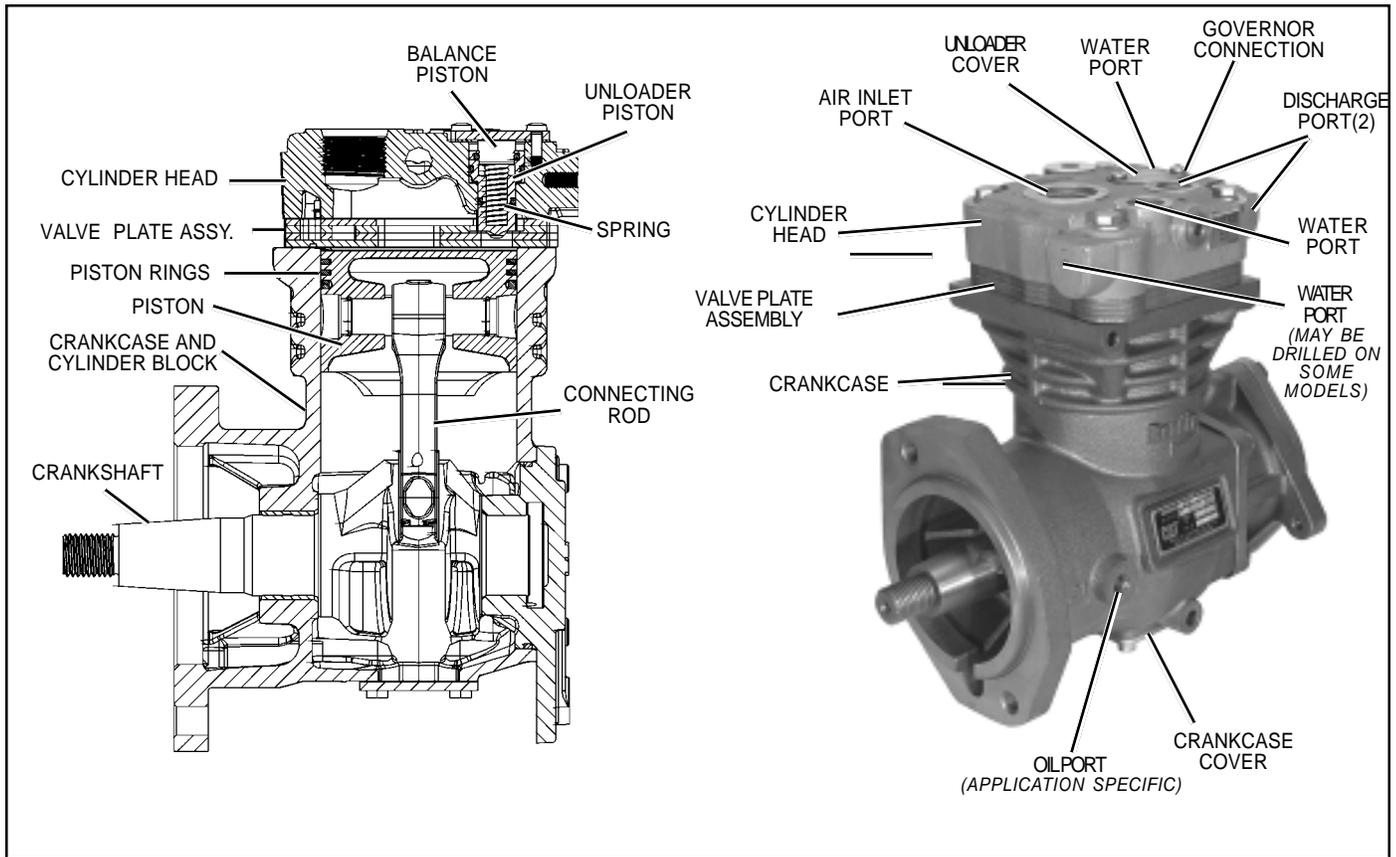


FIGURE 1 - BA-921 COMPRESSOR

### DESCRIPTION

The function of the air compressor is to provide and maintain air under pressure to operate devices in the air brake and/or auxiliary air systems. The BA-921 compressor is a single cylinder reciprocating compressor with a rated displacement of 15.8 cubic feet per minute at 1250 RPM.

The compressor consists of a water cooled cylinder head and valve plate assembly and an air cooled integral crankcase and cylinder block. The cylinder head is an aluminum casting which contains the required air and water ports as well as an unloader piston. The valve plate assembly consists of laminated and brazed steel plates which incorporate various valve openings and channels for

conducting air and engine coolant into and out of the cylinder head.

The discharge valves are part of the valve plate assembly. The cylinder head, with the valve plate comprise a complete cylinder head assembly.

The cast iron crankcase and cylinder block assembly, houses the piston, connecting rod, crankshaft and related bearings.

The BA-921 crankcase cover is stamped with information identifying the compressor model, customer piece number, Bendix piece number and serial number. See figure 2.

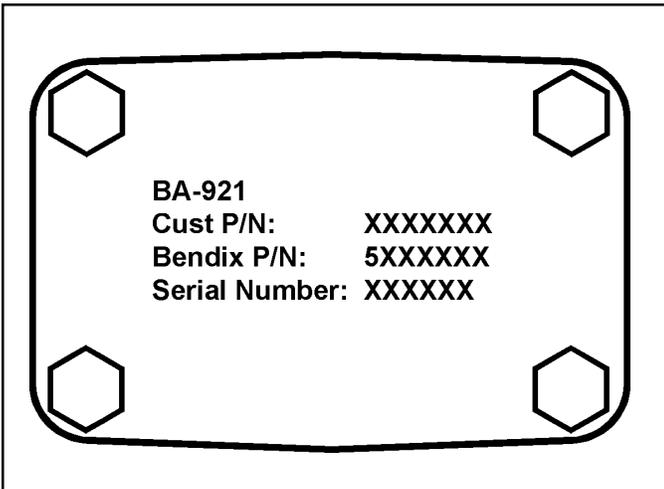


FIGURE 2 - BA-921 CRANKCASE COVER

## OPERATION

The compressor is driven by the vehicle engine and functions continuously while the engine is in operation. Actual compression of air is controlled by the compressor unloading mechanism operating in conjunction with a governor.

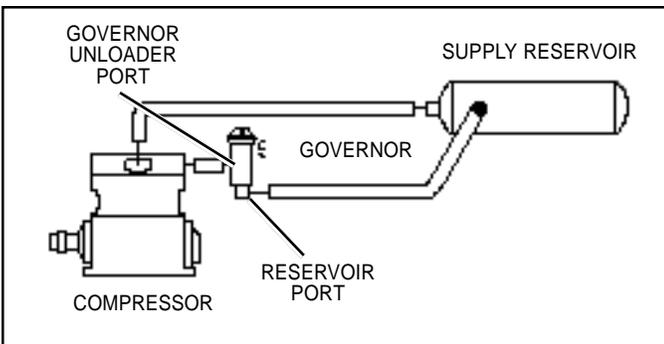


FIGURE 3 - BA-921 COMPRESSOR UNLOADER SYSTEM

### AIR INTAKE (LOADED)

During the piston down stroke, a vacuum is created in the cylinder bore above the piston. The vacuum causes the inlet reed valve to flex open. Atmospheric air flows through the open inlet valve and fills the cylinder bore above the piston. See figures 4 & 7.

### AIR COMPRESSION (LOADED)

When the piston reaches approximately bottom dead center (BDC), the inlet reed valve closes. Air above the piston is trapped by the closed inlet reed valve and is compressed as the piston begins to move toward top dead center (TDC). When air in the cylinder bore reaches a pressure greater than that of the system pressure the discharge reed valves open and air flows into the discharge line and air brake system.

Air, during the compression stroke, flows into the hollow center of the unloader piston through an opening in the end of the piston. Compressed air acts on the interior surfaces

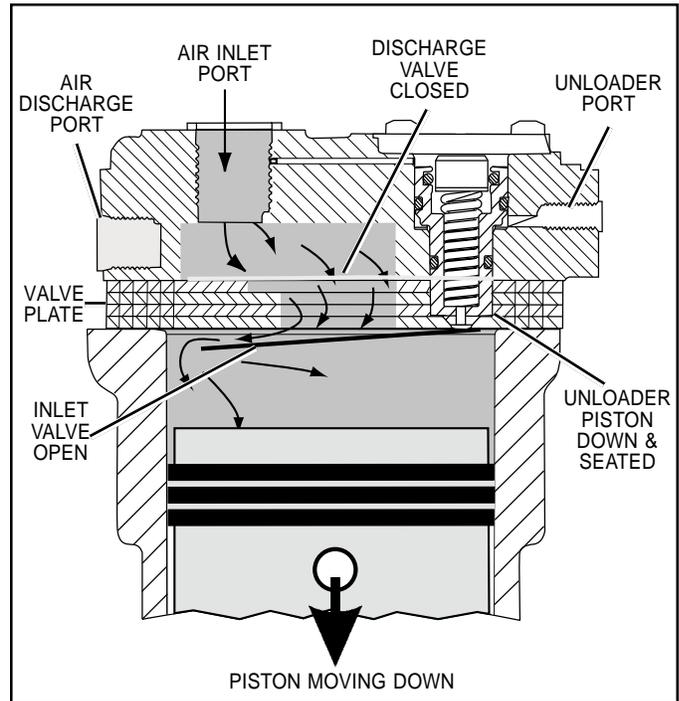


FIGURE 4 - OPERATIONAL-LOADED (INTAKE)

of the unloader piston and, along with the unloader piston spring, holds the unloader piston against its seat on the valve plate. See figures 5 & 7.

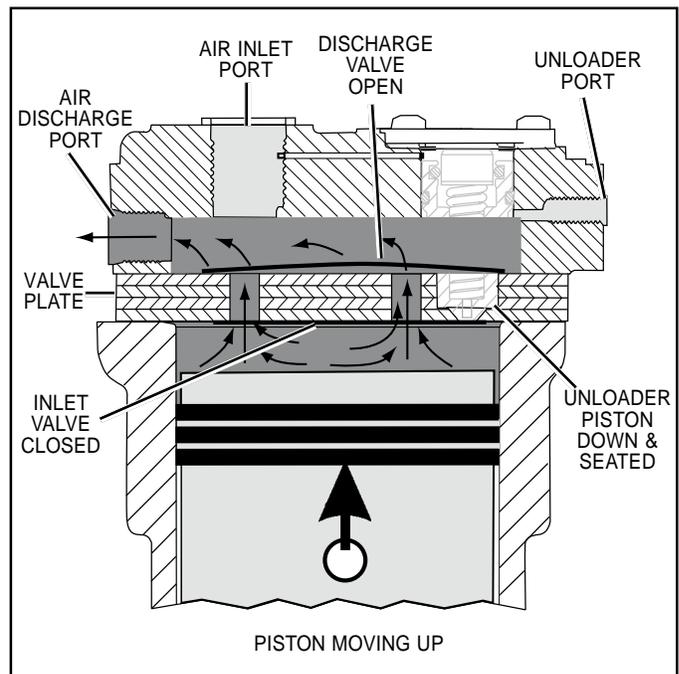


FIGURE 5 - OPERATIONAL-LOADED (COMPRESSION)

### NON-COMPRESSION OF AIR (UNLOADED)

When air pressure in the supply reservoir reaches the cut-out setting of the governor, the governor delivers system air to the compressor unloader port. Air entering the unloader port acts on the unloader piston causing it to move away from its seat on the valve plate assembly. When the

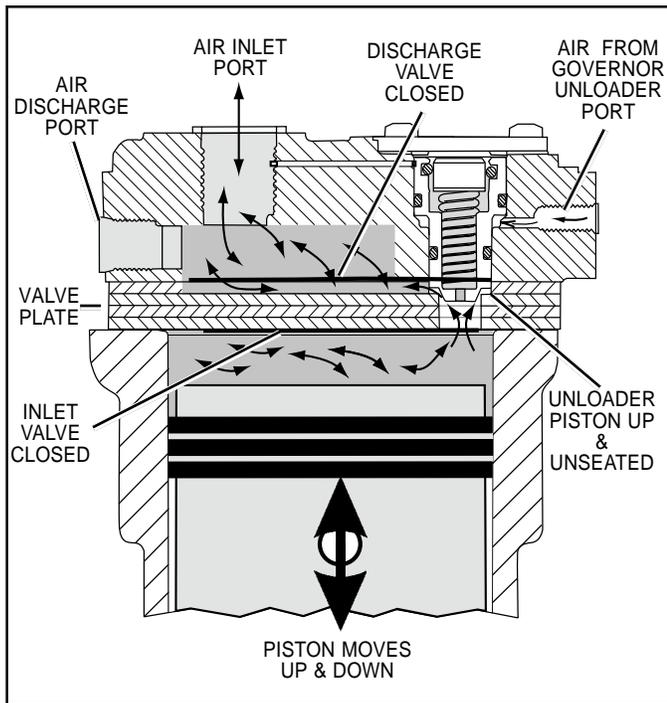


FIGURE 6 - OPERATIONAL-UNLOADED

unloader piston is unseated a passage is opened between the cylinder bore and the air inlet cavity in the cylinder head. Air compression ceases. See figures 6 & 7.

As the piston moves from bottom dead center (BDC) to top dead center (TDC) air in the cylinder bore flows past the unseated unloader piston, into the cylinder head inlet cavity and out the inlet port. On the piston down stroke (TDC to BDC) air flows in the reverse direction, from the inlet cavity past the unseated unloader piston and into the cylinder bore.

## LUBRICATION

The vehicle's engine provides a continuous supply of oil to the compressor. Oil is routed from the engine to the compressor oil inlet. An oil passage in the crankshaft conducts pressurized oil to precision sleeve main bearings and to the connecting rod bearings. Spray lubrication of the cylinder bores, connecting rod wrist pin bushings, and ball type main bearings is obtained as oil is forced out around the crankshaft journals by engine oil pressure. Oil then falls to the bottom of the compressor crankcase and is returned to the engine through drain holes in the compressor mounting flange.

## COOLING

Cooling fins are part of the crankcase/cylinder block casting. Coolant flowing from the engine cooling system through connecting lines enters the head and passes through internal passages in the cylinder head and valve plate assembly and is returned to the engine. Proper cooling is important in maintaining discharge air temperatures below the maximum recommended 400 degrees Fahrenheit. Figure 8 illustrates

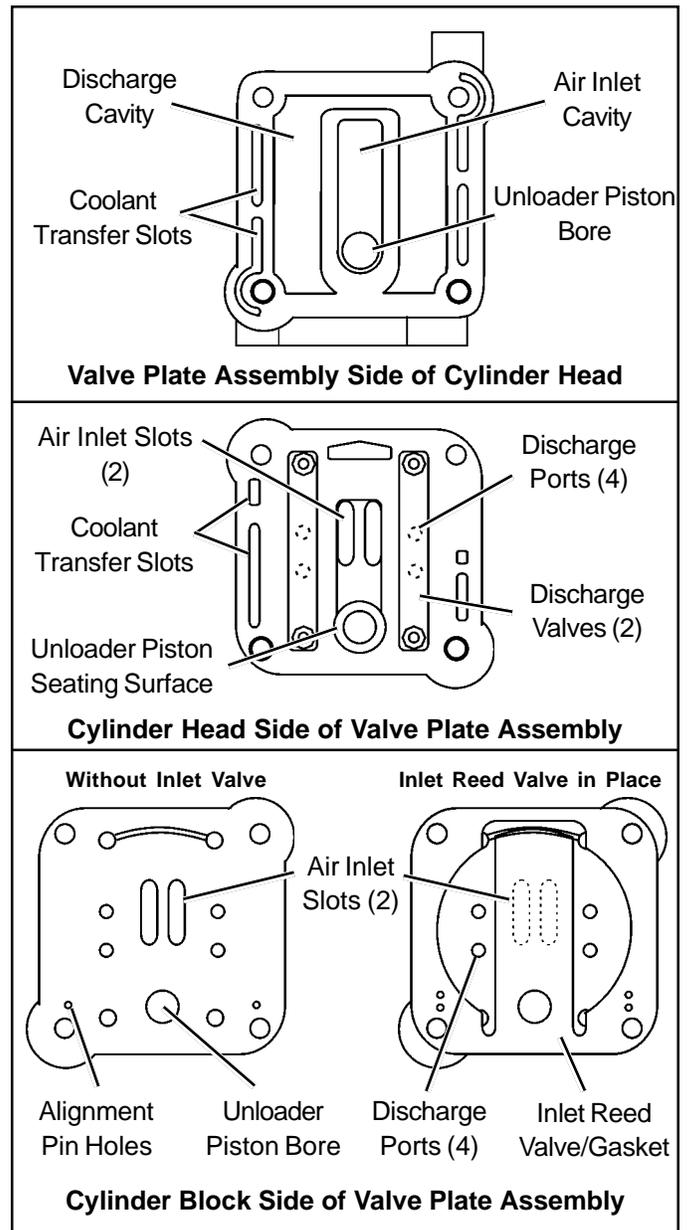


FIGURE 7 - CYLINDER HEAD AND VALVE PLATE ASSY.

the various approved coolant flow connections. See the tabulated technical data in the back of this manual for specific requirements.

## PREVENTATIVE MAINTENANCE

**Important Note:** Review the warranty policy before performing any intrusive maintenance procedures. An extended warranty may be voided if intrusive maintenance is performed during this period.

**EVERY 6 MONTHS, 1800 OPERATING HOURS OR AFTER EACH 50,000 MILES WHICHEVER OCCURS FIRST PERFORM THE FOLLOWING INSPECTIONS AND TESTS.**

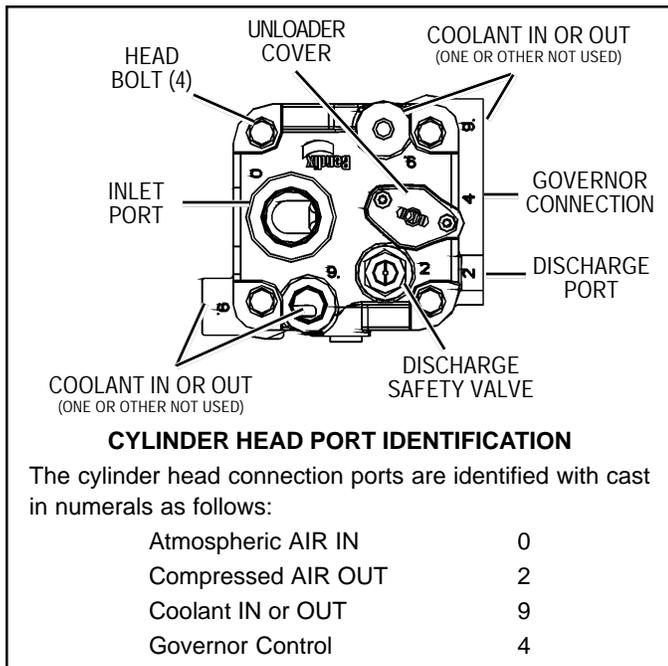


FIGURE 8- TYPICAL BA-921 CYLINDER HEAD

## AIR INDUCTION

The BA-921 compressor is designed for either natural aspiration (connection to the vacuum side of the engine's air induction system) or turbocharging. When attached to the pressure side of the turbocharger, pressure at the BA-921 inlet port must not exceed 45 psig. See the tabulated technical data in the back of this manual.

One of the single most important aspects of compressor preventive maintenance is the induction of clean air. Since the BA-921 is connected to the engine air cleaner, proper periodic maintenance of the engine air filter eliminates the need for separate filter maintenance.

Inspect the compressor intake fittings, and the connecting hoses each time engine air cleaner maintenance is performed.

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. The intake hose clamps and tighten them if needed.
3. Inspect the intake hose or line for signs of drying, cracking, chafing and ruptures and replace it if necessary.

## COMPRESSOR COOLING

Inspect the compressor discharge port, inlet cavity and discharge line for evidence of restrictions and carboning. If excessive buildup is noted, thoroughly clean or replace the affected parts. Since carbon buildup generally indicates inadequate cooling, closely inspect the compressor cooling system. Check all compressor coolant lines for kinks and

restrictions to flow. **Minimum** coolant line size is 3/8" I.D. Check coolant lines for internal clogging from rust scale. If coolant lines appear suspicious, check the coolant flow and compare to the tabulated technical data present in the back of this manual. Carefully inspect the air induction system for restrictions.

## LUBRICATION

Check the external oil supply line for kinks, bends, or restrictions to flow. Supply lines must be a minimum of 3/16" I.D. Refer to the tabulated technical data in the back of this manual for oil pressure minimum values.

## COMPRESSOR DRIVE

Check for noisy compressor operation, which could indicate excessive drive component wear. Adjust and/or replace as necessary. Check all compressor mounting bolts and retighten evenly if necessary. Check for leakage and proper unloader mechanism operation. Repair or replace parts as necessary.

## COMPRESSOR UNLOADER & GOVERNOR

Test and inspect the compressor and governor unloader system for proper operation and pressure setting.

1. Make certain the unloader system lines are connected as illustrated in figure 3.
2. Cycle the compressor through the loaded and unloaded cycle several times. Make certain that the governor cuts out at its specified pressure (cut in should be approximately 15-20 psi less than cutout pressure). Adjust or replace the governor as required.
3. 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.

## SERVICE TESTS

### GENERAL

The following compressor operating and leakage tests need not be performed on a regular basis. These tests should be performed when; it is suspected that leakage is substantially affecting compressor buildup performance, or when it is suspected that the compressor is "cycling" between the load and unloaded modes due to unloader plunger leakage.

### OPERATING TESTS

#### Compressor Performance

Vehicles manufactured after the effective date of FMVSS 121 must have a compressor capable of raising air system pressure from 85-100 psi in 25 seconds or less, with the

minimum required reservoir volume for the vehicle. This test is performed with the engine operating at maximum recommended governed speed. The vehicle manufacturer must certify this performance on new vehicles with appropriate allowances for air systems with greater than the minimum required reservoir volume. As a less severe alternative to running a high RPM test, a new compressor's buildup time can be measured and recorded at high idle. Subsequent testing throughout the compressor's service life can be compared to the base line new compressor performance. Compressor buildup times should be recorded and kept with the vehicle maintenance files for reference. When testing compressor buildup times it is essential that air system leakage be kept below the allowed maximum for the vehicle type being tested. Before running buildup tests check the service and supply systems for excessive leakage and repair as necessary.

**Note:** Supply system leakage is not displayed on the vehicle dash gauges and must be tested separately. Supply system components such as the governor, air dryer, reservoir drain cocks, safety valve and check valves can leak without indication on the dash gauges. These components must be checked for leakage separately and individually. Refer to the various maintenance manuals for individual component leakage tests and the Bendix "Test and Checklist" published in the Air Brake System Handbook (BW5057) for air system leakage testing.

## LEAKAGE TESTS

### Cylinder Head

Check for cylinder head gasket air leakage.

1. With the engine running, lower air system pressure to 60 psi and apply a soap solution around the cylinder head. Check the gasket between the cylinder head and valve plate assembly and the reed valve/gasket between the valve plate assembly and cylinder block for air leakage.
2. No leakage is permitted. If leakage is detected replace the compressor or repair the cylinder head using a genuine Bendix maintenance kit available from an authorized Bendix parts outlets.

### Unloader

In order to test the inlet and discharge valves and the unloader piston, it is necessary to have shop air pressure and an assortment of fittings. A soap solution is also required.

### Build-Up tests

1. With the engine running, lower air system pressure to 90 psi and raise engine RPM to 1800. Measure and

record the time required to raise system pressure from 100 psi to 130 psi Run this test three times and use the average time.

Note: This test should be run with the engine and air system at normal operating temperature (i.e. not cold).

2. Compare the average time recorded in step 2 with previously recorded build up times to evaluate compressor performance.

Unloader leakage is exhibited by excessive compressor cycling between the loaded and unloaded condition.

1. With service and supply system leakage below the maximum allowable limits and the vehicle parked, bring system pressure to governor cutout and allow the engine to idle.
2. The compressor should remain unloaded for a minimum of 5-10 minutes. If compressor cycling occurs more frequently and service and supply system leakage is within tolerance replace the compressor or repair the compressor unloader system using a genuine Bendix maintenance kit available from authorized Bendix parts outlets.

## COMPRESSOR REMOVAL & DISASSEMBLY

### GENERAL

The following disassembly and assembly procedure is presented for reference purposes and presupposes that a rebuild or repair of the compressor is being undertaken. Several maintenance kits are available and the instructions provided with these parts and kits should be followed in lieu of the instructions presented here.

### MAINTENANCE KITS & SERVICE PARTS

Cylinder Head Gasket Kit.

Unloader Kit.

Governor Adapter Kit.

Safety Valve.

Seal Kits.

All components shown in figure 9 with a key number are available in kits and/or as individual service parts.

### IMPORTANT! PLEASE READ:

**When working on or around a vehicle, the following general precautions should be observed:**

1. **Park the vehicle on a level surface, apply the parking brakes, and always block the wheels.**
2. **Stop the engine when working around the vehicle.**

3. If the vehicle is equipped with air brakes, make certain to drain the air pressure from all reservoirs before beginning any work on the vehicle.
4. Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that removes all electrical power from the vehicle.
5. When working in the engine compartment the engine should be shut off. Where circumstances require that the engine be in operation, extreme caution should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated, or electrically charged components.
6. Never connect or disconnect a hose or line containing pressure; it may whip. Never remove a component or plug unless you are certain all system pressure has been depleted.
7. Never exceed recommended pressures and always wear safety glasses.
8. Do not attempt to install, remove, disassemble or assemble a component until you have read and thoroughly understand the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.
9. Use only genuine Bendix replacement parts, components, and kits. Replacement hardware, tubing, hose, fittings, etc. should be of equivalent size, type, and strength as original equipment and be designed specifically for such applications and systems.
10. Components with stripped threads or damaged parts should be replaced rather than repaired. Repairs requiring machining or welding should not be attempted unless specifically approved and stated by the vehicle or component manufacturer.
11. Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.

## REMOVAL

In many instances it may not be necessary to remove the compressor from the vehicle when installing the various maintenance kits and service parts. The maintenance technician must assess the installation and determine the correct course of action.

These instructions are general and are intended to be a guide. In some cases additional preparations and precautions are necessary. In all cases follow the instructions contained in the vehicle maintenance manual in lieu of the instructions, precautions and procedures presented in this manual.

1. Block the wheels of the vehicle and drain the air pressure from all the reservoirs in the system.

2. Drain the engine cooling system and the cylinder head of the compressor. Identify and disconnect all air, water and oil lines leading to the compressor.
3. Remove as much road dirt and grease from the exterior of the compressor as possible.
4. Remove the discharge and inlet fittings, if applicable, and note their position on the compressor to aid in reassembly.

**Note:** If a cylinder head maintenance kit is being installed, stop here and proceed to PREPARATION FOR DISASSEMBLY. If replacing the compressor continue.

3. Remove any supporting bracketing attached to the compressor and note their positions on the compressor to aid in reassembly.
5. Remove the flange mounting bolts and remove the compressor from the vehicle.
6. Inspect gear and associated drive parts for visible wear or damage. Since these parts are precision fitted, they must be replaced if they are worn or damaged. If replacing the compressor or replacing the drive gear, remove the drive gear from the compressor crankshaft using a gear puller.
7. If the compressor is being replaced stop here and proceed to "Installing The Compressor" at the end of the assembly procedure.

## PREPARATION FOR DISASSEMBLY

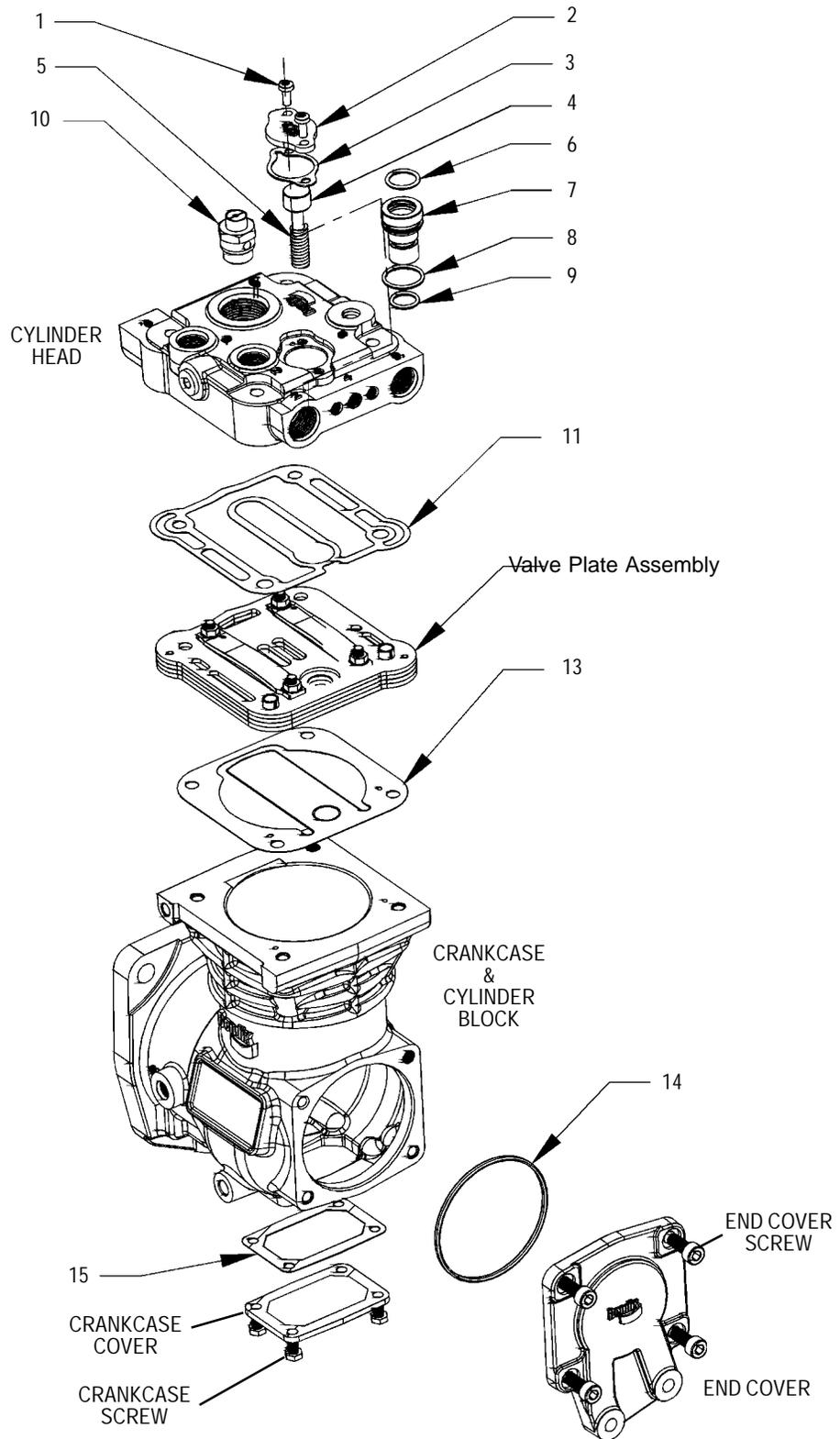
Remove the balance of road dirt and grease from the exterior of the compressor with a cleaning solvent. Mark the rear end cover or end cover adapter in relation to the crankcase. It is recommended but not specifically necessary to mark the relationship of the cylinder head to the valve plate assembly and crankcase and cylinder block assembly.

A convenient method to indicate the above relationships is to use a metal scribe to mark the parts with numbers or lines. Do not use marking methods such as chalk that can be wiped off or obliterated during rebuilding.

Prior to disassembly make certain that the appropriate kits and or replacement parts are available. Refer to figure 9 during the entire disassembly and assembly procedure.

## CYLINDER HEAD

1. Remove the discharge safety valve (10) from the cylinder head.
2. To restrain the spring force exerted by balance piston spring (5), hold the unloader cover (2) in place while removing the two unloader cover cap screws (1). Carefully release the hold on the unloader cover until the spring force is relaxed, then remove the unloader cover (2).
3. Remove the unloader cover gasket (3).



Item	Qty.	Description	Item	Qty.	Description	Item	Qty.	Description
1	2	Unloader Cover Cap Screw	6	1	O-Ring	11	1	Head Gasket
2	1	Unloader Cover	7	1	O-Ring	12	--	Intentionally Left Blank
3	1	Unloader Cap Gasket	8	1	Unloader Piston	13	1	Inlet Reed Valve/Gasket
4	1	Unloader Balance Piston	9	1	O-Ring	14	1	O-Ring
5	1	Spring	10	1	Safety Valve	15	1	Bottom Cover Gasket

FIGURE 9- BA-921 EXPLODED VIEW OF SERVICEABLE PARTS

- Remove the balance piston (4) and its spring (5) from the cylinder head.
- Remove the four hex head bolts and washers from the cylinder head.
- Gently tap the head and valve plate assembly with a soft mallet to break the gasket seal. Lift the cylinder head and valve plate assembly (12) off the cylinder block.
- Remove the metal reed valve/gasket (13).
- Gently tap the head and valve plate assembly (12) with a soft mallet to break the gasket seal. Then separate the cylinder head from the valve plate assembly (12) and remove the gasket (11).
- Turn the aluminum cylinder head over to expose the interior portion of the head. Push the unloader piston (8) along with its o-rings (6, 7 & 9) out of the cylinder head.

### CRANKCASE COVER

- Remove the four crankcase cover cap screws securing the crankcase cover to the crankcase. Using a soft mallet, gently tap the crankcase cover to break the gasket seal. Remove the crankcase cover gasket (15).

### REAR END COVER OR END COVER ADAPTER

- Remove the four end cover cap screws that secure the rear end cover or end cover adapter to the crankcase.
- Remove the rear end cover or end cover adapter from the crankcase. Remove the o-ring seal (14) from the end cover.

## CLEANING OF PARTS

### GENERAL

All parts should be cleaned in a good commercial grade of solvent and dried prior to inspection.

### CYLINDER HEAD

- Carefully remove all gasket material adhering to the aluminum cylinder head, steel valve plate assembly and cast iron cylinder block. Make certain not to deeply scratch or mar the gasket surfaces. Pay particular attention to the gasket surfaces of the aluminum head.
- Remove carbon deposits from the discharge and inlet cavities of the cylinder head and valve plate assembly. They must be open and clear in both assemblies. Make certain not to damage the aluminum head.
- Remove rust and scale from the cooling cavities and passages in the head and valve plate assembly (12) and use shop air to clear debris from the passages.
- Check the threads in all cylinder head ports for galling. Minor chasing is permitted.

- Make certain the unloader vent passage under the unloader cover (2) in the head is open and free of debris.

## INSPECTION OF PARTS

### CYLINDER HEAD & VALVE PLATE

- Carefully inspect the cylinder head gasket surfaces for deep gouges and nicks. If detected, the compressor must be replaced.
- Carefully inspect the valve plate assembly gasket surfaces for deep gouges and nicks. Pay particular attention to the metal gasket surface. A metal gasket (18) is used between the valve plate assembly and cylinder block. This surface must be smooth and free of all but the most minor scratching. If excessive marring or gouging is detected, the compressor must be replaced.
- Inspect the cylinder head for cracks or damage. With the cylinder head and head gasket secured to the valve plate assembly, apply shop air pressure to one of the coolant ports with all others plugged, and check for leakage by applying a soap solution to the exterior of the head. If leakage is detected in the cylinder head casting, replace the compressor.

### END COVER OR END COVER ADAPTER

Check for cracks and external damage. Check the crankshaft main bearing surface in the end cover or end cover adapter, check for excessive wear and flat spots and replace the end cover if necessary. Check for galling of the oil port threads and replace the end cover or end cover adapter if necessary. Minor thread chasing is permitted but do not "recut" the threads if they are badly damaged.

### CYLINDER BLOCK

- Check the cylinder head gasket surface on the cylinder block for nicks, gouges, and marring. A metal gasket is used to seal the cylinder head to the cylinder block. This surface must be smooth and free of all but the most minor scratching. If excessive marring or gouging is detected, the compressor must be replaced.

## ASSEMBLY

**General Note:** All torques specified in this manual are assembly torques and typically can be expected to fall off after assembly is accomplished. **Do not re-torque** after initial assembly torques fall unless instructed otherwise. A compiled listing of torque specifications is presented at the end of this manual.

### INCH POUNDS TO FOOT POUNDS

To convert inch pounds to foot pounds of torque, divide inch pounds by 12.

Example: 
$$12 \text{ Inch Pounds} = 1 \text{ Foot Pound}$$

### FOOT POUNDS TO INCH POUNDS

To convert foot pounds to inch pounds of torque, multiply foot pounds by 12.

Example: 1 Foot Pound x 12 = 12 Inch Pounds

## CRANKCASE COVER

1. Position the crankcase cover gasket (15) on either the crankcase or crankcase cover and install the crankcase cover on the crankcase using the four cap screws. "Snug" the four cap screws then torque to 62-71 inch pounds using a crossing pattern.

## CRANKCASE END COVER OR ADAPTER

1. Install the end cover o-ring (14) on the crankcase end cover.
2. Orient the crankcase end cover or end cover adapter to the crankcase using the reference marks made during disassembly. Carefully install the end cover or end cover adapter in the crankcase making certain not to damage the crankshaft bearing surface in it.
3. Install the four end cover screws or studs. "Snug" the screws then tighten to 195 to 213 inch pounds using a crossing pattern.

## CYLINDER HEAD

1. Note the position of the protruding alignment pins on the cylinder block. Install the metal inlet reed valve/gasket (13) over the alignment pins on the cylinder block.
2. Position the valve plate assembly (12) on the cylinder block so that the alignment pins in the cylinder block fit into the corresponding holes in the valve plate assembly (12).
3. Position and install the metal gasket (11) over the alignment bushings protruding from the valve plate assembly (12). When properly installed, the outline of the gasket matches the outline of the valve plate.
4. Position and install the cylinder head over the alignment bushings protruding from the valve plate assembly (12).

**Note:** The alignment bushings will only fit into two of the four cylinder head bolt holes.

5. Install the four hex head cylinder head bolts and washers and snug them, then tighten evenly to a torque of 265 to 292 inch pounds using a crossing pattern.
6. Install the unloader piston (8) with its pre-installed o-rings in the cylinder head making certain not to damage them in the process.
7. Install the balance piston spring (5) in the unloader piston (8), then install the small diameter of the balance piston (4) through the center of the spring.
8. Install the unloader cover gasket (3) on the cylinder head making certain the unloader vent passage and both screw holes align.

9. Position the unloader cover (2) on top of the balance piston (4) making certain the stamped logo is visible.
10. Press and hold the unloader cover (2) in place on the cylinder head and install both unloader cover cap screws (1). Torque the cover cap screws (1) to 62 to 71 inch pounds.

## INSTALLING THE COMPRESSOR

1. If the compressor was removed for replacement, install the drive components. **Torque the crankshaft nut to 250 foot pounds.**
2. Install any supporting bracketing on the compressor in the same position noted and marked during removal.
3. Install the gasket on the drive flange of the compressor. Make certain oil supply or return holes in the gasket are properly aligned with the compressor and engine. Gasket sealants are not recommended. Secure the compressor on the engine and tighten the mounting bolts.
4. Install the discharge, inlet and governor adapter fittings, if applicable, in the same position on the compressor noted and marked during disassembly. Make certain the threads are clean and the fittings are free of corrosion. Replace as necessary. See the Torque Specifications for various fitting sizes and types of thread at the rear of this manual.
5. Inspect all air, oil, and coolant lines and fittings before reconnecting them to the compressor. Make certain o-ring seals are in good or new condition. Tighten all hose clamps.
6. Clean oil supply line. Before connecting this line to the compressor. Run the engine briefly to be sure oil is flowing freely through the supply line.
7. Before returning the vehicle to service, perform the Operation and Leakage Tests specified in this manual. Pay particular attention to all lines reconnected during installation and check for air, oil, and coolant leaks at compressor connections. Also check for noisy operation.

## TESTING REBUILT COMPRESSOR

In order to properly test a compressor under operating conditions, a test rack for correct mounting, cooling, lubricating, and driving the compressor is necessary. Such tests are not compulsory if the unit has been carefully rebuilt by an experienced person. A compressor efficiency or build up test can be run which is not too difficult. An engine lubricated compressor must be connected to an oil supply line of at least 15 psi. pressure during the test and an oil return line must be installed to keep the crankcase drained. Connect to the compressor discharge port, a reservoir with a volume of 1500 cubic inches, including the volume of the connecting line. With the compressor operating at 2100

RPM., the time required to raise the reservoir(s) pressure from 85 psi to 100 psi should not exceed 5 seconds. During this test, the compressor should be checked for gasket leakage and noisy operation, as well as unloader operation and leakage. If the compressor functions as indicated reinstall on the vehicle connecting all lines as marked in the disassembly procedure.

### BA-921 SPECIFICATIONS

Typical weight .....	28 lbs.
Number of cylinders .....	1
Bore Diameter .....	92mm (3.622 in.)
Stroke .....	54 mm (2.125 in.)
Calculated displacement at 1250 RPM .....	15.8 CFM
Flow Capacity @ 1800 RPM & 120 PSI .....	11.8 CFM
Flow Capacity @ 3000 RPM & 120 PSI .....	18.0 CFM
Maximum recommended RPM .....	3000 RPM
Minimum coolant flow maximum RPM .....	1.3 Gals./Min.
Approximate horsepower required:	
Loaded 1800 RPM at 120 PSIG .....	4.5 HP
Unloaded 1800 RPM .....	1.3 HP
Maximum inlet air temperature .....	250 F°
Maximum discharge air temperature .....	400 F°
Minimum oil pressure required at engine idling speed .....	15 PSI
Minimum oil pressure required at maximum governed engine speed .....	15 PSI
Minimum oil-supply line size .....	3/16" I.D.
Minimum unloader-line size .....	3/16" I.D.
Minimum Governor Cutout Pressure .....	90 PSI

### TORQUE SPECIFICATIONS

Assembly Torques in inch pounds (in. lbs.)

M8x1.25-6g Cylinder Head .....	265 - 292
M5x0.75-6g Unloader Cap .....	62 - 71
M8x1.25-6g Governor Adapter .....	133 - 142
M8x1.25-6g Rear End Cover .....	195 - 213
M6x1.00-6g Crankcase Cover .....	62 - 71
M20x2.50-6g Crankshaft Nut .....	1858 - 2567
Inlet Port Fittings	
7/8"-12 UNF .....	221 - 248
3/4"-14 NPT .....	2 - 3 TFFT <sup>1</sup>
Discharge Port Fittings	
7/8"-12 UNF .....	221 - 248
3/4"-14 NPT .....	2 - 3 TFFT <sup>1</sup>
Water Port Fittings	
3/4"-16 UNF .....	221 - 248
3/8"-18 NPT .....	2 - 3 TFFT <sup>1</sup>
Unloader Port Fittings	
1/8"-27 NPT .....	2 - 3 TFFT <sup>1</sup>
Safety Valve Port	
3/4"-16 UNF .....	221 - 248
1/2"-14 NPT .....	2 - 3 TFFT <sup>1</sup>
Oil Port 7/16"-16 UNF .....	177 - 204

<sup>1</sup>Note: TFFT = Turns From Finger Tight

## COMPRESSOR TROUBLESHOOTING CHART

SYMPTOMS	CAUSE	REMEDY
1. Compressor passes excessive oil as evidenced by presence of oil at the exhaust ports of valving.	A. Restricted air intake.	A. Check engine air cleaner and replace if necessary. Check compressor air inlet for kinks, excessive bends and be certain inlet lines have minimum specified inside diameter. Recommended maximum air inlet restriction is 25" of water.
	B. Restricted oil return to engine.	B. Oil return to the engine should not be in any way restricted. Make certain oil drain passages in the compressor and mating engine surfaces are unobstructed and aligned. Correct gaskets must be used. Special care must be taken when seal ants are used with, or instead of, gaskets.
	C. Poorly filtered inlet air.	C. Check for damaged, defective or dirty air filter on engine or compressor. Check for leaking, damaged or defective compressor air intake components (e.g. induction line, fittings, gaskets, filter bodies, etc.). The compressor intake should not be connected to any part of the exhaust gas recirculation (E.G.R.) system on the engine.
	D. Insufficient compressor cooling (compressor runs hot).	D. For water-cooled portions of the compressor: <ol style="list-style-type: none"> <li>1. Check for proper coolant line sizes. Minimum recommended size is 3/8" I.D. tubing.</li> <li>2. Check the coolant flow through the compressor. Minimum allowable flow is 2.5 gallons per minute at engine governed speed. If low coolant flow is detected, inspect the coolant lines and fittings for accumulated rust scale, kinks and restrictions.</li> <li>3. Water temperature should not exceed 200 degrees Fahrenheit.</li> <li>4. Optimum cooling is achieved when engine coolant flows, as shown in Figure 8 of this manual.</li> </ol>
	E. Contaminants not being regularly drained from system reservoirs.	E. Check reservoir drain valves to insure that they are functioning properly. It is recommended that the vehicle should be equipped with functioning automatic drain valves, or have all reservoirs drained to zero (0) psi daily, or optimally to be equipped with a desiccant-type air dryer prior to the reservoir system.

## COMPRESSOR TROUBLESHOOTING CHART (Continued)

SYMPTOMS	CAUSE	REMEDY
1. (Continued.)	F. Compressor runs loaded an excessive amount of time.	F. Vehicle system leakage should not exceed industry standards of 1 psi pressure drop per minute without brakes applied and 3 psi pressure drop per minute with brakes applied. If leakage is excessive, check for system leaks and repair.
	G. Excessive engine crankcase pressure.	G. Test for excessive engine crankcase pressure & replace or repair ventilation components as necessary. (An indication of crankcase pressure is a loose or partially lifted dipstick.)
	H. Excessive engine oil pressure.	H. Check the engine oil pressure with a test gauge and compare the reading to the engine specifications. Bendix does not recommend restricting the compressor oil supply line because of the possibility of plugging the restriction with oil contaminants. Minimum oil supply line size is 3/16" I.D. tubing.
	I. Faulty compressor.	I. Replace or repair the compressor only after making certain none of the preceding installation defects exist.
2. Noisy compressor operation.	A. Loose drive gear or components.	A.. Inspect the fit of the drive gear on the compressor crankshaft. The gear or coupling must be completely seated and the crankshaft nut must be tight. If the compressor crankshaft surface is damaged, it is an indication of loose drive components. If damage to the compressor crankshaft is detected, replace the compressor. When installing the drive gear or pulley, torque the crankshaft nut to the appropriate torque specifications and use care when pressing drive components onto the crankshaft. Do not back off the crankshaft nut once it is tightened to the proper torque. Do not use impact wrenches to install the crankshaft nut.
	B. Excessively worn drive couplings or gears.	B. Inspect drive gear and couplings and engine for excessive wear. Replace as necessary. (Nonmetallic gears should be replaced when the compressor is changed.)
	C. Compressor cylinder head or discharge line restrictions.	C. Inspect the compressor discharge port and discharge line for carbon build-up. If carbon is detected, check for proper cooling to the compressor. (See Cause and Remedy (D) under Symptom #1.) Inspect the discharge line for kinks and restrictions. Replace discharge line as necessary.

## COMPRESSOR TROUBLESHOOTING CHART (Continued)

SYMPTOMS	CAUSE	REMEDY
2. (Continued.)	D. Worn or burned out bearings.	D. Check for proper oil pressure in the compressor. Minimum required oil pressure; 15 psi engine idling, 15 psi maximum governed engine rpm. Check for excessive oil temperature—should not exceed 240 degrees Fahrenheit.
	E. Faulty compressor.	E. Replace or repair the compressor after determining none of the preceding installation defects exist.
3. Excessive build-up and recover time. Compressor should be capable of building air system from 85-100 psi in 40 seconds with engine at full governed rpm. Minimum compressor performance is certified to meet Federal requirements by the vehicle manufacturer. Do not downsize the original equipment compressor.	A. Dirty induction air filter.	A. Inspect engine or compressor air filter and replace if necessary.
	B. Restricted induction line.	B. Inspect the compressor air induction line for kinks and restrictions and replace as necessary.
	C. Restricted discharge line or compressor discharge cavity.	C. Inspect the compressor discharge port and line for restrictions and carbon build-up. If a carbon build-up is found, check for proper compressor cooling. Replace faulty sections of the discharge line.
	D. Slipping drive components.	D. Check for faulty drive gears and couplings and replace as necessary. Check the condition of drive belts and replace or tighten, whichever is appropriate.
	E. Excessive air system leakage.	E. Test for excessive system leakage and repair as necessary. Use the following as a guide: Build system pressure to governor cutout and allow the pressure to stabilize for one minute. Using the dash gauge, note the system pressure and the pressure drop after two minutes. The pressure drops should not exceed: 1. 2 psi in each reservoir for a single vehicle. 2. 6 psi in each reservoir for a tractor and trailer. 3. 8 psi in each reservoir for a tractor and 2 trailers.
	F. Sticking unloader pistons.	F. Check the operation of the unloading mechanism. Check for proper operation of the compressor air governor. Make certain the air connections between the governor and compressor are correct. Refer to figure 3. If the governor is operating properly, replace the unloader mechanism. Inspect for bent, linked or blocked tubing leading to or from the governor.
	G. Faulty compressor.	G. Replace or repair the compressor after determining none of the preceding installation defects exist.

## COMPRESSOR TROUBLESHOOTING CHART (Continued)

SYMPTOMS	CAUSE	REMEDY
4. Compressor fails to unload.	A. Faulty governor or installation.	A. Test the governor for proper operation and inspect air lines to and from it for kinks or restrictions. Replace or repair the governor or connecting air lines
	B. Faulty or worn unloader pistons or bores.	B. Inspect for worn, dirty or corroded unloader piston and bore. Replace as necessary.
5. Compressor leaks oil.	A. Damaged mounting gasket.	A. Check the compressor mounting bolt torque. If the mounting bolt torque is low, replace the compressor mounting gasket before re-torquing the mounting bolts.
	B. Cracked crankcase or end cover.	B. Visually inspect the compressor exterior for cracked or broken components. Cracked or broken crankcases or mounting flanges can be caused by loose mounting bolts. The end cover can be cracked by over-torquing fitting or plugs installed in the end cover. Replace or repair the compressor as necessary.
	C. Loose crankcase end cover or bottom cover.	C. Check the cap screw torques and tighten as necessary. Replace gaskets or o-ring.
	D. Loose oil supply or return line fittings.	D. Check the torque of external oil line fittings and tighten as necessary.
	E. Porous compressor casting.	E. Replace the compressor if porosity is found.
	F. Mounting flange or end cover, o-ring or gasket missing, cut or damaged.	F. Replace as necessary.
6. Compressor constantly cycles (compressor remains unloaded for a very short time).	A. Leaking compressor unloader piston.	A. Repair or replace as necessary. Remove the compressor inlet air strainer or fitting. With the compressor unloaded (not compressing air), listen for air escaping.
	B. Faulty Governor installation.	B. Test the governor for proper operation and inspect air lines for kinks or restrictions. Replace or repair the governor or connecting air lines as required.
	C. Excessive system leakage.	C. Test for excessive system leakage as instructed in Symptom #3 Remedy E. Reduce leakage wherever possible.
	D. Excessive reservoir contaminants.	D. Drain reservoirs.

## COMPRESSOR TROUBLESHOOTING CHART (Continued)

SYMPTOMS	CAUSE	REMEDY
7. Compressor leaks coolant.	A. Improperly installed plugs and coolant line fittings.	A. Check torque of fittings and plugs and tighten as necessary. Over torqued fittings and plugs can crack the head or block casting.
	B. Freeze cracks due to improper antifreeze strength.	B. Test antifreeze and strengthen as necessary. Check coolant flow through compressor to assure the proper antifreeze mixture reaches the compressor.
	C. Faulty compressor (porous castings).	C. If casting porosity is detected, replace the compressor.
8. Compressor head gasket failure.	A. Restricted discharge line.	A. Clear restriction or replace line.
	B. Loose head bolts	B. Tighten evenly to a torque of 265-292 inch pounds.
	C. Faulty compressor or head gasket.	C. Check for rough or poorly machined head or block surfaces. Replace compressor as necessary.

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