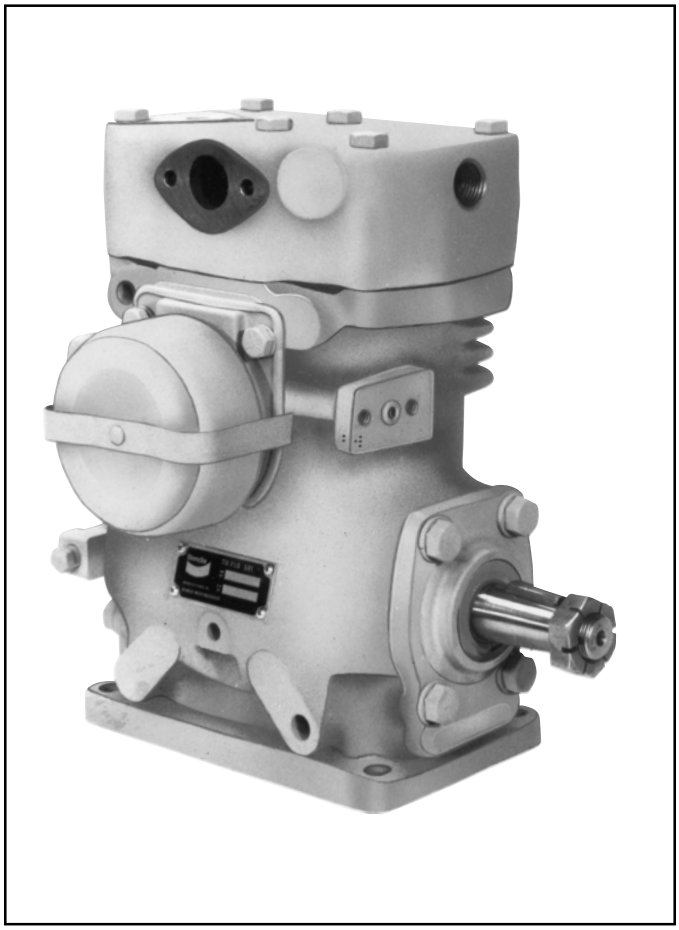
Bendix®

Service Data

SD-01-337

Bendix® TU-FLO® 501 Air Compressor



DESCRIPTION AND OPERATION

General

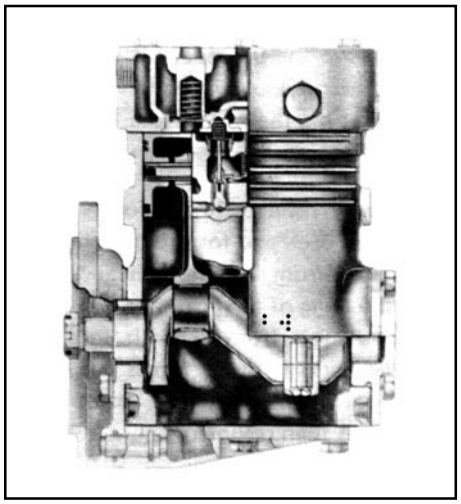
The function of the air compressor is to provide and maintain air under pressure to operate devices in the air brake and/or auxiliary air systems.

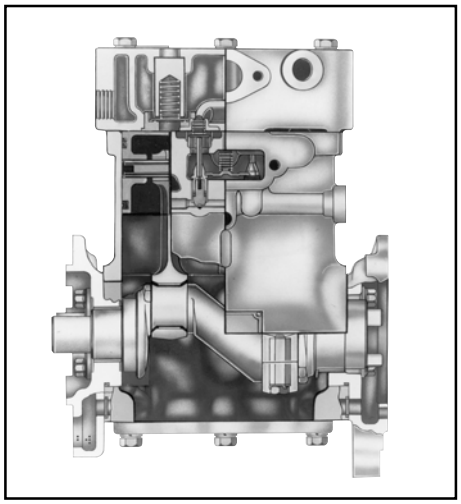
Description

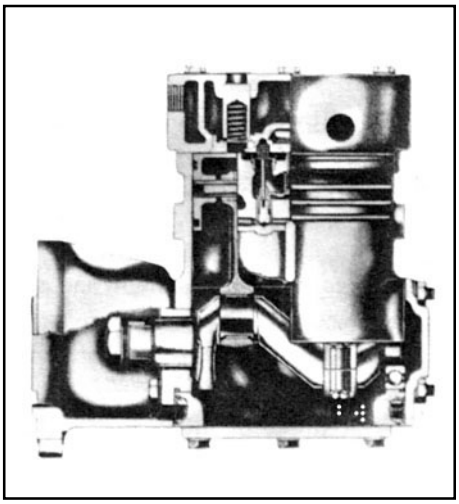
The Tu-Flo® 501 compressor is a two cylinder, single stage, reciprocating compressor with a rated displacement of 12 cubic feet of air per minute at 1250 R.P.M.

The Tu-Flo® 501 compressor is constructed from two major assemblies, the head and the crankcase. The head houses the discharge valving and is installed on the upper portion of the crankcase. The crankcase is a one piece casting combining the cylinder block and the crankcase. The upper portion of the casting houses the cylinder bores and inlet valving; and the lower portion, the crankshaft and main bearings. Various mounting and drive configurations, required by the numerous vehicle engine designs, are obtained by bolting different mounting flanges, end covers, and base adapters to the crankcase. Two horizontal governor mounting pads are located on either side of the upper portion of the crankcase to provide convenient governor mounting.

Two methods are employed for cooling the Tu-Flo® 501 compressor during operation. The cylinder head is connected to the engine's cooling system, while the cylinder bore portion of the crankcase has external fins for efficient air cooling.







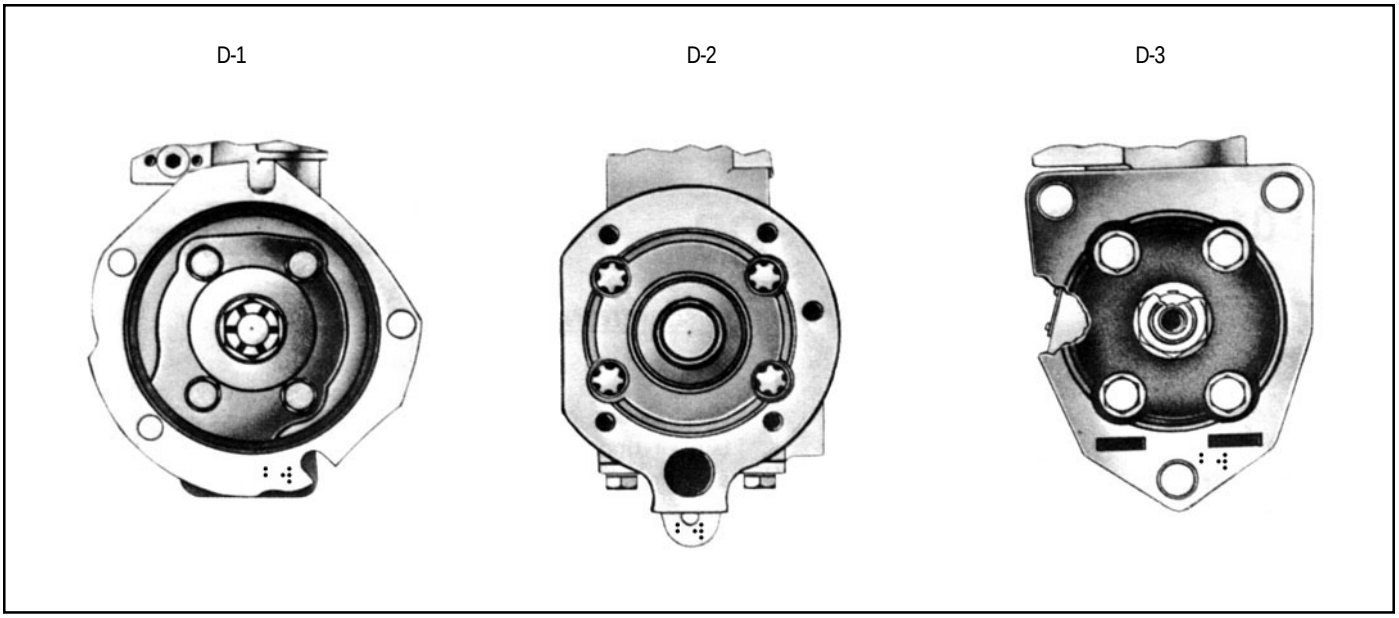


FIGURE 1 - VARIOUS COMPRESSOR MOUNTINGS

All Tu-Flo® 501 compressors utilize the engine's pressurized oil system to lubricate the internal moving parts.

A nameplate is attached to the crankcase to identify the compressor. The nameplate displays a Bendix piece number or in some cases an engine or vehicle manufacturer's piece number, along with a serial number.

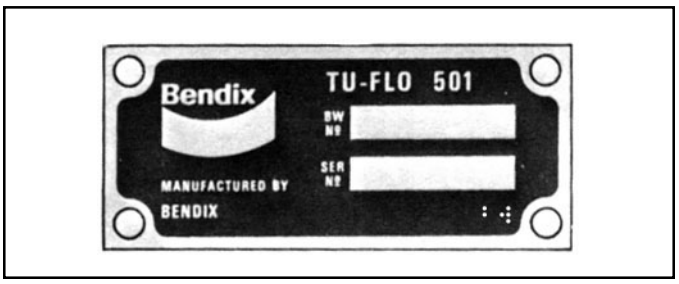


FIGURE 2 - COMPRESSOR NAMEPLATE

OPERATION

General

The compressor is driven by the vehicle engine and is operating continuously while the engine is running. Actual compression of air is controlled by the compressor unloading mechanism and the governor. The governor is generally mounted on the compressor and maintains the brake system air pressure to a preset maximum and minimum pressure level.

Intake and Compression of Air (Loaded)

During the down stroke of the piston, a slight vacuum is created between the top of the piston and the head, causing the flat circular inlet valve to move up and off its seat. (Note the flat square discharge valve remains on its seat.) Atmospheric air is drawn through the air strainer by the open inlet valve and into the cylinder (see Fig. 4). As the piston begins its upward stroke, the air that was drawn into the cylinder on the down stroke is being compressed. Air pressure on top of the inlet valve plus the force of its spring, returns the inlet valve to its seat. The piston continues the upward stroke and compressed air then flows by the open discharge valve, into the discharge line and on to the reservoirs (see Fig. 5). As the piston reaches the top of its stroke and starts down, the discharge valve spring and air pressure in the discharge line returns the discharge valve to its seat. This prevents the compressed air in the discharge line from returning to the cylinder bore as the intake and compression cycle is repeated.

Non-Compression of Air (Unloaded)

When air pressure in the reservoir reaches the cut-out setting of the governor, the governor allows air to pass from the reservoir into the cavity beneath the unloader pistons. This lifts the unloader pistons and plungers. The plungers move up and hold the inlet valves off their seats (see Fig. 6).

With the inlet valves held off their seats by the unloader pistons and plungers, air is pumped back and forth between the two cylinders. When air is used from the reservoir and the pressure drops to the cut-in setting of the governor, the governor closes and exhausts the air from beneath the unloader pistons. The unloader saddle spring forces the saddle, pistons and plungers down and the inlet valves return to their seats. Compression is then resumed.

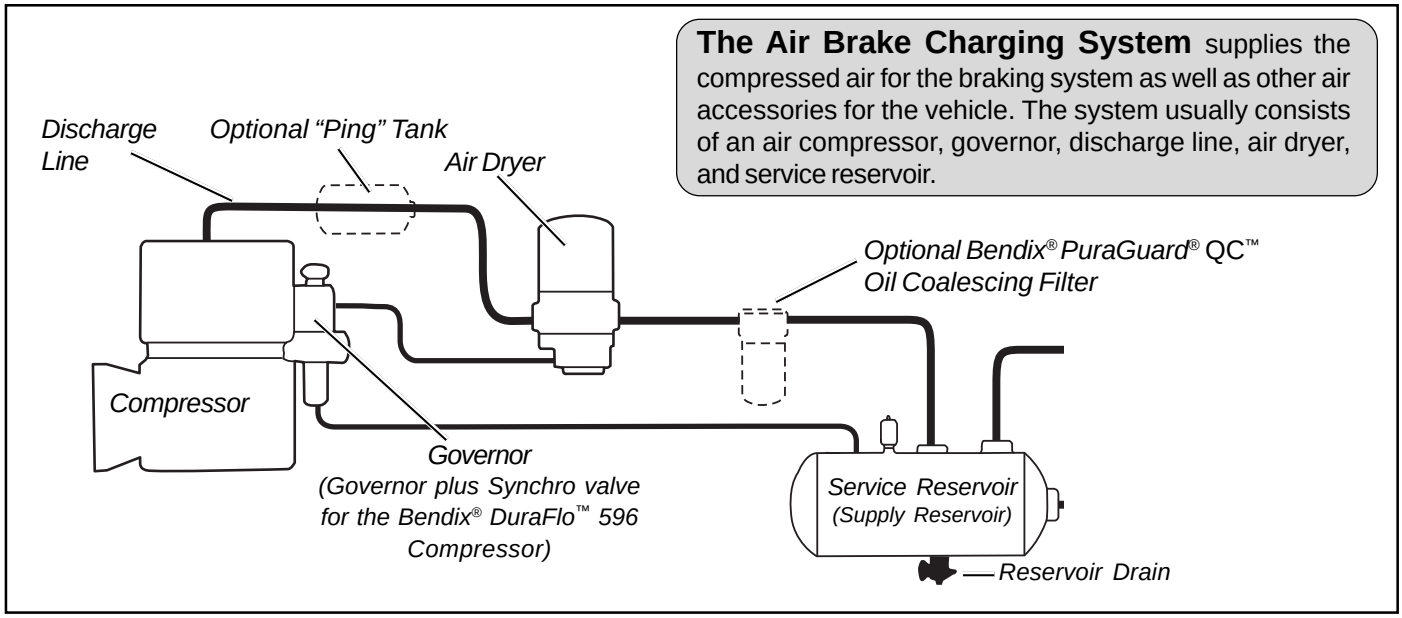


FIGURE 3A - ***SYSTEM DRAWING***

COMPRESSOR & THE AIR BRAKE SYSTEM

GENERAL

The compressor is part of the total air brake system, more specifically, the charging portion of the air brake system. As a component in the overall system its condition, duty cycle, proper installation and operation will directly affect other components in the system.

Powered by the vehicle engine, the air compressor builds the air pressure for the air brake system. The air compressor is typically cooled by the engine coolant system, lubricated by the engine oil supply and has its inlet connected to the engine induction system.

As the atmospheric air is compressed, all the water vapor originally in the air is carried along into the air system, as well as a small amount of the lubricating oil as vapor. If an air dryer is not used to remove these contaminants prior to entering the air system, the majority, but not all, will condense in the reservoirs. The quantity of contaminants that reach the air system depends on several factors including installation, maintenance and contaminant handling devices in the system. These contaminants must either be eliminated prior to entering the air system or after they enter.

DUTY CYCLE

The duty cycle is the ratio of time the compressor spends building air to the total engine running time. Air compressors are designed to build air (run "loaded") up to 25% of the time. Higher duty cycles cause conditions that affect air brake charging system performance which may require additional maintenance. Factors that add to the duty cycle are: air suspension, additional air accessories, use of an undersized compressor, frequent stops, excessive leakage from fittings, connections, lines, chambers or valves, etc. Refer to Table A in the Troubleshooting section for a guide to various duty cycles and the consideration that must be given to maintenance of other components.

COMPRESSOR INSTALLATION

While the original compressor installation is usually completed by the vehicle manufacturer, conditions of operation and maintenance may require additional consideration. The following presents base guidelines.

DISCHARGE LINE

The discharge line allows the air, water-vapor and oil-vapor mixture to cool between the compressor and air dryer or reservoir. The typical size of a vehicle's discharge line, (see column 2 of Table A in the Troubleshooting section) assumes a compressor with a normal (less than 25%) duty cycle, operating in a temperate climate. See Bendix and/or other air dryer manufacturer guidelines as needed.

The discharge line must maintain a constant slope down from the compressor to the air dryer inlet fitting or reservoir to avoid low points where ice may form and block the flow. If, instead, ice blockages occur at the air dryer or reservoir inlet, insulation may be added here, or if the inlet fitting is a typical 90 degree fitting, it may be changed to a straight or 45 degree fitting. Shorter discharge line lengths or insulation may be required in cold climates.

While not all compressors and charging systems are equipped with a discharge line safety valve this component is recommended. The discharge line safety valve is installed in the cylinder head (Tu-Flo® 550/750) or close to the compressor discharge port and protects against over pressurizing the compressor in the event of a discharge line freezeup.

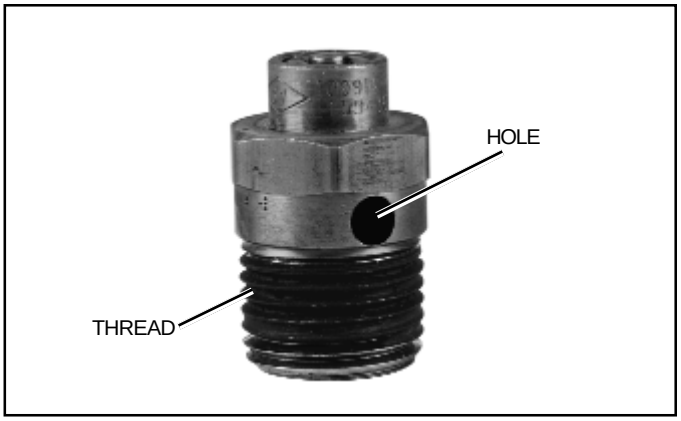


FIGURE 3B - ***DISCHARGE LINE SAFETY VALVE***

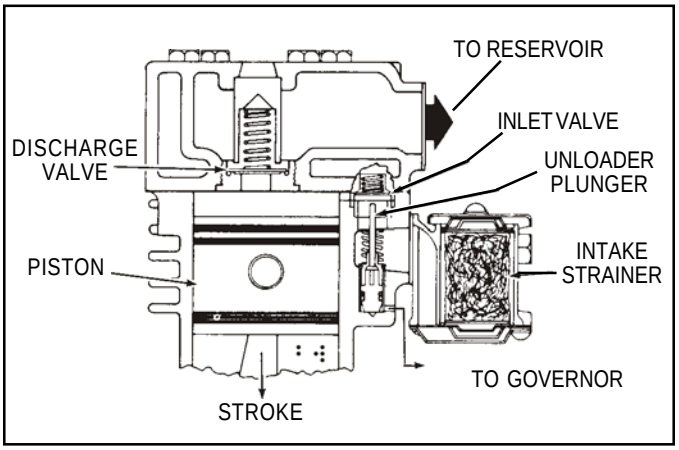


FIGURE 4 - INTAKE

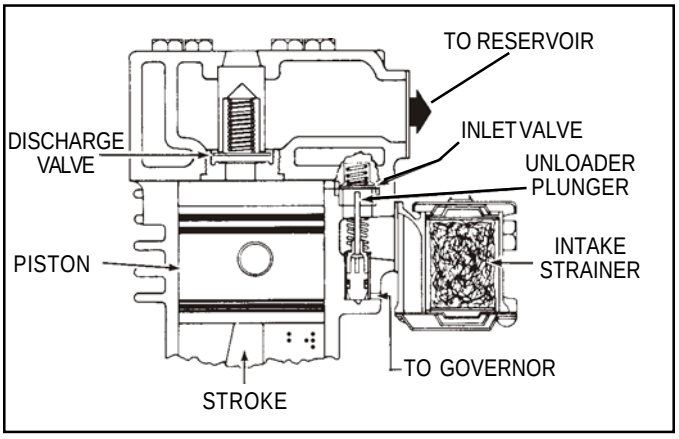


FIGURE 5 - COMPRESSION

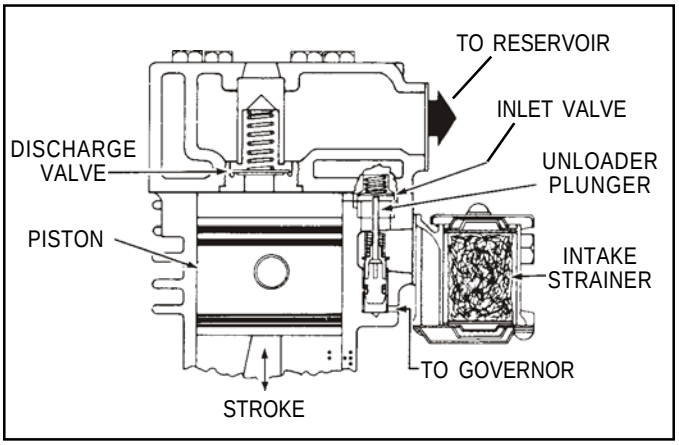


FIGURE 6 - UNLOADING

DISCHARGE LINE TEMPERATURE

When the temperature of the compressed air that enters the air dryer is within the normal range, the air dryer can remove most of the charging system oil. If the temperature of the compressed air is above the normal range, oil as oil-vapor is able to pass through the air dryer and into the air system. Larger diameter discharge lines and/or longer discharge line lengths can help reduce the temperature.

The air dryer contains a filter that collects oil droplets, and a desiccant bed that removes almost all of the remaining water vapor. The compressed air is then passed to the air brake service (supply) reservoir. The oil droplets and the water collected are automatically purged when the governor reaches its "cut-out" setting.

For vehicles with accessories that are sensitive to small amounts of oil, we recommend installation of a Bendix® PuraGuard® QC™ oil coalescing filter, designed to minimize the amount of oil present.

Lubrication

Since all Tu-Flo® 501 compressors are connected to the engine's pressurized oil system, a continuous flow of oil is provided to the compressor, which is eventually returned to the engine.

Oil is fed into the compressor in various ways, for example: through the rear end cover, the drive end of the crankshaft or through the front flange adapter. An oil passage in the crankshaft conducts pressurized oil to the precision sleeve main bearings and to the connecting rod bearings. Splash lubrication of the cylinder bores, connecting rod wrist pin bushings, and the ball type main bearings, on some models, is obtained as oil is forced out around the crankshaft journals by engine oil pressure.

Check the exterior of the compressor for the presence of oil seepage and refer to the TROUBLESHOOTING section for appropriate tests and corrective action.

Cooling

Air flowing through the engine compartment from the action of the engine's fan and the movement of the vehicle assists in cooling the crankcase. Coolant flowing from the engine's cooling system through connecting lines enters the head and passes through the head's water jacket and back to the engine. Proper cooling is important in maintaining discharge air temperatures below the maximum 400°F recommended.

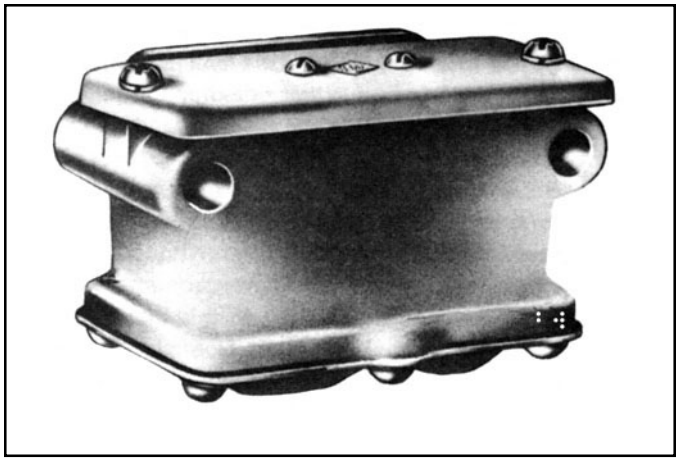


FIGURE 7 - POLYURETHANE SPONGE STRAINER

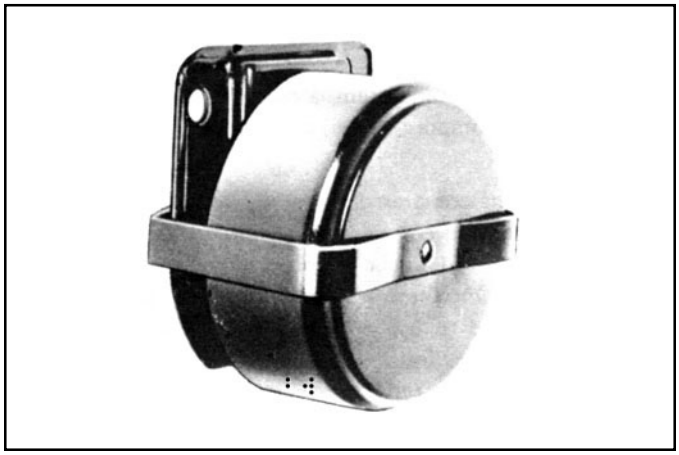


FIGURE 8 - PAPER AIR STRAINER DRY ELEMENT-PLEATED

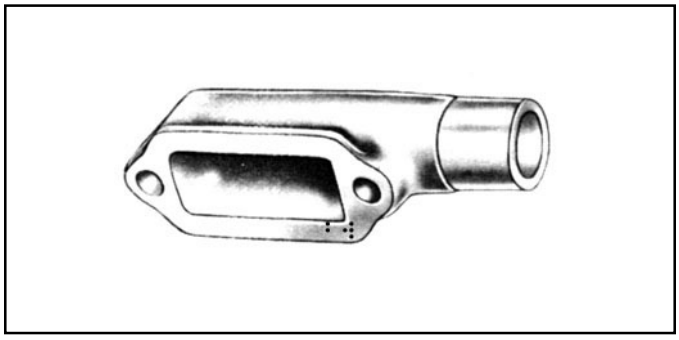


FIGURE 9 - COMPRESSOR INTAKE ADAPTER

PREVENTIVE MAINTENANCE

Regularly scheduled maintenance is the single most important factor in maintaining the air brake charging system. Refer to Table A in the Troubleshooting section for a guide to various considerations that must be given to the maintenance of the compressor and other related charging system components.

Every month, 300 operating hours or after each 10,000 miles, depending on the operating conditions, experience and the type of strainer used, service the air strainer.

POLYURETHANE SPONGE STRAINER EVERY 5000 MILES OR 150 OPERATING HOURS

Remove and wash all of the parts. The strainer element should be cleaned or replaced. If the element is cleaned, it should be washed in a commercial solvent or a detergent and water solution. The element should be saturated in clean engine oil, then squeezed dry before replacing it in the strainer. Be sure to replace the air strainer gasket if the entire air strainer is removed from the compressor intake.

DRY ELEMENT-PLEATED PAPER AIR STRAINER

EVERY 20,000 MILES OR 800 OPERATING HOURS

Remove the spring clips from either side of mounting baffle and remove the cover. Replace the pleated paper filter and remount the cleaned cover making sure the filter is in position. Be sure to replace the air strainer gasket if the entire air strainer is removed from the compressor intake.

(NOTE: Some compressors are fitted with compressor intake adapters which allow the compressor intake to be connected to the engine air cleaner.)

In this case, the compressor receives a supply of clean air from the engine air cleaner. When the engine air filter is changed, the compressor intake adapter should be checked. If it is loose, remove the intake adapter, clean the strainer plate, if applicable, and replace the intake adapter gasket, and reinstall the adapter securely. Check line connections both at the compressor intake adapter and at the engine air cleaner. Inspect the connecting line for ruptures and replace it if necessary.

EVERY 6 MONTHS, 1800 OPERATING HOURS OR AFTER EACH 50,000 MILES

Remove the discharge head fittings and inspect the compressor discharge port and discharge line for excessive carbon deposits. If excessive buildup is noted in either, the discharge line must be cleaned or replaced and the compressor checked more thoroughly, paying special attention to the air induction system, oil supply and return system, and proper cooling. If necessary, repair or replace the compressor. Check for proper belt and pulley alignment and belt tension. Adjust if necessary, paying special attention not to over tighten the belt tension. Check for noisy compressor operation, which could indicate a worn drive gear coupling or a loose pulley. Adjust and/or replace as necessary. Check all compressor mounting bolts and retighten evenly if necessary. Check for leakage and proper unloader mechanism operation. Replace if defective in any way.

EVERY 24 MONTHS, 7200 OPERATING HOURS OR AFTER EACH 200,000 MILES

Perform a thorough inspection as indicated below and depending upon the results of this inspection or experience, disassemble the compressor, clean and inspect all parts thoroughly, repair or replace all worn or damaged parts using only genuine Bendix replacements or replace the compressor with a genuine Bendix remanufactured unit.

IMPORTANT - Should it be necessary to drain the engine cooling system to prevent damage from freezing, the cylinder head of the compressor must also be drained.

GENERAL SERVICE CHECKS

Inspection

It is of the utmost importance that the compressor receives a clean supply of air. The air strainer must be properly installed and kept clean. If the compressor intake is connected to the engine air cleaner, supercharger, etc., these connections must be properly installed and maintained. Check the compressor mountings to be sure they are secure. Check the drive for proper alignment, belt tension, etc.

Inspect the oil supply and return lines. Be sure these lines are properly installed and that the compressor is getting the proper supply of oil, and just as important, that the oil is returning to the engine. Check the coolant lines to and from the compressor and see that the cooling fins on the crankcase are not clogged with dirt, grease, etc. Check the unloader mechanism for proper and prompt operation.

Operating Tests

Vehicles manufactured after the effective date of FMVSS 121, with the minimum required reservoir volume, must have a compressor capable of raising air system pressure from 85-100 P.S.I. in 25 seconds or less. This test is performed with the engine operating at maximum 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.

Air Leakage Tests

Leakage past the discharge valves can be detected by removing the discharge line, applying shop air back through the discharge port and listening for escaping air. Also, the discharge valves and the unloader pistons can be checked for leakage by building up the air system until the governor cuts out, then stopping the engine. With the engine stopped, listen for escaping air at the compressor intake. To pinpoint leakage if noted, apply a small quantity of oil around the unloader pistons. If there is no noticeable leakage at the unloader pistons, the discharge valves may be leaking. If the compressor does not function as described above, or leakage is excessive, it is recommended that it be returned to the nearest authorized Bendix Distributor for a factory remanufactured compressor. If this is not possible, the compressor can be repaired using genuine Bendix replacement parts, in which case, the following information should prove helpful.

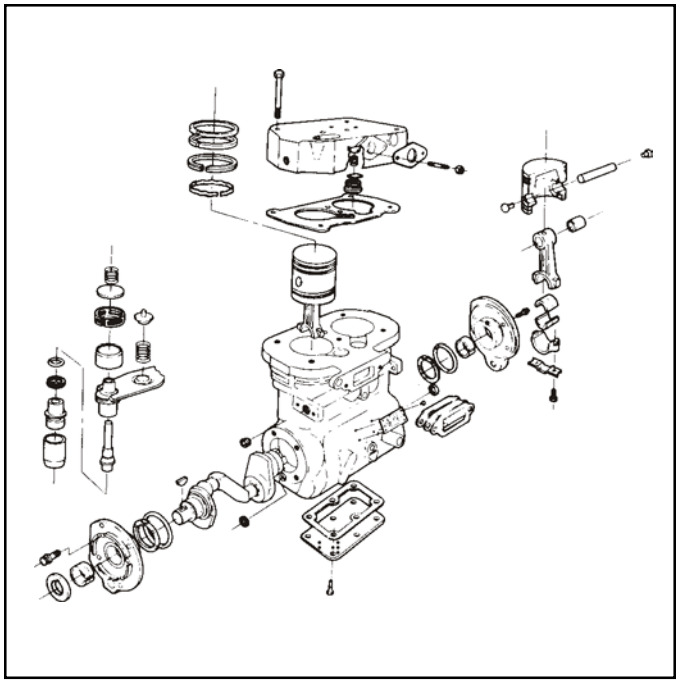


FIGURE 10 - TU-FLO® 501 AIR COMPRESSOR (THRU DRIVE) EXPLODED VIEW

REMOVING AND DISASSEMBLY

Removing

These instructions are general and are intended to be a guide, in some cases additional preparations and precautions are necessary. Chock the wheels of the vehicle and drain the air pressure from all the reservoirs in the system. Drain the engine cooling system and the cylinder head of the compressor. Disconnect all air, water and oil lines leading to and from the compressor. Remove the drive gear(s) or pulley from the compressor crankshaft using a gear puller. Inspect the pulley or gear and associated parts for visible wear or damage. Since these parts are precision fitted, they must be replaced if they are worn or damaged.

DISASSEMBLY

General

Remove road dirt and grease from the exterior of the compressor with a cleaning solvent. Before the compressor is disassembled, the following items should be marked to show their relationship when the compressor is assembled. Mark both the front and rear end cover in relation to the crankcase. Mark the drive end of the crankshaft in relation to the front end cover and the crankcase. Mark the cylinder head in relation to the crankcase. Mark the base plate or base adapter in relation to the crankcase.

A convenient method to indicate the above relationship is to use a metal scribe to mark the parts with numbers or lines. Do not use a marking method that can be wiped off or obliterated during rebuilding, such as chalk. Remove all compressor attachments such as governors, air strainers or inlet fittings, discharge fittings and pipe plugs.

Cylinder Head

Remove the six cylinder head cap screws and tap the head with a soft mallet to break the gasket seal. Remove the inlet valve springs from the head and inlet valves from their guides in the crankcase. Remove inlet valve guides from around the inlet valve seats on the crankcase taking care not to damage seats. Scrape off any gasket material from the cylinder head and crankcase. Unscrew the discharge valve seats from the head and remove the discharge valves and springs. Inspect the discharge valve seats for nicks, cracks, and excessive wear and replace if necessary.

The discharge valve stops should be inspected for wear and replaced if excessive peening has occurred. To determine if excessive peening has occurred, measure the discharge valve travel. Discharge valve travel must not exceed .057 inches. To remove the discharge valve stops, support the machined surface of the cylinder head on an arbor press bed and gently press the stops from the top of the head and out the bottom. Be sure to allow sufficient clearance for the stops between the press bed and the bottom of the cylinder head. The valve stop bores in the cylinder head must be inspected for excessive scoring. A new head body must be used if scoring is excessive. Discard the inlet valves and springs, the discharge valves and springs and the discharge valve seats if defective.

Crankcase Base Plate or Adapter

Remove the cap screws securing the base plate or base adapter. Tap with soft mallet to break the gasket seal. Scrape off any gasket material from crankcase and plate or adapter.

Connecting Rod Assemblies

(Note: Before removing the connecting rods, mark each connecting rod and its cap. Each connecting rod is matched to its own cap for proper bearing fit, and these parts must not be interchanged.)

Straighten the prongs of the connecting rod bolt lock strap and remove the bolts and bearing caps. Push the piston with the connecting rods attached out the top of the cylinders of the crankcase. Replace the bearing caps on their respective connecting rods. Remove the piston rings from the pistons. If the pistons are to be removed from the connecting rods, remove the wrist pin lock wires or teflon plugs and press the wrist pins from the pistons and connecting rods.

If the pistons are removed from the rod, inspect the bronze wrist pin bushing. Press out and replace the bushing if it is excessively worn. (See inspection of Parts) Discard the piston rings and the connecting rod journal bearings. Discard the wrist pin bushings if they were removed.

Crankcase

Remove the key or keys from the crankshaft and any burrs from the crankshaft where the key or keys were removed.

(Note: Through Drive Compressors may have a crankshaft key at both ends.)

Remove the four cap screws securing front or drive-end end cover or flange adapter. Remove the end cover, taking care not to damage the crankshaft oil seal or front main bearing, if any. Remove both of the small seal rings from the crankcase, and the o-ring from around the front end cover. Remove the four cap screws securing the rear end cover and remove the rear end cover taking care not to damage the rear main bearing, if any. Remove both of the small seal rings from the crankcase and the o-ring from around the end cover. If the compressor has ball type main bearings, press the crankshaft and ball bearings from the crankcase, then press the ball bearings from the crankshaft. Remove the unloader spring, spring saddle, and spring seat from the inlet cavity of the crankcase, using long nose pliers. Remove the unloader plungers and guides. Cover the inlet cavity with a shop rag and apply air pressure to the governor mounting pad unloader port to blow the unloader pistons out of their bores and into the inlet cavity.

CLEANING OF PARTS

General

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

Cylinder Head

Remove all the carbon deposits from the discharge cavities and all the rust and scale from the cooling cavities of the cylinder head body. Scrape all the foreign matter from the body surfaces and use shop air pressure to blow the dirt particles from all the cavities.

Crankcase

Clean the carbon and dirt from the inlet and unloader passages. Use shop air pressure to blow the carbon and dirt deposits from the unloader passages.

Oil Passages

Thoroughly clean all oil passages through the crankshaft, crankcase, end covers, and base plate or base adapter. Inspect the passages with a wire to be sure. Blow the loosened foreign matter out with air pressure.

OIL PASSING

All reciprocating compressors currently manufactured will pass a minimal amount of oil. Air dryers will remove the majority of oil prior to entrance into the air brake system. For particularly oil sensitive systems the Bendix® PuraGuard® QC™ oil coalescing filter can be used in conjunction with a Bendix air dryer.

If compressor oil passing is suspected, refer to the TROUBLESHOOTING section and TABLE A for the symptoms and corrective action to be taken. In addition, Bendix has developed the "**B**endix **A**ir **S**ystem **I**nspection **C**up" or **BASIC** test to help substantiate suspected excessive oil passing. The steps to be followed when using the BASIC test are presented in APPENDIX A at the end of the TROUBLESHOOTING section.

INSPECTION OF PARTS

Cylinder Head Body

Inspect the cylinder head for cracks or damage. 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 body. If leakage is detected, replace the head.

End Covers

Check for cracks and external damage. If the crankshaft main bearings are installed in the end cover, check for excessive wear and flat spots and replace them if necessary. If the compressor has an oil seal in the end cover, it should be removed by pressing it out of the end cover.

Crankcase

Check all crankcase surfaces for cracks and damage. On compressors where ball bearing main bearings are used the difference between the O.D. of the outer race and the I.D. of the crankcase hole should be .0000 in. to .0015 in. loose. This is to maintain the correct press fit. The crankcase must be replaced if the fit is too loose.

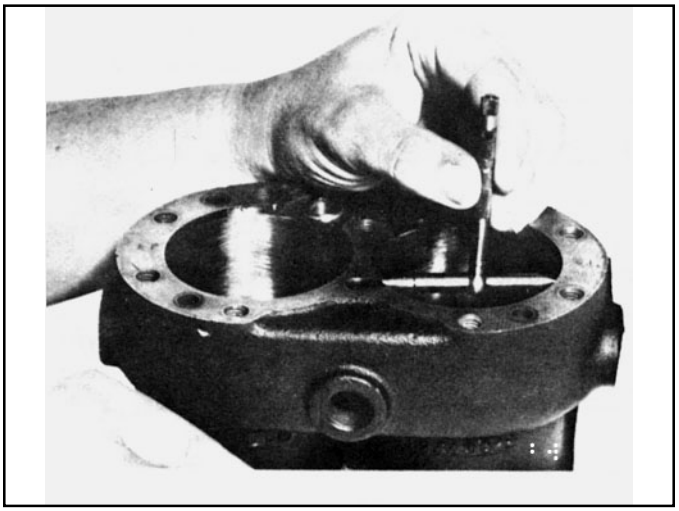


FIGURE 11 - MEASURING CYLINDER BORES

On compressors fitted with precision, sleeve main bearings, the difference between the O.D. of the crankshaft journal and the main bearing I.D. must not exceed .0065 in. If the clearance is greater than .0065 in., the end cover or main bearing must be replaced.

Check the unloader bore bushings to be sure they are not worn, rusted, or damaged. If these bushings are to be replaced, they can be removed by running a 1/8 in. pipe thread tap into the bushing, and inserting a 1/8 in. pipe threaded rod and pulling the bushing straight up and out. Do not use an easy-out for removing these bushings. If the inlet valve seats are worn or damaged, so they cannot be reclaimed by facing, they should be replaced. Cylinder bores should be checked with inside micrometers or calipers. (Fig. 11). Cylinder bores which are scored or out of round by more than .001 in. or tapered more than .002 in. should be rebored or honed oversize. Oversized pistons and piston rings are available in .010 in., .020 in. and .030 in. oversizes. Cylinder bores must be smooth, straight, and round. Clearance between the cast iron pistons and cylinder bores should be between .002 in. minimum and .004 in. maximum.

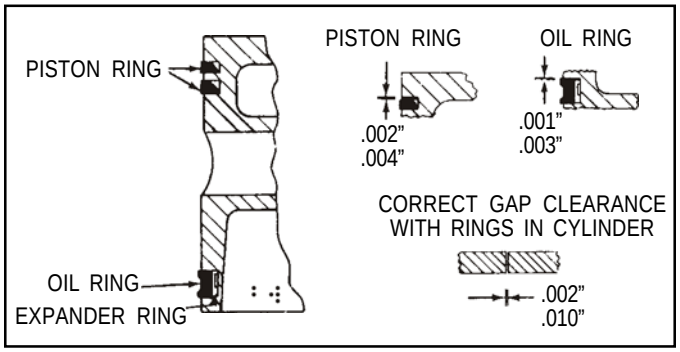


FIGURE 12 - CORRECT GROOVE CLEARANCE

Pistons

Check the pistons for scores, cracks, or enlarged ring grooves; replace the pistons if any of these conditions are found. Measure each piston with a micrometer in relation to the cylinder bore diameter to be sure the diametral clearance is between .002 in. minimum and .004 in. maximum.

Check the fit of the wrist pins to the pistons and connecting rod bushings. The wrist pin should be a light press fit in the piston. If the wrist pin is a loose fit, the piston and pin assembly should be replaced. Check the fit of the wrist pin in the connecting rod bushing by rocking the piston. This clearance should not exceed .0007 in. Replace the wrist pin bushings if excessive clearance is found. Wrist pin bushings should be reamed to between .5314 in. and .5317 in. after being pressed into the connecting rods.

Check the fit of the piston rings in the piston ring grooves. Check the ring gap with the rings installed in the cylinder bores. Refer to Fig. 12 for correct gap and groove clearances.

Crankshaft

Check the crankshaft threads, keyways, tapered ends and all machined and ground surfaces for wear, scores, or damage. Standard crankshaft journals are 1.1250 in. to 1.1242 in. in diameter. If the crankshaft journals are excessively scored or worn or out of round and cannot be reground, the crankshaft must be replaced. Connecting rod bearing inserts are available in .010 in., .020 in. and .030 in. undersizes for compressors with reground crankshafts. Main bearing journals must be maintained so the ball bearings are a snug fit or so that no more than .0065 in. clearance exists between the precision sleeve main bearing and the main bearing journals on the crankshaft. In crankshafts fitted with oil seal rings, the oil seal ring groove or grooves must not be worn. The ring groove walls must have a good finish and they must be square. Check to be sure the oil passages are open through the crankshaft.

Connecting Rod Bearings

Used bearing inserts must be replaced. Connecting rod caps are not interchangeable. The locking slots of the connecting rod and cap should be positioned adjacent to each other. Clearance between the connecting journal and the connecting rod bearing must not be less than .0003 in. or more than .0021 in. after rebuilding.

REPAIRS

Discharge Valves, Valve Stops and Seats

If the discharge valve seats merely show signs of slight wear, they can be dressed by using a lapping stone, grinding compound and grinding tool. If the discharge valve stops are to be replaced, an application of a sealer is required, such as “Locktite Retaining Compound #75.” Be sure that the press fit between the discharge valve stop outside diameter and the valve stop bore in the cylinder head is a minimum of .0008 in. and a maximum of .0028 in. If this fit can not be maintained, a new cylinder head body must be used. Be sure to completely support the outside top of the cylinder head casting, while pressing in the replacement stops. Install the new discharge valve springs and valves. Screw in the discharge valve seats. Discharge valve travel should be between .041 in. to .057 in.

To test for leakage by the discharge valves, apply 100 pounds of air pressure through the cylinder head discharge port and apply a soap solution to the discharge valves and seats. A slight leakage in the form of soap bubbles is permissible. If excessive leakage is found, leave the air pressure applied and with the use of a fibre or hardwood dowel and a hammer, tap the discharge valves off their seats several times. This will help the valves to seat and should reduce the leakage. With the air pressure still applied at the discharge port of the cylinder head, check for leakage around the discharge valve stops exposed on the top of the cylinder head casting. No leakage is permitted.

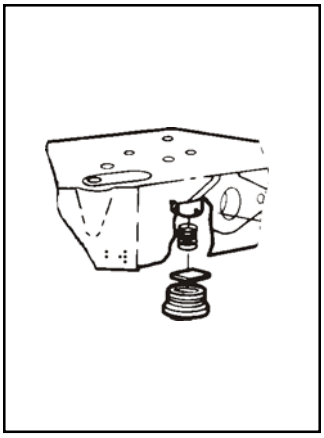


FIGURE 13 - DISCHARGE VALVE, VALVE STOP AND SEAT

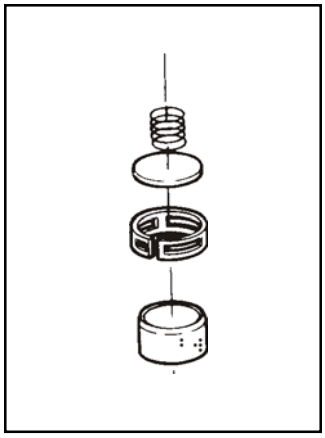


FIGURE 14 - INLET VALVE AND SEAT

Inlet Valves and Seats

Inlet valves and springs should be replaced, if the inlet valve seats show signs of slight nicks or scratches. They can be redressed with a fine piece of emery cloth or by lapping with a lapping stone, grinding compound and grinding tool. If the seats are damaged to the extent that they cannot be reclaimed, they must be replaced. The dimension from the top of the cylinder block to the inlet valve seat should not exceed .113 in. nor be less than .101 in.

ASSEMBLY

General Note: All torques specified in this manual are **assembly** torques and can be expected to fall off after assembly is accomplished. **Do not retorque** after initial assembly torques fall.

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

inch pounds ÷ 12 = foot pounds

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

foot pounds x 12 = inch pounds

Installing the Crankshaft

Cautionary Note:

All flange mounted compressors must be assembled without a gasket between the crankcase and flange adapter and some compressors do not require gaskets on the end cover. Install the new crankcase gaskets only where they were removed during disassembly. In service failure of the compressor will occur if gaskets are used in disregard of the preceding.

If the compressor uses a ball type main bearing, press the ball bearing onto the correct end of the crankshaft. Position the ball bearing and the crankshaft in the crankcase, making sure the drive end of the crankshaft is positioned in the crankcase as marked before disassembly. Carefully press the crankshaft and ball bearing into the crankcase using an arbor press.

In the case of compressors with a front ball bearing, place two small seal rings in the counter-sunk holes at the front of the crankcase, as well as an end cover gasket. Install the front end cover in the proper position as marked before disassembly, taking care not to damage the new oil seal.

In the case of compressors with a rear ball bearing, place two small seal rings in the counter-bore at the rear of the crankcase. In one case a gasket is used and in another a large o-ring is placed in the counterbore at the rear of the crankcase. These are in addition to the seal rings. Install the rear end cover in the proper position as marked before disassembly. Since June, 1978, the two small seal rings have been increased slightly in cross section and a retaining ring added, as shown in Figure 15.

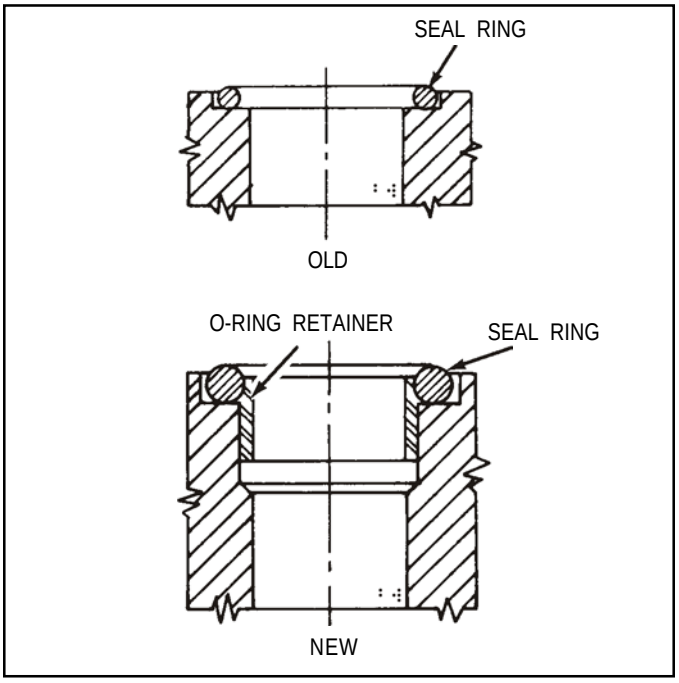


FIGURE 15

In the case of compressors with a sleeve bearing either front or rear, place the two small seal rings in the counter-sunk holes in the crankcase. **Caution:** An end cover gasket must not be used. Place the o-ring seal in the groove around the flange adapter or the end cover, and affix the thrust washer. Install the flange adapter or end cover in the proper position as marked before disassembly, taking care not to damage the sleeve bearing.

Secure the flange adapter, front or rear end cover to the crankcase by tightening the four cap screws. See note below for torque.

Note: For cast iron flange adapters, torque the four 7/16 in. cap screws to 38-45 foot pounds. For die cast aluminum end covers, torque the four 7/16 in. cap screws to 25-30 foot pounds. All end covers using 5/16 in. cap screws or stud and nuts are torqued to 15-18 foot pounds. For through drive compressors with a cast iron end cover, torque the four 7/16 in. cap screws to 25-30 foot pounds.

Pistons and Connecting Rods

If new wrist pin bushings are to be used, they should be pressed into the connecting rods so that the oil hole in the bushing lines up with the one in the rod. The new bushings should then be reamed or honed to provide between .0001 in. (.00254 mm) and .0006 in. (.01524 mm) clearance on the wrist pin. Position the connecting rod in the piston and press in the wrist pin.

Pistons installed in compressors manufactured prior to November, 1976, will have the wrist pin secured in the piston by a lock wire extending through matching holes in wrist pin and piston boss, anchored in a hole in the side wall of the piston. If the original pistons are used the wrist pin must be pressed in so the hole in the wrist pin aligns with that of the piston and secure same by inserting the new lockwire through the hole in piston and wrist pin and lock the wire by snapping the short 90° section into the lockwire hole in the bottom of the piston.

Compressors built after November, 1976, will have the wrist pin secured by Teflon buttons in either end of the wrist pin, allowing the wrist pin to float. The Teflon buttons pc. no. 292392 may be used with either new or old wrist pins. The later design pistons have two rings above the wrist pin and one below. Install the piston rings in the correct location with the ring pipmarks up. Stagger the position of the ring gaps. Pre-lubricate the piston, piston rings, wrist pins and connecting rod.

Unloader

A new unloader kit should used when rebuilding. (Figure 14). (Piece Number 279615). The unloader pistons in the kit are pre-lubricated with a special lubricant piece number 239379 and need no additional lubrication. Install the unloader pistons in their bores being careful not to cut the o-rings. Position the unloader plungers in their guides and slip them in and over the tops of the pistons. Install the unloader spring seat in the crankcase inlet cavity; a small hole is drilled in the crankcase for this purpose. Position the saddle between the unloader piston guides, so its forks are centered on the guides. Install the unloader spring, making sure it seats over the spring seats both in the crankcase and on the saddle.

Position and install the inlet valve guides, then drop the inlet valves in their guides. The inlet valves should be a loose sliding fit in the guides.

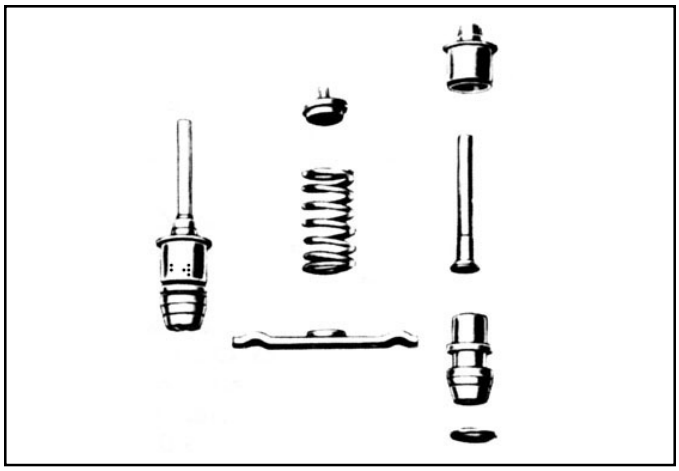


FIGURE 16 - UNLOADER MECHANISM

Cylinder Head

Install the inlet valve springs in the cylinder head by applying a turning motion to the spring after it is in the head. The turning motion should dig the spring wire into the spring seat in the bottom of the spring bore in the head. Should this procedure fail after repeated attempts, use a very small quantity of grease to hold them in place, just enough to keep the springs from failing out. Place the cylinder head gasket on the cylinder block. Carefully align the cylinder head assembly on the block and install the cap screws, tightening them evenly to a torque of 25-30 foot pounds.

Base Plate or Base Adapter

Position the base plate or base adapter gasket on the crankcase and install the base plate or base adapter as marked before disassembly. Tighten the six cap screws securing the cast iron base adapter evenly to a torque of 38-45 foot pounds, and 12-16 foot pounds for base plate or aluminum cover.

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 P.S.I. 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 connecting line. With the compressor operating at 2100 R.P.M., the time required to raise the reservoir(s) pressure from 85 P.S.I. to 100 P.S.I. should not exceed 7 seconds. During this test, the compressor should be checked for gasket leakage and noisy operation, as well as unloader operation and leakage.

INSPECTION OF REBUILT UNIT

Check to be sure that covers, plugs, or masking tape are used to protect all ports if compressor is not to be installed immediately. Fit the end of all crankshafts with keys, nuts, and cotter pins as required and then protect the ends against damage by wrapping with masking tape or friction tape. The open bottom of a vertical engine lubricated compressors should be protected against the entrance of dirt during handling or storage, by installing a temporary cover over the base.

COMPRESSOR TROUBLESHOOTING

IMPORTANT: The troubleshooting contained in this section considers the compressor as an integrated component of the overall air brake charging system and assumes that an air dryer is in use. The troubleshooting presented will cover not only the compressor itself, but also other charging system devices as they relate to the compressor.

WARNING! PLEASE READ AND FOLLOW THESE INSTRUCTIONS TO AVOID PERSONAL INJURY OR DEATH:

When working on or around a vehicle, the following general precautions should be observed at all times.

1. **Park the vehicle on a level surface, apply the parking brakes, and always block the wheels. Always wear safety glasses.**
2. **Stop the engine and remove ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. 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.**
3. **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.**
4. **If the work is being performed on the vehicle's air brake system, or any auxiliary pressurized air systems, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle. If the vehicle is equipped with an AD-IS™ air dryer system or a dryer reservoir module, be sure to drain the purge reservoir.**
5. **Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.**

6. **Never exceed manufacturer's recommended pressures.**
7. **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.**
8. **Use only genuine Bendix® replacement parts, components and kits. Replacement hardware, tubing, hose, fittings, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems.**
9. **Components with stripped threads or damaged parts should be replaced rather than repaired. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.**
10. **Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.**
11. **For vehicles with Antilock Traction Control (ATC), the ATC function must be disabled (ATC indicator lamp should be ON) prior to performing any vehicle maintenance where one or more wheels on a drive axle are lifted off the ground and moving.**

TABULATED DATA

Number of cylinders	2
Bore size	2.625 in.
Stroke	1.50 in.
Piston displacement at 1250 RPM	12 cu. ft.
Piston displacement per revolution	16.5 cu. in.
Maximum recommended RPM (naturally aspirated)	3000
Minimum coolant flow at maximum RPM	2.5 gal./min.
Horsepower required at 3000 RPM against 100 PSI head pressure	4.9 H.P.
Recommended minimum discharge line size	5/8 in. OD Copper Tube
Recommended minimum oil return line size	5/8 in. OD Tubing
Recommended minimum oil supply line size	1/4 in. OD Tubing
Recommended minimum unloader line size	1/4 in. OD Tubing
Recommended minimum inlet cavity line size (when compressor is connected to engine air cleaner)	5/8 in. ID minimum
Recommended minimum coolant line size	1/2 in. OD Tubing
Recommended maximum inlet air temperature	250°F
Recommended maximum discharge air temperature	400°F
Minimum pressure required to unload	60 PSI