

SECTION II

AIR CONDITIONING

PACKARD AIR CONDITIONING

Description

The Packard air conditioning system is basically a mechanical refrigeration system which provides comfort in the passenger compartment of the car by cooling the air while also removing moisture from the air.

While the cooling of the air may account for the reduction in actual temperature, the removal of moisture, or dehumidifying, may produce a greater cooling effect than the actual reduction of temperature. For example, if the temperature outside the car is 95° and the temperature inside the car is 80°, the cooling effect of dehumidification may make it feel the same as if the temperature were 70°.

Precautions in Handling Lines

Occasionally it may be necessary to replace all or portions of the refrigerant lines. The replacement lines should come out of stock completely sealed and dehydrated.

The lines should be free of kinks because kinks will cause restrictions in the flow of refrigerant. The refrigeration capacity of the entire system can be greatly reduced by a single kink in any line.

Inasmuch as the high and low pressure lines are installed close together, tubing clamps are used and these should be reinstalled if removed. The clamps keep the tubing separated which reduces vibration and the possibility of damage to the tubing.

The use of proper wrenches when making flare connections is important. If the wrench is too short, the flare may not be seated tight enough and a leak might develop. If the wrench is too long and heavy, the flare seat may be damaged. Wherever possible, the opposing fitting should be backed up with a second wrench to prevent distorting the connecting lines or parts.

In the event any line is opened to the atmosphere, the opening should be immediately capped or plugged to prevent the entrance of moisture and dirt.

Precautions in Handling Freon-12

All refrigerant drums are shipped with a heavy metal screw cap. The purpose of the cap is to protect the valve and safety plug from damage. It is good practice to replace the cap after each use of the drum for the same reason.

If it is ever necessary to transport or carry a drum of refrigerant in a car, keep it in the luggage compartment. The drum should not be exposed to the radiant heat from the sun for the resulting increase in pressure may cause the safety plug to release or the drum to burst.

For the same reason, the drum should never be subjected to high temperature when adding refrigerant to the system. In most instances, heating the drum is required to raise the drum pressure higher than the pressure in the system during the operation. It would be unwise to place the drum on a gas stove, radiator or use a blow torch while preparing for the charging operation, for a serious accident can result. Don't depend on the safety plug—many drums have burst when the safety plug failed. Remember, pressure can be a powerful force. A bucket of hot water, not over 125° F., or hot wet rags around the drum is all the heat that is required. If the occasion ever arises where it is necessary to fill a small drum from a large one, never fill the drum completely. Space should always be allowed above the liquid for expansion. If the drum were completely full and the temperature was increased, hydraulic pressure would result and a tremendous force could be developed.

Discharging large quantities of Freon-12 into a room can usually be done safely as the vapor would produce no ill effects. However, this should not be done if the area contains a flame producing device such as a gas heater. While Freon-12 normally is non-poisonous, heavy concentrations of it in contact with

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a live flame will produce a toxic gas. The same gas will also attack all bright metal surfaces.

The last precaution is one that is vitally important. Nature gives us only one pair of eyes and we are all concerned about keeping them. When working around a refrigerating system, one never knows when an accident may cause liquid refrigerant to hit the face. If the eyes are protected with goggles or glasses, no serious damage can result. Just remember, any Freon-12 liquid that you can touch or that touches you is at least 21.7° F. below zero. The eyes can't take much of this temperature.

If Freon-12 liquid should strike the eye, here is what to do:

Keeping calm in any situation which requires clear thinking is important.

When anything gets in the eye, the natural tendency is to rub it. Above all—don't! Splash the affected area with quantities of cold water to gradually get the temperature above the freezing point.

The use of mineral, cod, or an antiseptic oil is important in providing a protective film over the eyeball to reduce the possibility of infection.

As soon as possible, call or consult an eye specialist for immediate and future treatment.

Maintaining Chemical Stability

Whenever it becomes necessary to disconnect a refrigerant line, it should be immediately plugged or capped, depending on the type of connection. All air contains moisture and air that enters any part of the system will carry the moisture with it and the exposed surfaces will collect the moisture quickly. Capping the tubing will also prevent dirt and foreign matter from entering.

Tools should also be kept clean and dry. This includes the gauge set and replacement parts.

When adding oil, the container should be exceptionally clean and dry due to the fact that the oil in the container is as moisture-free as it is possible to make it. Therefore, it will quickly absorb any moisture with which it comes in contact. For this same reason the oil container should not be opened until ready for use and then it should be capped immediately after use.

When it is necessary to open a system, everything needed should be ready and handy so that as little time as possible will be required to perform the operation. The system should not be left open any longer than is necessary.

Finally, after the operation has been completed and the system sealed again, a vacuum pump should be used to remove any air that might have entered.

SERVICE OPERATIONS

Pumping Down and Charging the System

Refer to figure 1 and assemble the evacuating and charging equipment as shown.

Attach the high and the low pressure gauge hoses to the compressor valves as shown in figure 2. The high pressure gauge hose should be connected to the high pressure shut-off valve "A." The low pressure and vacuum gauge hose should be connected to the low pressure shut-off valve "B." The vacuum pump and the Freon tank should be connected as shown.

The Freon should be weighed into the system using a platform type scale or a spring type scale and it should be put into the system in a vaporous state and not in liquid form. The Freon pressure in the tank can be increased, if necessary, using hot wet rags wrapped around the tank or by placing the tank in warm water. The temperature of the water should not exceed 125°.

The system should be partially charged and leak tested as follows:

1. Close valve "B" by turning the valve stem all the way in using the valve wrench J 6105-1.
2. Open valve "A" by turning the valve stem all the way out.
3. Close hand valves "C" and "D" on gauge set by turning the valves in.
4. Close hand valve "F" on the vacuum pump by turning the valve in.
5. Open valve "E" on the Freon tank. Make a notation of the scale reading.
6. Start the engine, turn on the air conditioning switch on the instrument panel.
7. Open hand valve "D." This will permit the Freon to be drawn into the compressor and be pumped into the system.

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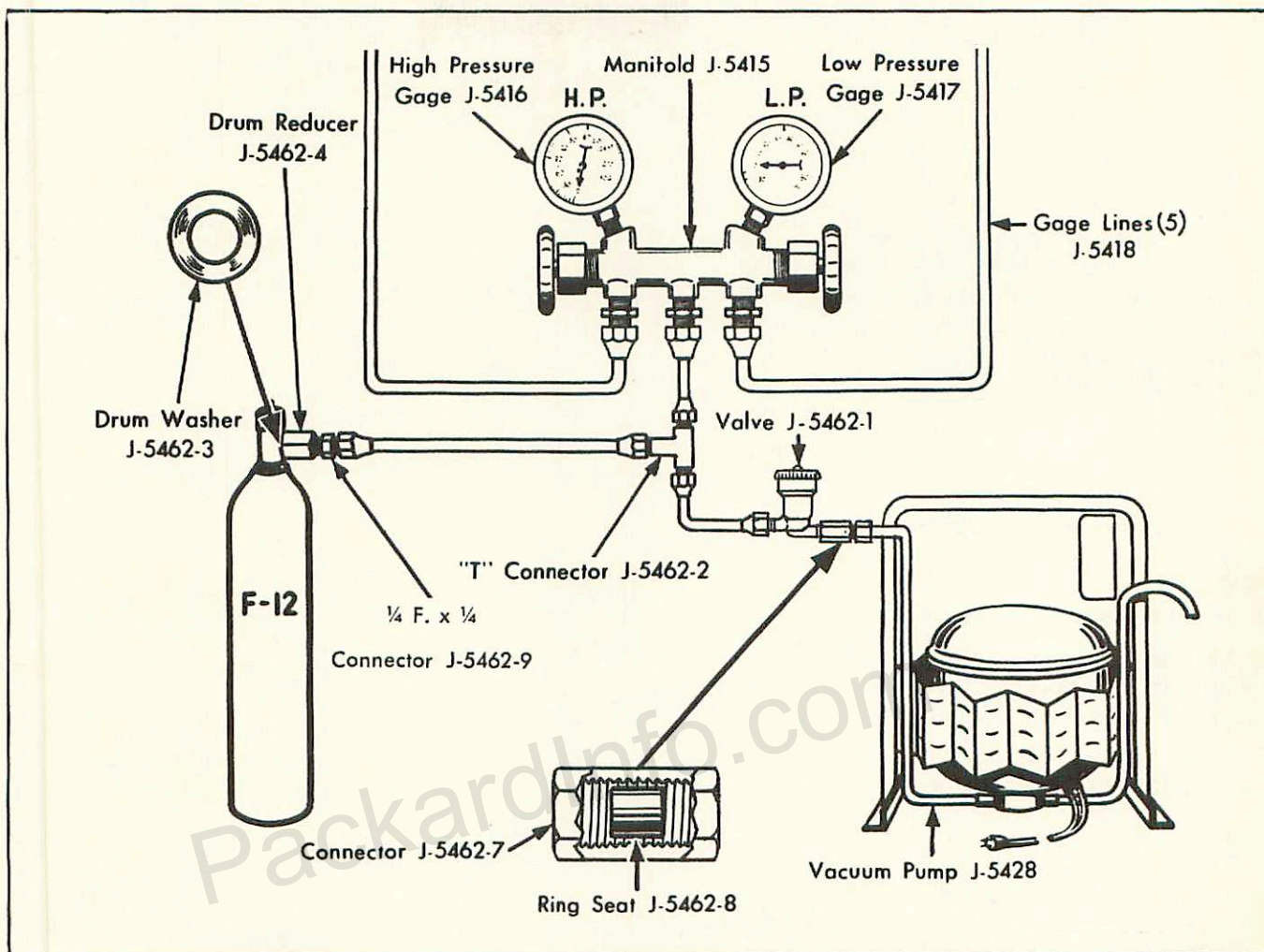


Figure 1

8. Permit one pound of Freon to enter the system and then close valves "D" and "E."
9. Fully open valve "B," run the engine and compressor for approximately two minutes and then stop the engine.

Thoroughly leak test the entire system, valves, couplings, joints, etc. with leak detector J 6084 and correct any leaks.

After partially charging and leak testing the system, it should be evacuated or pumped down to remove any moisture which may have been in the system. The engine and compressor should not be run when performing these operations:

1. Valves "A" and "B" should be fully opened and then both valves should be turned in two full turns.

2. Open valve "F" at the vacuum pump.
3. Open hand valves "C" and "D." This will permit the Freon vapor to be discharged out of the outlet tube at the vacuum pump.
4. When the gauge pressures have lowered, start the vacuum pump and allow it to run for approximately 20 minutes. After 20 minutes, close valve "F" and stop the pump. The low pressure gauge will show a vacuum of at least 24" HG.

Recharge (final charge) the system in the same manner as described for partially charging the system; however, five pounds of Freon should be installed. Check the operation of the system as described under "Qualifying the System."

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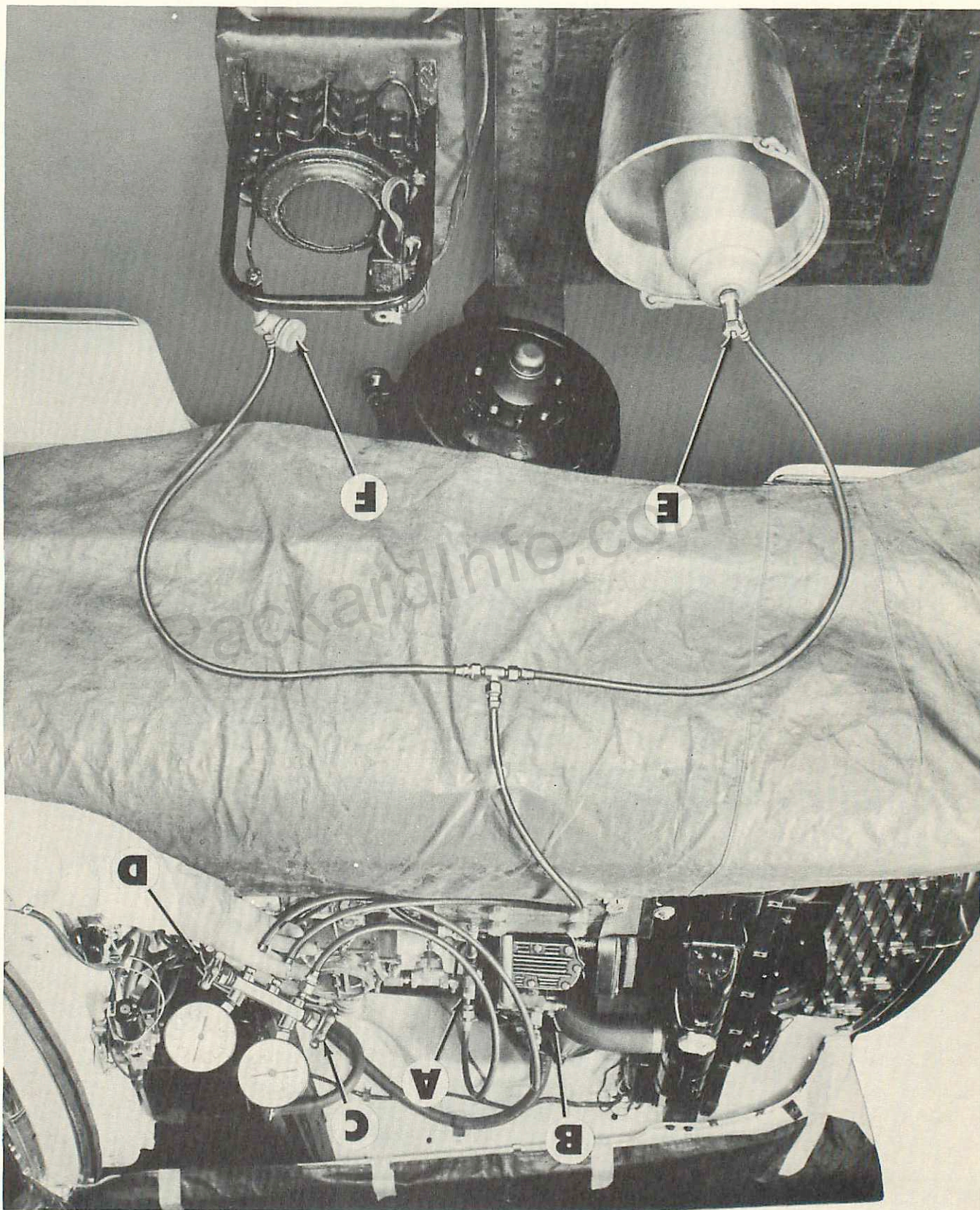


Figure 2

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Adding Refrigerant

This procedure is performed when an unknown amount of refrigerant is lost through a leak and the system requires additional Freon.

The hookup of the charging equipment is the same as described for charging the system except that the vacuum pump is not required. The center hose on the gauge set should be connected directly to the Freon tank.

It is recommended that a fan be placed in front of the car with the air blast directed into the radiator grille and condenser.

1. Refer to figure 2. Valves "A" and "B" should be fully open (stems all the way out) when removing gauge port caps and connecting the gauge lines.
2. After connecting gauge lines, close valve "B" by turning valve stem all the way in.
3. Close valves "C" and "D" by turning valves all the way in.
4. Open the Freon tank valve.

NOTE: The Freon tank should be maintained in an upright position so that *vapor only* will be drawn into the system. Do not invert the tank to add Freon in liquid form because the compressor can be damaged in this manner.

5. Start the engine and turn on the air conditioning switch on the instrument panel.
6. Note the scale reading and open valve "D." Weigh one pound of Freon into the system and then close valve "D."
7. Fully open valve "B."
8. Run the engine at approximately 2000 RPM and watch the sight glass. When the system is fully charged, the Freon will pass through the sight glass in a solid column while the system is in its cooling cycle and will be cloudy or "milky" in the by-pass cycle. The tube under the sight glass tube and to the modulating valve will be quite cold in the cooling cycle and will become warmer in the by-pass cycle. If the Freon is cloudy in both cycles and the temperature of the tube does not change, additional Freon is required. Repeat the foregoing operations adding one pound of Freon at a time and then rechecking until the system is fully charged.
9. Check the operation of the system as described under "Qualifying the System."

Qualifying the System

This operation is performed after the system has been charged to determine whether the system is operating properly.

Average operating pressures with the car engine running at 2000 RPM and a fan directed into the radiator grille are: Low Pressure 10-25 lbs. High Pressure 130-200 lbs. It must be remembered that the operating pressures change as the ambient air temperature changes. In some localities where very high temperatures are reached, it is possible that these average operating pressures may be exceeded.

1. With the gauge set connected to the gauge ports at the compressor, as shown in figure 2, the valves should be in the following positions: Shutoff valves "A" and "B," fully opened (stems all the way out),—Hand valves "C" and "D," fully closed (valves all the way in).
2. Close all car windows, place the heat and ventilating control levers in the up or "off position," pull the knob at the center of the evaporator case all the way out and open the cold air outlets in the top of the instrument panel.
3. Hook up engine tachometer, start engine and turn air conditioning control switch to "full blower" (all the way to the right).
4. Run engine at 2000 RPM for five minutes with thermometer in cold air outlet. After five minutes, the temperature at the cold air outlet should be between 32° and 40°. If the temperature is above 40°, turn the modulating valve adjusting screw, indicated by arrow in figure 3, out $\frac{1}{4}$ turn at a time to lower the temperature at the outlet. If the temperature at the outlet is below 32°, the modulating valve adjusting screw should be turned in to raise the temperature at the outlet,—otherwise, frosting at the evaporator coils may occur to restrict the cold air flow.
5. To check pressures during the five minute running period, turn valves "A" and "B" in approximately one turn.
6. After qualifying the system, turn valves "A" and "B" all the way out. Loosen the gauge hoses at the compressor to permit the pressure in the hose lines to bleed off and then disconnect the hoses. Install and tighten the two gauge port caps and the valve stem caps.

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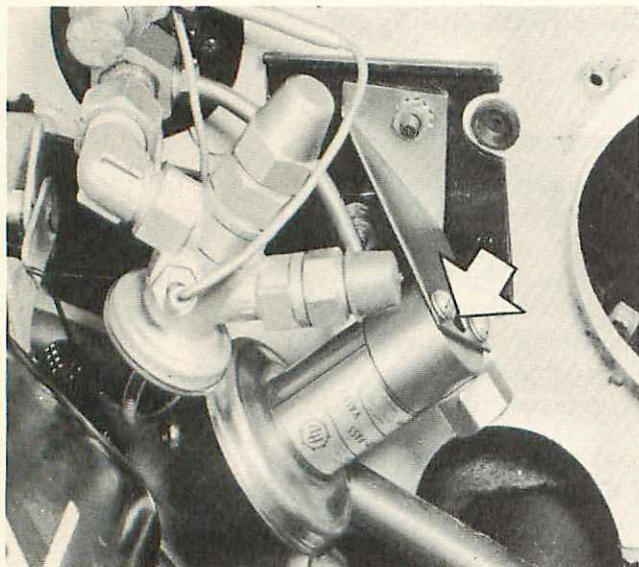


Figure 3

Compressor Oil Level

If a refrigerant leak is found which indicates some loss of oil, by the presence of oil around the leak, or when it is necessary to determine whether or not the compressor has a sufficient amount of oil in it, check and add oil as follows:

1. Remove the shut off valve caps "A" and "B," figure 4, and fully close the valves by turning the valve stems all the way in.
2. The oil level is checked as shown in figure 4, by removing the cap screw and using a narrow scale or rod as a dipstick. The cap screw first

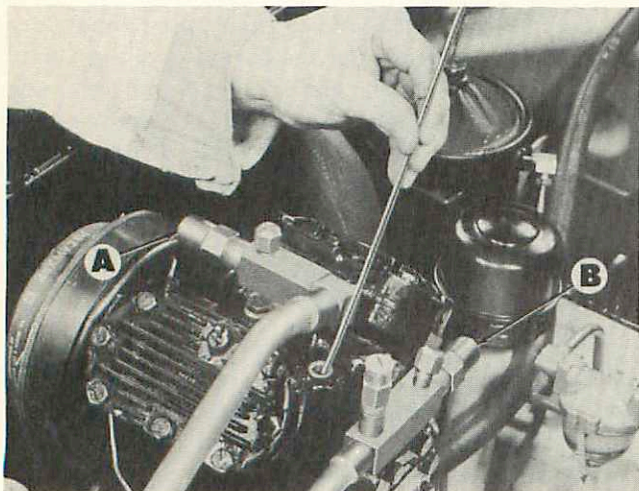


Figure 4

should be loosened to permit the pressure in the compressor to bleed off and then removed to check the oil level.

3. If the system has been in service, a certain amount of compressor oil has been carried into the system. The operating oil level in systems which have been in service is $\frac{3}{4}$ " from the bottom of the dipstick. The dry fill, for systems which have not been in service, is $1\frac{3}{8}$ " from the bottom of the dipstick.
4. After adding oil, if necessary, reinstall and tighten the cap screw. Fully open valves "A" and "B" by turning the valve stems all the way out and then reinstall the valve stem caps.

Compressor Belt Tension

The compressor belt tension is adjusted by moving the idler pulley and bracket assembly as required.

To adjust the belt tension, loosen the two cap screws which attach the idler pulley bracket to the compressor support. Using a spring scale attached to the idler pulley pivot bolt retaining nut, obtain a 40 to 45 pound pull and then tighten the idler pulley bracket retaining screws. See figure 5.

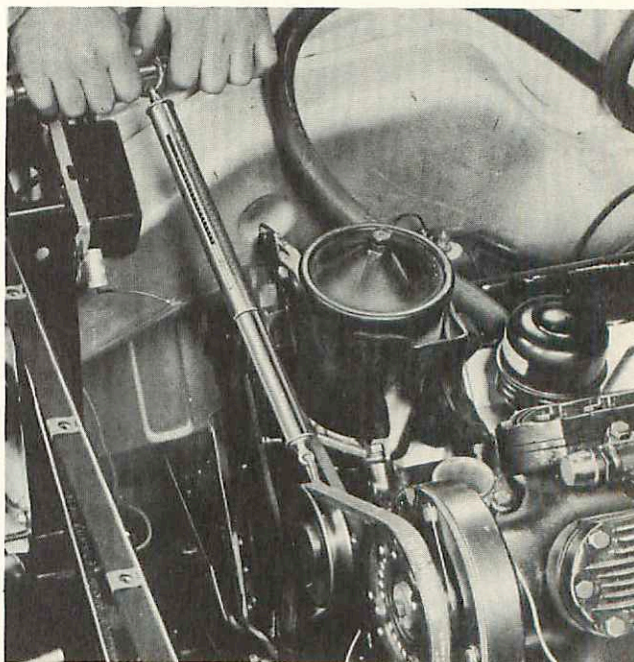


Figure 5

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Compressor Removal and Installation

To remove a compressor for engine maintenance, remove the shut off valve stem caps and fully close the valves by turning the valve stems all the way in. Loosen the gauge port cap on each valve to permit pressure to bleed out of the compressor.

Remove the shut off valve retaining cap screws to detach the shut off valves from the compressor.

Loosen the idler pulley bracket retaining screws and lift the compressor belt off the compressor clutch pulley.

Remove the compressor base to engine retaining nuts and cap screws and lift off the compressor assembly.

The compressor may be installed by reversing the removal procedure.

Adjust the compressor belt tension as described under "Compressor Belt Tension." Attach the shut off valves to the compressor using new gaskets. Fully open both shut off valves by turning the valve stems all the way out and then install the valve stem caps and tighten the gauge port caps.

Compressor Seal Replacement

Remove the compressor clutch and then remove the compressor end plate as shown in figure 6.

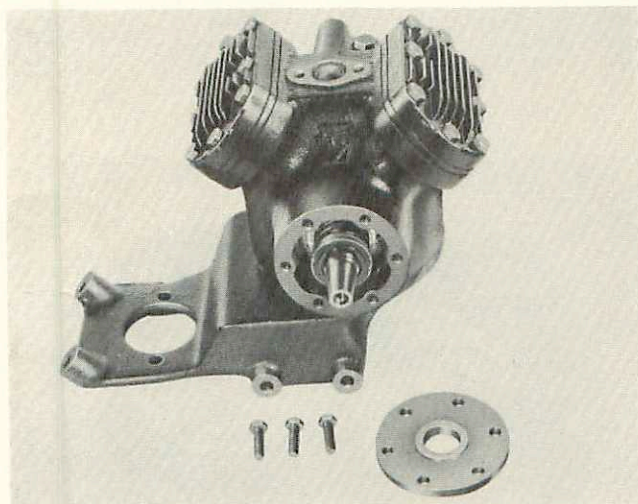


Figure 6

Remove the seal, seal retainer, spring and spring seat as shown in figure 7.

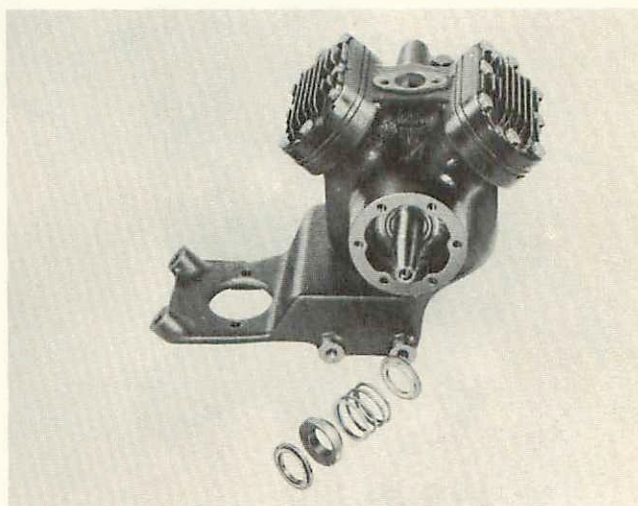


Figure 7

Thoroughly clean the gasket surface on both the compressor cylinder and on the end plate.

Install the new seal by first installing the spring seat, spring and the seal retainer. Install the seal as shown in figure 8. Note the groove in the seal and the tab in the seal retainer. To insure proper sealing, care should be exercised when handling the seal ring, so that moisture does not come in contact with the sealing face of the ring.

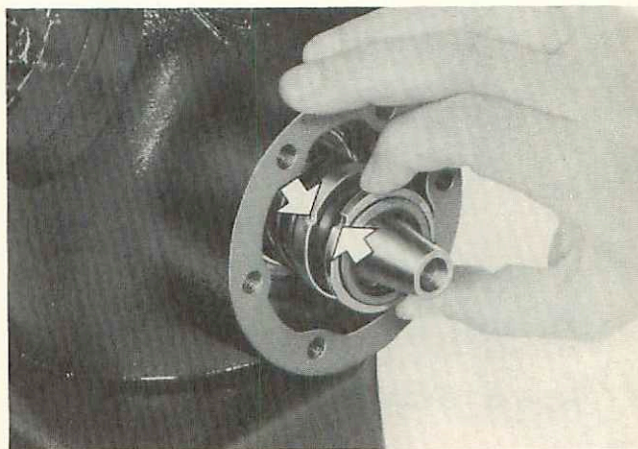


Figure 8

Using a suitable sealing compound on both sides of the new gasket, install the gasket and end plate. Torque tighten the plate retaining screws evenly 15 to 18 foot pounds.

Install the compressor drive clutch and torque tighten the retaining screws evenly 15 to 18 foot pounds.

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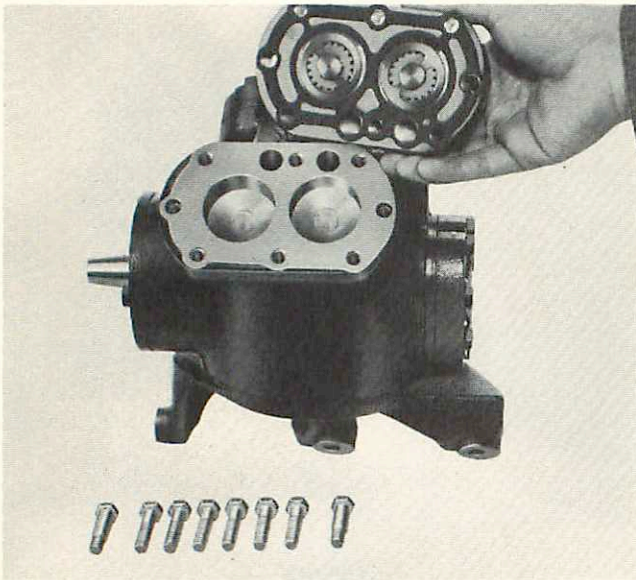


Figure 9

Compressor Valve and Plate Replacement

Remove the cylinder head bolts and then remove the cylinder head and valve plate assembly as shown in figure 9.

Separate the valve and plate assembly from the cylinder head as shown in figure 10.

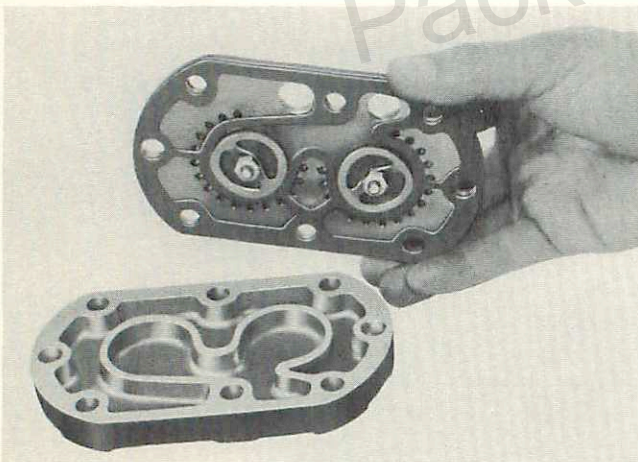


Figure 10

Figures 11 and 12 show the valves removed from one side of the valve plate. Points "A" of the valve and spring in figure 11 should be over point "B" of the plate.

Figures 13 and 14 show the proper positioning of the gaskets on each side of the plate. Dirt or foreign matter between the valves and their seating surfaces

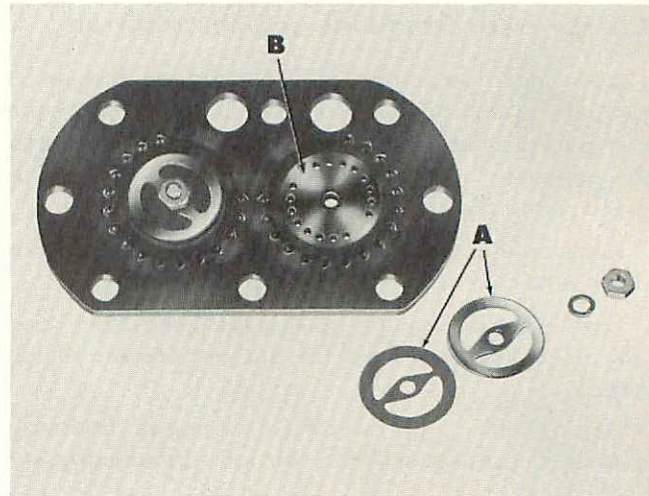


Figure 11

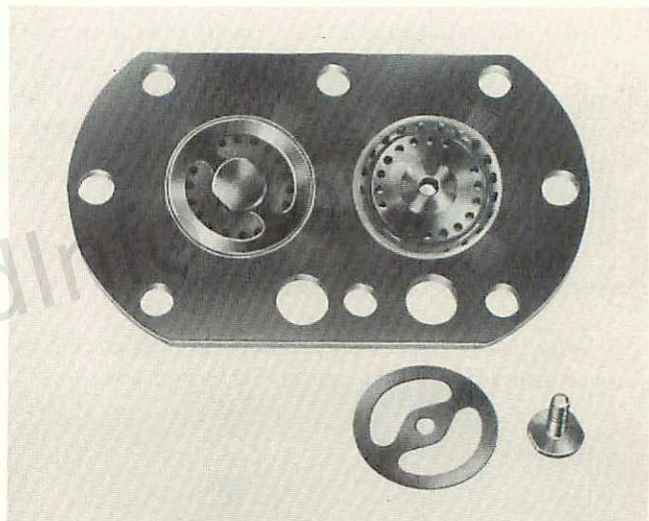


Figure 12

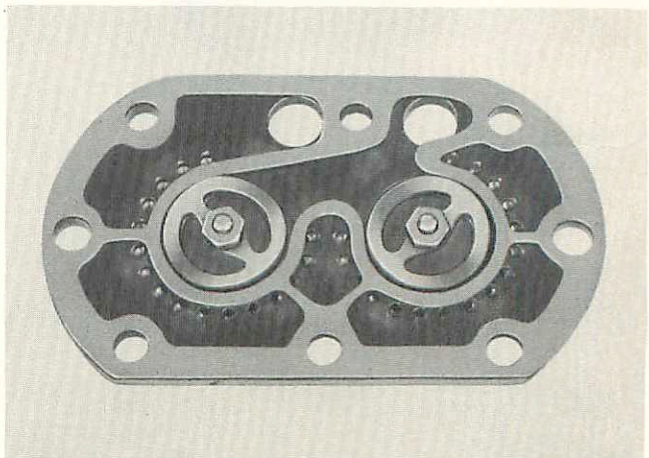


Figure 13

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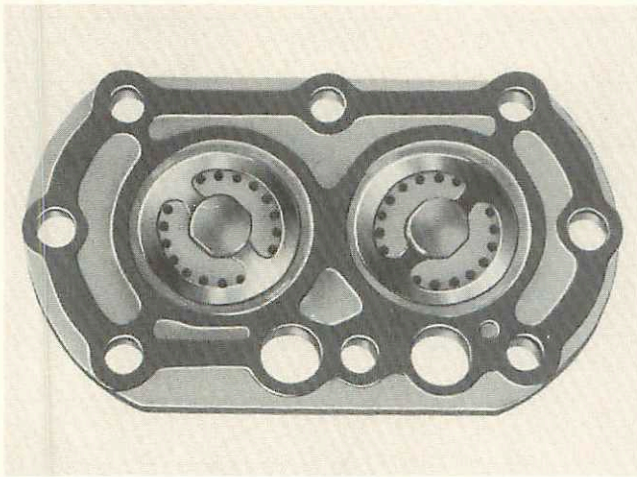


Figure 14

will cause improper compressor operation and care must be taken when assembling the valves to the plates.

When reinstalling the valve and plate assemblies and cylinder heads the cylinder head retaining bolts

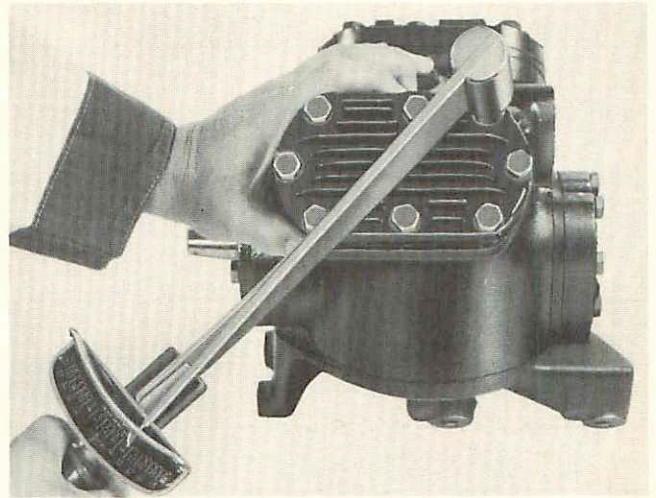


Figure 15

should be torqued to 30 foot pounds as shown in figure 15.

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