

AIR CONDITIONING

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AIR CONDITIONING SYSTEM

General

When driving at normal highway speeds the Jeep air conditioning unit will provide maximum efficiency. However, when operating under stop-and-go city driving conditions a slight reduction in cooling efficiency will generally be experienced.

It is recommended that maximum temperature setting be used for average city driving, and intermediate temperature setting for highway driving.

The same air conditioning unit, as shown for the Wagoneer in Figure 13A-1 is applicable to Cherokee and Truck models.

When driving at relatively high speed for an extended period of time, the cooling coil may possibly frost over resulting in a temporary loss of cooling. Should this occur, simply turn the TEMP knob to OFF and allow the blower to operate for a few minutes to allow the cooling coil to defrost. Then turn the TEMP knob to a setting which is not as cold as the setting at which frosting occurred.

To maintain maximum cooling efficiency, periodically remove bugs and foreign matter from the condenser and radiator fins. Also, DO NOT install a bug screen or other screen material in front of the condenser and radiator.

Water forming under a vehicle, at a point below the cooling case, is condensation water draining from the unit — and is considered normal.

The engine TEMP gauge pointer will indicate a slightly higher than normal temperature when the air conditioning unit is operating. However, should excessive overheating occur, check the condition of all water hoses, check the radiator for rust or scaling conditions, and make sure that the condenser is free of bugs or other foreign matter.

The air conditioner can also be employed for fast, efficient defogging of windows during cool damp weather.

The condenser is mounted ahead of the radiator and the remaining components are in the engine compartment.

The compressor is a two-cylinder engine, belt-driven type. An electro-magnetic clutch couples the compressor to the drive pulley. The drive pulley free-wheels when the air conditioner is not in use.

The start position on the ignition switch automatically disconnects all accessories including the air conditioner to reduce the battery load and provide easier starting.

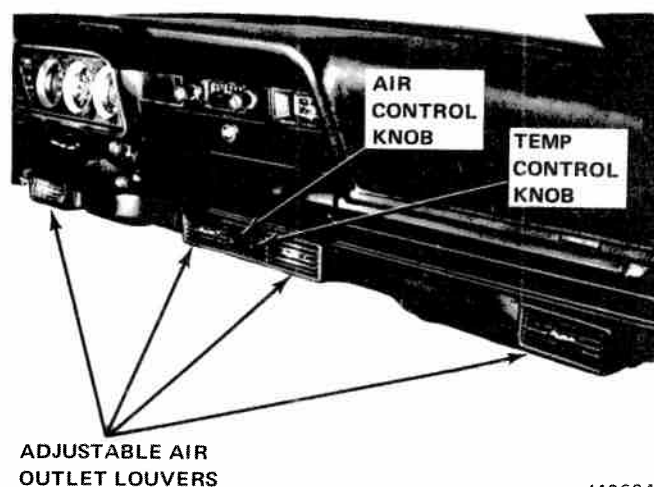


Fig. 13A-1 Air Conditioner—Cherokee-Wagoneer-Truck

Operation

For fast, maximum efficiency, purge the vehicle of hot air by driving the equivalent of two or three city blocks with at least one window open. During this time, place the TEMP control in the MAX position and the FAN control in the PC position. This permits the evaporator to pre-cool in hot weather conditions.

CAUTION: Do not leave fan control on PC for longer than 30 seconds. Move the fan control to HI position and roll up all windows.

Adjust the air outlets to obtain desired air flow distribution by moving the louver levers left, right, up, or down. Airflow can be adjusted for quick delivery to a specific spot or for gentle diffusion of air throughout the vehicle.



When the interior of the vehicle has cooled down to the desired temperature, the AIR knob may be set to obtain the desired volume of air from the air outlets. The TEMP knob may be rotated to vary the temperature. It may be necessary to experiment with the TEMP knob to determine the settings best suited to

various driving conditions. Generally, the MAX setting is comfortable for city driving, and a lesser setting comfortable for open road driving.

Run the engine well above idle speed for more efficient cooling under conditions where the system is operated with the vehicle standing.

PERFORMANCE DIAGNOSIS

Condition	Possible Cause	Correction
COMPRESSOR NOISE	(1) Broken valves (2) Overcharged (3) Incorrect oil level (4) Piston slap. (5) Broken rings	(1) Replace valve plate (2) Discharge, evacuate, and install correct charge (3) Isolate compressor and check oil level. Correct as necessary. (4) Replace compressor. (5) Replace compressor
EXCESSIVE VIBRATION	(1) Incorrect belt tension (2) Clutch loose (3) Overcharged (4) Pulley misaligned	(1) Set belt tension. Refer to Compressor Belt Tension (2) Tighten clutch (3) Discharge, evacuate, and install correct charge (4) Align pulley
CONDENSATION DRIPPING IN PASSENGER COMPARTMENT	(1) Drain hose plugged or improperly positioned (2) Insulation removed or improperly installed	(1) Clean drain hose and check for proper installation. (2) Replace insulation on expansion valve and hoses.
FROZEN EVAPORATOR COIL	(1) Faulty thermostat. (2) Thermostat capillary tube improperly installed.	(1) Replace thermostat. (2) Install capillary tube correctly.

PRESSURE DIAGNOSIS

Condition	Possible Cause	Correction
LOW SIDE LOW— HIGH SIDE LOW	(1) System refrigerant low. (2) Expansion valve clogged. (3) Restriction in liquid line.	(1) Evacuate, leak test, and charge. (2) Replace expansion valve. (3) Check line for kinks replace if necessary.
LOW SIDE HIGH— HIGH SIDE LOW	(1) Internal leak in compressor-worn (2) Head gasket leaking. (3) Expansion valve. (4) Drive belt slipping	(1) Remove compressor cylinder head and inspect compressor. Replace valve plate assembly if necessary. If compressor pistons, rings, or cylinders are excessively worn or scored replace compressor. (2) Install new cylinder head gasket. (3) Replace expansion valve. (4) Set belt tension.
LOW SIDE HIGH— HIGH SIDE LOW	(1) Clogged condenser fins. (2) Air in system. (3) Expansion valve (4) Loose or worn fan belts.	(1) Clean out condenser fins. (2) Evacuate, leak test, and charge system. (3) Replace expansion valve. (4) Adjust or replace belts as necessary.
LOW SIDE LOW— HIGH SIDE HIGH	(1) Expansion valve (2) Restriction in liquid line (3) Restriction in receiver (4) Restriction in condenser	(1) Replace expansion valve (2) Check line for kinks-replace if necessary. (3) Replace receiver. (4) Replace condenser
LOW SIDE AND HIGH SIDE NORMAL (INADEQUATE COOLING)	(1) Air in system (2) Moisture in system	(1) Evacuate, leak test, system (2) Evacuate, leak test, and charge system. Replace receiver/dryer if necessary

SYSTEM COMPONENTS—FUNCTION

Compressor—The compressor is a two-cylinder, belt-driven pump used to increase the pressure of the refrigerant in the system.

Condenser—The condenser is mounted in front of the radiator to allow air to flow over the cooling fins and receive heat from the refrigerant. As the refrigerant passes through the condenser, it liquifies (condenses).

Receiver/Dryer—The receiver/dryer is a reservoir used to store the precise amount of refrigerant required by the system. The receiver capacity must be adequate to provide a steady flow of refrigerant to the expansion valve.

Expansion Valve—The thermostatic expansion valve is located at the inlet side of the evaporator. It meters the refrigerant to the evaporator. If too much refrigerant is metered, a flooding condition results and the unit will not cool. If too little refrigerant is

metered, the system is starved and will not cool. The metering action of the expansion valve is controlled by the temperature sensing bulb mounted on the outlet (suction) line of the evaporator.

Evaporator—The evaporator is an air cooler and dehumidifier. As the refrigerant enters the evaporator core it begins to boil. The heat in the air passing over the evaporator transfers or gives up its heat to the boiling refrigerant. At the air cools, the moisture in the air condenses on the evaporator core and is drained off as water.

REFRIGERATION CYCLE

As the compressor increases the pressure of the system refrigerant, it also heats it (fig. 13A-2). The hot refrigerant is then pumped into the condenser where it cools by giving off heat to air passing over the condenser fins. As the refrigerant cools in the condenser, it condenses into a liquid. Still under high pressure, the refrigerant passes into the receiver. The receiver

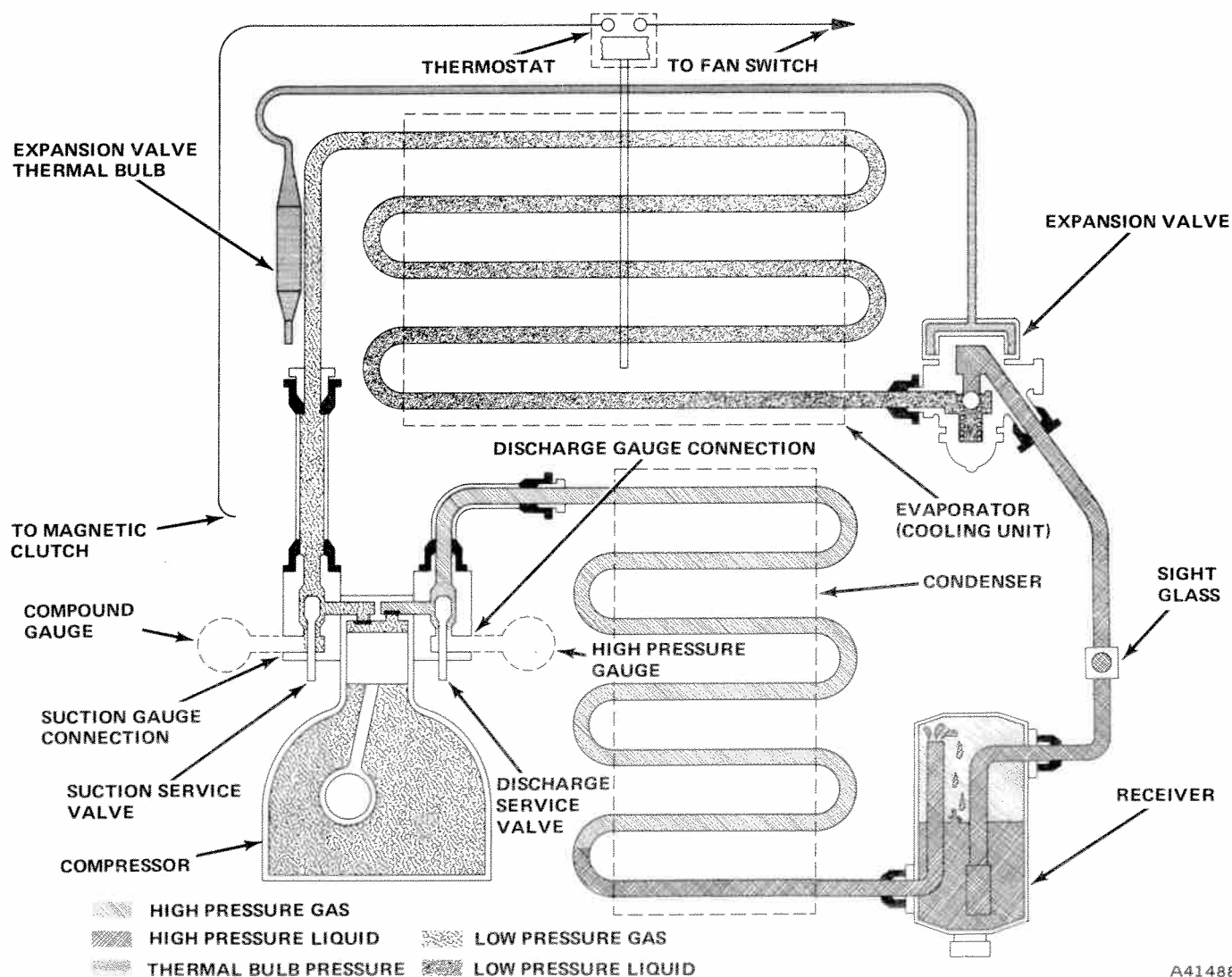


Fig. 13A-2 Refrigeration Cycle

acts as a reservoir to furnish refrigerant to the expansion valve at all times. From the receiver, the high pressure liquid refrigerant passes to the expansion valve. The expansion valve meters refrigerant into the evaporator where a low pressure is maintained by the suction side of the compressor. As it enters the evaporator, the refrigerant immediately begins to boil by absorbing heat from the air passing over the evaporator core. Having given up its heat to boil the refrigerant, the air is cooled and passes into the passenger compartment of the vehicle. The refrigerant continues to boil in the evaporator until all the liquid has vaporized. From the evaporator the refrigerant is drawn back to the compressor to repeat the cycle.

REFRIGERANT SAFETY PRECAUTIONS

The refrigerant used in air conditioning systems is dichlorodifluoromethane, commonly known as Refrigerant 12 (or R-12). It is transparent and colorless in both the liquid and vapor state. Since it has a boiling point of **21.7°F below zero**, at atmospheric pressure, it vaporizes at all normal temperatures and pressures. The vapor is heavier than air, nonflammable and nonexplosive. It is nonpoisonous except when in direct contact with open flame, and is noncorrosive except when combined with water. Observe the following precautions when handling R-12.

R-12 evaporates so rapidly at normal atmospheric pressures and temperatures that it tends to freeze anything it contacts. For this reason, extreme care must be taken to prevent any liquid refrigerant from contacting the skin and especially the eyes.

WARNING: *Always wear safety goggles when servicing the refrigeration part of the air-conditioning system. Keep a bottle of sterile mineral oil and a weak solution of boric acid handy when working on the refrigeration system. Should any liquid refrigerant get into the eyes, use a few drops of mineral oil to wash them out (R-12 is rapidly absorbed by the oil). Next, wash the eyes with the weak solution of boric acid. Call a doctor immediately, even though irritation has ceased after first aid treatment.*

WARNING: *Do not heat R-12 above 125°F.*

In most instances, moderate heat is required to bring the pressure of the refrigerant in its container above the pressure of the system when charging or adding refrigerant. A bucket or large pan of hot water not over 125°F is all the heat required for this purpose. Do not heat the refrigerant container with a blowtorch or any other means that would raise temperature and pressure above this temperature. Do not weld or steam clean on or near the system components or refrigerant lines.

When metering R-12 into the refrigeration system, **keep the supply tank or cans in an upright position.** If the refrigerant container is on its side or upside down, liquid refrigerant will enter the system and damage the compressor.

WARNING: *Always maintain good ventilation in the working area. Always discharge the refrigerant into the service bay exhaust system or outside the building. Large quantities of refrigerant vapor in a small, poorly ventilated room can displace the air and cause suffocation.*

Although R-12 vapor is normally nonpoisonous, it can be changed into a very poisonous gas if allowed to come in contact with an open flame. Do not discharge large quantities of refrigerant in an area having an open flame. A poisonous gas is produced when using the halide torch leak detector. Avoid inhaling the fumes from the leak detector.

CAUTION: *Refrigerant will tarnish bright metal and chrome surfaces. Avoid splashing refrigerant on any surface. Refrigerant in combination with moisture is very corrosive and can cause great damage to all metal surfaces.*

SERVICE VALVES

The discharge and suction service valves are mounted on the compressor cylinder head and are used for diagnosis, charging, discharging, evacuating and component removal.

The service valves are three-position valves (fig. 13A-3). The normal operating position, shown in figure 13A-3, View B, has the valve stem turned **counter clockwise** to the **back-seated** (full-out) position.

When the valve stem is turned **clockwise to the front-seated** (full-in) position (fig. 13A-3 View A), the compressor is isolated from the system. This position is used when removing the compressor or when checking compressor oil level.

When the valve is **midpositioned** (cracked) (fig. 13A-3 View C), the gauge port is **open**. This position is used when charging, discharging, evacuating and checking system pressures.

PRESSURE GAUGE AND MANIFOLD SET

The Pressure Gauge and Manifold Set, Tool J-5725-04 (fig. 13A-4), is the most important tool used to service the air conditioning system. The gauge set is used to determine system high and low

side gauge pressures, the correct refrigerant charge, and in system diagnosis. It is designed to provide simultaneous high and low side pressure indications, because these pressures must be compared to determine correct system operation.

Low Side Gauge

The low side gauge is a compound gauge, which means that it will register both pressure and vacuum. The compound gauge is calibrated 0 to 150 pounds pressure and 0 to 30 inches vacuum. It is connected to the suction service valve to check low side pressure or vacuum.

High Side Gauge

The high side gauge is used to check pressure in the discharge side of the air conditioning system.

Manifold

The gauges are connected into the air conditioning system through a manifold (fig. 13A-4). The manifold has three connections. The low side hose and fit-

- 1 - TO SERVICE PORT
- 2 - TO HOSE
- 3 - TO COMPRESSOR

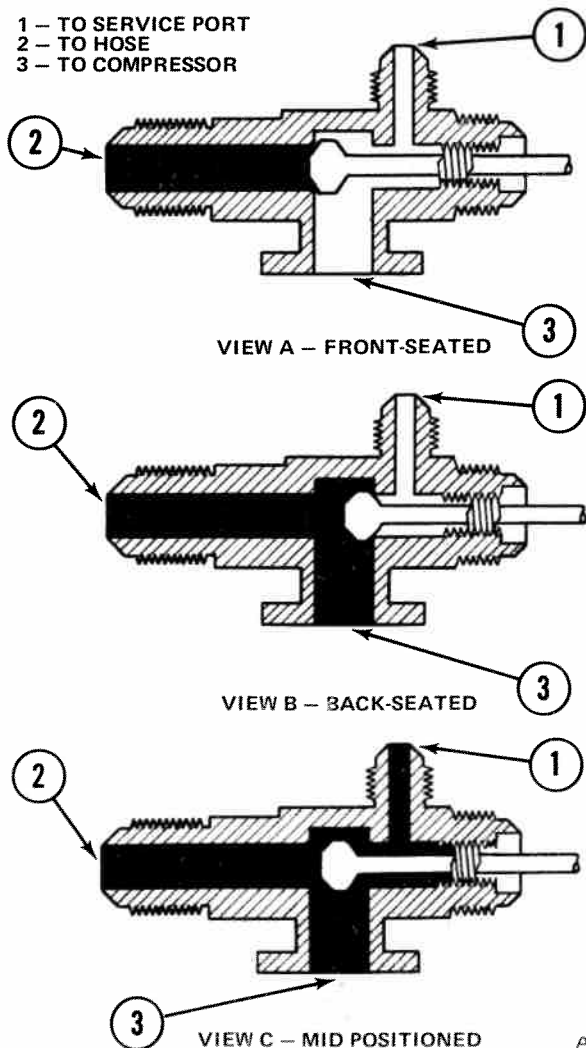


Fig. 13A-3 Service Valve Operating Positions

ting is connected directly below the low side gauge. The high side hose and fitting is connected below the high side gauge.

The center connection of the manifold is used for charging, discharging, evacuating and any other necessary service. Both the high and low side of the manifold have hand shutoff valves. The hand shutoff valves open or close the respective gauge connections to the center service connection or to each other. The manifold is constructed so that pressure will be indicated on the gauges regardless of hand valve position.

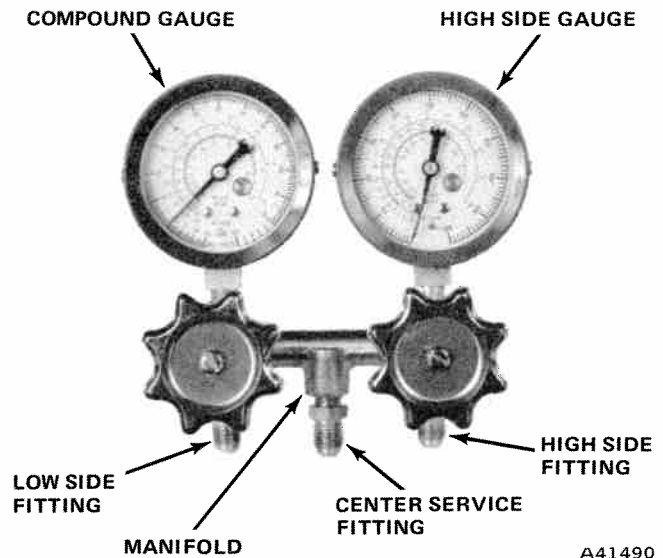


Fig. 13A-4 Pressure Gauge and Manifold Set, Tool J-5725-04

Connecting the Pressure Gauge and Manifold Set

- (1) Remove protective caps from service valve gauge ports and valve stems.
- (2) Close both hand valves on the gauge manifold set.
- (3) Connect compound gauge hose to compressor suction service valve gauge port (low side).
- (4) Connect high pressure gauge hose to discharge service valve gauge port (high side).

NOTE: If necessary, to facilitate installation of the gauge set, loosen the service valve-to-compressor fitting and rotate the service valve slightly. Tighten the service valve-to-compressor fitting to 25 foot-pounds torque.

- (5) Set both service valve stems to mid or cracked position. The gauges will indicate the high and low side pressures respectively.

- (6) Purge any air from the high side test hose by opening the high side hand valve on the manifold for 3 to 5 seconds (center connection on manifold must be open).

(7) Purge any air from the low side test hose by opening the low side hand valve on the manifold for 3 to 5 seconds (center connection on manifold must be open).

(8) The air conditioning system may be operated with the gauge manifold set connected in this manner. The gauges will indicate the respective operative pressures.

CHECKING SYSTEM PRESSURES

The pressure developed on the high side and low side of the compressor indicate whether the system is operating properly.

- (1) Attach the Pressure Gauge and Manifold Set.
- (2) Close both hand valves on the Gauge and Manifold Set.
- (3) Set both service hand valve stems to mid-position.
- (4) Operate AC system with engine running at 1500 rpm and controls set for maximum cooling.
- (5) Insert a thermometer into the discharge air outlet and observe air temperature.
- (6) Observe high and low side pressures and compare with those shown in the Normal Operating Temperatures and Pressures chart. If pressures are abnormal, refer to Pressure Diagnosis chart.

SIGHT GLASS

A sight glass is incorporated into the receiver-to-evaporator hose at the quick disconnect coupling. The sight glass provides a visual check of the system refrigerant level. A continuous stream of bubbles will appear in the sight glass of a system which is not properly charged. Properly charged and completely discharged systems will appear similar through the sight glass because of a lack of bubbles. To distinguish between the two situations, cycle the magnetic clutch OFF and ON with the engine running at 1500 rpm. During the time the clutch is off, bubbles will appear if refrigerant is in the system and will disappear when the clutch is on. If no bubbles appear when cycling the magnetic clutch, there is no refrigerant in the system, since some bubbles would appear in a fully charged system. If the system is discharged, it will be necessary to leak test, repair as required, evacuate, and charge the system.

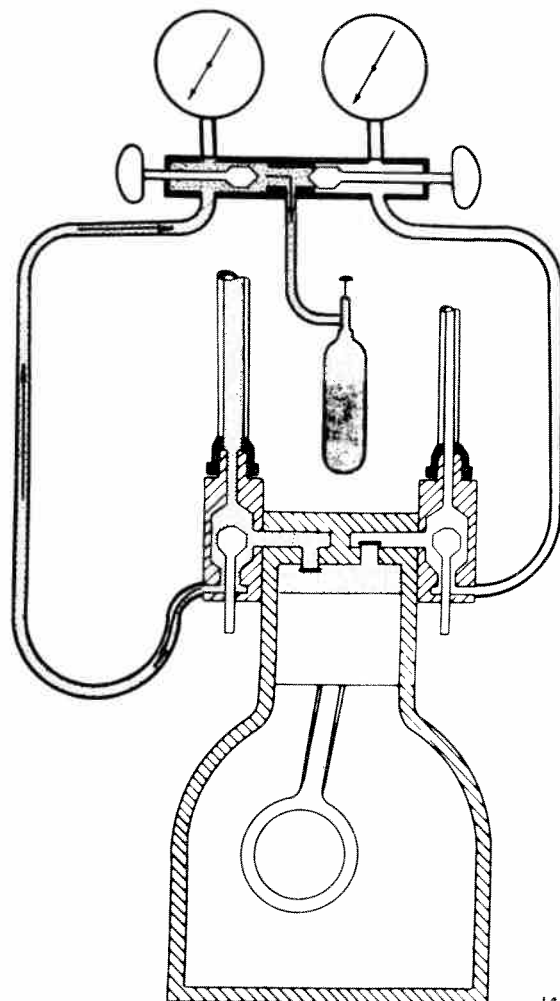
DISCHARGING THE SYSTEM

Refrigerant should be discharged from the system before replacing any part in the system except the compressor.

- (1) Connect the Pressure Gauge and Manifold Set to the proper service valves.
- (2) Turn both manifold hand valves to the maximum counterclockwise (open) position.

(3) Open both service valves a slight amount and allow the refrigerant to discharge slowly from the system (fig. 13A-5).

CAUTION: Do not allow the refrigerant to rush out, as the oil in the compressor will be forced out along with it.



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Fig. 13A-5 Valve Positions for Discharging

EVACUATING THE SYSTEM

A system that has had the refrigerant removed during repair, or that is excessively low on refrigerant, must be evacuated with a vacuum pump before new refrigerant is installed. The primary reason for evacuating a system is to remove any moisture that may have entered the system.

Moisture in any quantity is extremely harmful to the air conditioning system. Moisture may collect and freeze in the thermostatic expansion valve orifice, blocking refrigerant flow and prevent system cooling. Moisture will also react with R-12 to form hydrochloric acid which will corrode metal parts of the system. Corrosion particles may become detached and block the small passages and orifices in the system.

Unwanted air and moisture are removed from the system by controlling the pressure, that is creating a vacuum throughout the system. A vacuum pump is used to lower the pressure sufficiently so that the moisture boiling temperature is reduced to a point where the water will vaporize and can then be evacuated from the system.

Water boils at 212°F at 14.7 psi (sea level). As the vacuum pump lowers the pressure of the closed air conditioning system, the boiling point of the moisture in the system will also be lowered. In evacuating the system, it is necessary to lower the boiling point of any moisture in the system to a point lower than the ambient (surrounding) temperature to ensure that all moisture is boiled off. At an ambient temperature of 75°F, when the desired vacuum of 29.5 inches of Hg. is reached, water will boil at approximately 72°F and a complete boiling off of all moisture in the system is assured when this vacuum reading has been reached.

At altitudes higher than sea level, it will not be possible to obtain a vacuum reading of 29.5 inches of Hg. on the low side compound gauge. For each 1,000 feet of altitude, the vacuum gauge must be corrected by one inch of Hg. to compensate for a change in the atmospheric pressure. For example, at altitudes of 1,000 feet, a gauge reading of 28.5 inches of Hg. will be the same as a gauge reading of 29.5 inches of Hg. at sea level. When this vacuum is reached, a minimum of 30 minutes should be allowed in evacuating the system to ensure complete moisture removal.

Evacuating Procedure with J-23178 Vacuum Pump

The J-23178 vacuum pump and motor is a self-contained unit equipped with a carrying handle and stand. The unit must be kept upright at all times to prevent oil from spilling.

(1) Connect Pressure Gauge and Manifold Set, Tool J-5725-04.

(2) Discharge system.

(3) Connect center service hose to inlet fitting of vacuum pump (fig. 13A-6).

(4) Open both manifold hand valves wide open.

(5) Start Vacuum pump — note compound gauge reading.

(6) Operate pump a MINIMUM of 30 minutes after reaching lowest vacuum.

(7) Test system for leaks. Close both manifold hand valves, turn off vacuum pump, and note compound gauge reading. Gauge needle should remain stationary at point where pump turned off.

(8) If gauge needle returns to zero rapidly, install a partial charge in the system and locate the leak with leak detector. Repair leak and repeat evacuation procedure.

(9) If gauge needle remains stationary and vacuum is maintained for 3 to 5 minutes, resume evacuation for minimum of 30 minutes.

(10) Close both manifold hand valves and stop vacuum pump.

(11) Disconnect center service hose from vacuum pump. The system is now ready for charging.

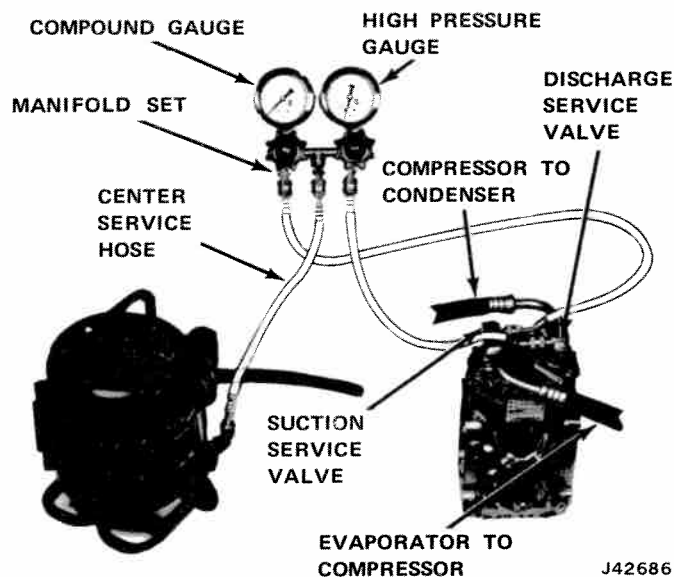


Fig. 13A-6 Evacuating System With Vacuum Pump

Evacuation Procedure with J-8393-01 Portable Air Conditioning Service Station

The J-8393-01 Portable Air Conditioning Service Station (fig. 13A-7) is a completely portable station equipped with vacuum pump, metering-charging cylinder, refrigerant supply, gauges, hoses and hand control valves.

The control switch for the vacuum pump is mounted on the rear of the charging station. It should be in the OFF position before inserting plug into the power source.

There are four hand control valves on the face of the control panel, identified and numbered as follows: low-pressure control (1), high-pressure control (2), vacuum control (3), and R-12 control (4). When not in use, keep all hand control valves in the OFF position to prevent dirt and moisture from entering.

(1) Close all hand valves.

(2) Connect high-pressure line, red hose, to discharge service port on the compressor.

(3) Connect low-pressure line, blue hose, to suction service port on the compressor.

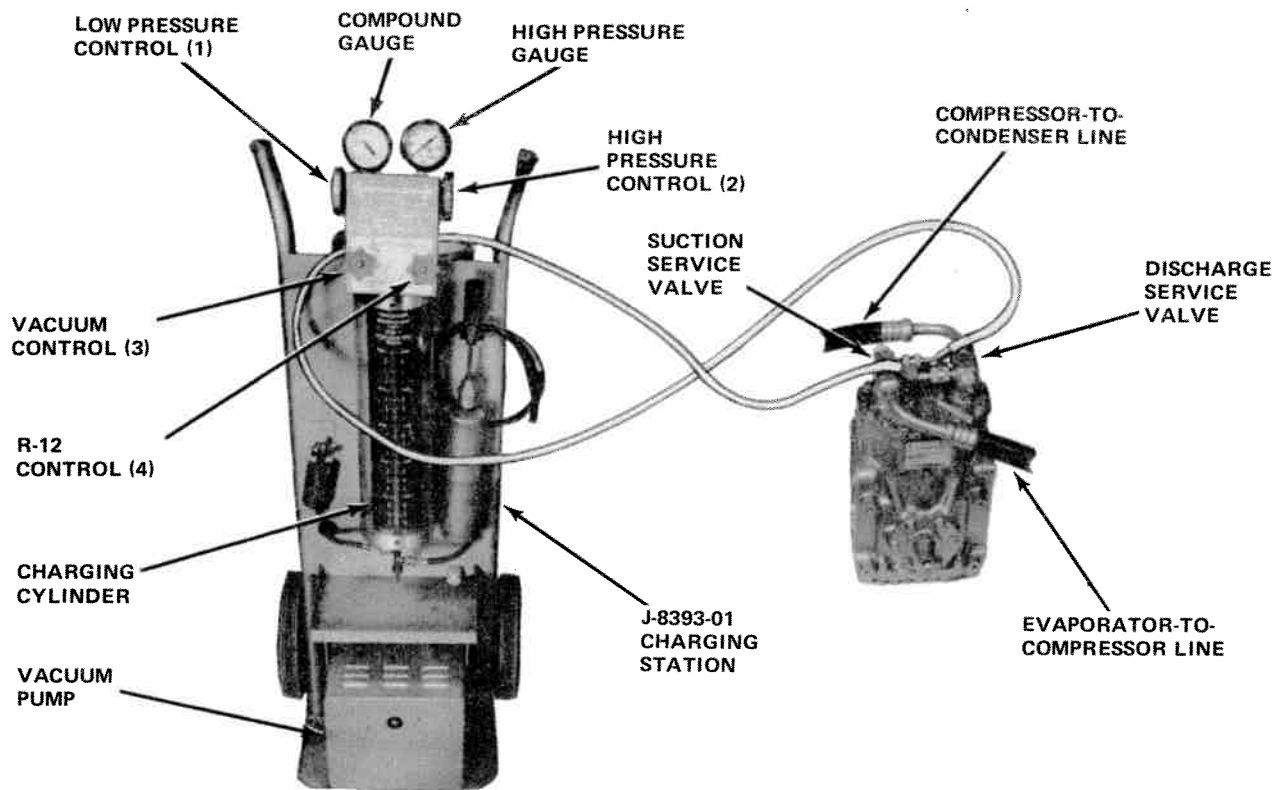
(4) Discharge system, leaving suction and discharge service valves in the mid or cracked position.

(5) Connect vacuum pump hose to vacuum pump inlet.

(6) Open the low-pressure hand control valve (1) and the high-pressure hand control (2).

(7) Start vacuum pump — note compound gauge reading.

(8) Operate pump a minimum of 30 minutes after reaching lowest vacuum.



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Fig. 13A-7 Portable Air Conditioning Service Station

(9) Close high-pressure (2) and low-pressure (1) hand control valves and stop vacuum pump. The system is now ready for charging.

CHECKING FOR LEAKS

Whenever a system requires more than 1/2 pound of refrigerant after a season's operation, a serious leak is indicated which must be located and repaired.

Most leaks will be located at points of connection and are caused by vehicle vibration. Correction of this type of leak may only require retightening of the connection. However, some leaks may occur only at periods of high traffic on a very warm day. This type of leak most often occurs through the compressor shaft seal or service valve gasket.

A system must contain an adequate quantity of refrigerant to be properly leak tested. If a system is completely discharged, evacuate and install 1/2 pound of refrigerant.

External leaks are detected and located with a halide torch, Tool J-6084 (fig. 13A-8). The torch burns propane fuel and is equipped with a search hose. When air is drawn into the hose by the torch, it contacts a heated copper reactor ring in the torch. If refrigerant gas is present in the air, the normally light blue flame will change color. A small refrigerant leak will change the flame color to yellow. A large refrigerant leak will change it to green or purplish-blue.

Leak Test Procedure Using Halide Torch

(1) Open torch valve and light torch, adjusting flame just high enough to heat copper reactor ring to a cherry red.

(2) Lower flame until it is about 1/4 inch above or even with the copper reactor ring. The smaller flame is more sensitive to refrigerant.

(3) Move search hose slowly **under** all connections, joints and seals. Because refrigerant is heavier than air, leaks may be more readily detected on the lower side of the areas being checked.

(4) Watch for color change or flame indicating area of leak.

WARNING: When refrigerant comes into contact with an open flame, phosgene gas is formed. Never inhale the vapors or fumes from the halide torch — they may be poisonous.

(5) Repair leaks as required.

(6) Evacuate and leak-test system after all leaks are corrected.

(7) Charge system.

CHARGING THE SYSTEM

Before making a complete charge check the compressor oil level, leak test if necessary, and evacuate the system.

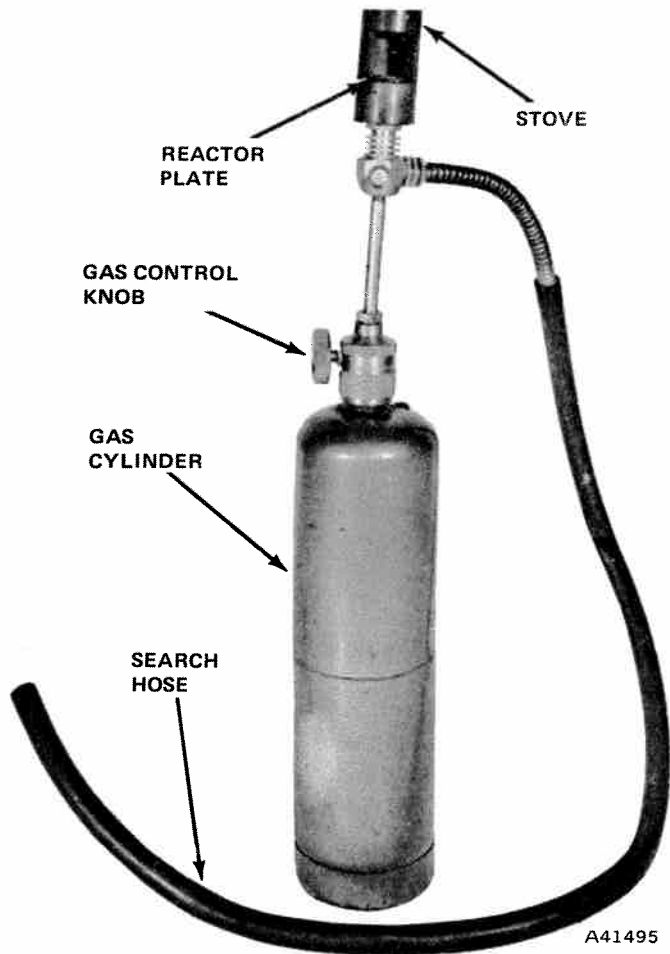


Fig. 13A-8 Halide Torch

Charge Capacity

The capacity for all models is 2-1/4 pounds of Refrigerant R-12 (dichlorodifluoromethane).

Charging Procedure With J-6272-01 No. 4 Multi-Opener Refrigerant Dispenser

The following charging procedure is based on the use of Pressure Gauge and Manifold Set (Tool J-5725-04). Charging Lines (Tool J-5418), and No. 4 Multi-Opener Refrigerant Dispenser (Tool J-6272-01). Refer to figure 13A-9.

WARNING: Wear goggles to protect eyes.

- (1) Connect Pressure Gauge and Manifold Set J-5727-04 and evacuate system. Keep both service valves in the mid or cracked position.
- (2) Close both gauge hand valves.
- (3) Disconnect the service hose from the vacuum pump and connect it to the center of the No. 4 Multi-Opener Refrigerant Dispenser J-6272-01. Close the four petcock valves on the dispenser.
- (4) Attach the necessary number of refrigerant cans to the dispenser. Refer to Charge Capacity for

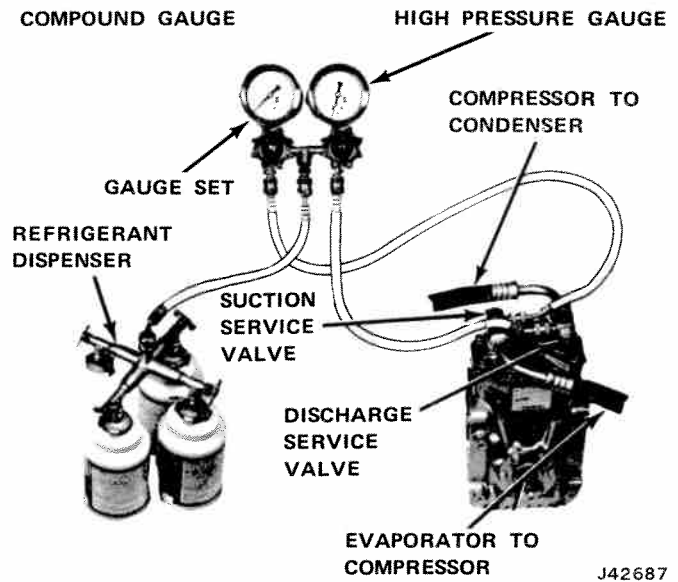


Fig. 13A-9 Charging System With Multi-Opener Refrigerant Dispenser

the proper weight of refrigerant necessary to charge the vehicle being serviced.

(5) Open one dispenser petcock valve. Loosen the center service hose at the Pressure Gauge and Manifold Set allowing refrigerant to purge air from the line. Tighten the service hose connection and close dispenser petcock valve.

(6) Open the suction (compound) gauge hand valve and one dispenser petcock valve. Do not open the discharge (high pressure) gauge hand valve.

(7) Start engine and place AC controls in the maximum cooling position. The compressor will operate and help pull refrigerant gas into the suction side of the system.

NOTE: The refrigerant cans may be placed upright in warm water no hotter than 125°F to speed up the charging process.

(8) When the first refrigerant can is empty, open another dispenser petcock valve to continue charging the system.

(9) Continue charging until the specified amount of refrigerant is in the system. The frost line on the refrigerant can will indicate what portion of the refrigerant in the can has entered the system. This may be used as a guide when a system requires a fraction of a full can.

NOTE: If an accurate scale is available, weigh the refrigerant cans before and during the charging procedure to assure that the correct amount of refrigerant is being used.

(10) When system is fully charged, close the suction (compound) gauge hand valve and all dispenser petcock valves.

(11) Back-seat the suction and discharge service valves to their normal operating position by turning them fully counterclockwise.

(12) Loosen the Pressure Gauge and Manifold Set service hoses to allow refrigerant trapped in hoses to discharge.

(13) Remove Pressure Gauge and Manifold Set and install all dust caps on fittings.

(14) Operate the system 10 to 15 minutes to allow it to normalize and to determine if the system will cycle properly.

Charging Procedure With J-8393-01 Portable Air Conditioner Service Station

The following charging procedure is based on the use of the Portable Air Conditioning Service Station, Tool J-8393-01.

WARNING: *Wear goggles to protect eyes.*

- (1) Discharge and evacuate system
- (2) With all control valves on the charging station closed, open the refrigerant drum valve.
- (3) Bleed the charging cylinder through valve located on the back of the control panel directly above cylinder. Close bleed valve occasionally to check level in charging cylinder. Raising the refrigerant drum above the level of the charging cylinder will speed up the filling process. When correct amount of refrigerant is in the charging cylinder, close the bleed valve.
- (4) Close refrigerant drum valve.
- (5) Open the low-pressure control (1) and mid-position (crack) the suction service valve.
- (6) Start engine and place AC controls in maximum cooling position. Refrigerant gas will enter the low (suction) side of the system due to compressor pumping action.

(7) When the correct quantity of refrigerant is in the system, close all control valves and back-seat the suction and discharge service valves.

(8) Disconnect service hoses from suction and discharge service valves.

(9) Operate the system 10 to 15 minutes to allow it to normalize and to determine if the system will cycle properly.

COMPRESSOR

The compressor is the belt-driven, two-cylinder reciprocating type. It is attached to the engine with a mounting bracket as shown in figures 13A-10, and 11.

Compressor Valve Leak Diagnosis

The compressor should be at operating temperature to perform an accurate test.

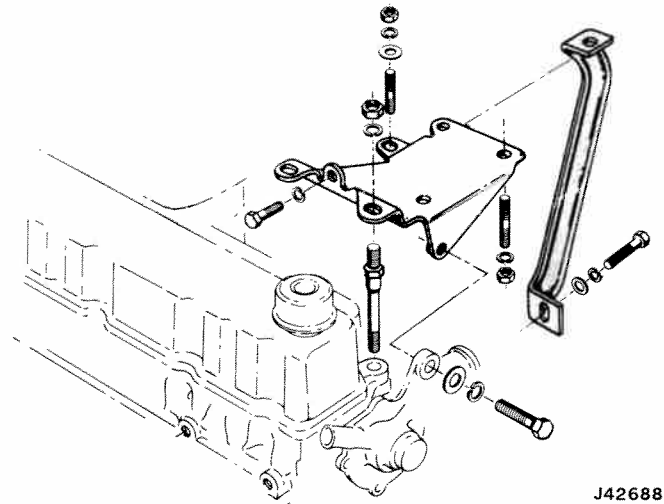


Fig. 13A-10 Compressor Mounting-Six Cylinder

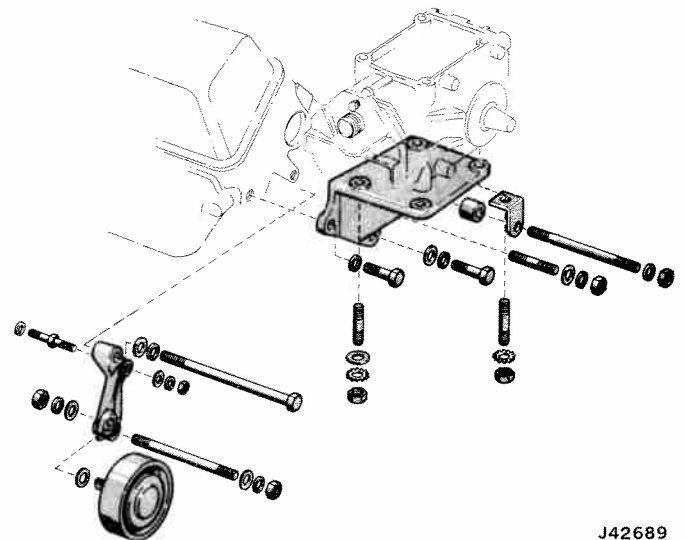


Fig. 13A-11 Compressor Mounting-V-8

(1) Install Pressure Gauge and Manifold Set, Tool J-5727-04.

(2) Front-seat the suction and discharge service valves by turning them clockwise.

(3) Discharge refrigerant remaining in compressor by opening suction gauge hand valve slowly.

(4) Open the suction gauge hand valve and close the high pressure gauge hand valve.

(5) Start engine and operate compressor. Pressure will build up rapidly. Stop compressor at 150 to 200 pounds pressure.

(6) The pressure should hold if the discharge valve is operating properly. Loss of pressure indicates leaking compressor discharge valve or head gasket.

Compressor Belt Tension

Belt tensions are important and should be inspected at time of new car pre-delivery and at subsequent scheduled maintenance intervals.

Belt Tension Gauge, Tool J-7316, will provide accurate belt tension adjustments. Install the gauge on the longest accessible belt span. Belt tension for new car pre-delivery and all belts with previous service should be 105 to 130 pounds for V-8 engines and 90 to 115 for 6 cylinder engines.

Belt tension is adjusted by the idler or power steering pump mounting bracket.

When a new belt is installed, it should be adjusted to 125 to 155 pounds (155 preferred) tension to compensate for the initial run-in loss that occurs within the first several minutes of operation.

NOTE: *New belt tension specifications apply only to service replacement belts. Once a belt has been tensioned and run it is considered a used belt and should be adjusted to used-belt specifications.*

A characteristic of the **Dacron type belt** used to drive the AC compressor is that it tends to increase in tension—rather than stretch—when subjected to heat. The loss in belt tension which can be observed after the initial run-in is the result of wear-in which allows the belt to ride deeper in the V-groove of the pulleys.

If a belt is run with less than the specified tension, slippage can occur which can cause the belt contact surfaces to become glazed. A glazed belt has lost some of its load carrying capabilities and may slip even when adjusted to specified belt tension.

Belt **vibration**, particularly on 6 cylinder models, is usually the result of improper belt tension. When excessive belt vibration or flutter is encountered, adjust the belt tension to specifications. Adjusting to higher tensions will not stop vibration but will increase stress on the idler assembly.

Isolating the Compressor

It is not necessary to discharge the system for compressor removal. The compressor can be isolated from the remainder of the system, eliminating the need for recharging when performing compressor service.

(1) Connect Pressure Gauge and Manifold Set, Tool J-5727-04.

(2) Close both gauge hand valves and mid-position (crack) both service valves.

(3) Start engine and operate air conditioning.

(4) Turn the suction service valve slowly clockwise toward the front-seated position. When suction pressure is reduced to zero or less, stop engine and compressor and quickly finish front-seating the suction service valve. Suction pressure should be slightly above zero.

(5) Front-seat the discharge service valve.

(6) Loosen oil check plug slowly to release any internal pressure in compressor. The compressor is now isolated from the remainder of the system. Refrigerant

lines and service valves can be removed from compressor as complete assemblies.

Compressor Removal

(1) Isolate compressor (see the above procedure).

(2) Remove both service valves and place protective caps over compressor head fittings.

(3) Loosen and remove compressor belt.

(4) Disconnect clutch wire.

(5) Remove compressor mounting bracket-to-engine attaching bolts and nuts.

(6) Remove compressor and mounting bracket as an assembly and place on work bench.

(7) Remove the bracket and bracket attaching studs.

Compressor Installation

(1) Bench assemble the mounting bracket to the compressor.

(2) Install compressor and bracket assembly to engine.

(3) Install compressor drive belt and adjust to proper tension.

(4) Attach compressor service valves and lines.

(5) Purge compressor of air and open service valves.

(6) Connect clutch wire.

Compressor Front Seal Replacement

The compressor front seal is serviced in kit form. Kit components are shown in figure 13A-12. All seal parts must be replaced if a leak has been detected at the seal.

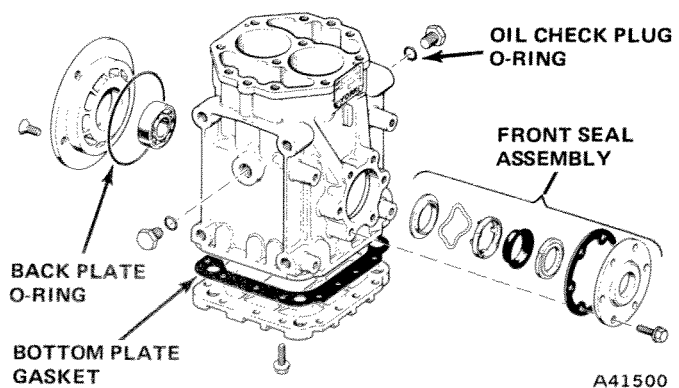


Fig. 13A-12 Compressor Seal Components and Gaskets

NOTE: *A small amount of oil around the shaft seal is normal and does not indicate a seal leak. All seal parts were dipped in oil at the time of assembly and operation may force out surplus oil.*

(1) Discharge remaining refrigerant in system, then back-seat both service valves to prevent air, moisture, and dirt from entering system.

(2) Remove service valves from compressor and install plastic plugs in both suction and discharge compressor ports.

(3) Remove compressor for subsequent bench work.

(4) Remove clutch pulley and woodruff key from compressor shaft.

(5) Remove seal plate capscrews and washers, pry seal plate loose, and remove.

(6) Pry behind seal drive ring, that part of the seal assembly farthest back on the shaft, and remove seal assembly.

(7) Clean new seal assembly components in clean refrigeration oil.

NOTE: Cleanliness, careful handling, and clean refrigeration oil are important elements of successful seal replacement.

(8) Push seal assembly, less carbon ring, if loose, over compressor shaft with carbon ring retainer facing out. Move assembly in and out on shaft to seat neoprene ring on shaft. Push assembly in until seal retainer assembly contacts bearing race. If carbon ring was loose, position it in ring retainer with polished side out. Carbon ring must seat in the retainer.

(9) Coat mating surfaces of compressor and seal plate with a film of refrigeration oil. Position seal ring in groove on the compressor. Install seal plate with polished face toward carbon ring.

(10) Install seal plate capscrews and tighten evenly while rotating compressor shaft. Center seal plate on shaft by lightly tapping plate. Tighten capscrews in a diagonal pattern to 90 inch-pounds torque.

Back Plate O-Ring Seal Replacement

(1) Isolate and remove compressor.

(2) Remove four back plate attaching screws.

(3) Remove back plate by gently prying it loose from crankcase. Pry in such a manner to pull parallel to bearing surface.

(4) Remove O-ring seal from back plate.

(5) Clean back plate and apply a light film of refrigeration oil to O-ring sealing area.

(6) Position O-ring seal on back plate and install back plate over rear bearing and into the crankcase.

(7) Install four back plate attaching screws and tighten in a diagonal pattern to 9 to 17 foot-pounds of torque.

(8) Install and purge compressor of air.

(9) Leak test system. Evacuate and charge if necessary.

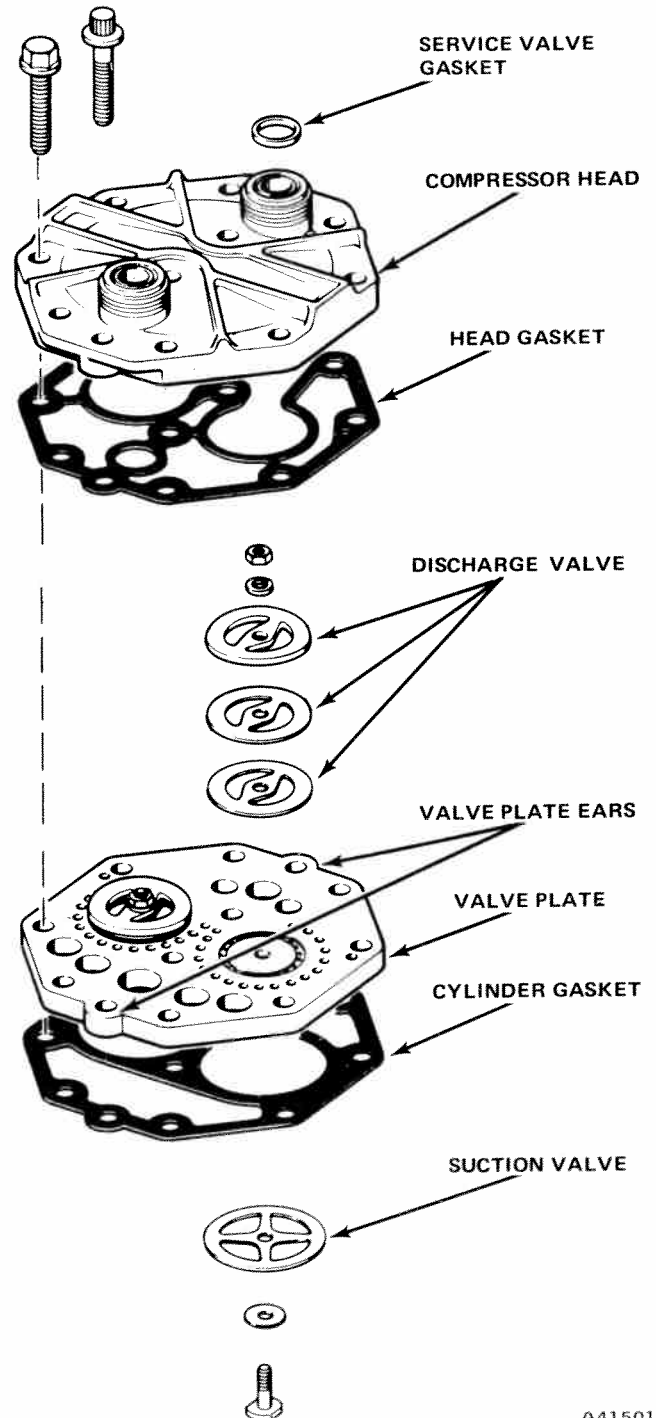
Head, Valve Plate, and Gasket Replacement

(1) Isolate compressor.

(2) Remove service valves from compressor. The compressor head service valve ports are identified D for discharge and S for suction.

(3) Remove compressor head attaching screws.

(4) Tap under valve plate ears (short, half-round projections on the valve plate) to remove head and valve plate (fig. 13A-13).



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Fig. 13A-13 Head and Valve Plate Assembly Sequence

(5) Tap the valve plate ears while holding the compressor head to separate the head from the valve plate.

(6) Clean all gasket material from head, valve plate, and compressor using care not to scratch or nick the sealing surfaces.

(7) Coat all machined sealing surfaces with a light film of refrigeration oil.

(8) Install a new valve plate cylinder gasket on the compressor body, locating the gasket on the dowel pins.

(9) Install the valve plate on the compressor, locating it on the dowel pins so that discharge valve is at top. Figure 13A-13 shows the correct assembly sequence.

(10) Install a new head gasket, locating it on the dowel pins.

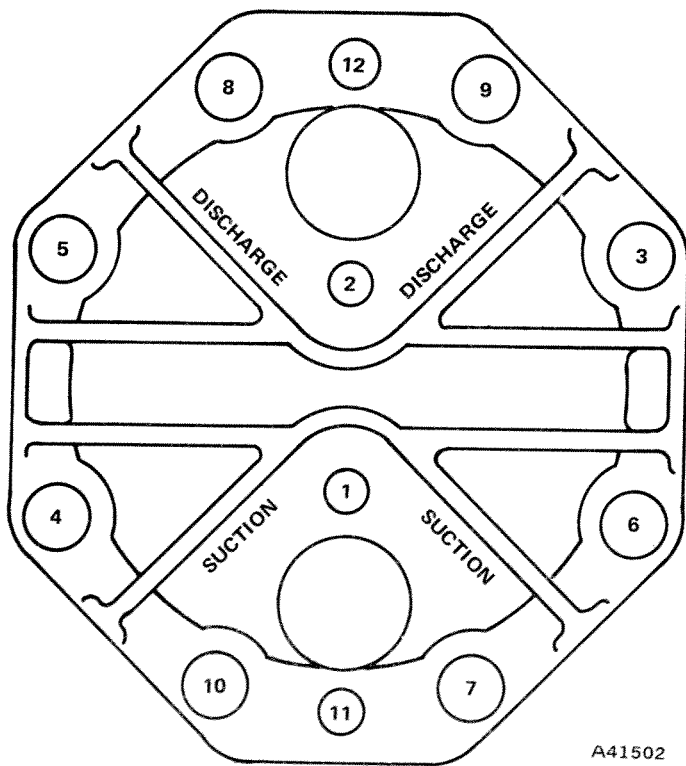
(11) Install head. Tighten compressor head cap-screws to 15 foot-pounds torque, following sequence outlined in figure 13A-14.

(12) Coat service valve ports with a light film of refrigeration oil and install new service valve gaskets.

(13) Install service valves.

(14) Purge compressor of air.

(15) Leak test system. Evacuate and charge if necessary.



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Fig. 13A-14 Compressor Head Capscrew Tightening Sequence

Bottom Plate Gasket Replacement

(1) Isolate and remove compressor.

(2) Remove bottom plate attaching screws and

carefully remove bottom plate.

(3) Clean all gasket material from bottom plate and compressor using care not to scratch or nick the sealing surfaces.

(4) Coat all sealing surfaces with a light film of refrigeration oil.

(5) Install a new bottom plate gasket and install bottom plate. Tighten the bottom plate attaching screws to 150 inch-pounds torque.

(6) Install and purge compressor of air.

(7) Leak test system. Evacuate and charge if necessary.

Checking Compressor Oil Level

Initially, the compressor has 7 ounces of 280 to 300 Seybolt refrigeration oil in the crankcase. In normal operation, a small amount of oil is always circulating with the refrigerant in the system. Unless the system has developed a leak, the oil level will remain the same in the system.

CAUTION: The oil level should be checked whenever the system is discharged for a service part replacement, and especially after a rapid loss of refrigerant has occurred because of a ruptured line, etc.

NOTE: Check compressor oil level with compressor in operating position, and only after the vehicle interior air has been cooled to the desired temperature. Operating the system stabilizes the oil entrained in the system, and provides an accurate oil level reading. The oil check plugs are located on either side of the compressor crankcase.

Before installing a new compressor, check the oil level in the compressor to be replaced prior to removing it. The oil level in the replacement compressor must be adjusted to correspond with that of the replaced compressor.

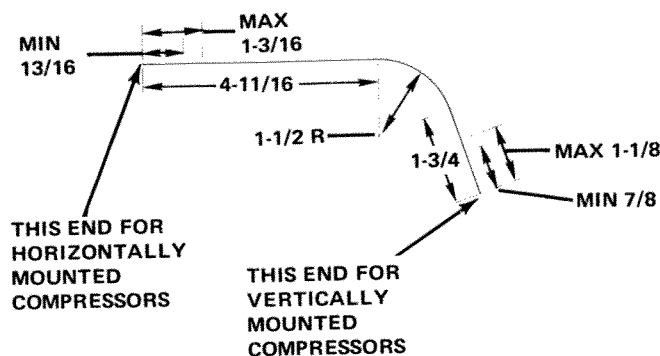
(1) Isolate the compressor.

(2) Loosen crankcase oil check plug slowly to release any internal pressure in the compressor. Remove check plug when all pressure is relieved.

(3) Fabricate a dipstick rod as shown in figure 13A-15.

(4) Hold the dipstick as vertical as possible and insert in check plug opening. The oil level should be within the specified levels indicated in figure 13A-15.

NOTE: Refrigeration oil readily absorbs moisture. Keep the container capped until ready to use, and recap immediately after use.



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Fig. 13A-15 Oil Dipstick Fabrication Dimensions (Inches)

(6) Install oil check plug O-ring seal. Be sure O-ring is not twisted.

NOTE: Oil filler plug leaks are usually due to a damaged O-ring or dirt on the seat.

- (7) Install plug, being careful not to overtighten it.
- (8) Purge compressor of air.

Purging Compressor of Air

The compressor must be purged of air whenever it has been isolated for oil level check or other service procedures without discharging the entire system.

- (1) Cap service gauge ports on both service valves.
- (2) Back-seat the suction service valve to allow system refrigerant to enter compressor.
- (3) Place the discharge service valve in the mid or cracked position.
- (4) Loosen the discharge service valve gauge port cap to permit the refrigerant to force any air out of the compressor.
- (5) Back-seat the discharge service valve and tighten the gauge port cap.
- (6) The compressor is now ready for service.

MAGNETIC CLUTCH

The magnetic clutch consists of a stationary electromagnetic coil, and a rotating pulley and plate assembly.

The electromagnetic coil is mounted on four bosses on the compressor. The pulley and plate assembly is mounted on the compressor shaft. When the air conditioner is off, the pulley is free to turn on the clutch hub bearing. When the clutch is energized, the plate is magnetically attracted to the pulley and turns the compressor crankshaft.

Do not attempt to replace the bearing, pulley or clutch plate separately. These components are serviced

only as a complete assembly. The coil is serviced as a separate unit.

Electrical Diagnosis

Refer to the Magnetic Clutch Troubleshooting guide when diagnosing magnetic clutch malfunctions.

Diagnosis for Noisy Clutch

Spin the pulley by hand. There must be no interference between the field and the rotor assembly. The clutch coil must be mounted properly using the special capscrews which position the field coil to the compressor.

A worn pulley bearing can be detected by the roughness felt when spinning the pulley. Do not attempt to replace the bearing.

A new clutch may emit a short squeal when initially engaged. After a few cycles of operation the noise will disappear.

Clutch Removal

- (1) Remove compressor belt.
- (2) Energize the clutch or use a spanner wrench to hold the clutch plate while removing the clutch-to-shaft attaching bolt and washer.
- (3) Install a 5/8-inch-11 standard thread bolt in the threaded center of the clutch plate.
- (4) Tighten the bolt and pull the clutch from the shaft.

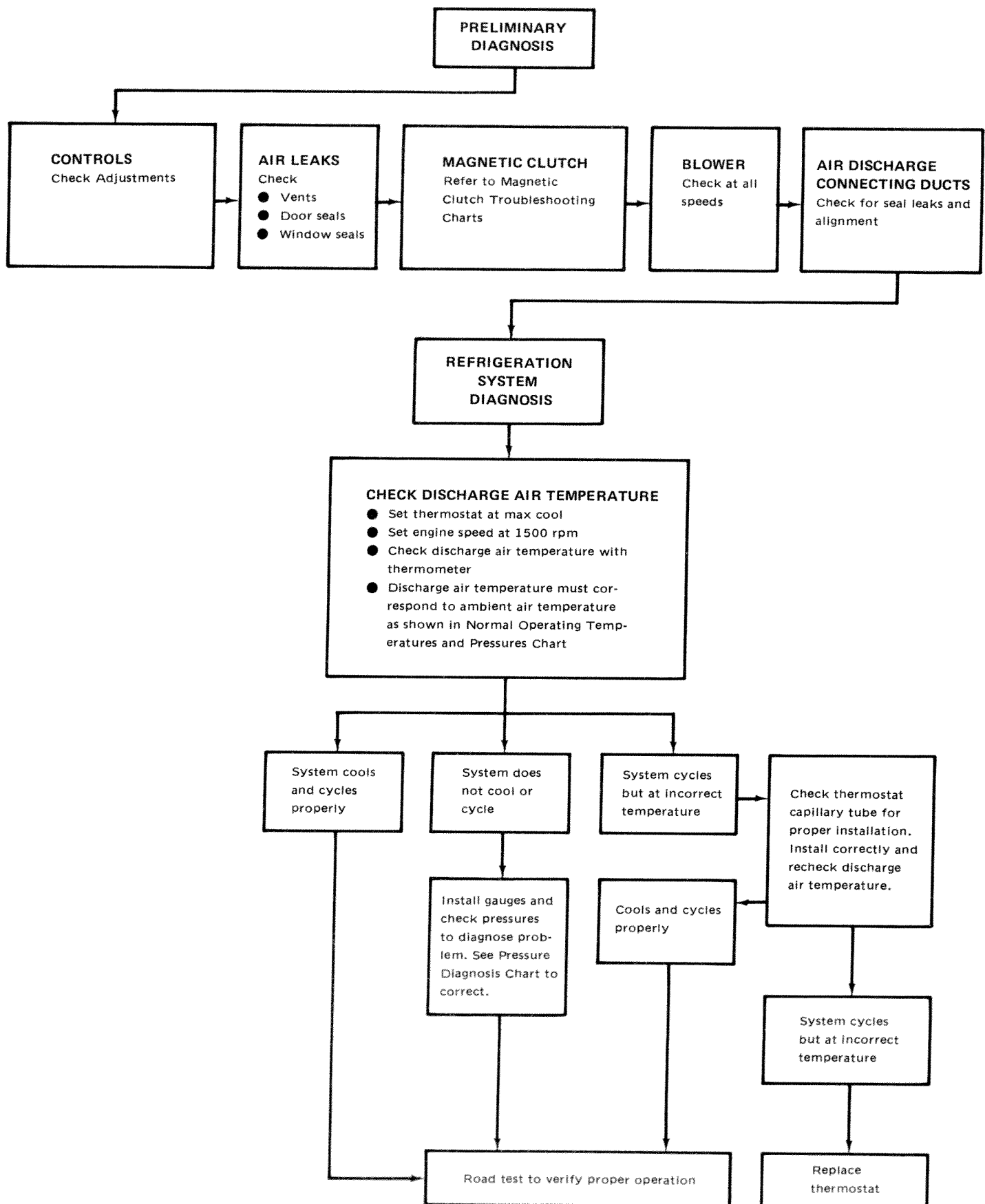
CAUTION: Do not pry on clutch to remove.

- (5) Remove four capscrews which retain the magnetic coil and disconnect coil wire. Remove coil.

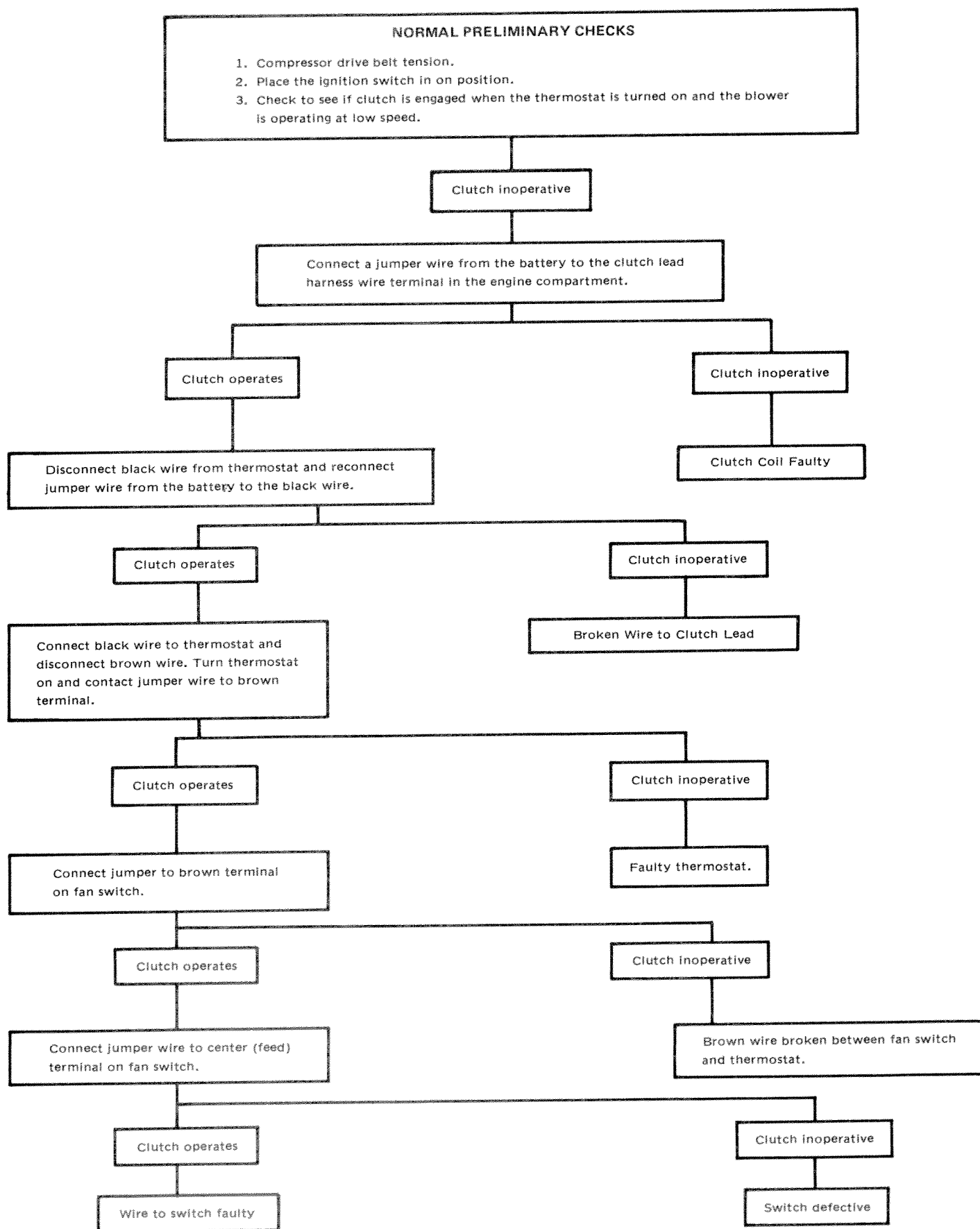
Clutch Installation

- (1) Install magnetic coil with the four special capscrews provided with the replacement unit. These capscrews are used to ensure the coil is positioned properly on the compressor.
- (2) Tighten capscrews to 7 to 10 foot-pounds torque.
- (3) Install woodruff key on compressor shaft.
- (4) Align clutch assembly with key and install clutch on shaft.
- (5) Install clutch-to-shaft attaching bolt and tighten to 20 foot-pounds torque. Connect clutch coil wire and energized clutch to hold unit when tightening.
- (6) Install compressor belt and adjust belt tension to specifications.

SYSTEM TROUBLESHOOTING



MAGNETIC CLUTCH TROUBLESHOOTING



NORMAL OPERATING TEMPERATURES AND PRESSURES

Engine Speed (RPM)	Ambient Temperature (°F)	Average Discharge Air Temperature (°F)	Head Pressure (PSI)	Suction Pressure (PSI)
1500	60	45	110	9
1500	70	45	135	10
1500	80	46	170	11
1500	90	47	190	12
1500	100	48	220	14
1500	110	48	275	18

CONDENSER AND RECEIVER/DRYER ASSEMBLY

Removal

- (1) Discharge refrigerant from system.

NOTE: Discharge system slowly to prevent loss of compressor oil.

- (2) Drain radiator.
- (3) Remove fan shroud and radiator.
- (4) Disconnect pressure line at condenser.
- (5) Remove four condenser attaching screws and tilt bottom of condenser toward engine.

NOTE: Plug all open connections to prevent entry of dirt and moisture.

- (6) From underside of vehicle, disconnect receiver/dryer-to-evaporator hose at receiver/dryer.
- (7) Remove condenser and receiver/dryer assembly.
- (8) The receiver/dryer may now be removed from condenser, if necessary.

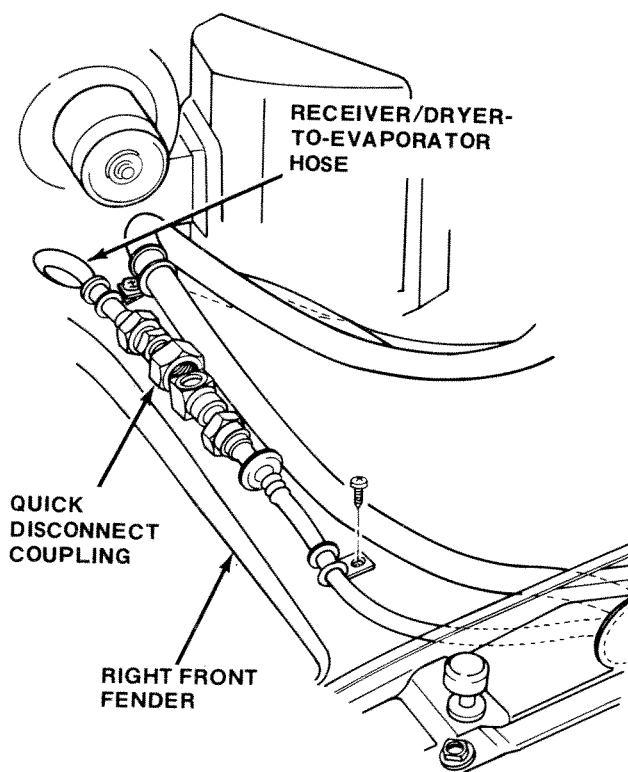
Installation

- (1) If removed, install receiver/dryer to condenser.
- (2) Place condenser in position and connect receiver/dryer-to-evaporator hose at receiver/dryer.
- (3) Install condenser attaching screws.
- (4) Connect pressure line at condenser.
- (5) Install radiator and fan shroud.
- (6) Fill radiator.
- (7) Evacuate, leak test, and charge the system.

EVAPORATOR HOUSING ASSEMBLY

Removal

- (1) Discharge the system.
- (2) Disconnect inlet (suction) line at compressor.
- (3) Disconnect receiver-to-evaporator hose at the quick disconnect coupling (fig. 13A-16).



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Fig. 13A-16 Quick-Disconnect Coupling

- (4) Remove hose clamps and dash grommet retaining screws.

- (5) Remove the eight evaporator housing-to-instrument panel retaining screws and the one evaporator housing-to-mounting bracket screw (fig. 13A-17).

- (6) Lower evaporator housing and pull hoses and grommet through opening.

The blower motor, blower motor housing, and evaporator core may be serviced after the evaporator housing is removed (fig. 13A-18).

NOTE: It is not necessary to discharge the system to service the blower motor. The evaporator housing may be lowered from the instrument panel to gain access to the blower motor attaching screws.

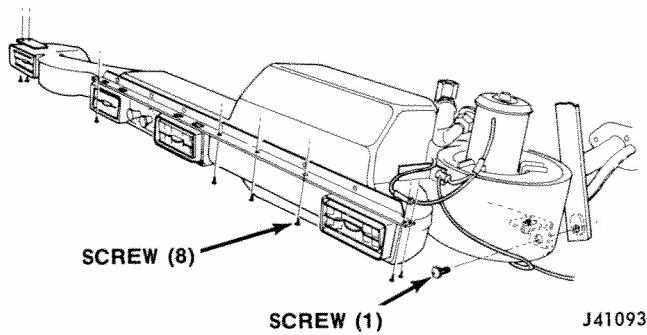


Fig. 13A-17 Evaporator Housing Mounting

Installation

- (1) Push hoses through grommet opening, and install grommet by pushing toward engine compartment of vehicle.
- (2) Raise evaporator and install evaporator housing-to-instrument panel retaining screws and the evaporator-to-mounting bracket screw.
- (3) Install hose clamps and grommet retaining screws.
- (4) Connect receiver-to-evaporator hose at quick disconnect coupling.
- (5) Connect inlet (suction) line to compressor.
- (6) Evacuate, leak test, and charge the system.

EXPANSION VALVE SERVICE

The valve is preset and should not be adjusted. A defective valve requires replacement.

- (1) Discharge the system.
- (2) Remove evaporator housing assembly.
- (3) Remove insulation wrapped around suction line and expansion valve. Mark capillary tube location on suction line.
- (4) Disconnect inlet and outlet connections, capillary tube clamp, and equalizer tube.
- (5) Remove expansion valve.
- (6) Clean suction line to provide a positive contact with replacement expansion valve capillary tube.
- (7) Reconnect inlet and outlet hoses. Clamp capillary tube at marked position and connect equalizer tube.

NOTE: Clamp capillary tube securely so that a firm contact with the suction line is formed.

- (8) Wrap expansion valve and line with insulation.
- (9) Install evaporator housing assembly.
- (10) Evacuate, leak test, and charge the system.

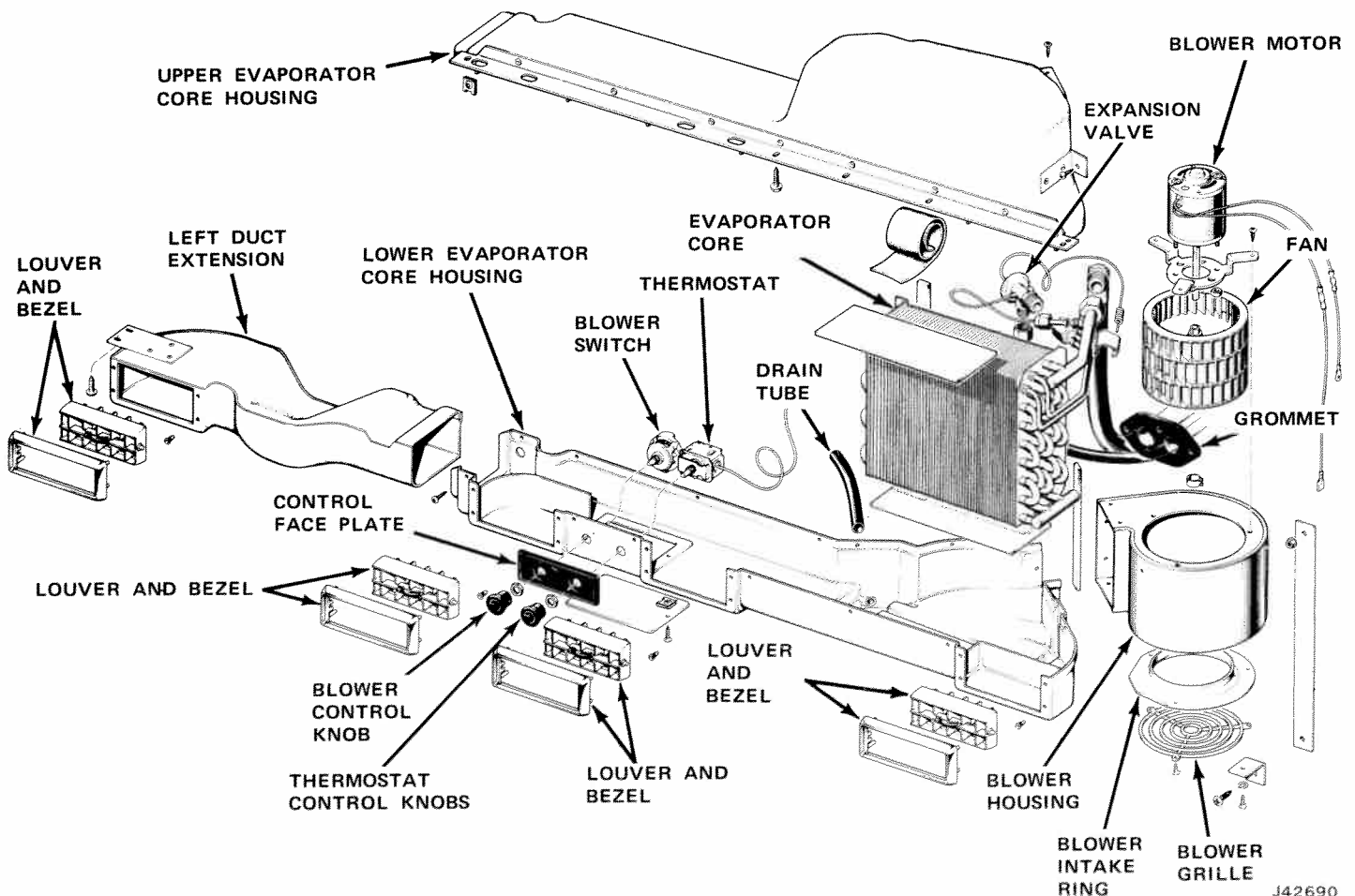


Fig. 13A-18 Evaporator Housing Assembly

SYSTEM CONTROLS SERVICE

Fan Switch

The fan switch may be serviced by removing the access plate located on the lower evaporator case below the control panel.

Temperature Control Switch

To service the temperature control switch, the evaporator case must be disassembled.

Thermostat

When installing a new temperature control thermostat, insert the capillary tube into the evaporator coil a minimum of three inches (fig. 13A-19).

CAUTION: *Handle the tube with care to avoid bends or kinks which could cause the thermostat to malfunction.*

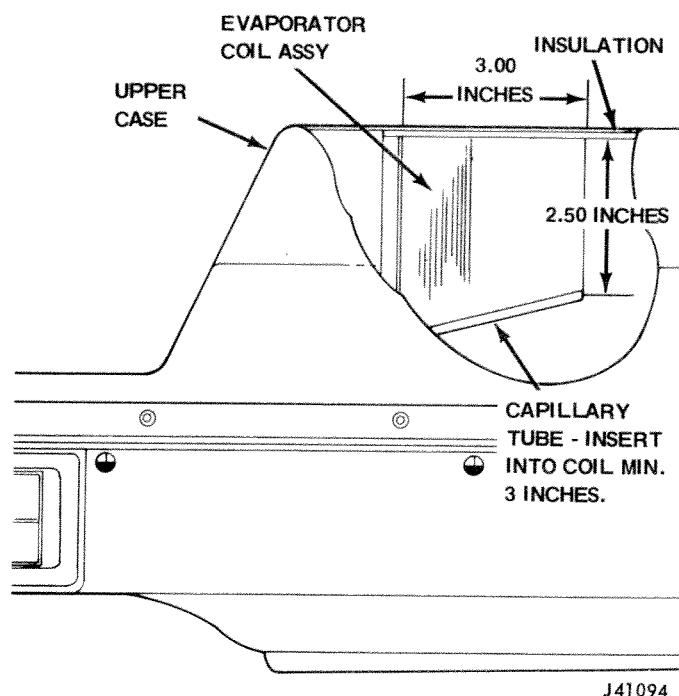


Fig. 13A-19 Capillary Tube Position

TECHNICAL SERVICE LETTER REFERENCE

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