AIR CONDITIONING

AIR CONDITIONING SYSTEM

General

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

It is recommended that intermediate temperature and high fan setting be used for average city driving and intermediate temperature and medium fan setting for highway driving.

A new factory installed underdash air conditioning system is available this year for all CJ Models as shown in figure 13A-1.

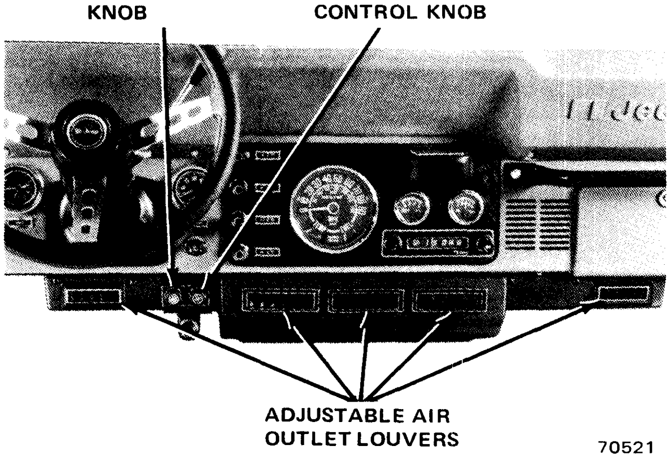

Fig. 13A-1 Air Conditioner—CJ

The air conditioning system, as shown for the Wagoneer in figure 13A-2, is applicable to Cherokee and Truck Models.

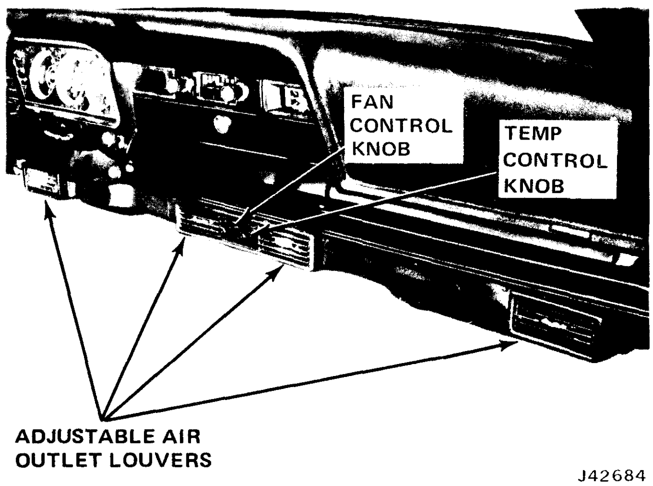

Fig. 13A-2 Air Conditioner—Cherokee-Wagoneer-Truck

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. 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 system and is considered normal.

The engine TEMP gauge pointer will indicate a slightly higher than normal temperature when the air conditioning system 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 also can be used 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, belt-driven pump. An electromagnetic clutch couples the compressor to the drive pulley. The drive pulley freewheels 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 battery load and provide easier starting.

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 HI or PC position. This permits the evaporator to precool in hot weather.

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

Adjust the air outlets to obtain desired airflow 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 to the desired temperature, the FAN 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, an intermediate temperature and high fan setting is comfortable for city driving, and a lesser fan setting comfortable for open road driving.

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

Performance Diagnosis

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

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Performance Diagnosis (Continued)

Condition	Possible Cause	Correction
FROZEN EVAPORATOR COIL	(1) Faulty thermostat (2) Thermostat capillary tube improperly installed	(1) Replace thermostat (2) Install capillary tube correctly

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Pressure Diagnosis

Condition	Possible Cause	Correction
LOW SIDE LOW–HIGH SIDE LOW	(1) System refrigerant low	(1) Evacuate, leak test, and charge system
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 HIGH	(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, and charge system (2) Evacuate, leak test, and charge system

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SYSTEM COMPONENTS—FUNCTION

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

Magnetic Clutch—The magnetic clutch consists of a stationary electromagnetic coil and rotating pulley and plate assembly. The clutch pulley drives the compressor crankshaft when the coil is energized. When the coil is de-energized, the clutch pulley rotates freely and the compressor is inoperative.

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 refrigerant level in the receiver/drier must be adequate to provide a steady flow of refrigerant to the expansion valve. The receiver/drier contains a desiccant to remove moisture from the system. The receiver/drier must be replaced anytime the system has bee left open to atmosphere due to a system component failure. If during servicing the receiver/drier is removed from the system, it must be tightly capped immediately.

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 system 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. As 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-3). 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 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

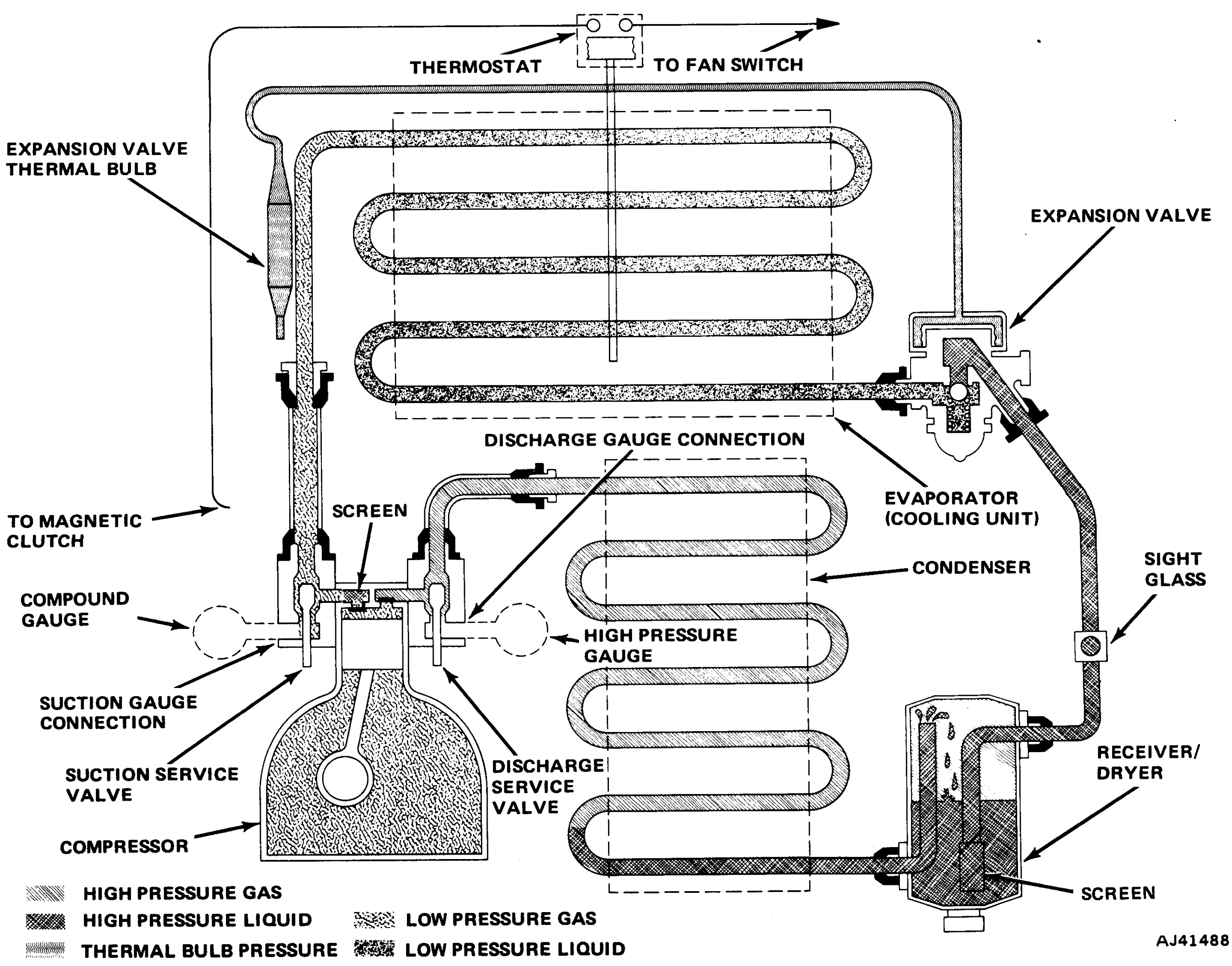

Fig. 13A-3 Refrigerant Cycle

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 the 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.

REFERIGERANT 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.

CAUTION: *Keep R-12 containers upright when charging the system, so as to utilize the vapor instead of the liquid.*

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 connected to the compressor cylinder head and are used for diagnosis, charging, discharging, evacuating, and component removal.

The service valves have three positions (fig. 13A-4). The normal operating position, shown in figure 13A-4, View B, has the valve stem turned **counterclockwise to the back-seated** (full-out) position.

When the valve stem is turned **clockwise to the front-seated** (full-in) position (fig. 13A-4, 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-4, View C), the gauge port is open. This position is used when charging, discharging, evacuating, and checking system pressures.

PRESSURE GAUGE AND MANIFOLD ASSEMBLY

The Pressure Gauge and Manifold Assembly, Tool J-23575 (fig. 13A-5), is the most important tool used to service the air conditioning system. The gauge assembly 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

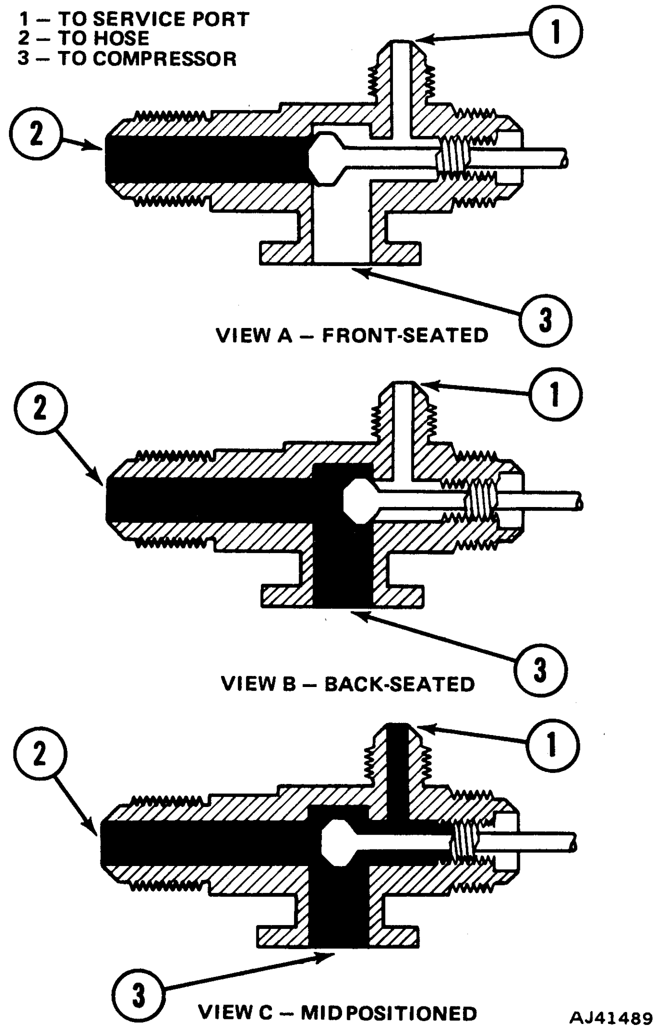

Fig. 13A-4 Service Valve Operating Positions

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-5). The manifold has three connections. The low side hose and fitting 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

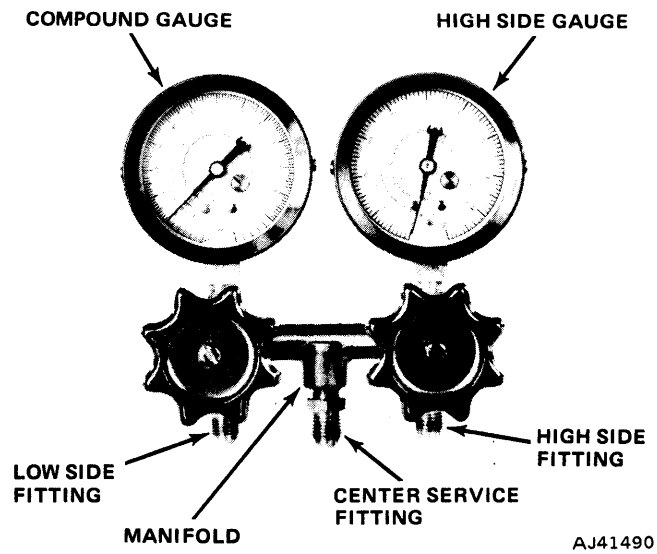

Fig. 13A-5 Pressure Gauge and Manifold Assembly Tool J-23575

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.

Connecting the Pressure Gauge and Manifold Assembly

(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 faciliate installation of gauge assembly, 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 cracked or mid-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 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).

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

CHECKING SYSTEM PRESSURES

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

Normal Operating Temperatures and Pressures *

Relative Humidity (percent)	Surrounding Air Temperature (°F)	Engine Speed (RPM)	Maximum Desirable Center Register Discharge Air Temperature (°F)	Suction Pressure PSI (REF)	Head Pressure PSI (+25 PSI)
	70		40	11	177
20	80	1500	41	15	208
	90		42	20	226
	100		43	23	255
	70		40	12	181
30	80	1500	41	16	214
	90		42	22	234
	100		44	26	267
	70		40	13	185
40	80	1500	42	18	220
	90		43	23	243
	100		44	26	278
	70		40	14	189
50	80	1500	42	19	226
	90		44	25	251
	100		46	27	289
	70		41	15	193
60	80	1500	43	21	233
	90		45	25	259
	100		46	28	300
	70		41	16	198
70	80	1500	43	22	238
	90		45	26	267
	100		46	29	312
	70		42	18	202
80	80	1500	44	23	244
	90		47	27	277
	100		–	–	–
	70		42	19	206
90	80	1500	47	24	250
	90		48	28	284
	100		–	–	–

*Operate engine with transmission in neutral. Keep vehicle out of direct sunlight.

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(1) Attach Pressure Gauge and Manifold Assembly.

(2) Close both hand valves on Gauge and Manifold Assembly.

(3) Set both service hand valve stems to midposition.

(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 in the top of the receiver/dryer on CJ models and in the receiver/dryer-to-evaporator hose at the quick-disconnect coupling on Cherokee, Wagoneer and Truck models. 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 the 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, evacuate, repair as required, 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 Pressure Gauge and Manifold Assembly 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-6).

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

EVACUATING THE SYSTEM

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

Moisture in any quantity is extremely harmful to t! air conditioning system. Moisture may collect and free in the thermostatic expansion valve orifice, blocki

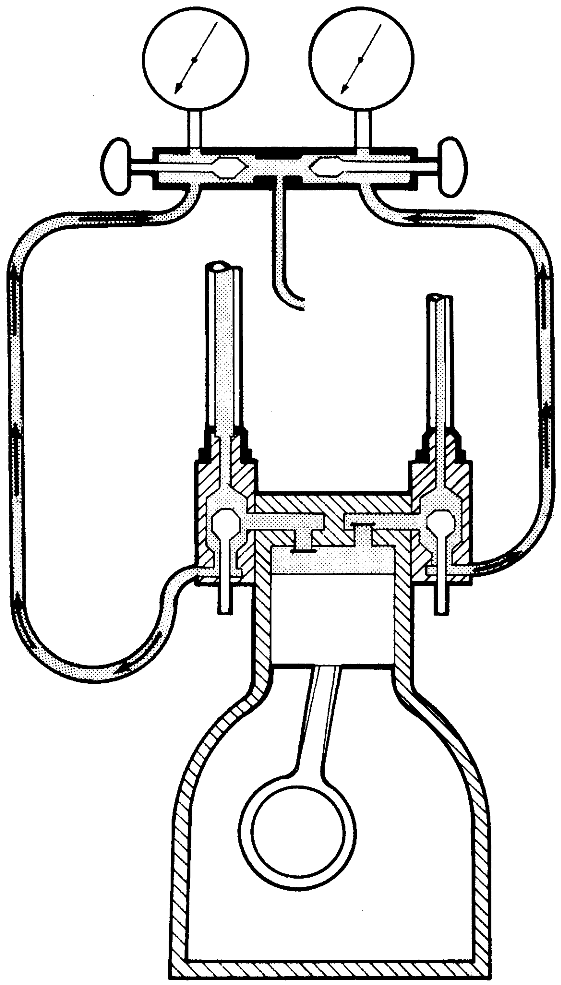

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Fig. 13A-6 Valve Positions for Discharging

ınt flow and preventing system cooling. Mois- also react with R-12 to form hydrochloric acid ll corrode metal parts of the system. Corrosion may become detached and block the small pas- orifices in the system.

ted air and moisture are removed from the controlling the pressure, that is creating a roughout the system. A vacuum pump is used ıe pressure sufficiently so that the moisture ıperature is reduced to a point at which the vaporize and can then be evacuated from the

ils at 212°F at 14.7 psi (sea level). As the ıp lowers the pressure of the closed air con- ıtem, the boiling point of the moisture in the ılso be lowered. In evacuating the system, it :o lower the boiling point of any moisture in a point lower than the ambient (surround- ture to ensure that all moisture is boiled ıbient temperature of 75°F, when the de- of 29.5 inches of Hg is reached, water will mately 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 mercury (Hg) to compensate for a change in the atmospheric pressure. For exampl; at altitudes of 1,000 feet, a gauge reading of 28.5 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 Assembly, Tool J-23575.

(2) Discharge system.

(3) Connect center service hose to inlet fitting of vacuum pump (fig. 13A-7).

(4) Open both manifold hand valves wide open.

(5) Start vacuum pump; note compound gauge reading.

(6) 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.

(7) 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.

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

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

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

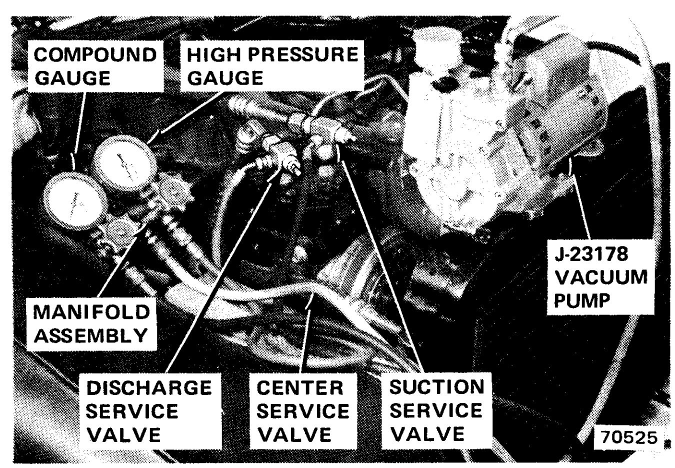


Fig. 13A-7 Evacuating System with Vacuum Pump

Evacuation Procedure with J-23500 Portable Air Conditioning Service Station

The J-23500 Portable Air Conditioning Service Station (fig. 13A-8) 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 cracked or midposition.

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

(6) Open 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.

(9) Close vacuum control valve (3) and stop vacuum pump. The system is 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.

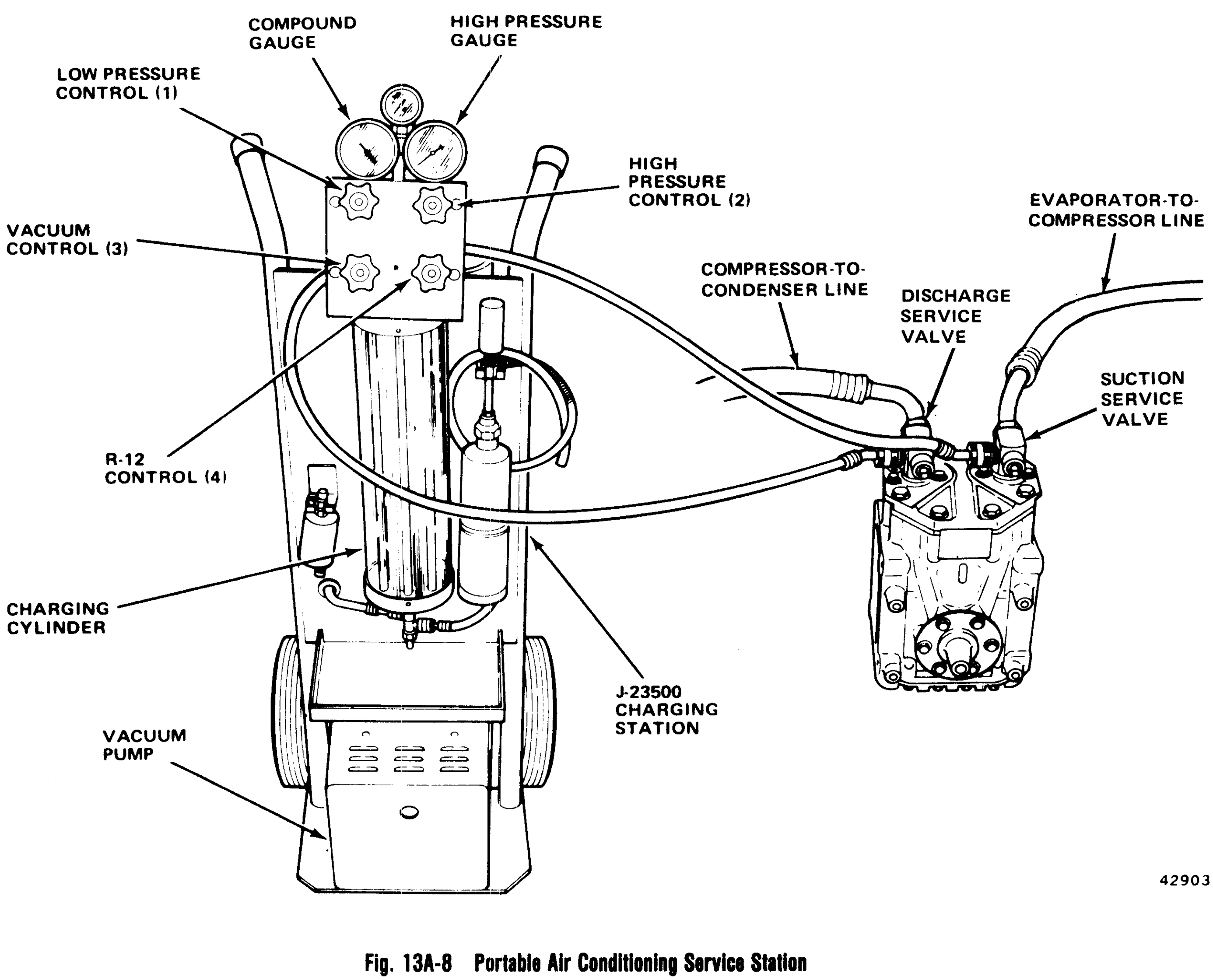


Fig. 13A-8 Portable Air Conditioning Service Station

However, some leaks may occur only at periods of high usage 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-9). 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

NOTE: *Use compressed air to purge test area of refrigerant. This prevents the torch from indicating a leak in an area where none exists.*

(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 detected more readily 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.

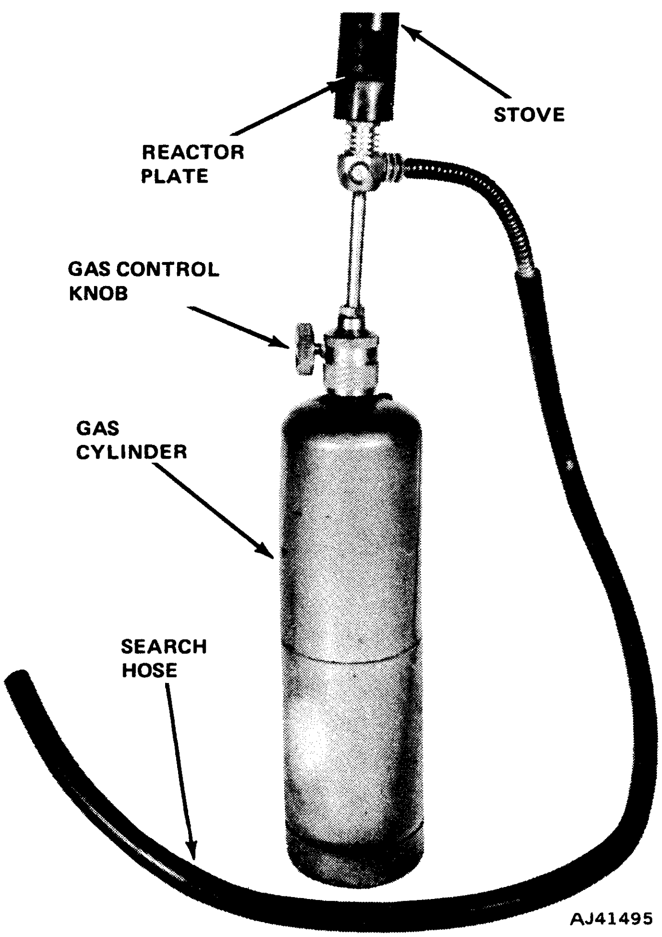


Fig. 13A-9 Halide Torch J-6084

CHARGING THE SYSTEM

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

Charge Capacity

The recommended charge for the respective systems is as follows: CJ—2-1/2 pounds R-12; Cherokee, Wagoneer and Truck—2-1/4 pounds R-12. Capacites are also indicated on a decal attached to the compressor.

Charging Procedure with J-6272-02 Multi-Refrigerant Can Opener

The following charging procedure is based on the use of Pressure Gauge and Manifold Assembly (Tool J-23575) and No. 4 Multi-Refrigerant Can Opener (Tool J-6272-02). Refer to figure 13A-10.

WARNING: *Wear goggles to protect eyes.*

(1) Connect Pressure Gauge and Manifold Assembly J-23575 and evacuate system. Keep both service valves in the cracked or midposition.

(2) Close both gauge hand valves.

(3) Disconnect service hose from vacuum pump and connect it to the center of the No. 4 Multi-Refrigerant Can Opener J-6272-02. Close the petcock valves on the dispenser.

(4) Attach the necessary number of refrigerant cans to the dispenser. Refer to Charge Capacity for 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.

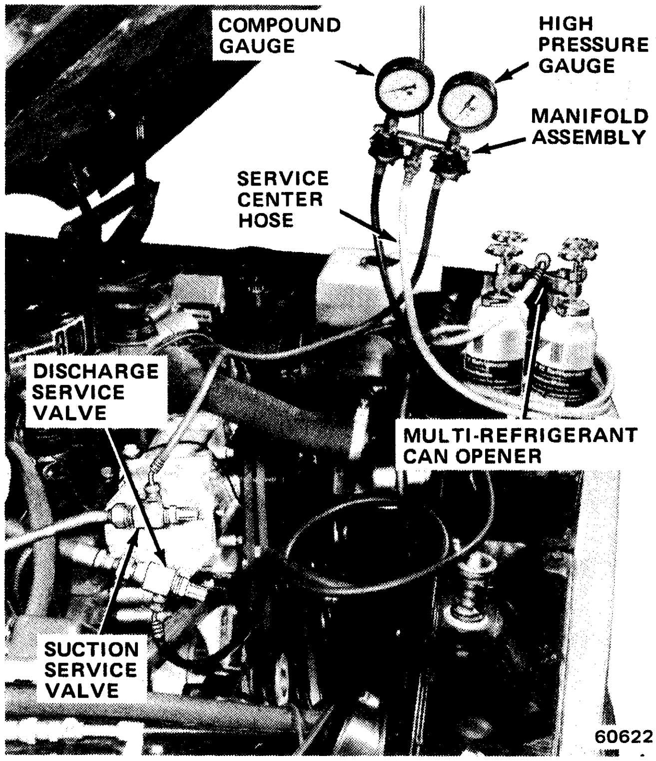


Fig. 13A-10 Charging System with Multi-Refrigerant Can Opener

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 check may be used as a visual 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 for 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-23500 Portable Air Conditioner Service Station

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) Close low-pressure control valve (1) and midposition (cracked) suction and discharge service valves on compressor.

(6) Fully open refrigerant control valve (4) and high-pressure control valve (2). Liquid refrigerant contained in charging cylinder will enter high side of system.

(7) When full charge has entered system, close refrigerant control valve (4) and high-pressure control valve (2). Back-seat the suction and discharge service valves on compressor.

NOTE: *During charging, place a fan in front of the vehicle to pass air over the condenser, which will shorten the time required for charging.*

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

(9) Operate 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-11 and 13A-12.

Compressor Valve Leak Diagnosis

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

(1) Install Pressure Gauge and Manifold Assembly, Tool J-23575.

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

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

(4) Open suction gauge hand valve and close 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) Pressure should hold if the discharge valve is operating properly. Loss of pressure indicates leaking compressor discharge valve or head gasket.

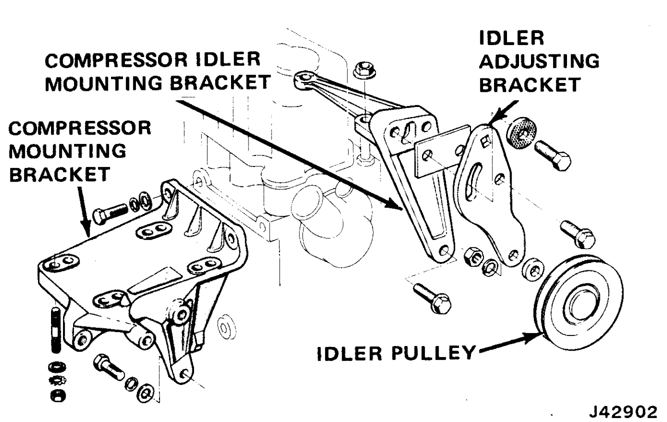


Fig. 13A-11 Compressor Mounting—Six-Cylinder Engine

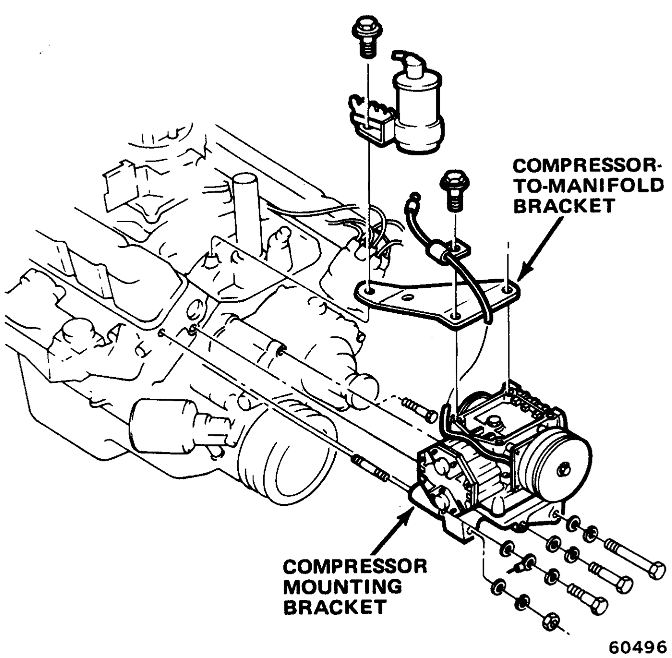


Fig. 13A-12 Compressor Mounting—V-8 Engine

Compressor Belt Tension

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

Belt Tension Gauge, Tool J-23600, will provide accurate belt tension adjustments. Install the gauge on the longest accessible belt(s) span. Belts tension for new vehicle pre-delivery and all belts with previous service should be 90 to 115 pounds.

Six-cylinder belt tension is adjusted by the idler mounting bracket.

V-8 belt(s) tension is adjusted by the alternator.

When a new belt(s) 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(s)** 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 belt contact surfaces to become glazed. A glazed belt has lost some of its load carrying capability and may slip even when adjusted to specified belt tension.

Belt **vibration**, particularly on six-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 belt tension 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 Assembly, Tool J-23575.

(2) Close both gauge hand valves and mid-position (cracked) both service valves on compressor.

(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—Six-Cylinder

(1) Isolate compressor (see previous procedure).

(2) Remove both service valves and cap compressor and valves.

(3) Loosen compressor belt and move aside.

(4) Remove alternator belt and adjusting bolt.

(5) Remove upper alternator mounting bolt.

(6) Loosen lower alternator mounting nut.

(7) Remove back idler.

(8) Remove compressor mounting nuts and remove compressor.

Compressor Installation—Six-Cylinder

(1) Position compressor and install mounting nuts.

(2) Install back idler.

(3) Install alternator upper mounting bolt.

(4) Tighten lower mounting nut.

(5) Install alternator adjusting bolt.

(6) Install alternator drive belt and adjust to proper tension.

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

(8) Attach compressor service valves and lines.

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

(10) Connect clutch wire.

Compressor Removal—V-8

(1) Disconnect battery negative cable.

(2) Isolate compressor (see procedure above).

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

(4) Loosen and remove compressor belt set.

(5) Disconnect clutch wire.

(6) Remove alternator.

(7) Remove coil from upper compressor-to-engine bracket.

(8) Remove battery ground cable from lower bracket-to-compressor attaching stud.

(9) Remove upper bracket-to-intake manifold attaching bolt.

(10) Remove lower bracket-to-engine attaching bolts, nuts, and washers.

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

(12) Remove bracket and bracket attaching studs.

Compressor Installation—V-8

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

(2) Position compressor and bracket assembly on engine and install bolts, washers, and nuts.

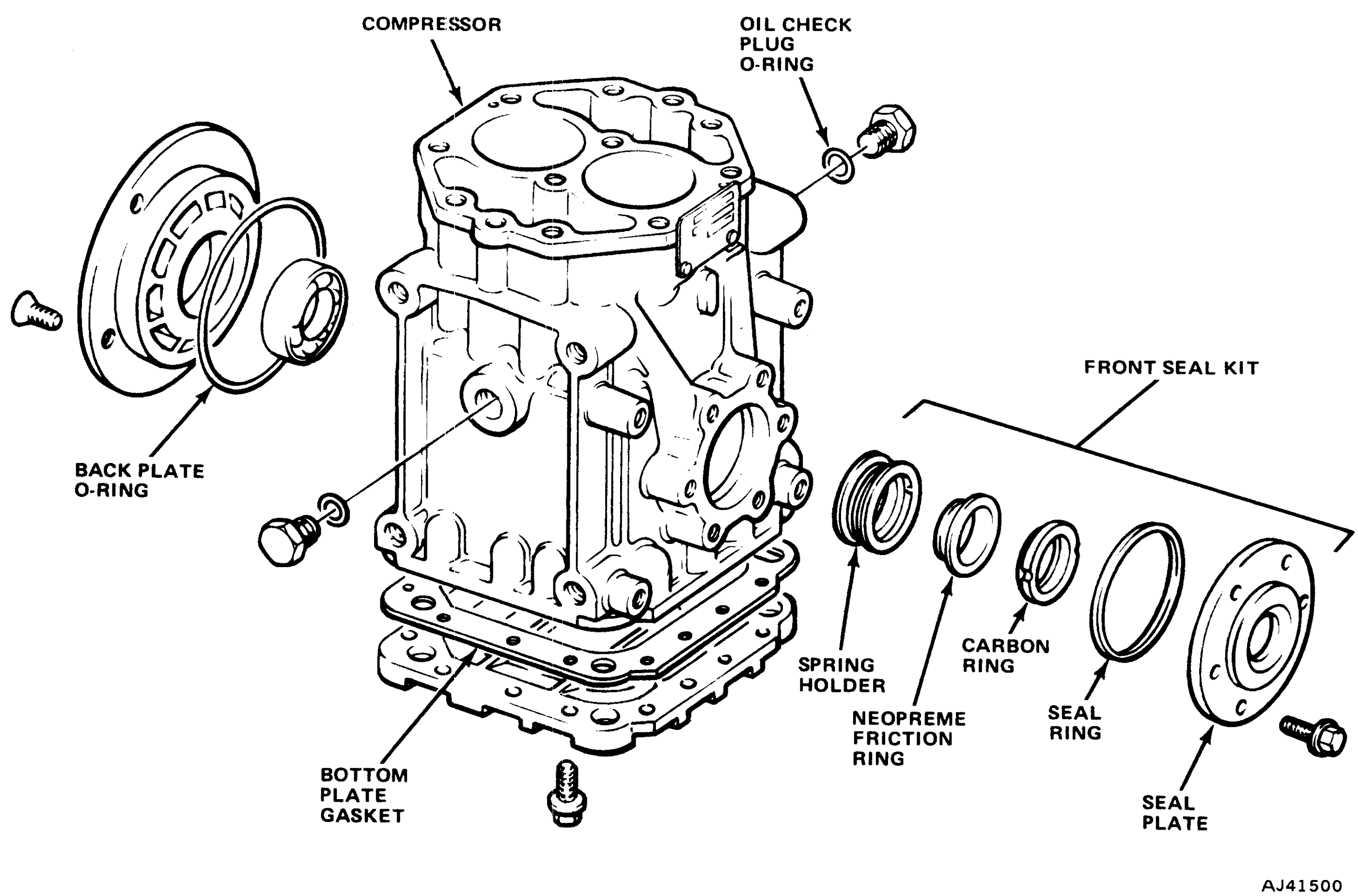


Fig. 13A-13 Compressor Seal Components and Gaskets

(3) Install upper bracket-to-intake manifold attaching bolt.

(4) Install battery ground cable to lower bracket-to-compressor stud.

(5) Install coil to upper compressor-to-engine bracket.

(6) Install alternator.

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

(8) Attach compressor service valves and lines.

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

(10) Connect clutch wire.

(11) Connect battery negative cable.

Compressor Front Seal Replacement

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

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 drive belt(s).

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

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

(5) Carefully pry behind seal drive ring, that part of the seal assembly farthest back on the shaft, and remove seal assembly.

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

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

(7) 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.

NOTE: *The carbon ring must seat in the retainer.*

(8) Coat mating surfaces of compressor and seal plate with a film of refrigeration oil. Position seal ring in groove on the seal plate and install seal plate.

(9) 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

NOTE: *On six-cylinder engines, it is not necessary to remove the compressor.*

(1) Isolate and remove compressor.

(2) Remove four back plate attaching screws using Torx Bit Tool J-25359-02.

(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 using Torx Bit Tool J-25359-02 and tighten in a diagonal pattern to 13 foot-pounds 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-14).

(5) Tap 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 the discharge valve is at top. Figure 13A-14 shows the correct assembly sequence.

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

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

(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.

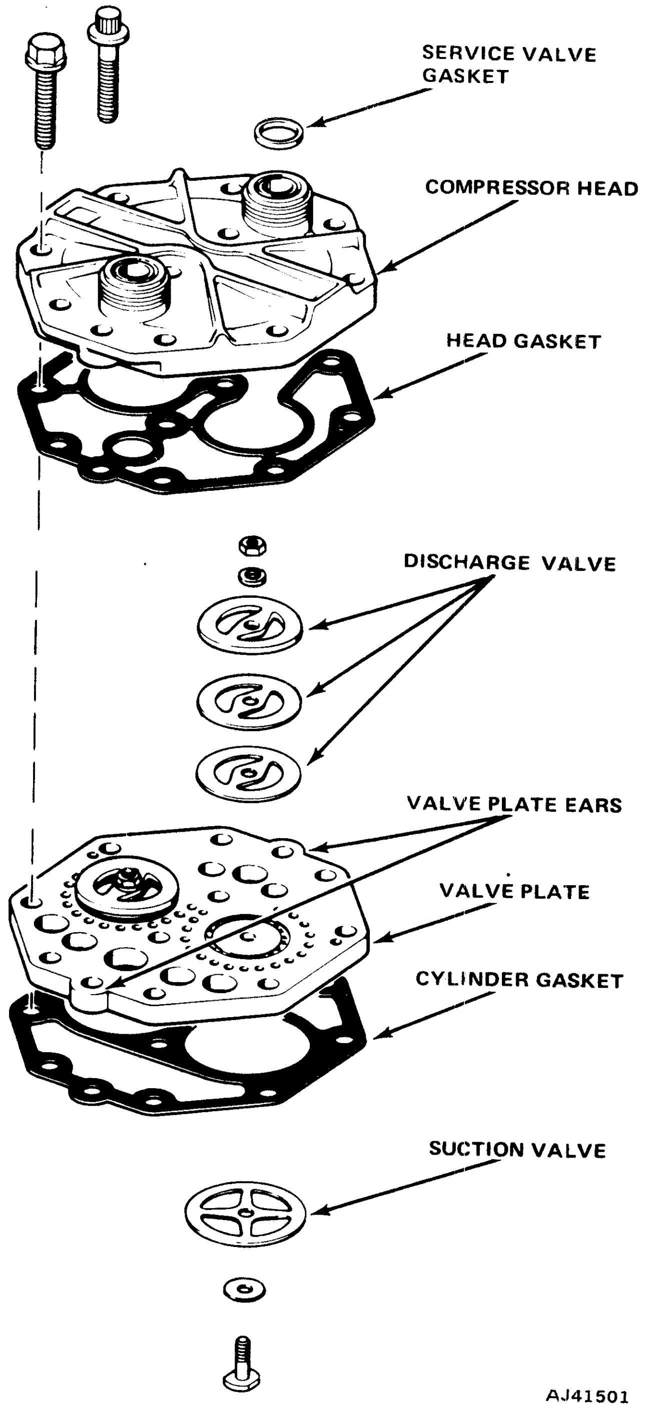


Fig. 13A-14 Head and Valve Plate Assembly Sequence

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.

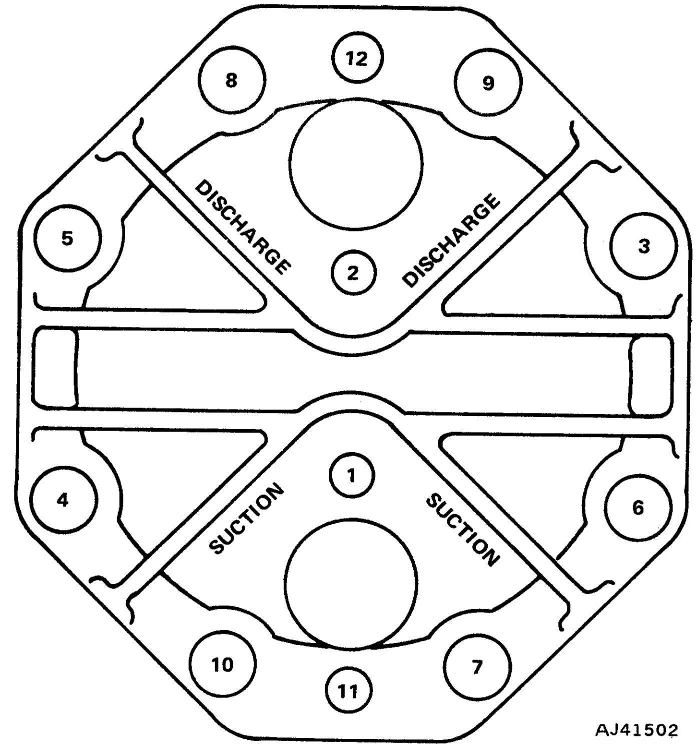


Fig. 13A-15 Compressor Head Capscrew Tightening Sequence

(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 as necessary.

Checking Compressor Oil Level

Initially, the compressor has 7 ounces of refrigeration oil in the crankcase (Approved oil: Sun Oil Suniso 5, Texaco Capella E, or equivalent). 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 constant.

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 the 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 to 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-16.

(4) Hold dipstick as vertical as possible and insert in check plug opening. The oil level should be within the specified levels indicated in figure 13A-16.

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

(5) 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.*

(6) Install plug, being careful not to overtighten it.

(7) Purge compressor of air.

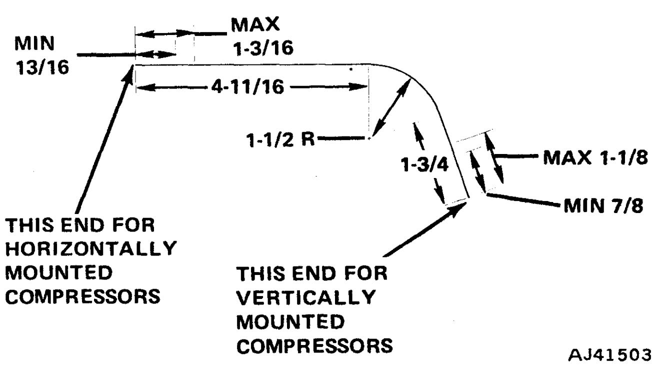


Fig. 13A-16 Oil Dipstick Fabrication Dimensions (Inches)

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 cracked or midposition.

(4) Loosen the discharge service valve gauge port cap to permit the refrigerant to force air out of the compressor.

(5) Back-seat the discharge service valve and tighten the gauge port cap.

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 run 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(s).

(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 5/8-11 standard thread bolt in the threaded center of the clutch plate.

(4) Tighten bolt and pull clutch from the shaft.

CAUTION: *Do not pry on clutch to remove.*

(5) Remove 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.

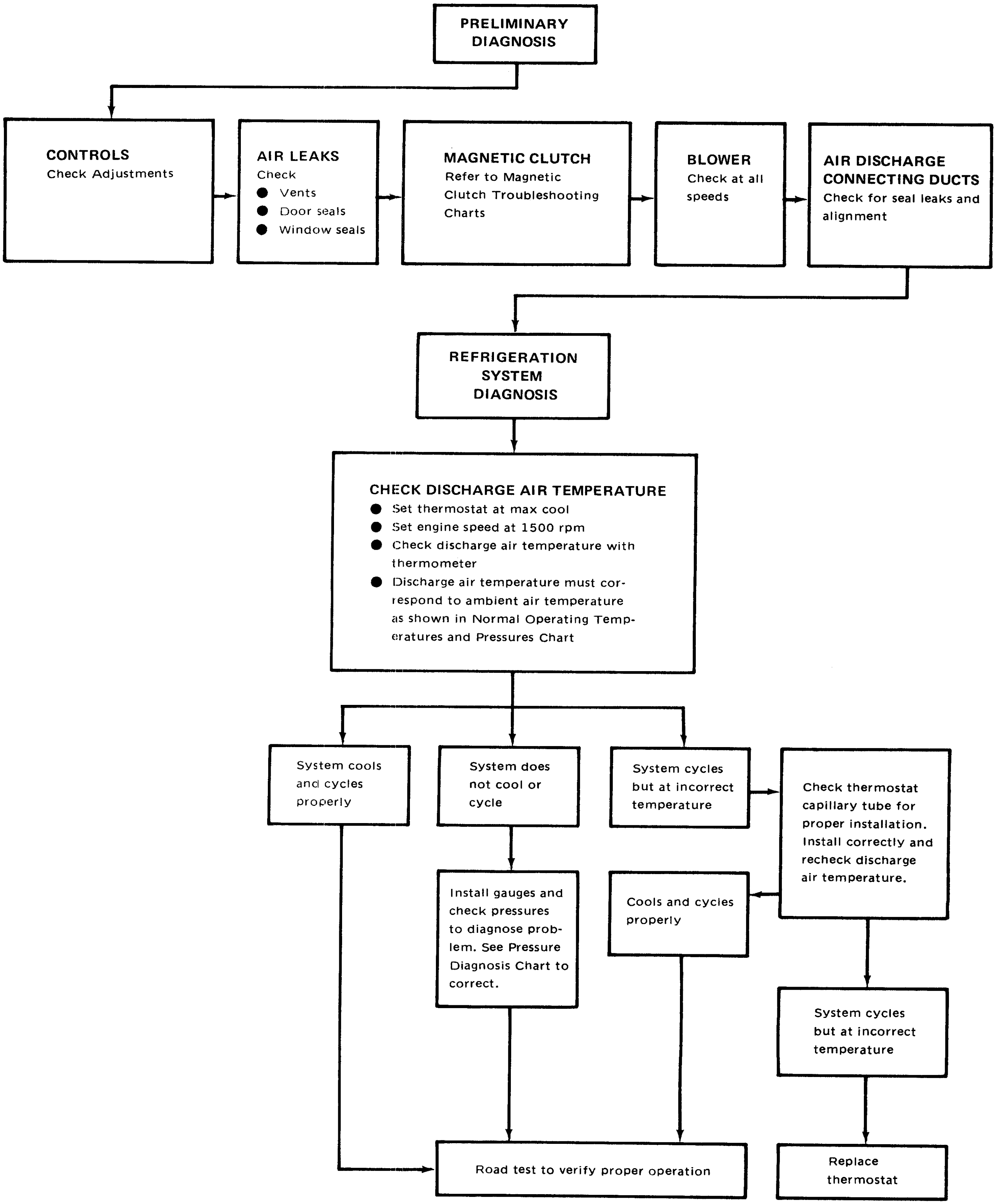
(2) Tighten capscrews to 7 to 10 foot-pounds torque.

(3) Align clutch assembly with key and install clutch on shaft.

(4) Install clutch-to-shaft attaching bolt and tighten to 20 foot-pounds torque. Connect clutch coil wire and energize clutch to hold unit when tightening.

(5) Install compressor belt(s) and adjust belt tension to specifications.

System Troubleshooting



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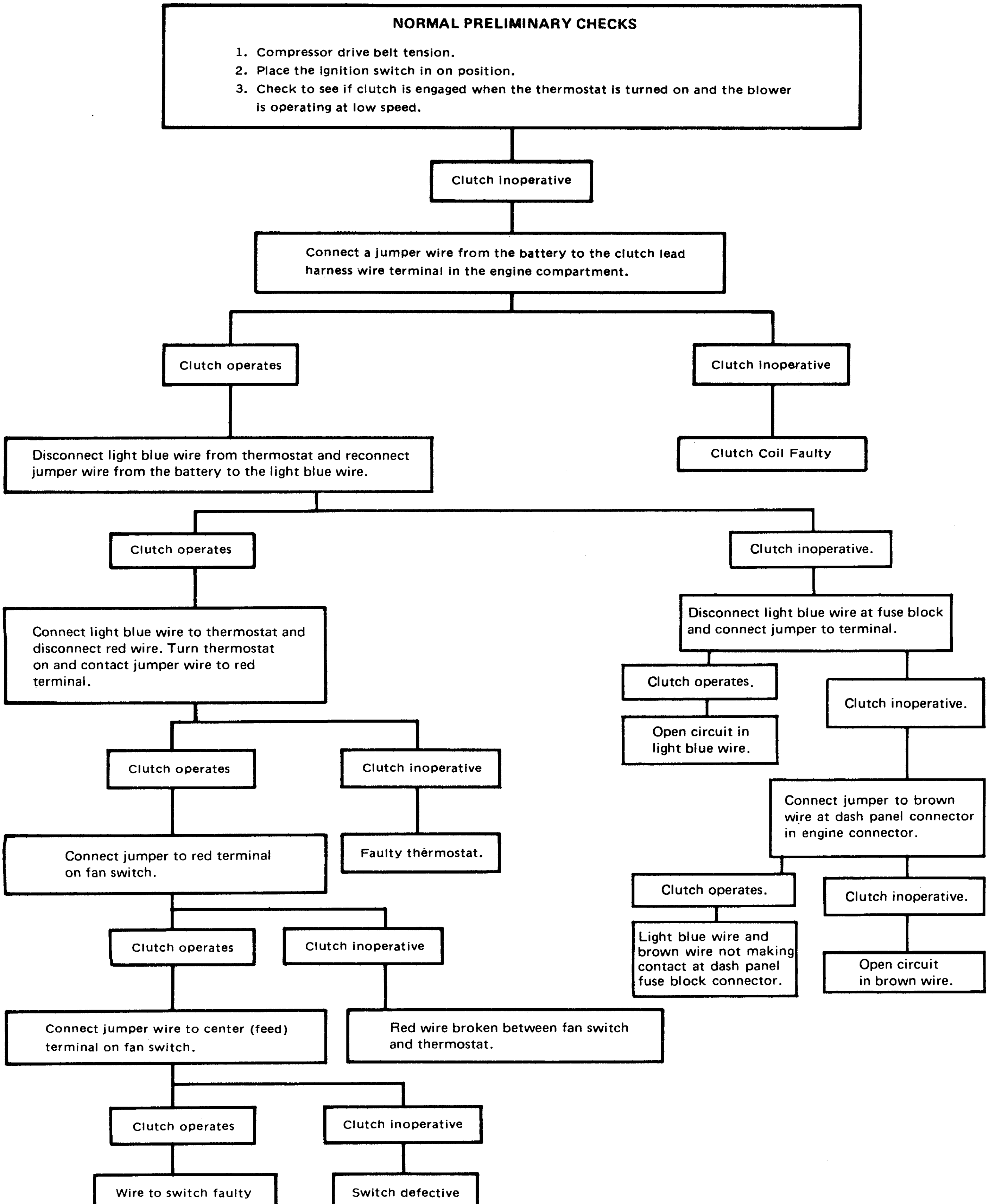
Magnetic Clutch Troubleshooting



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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 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) Remove receiver/dryer 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 system.
(2) Disconnect inlet (suction) line at compressor.
(3) Disconnect receiver/dryer-to-evaporator hose at the quick-disconnect coupling (fig. 13A-17).
(4) Remove hose clamps and dash grommet retaining screws.
(5) Remove evaporator housing-to-instrument panel attaching screws and the evaporator housing-to-mounting bracket screw (fig. 13A-18 or 13A-19).
(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-20 or 13A-21).

NOTE: *It is not necesary 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.*

Installation

(1) Push hoses through grommet opening, and install grommet by pushing toward engine compartment of vehicle and fasten to dash panel with two attaching screws.

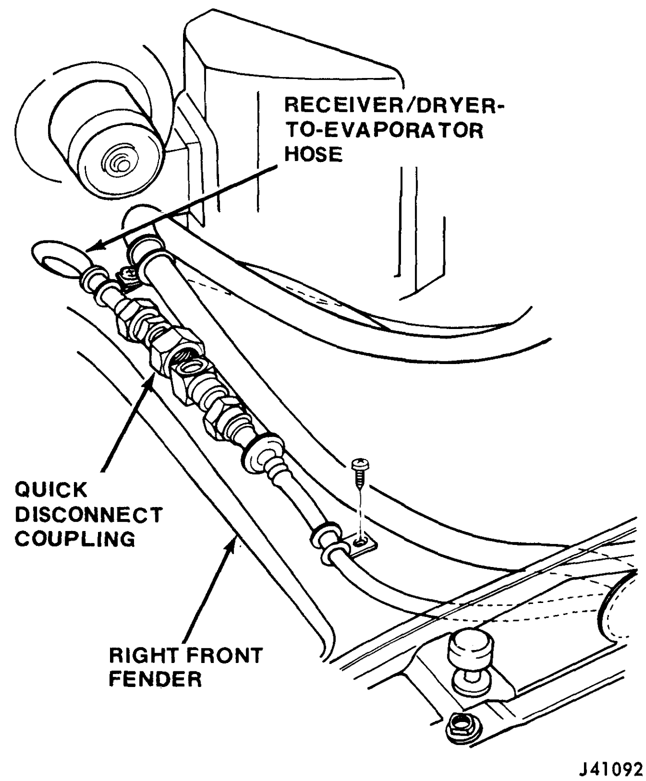

Fig. 13A-17 Quick-Disconnect Coupling

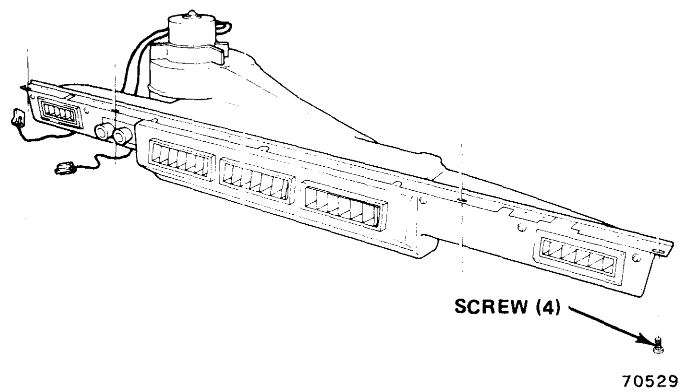

Fig. 13A-18 Evaporator Housing Mounting—CJ

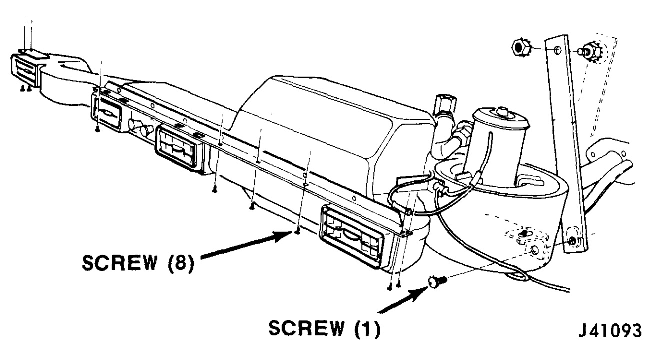

Fig. 13A-19 Evaporator Housing Mounting—Cherokee-Wagoneer-Truck

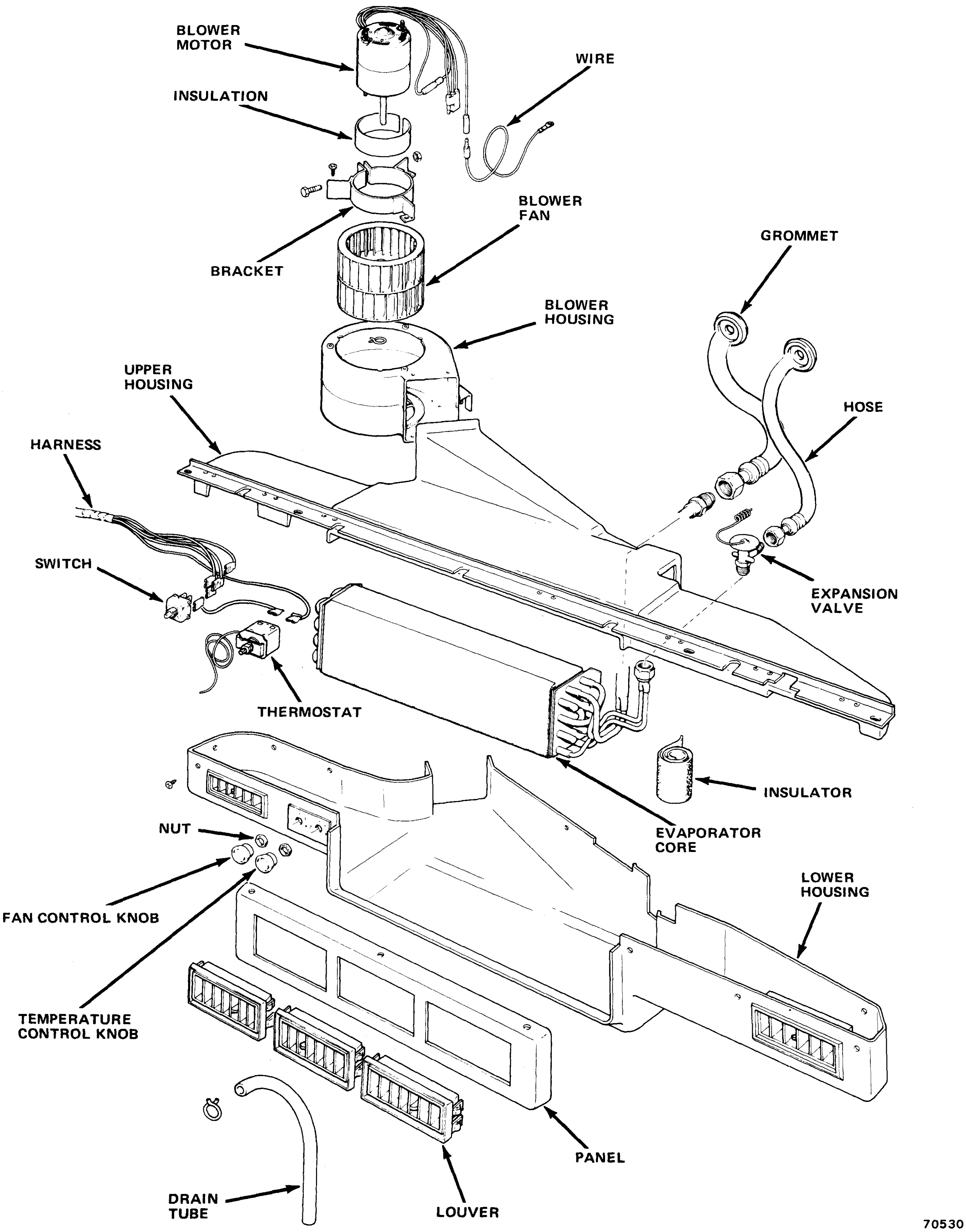

Fig. 13A-20 Evaporator Housing Assembly—CJ

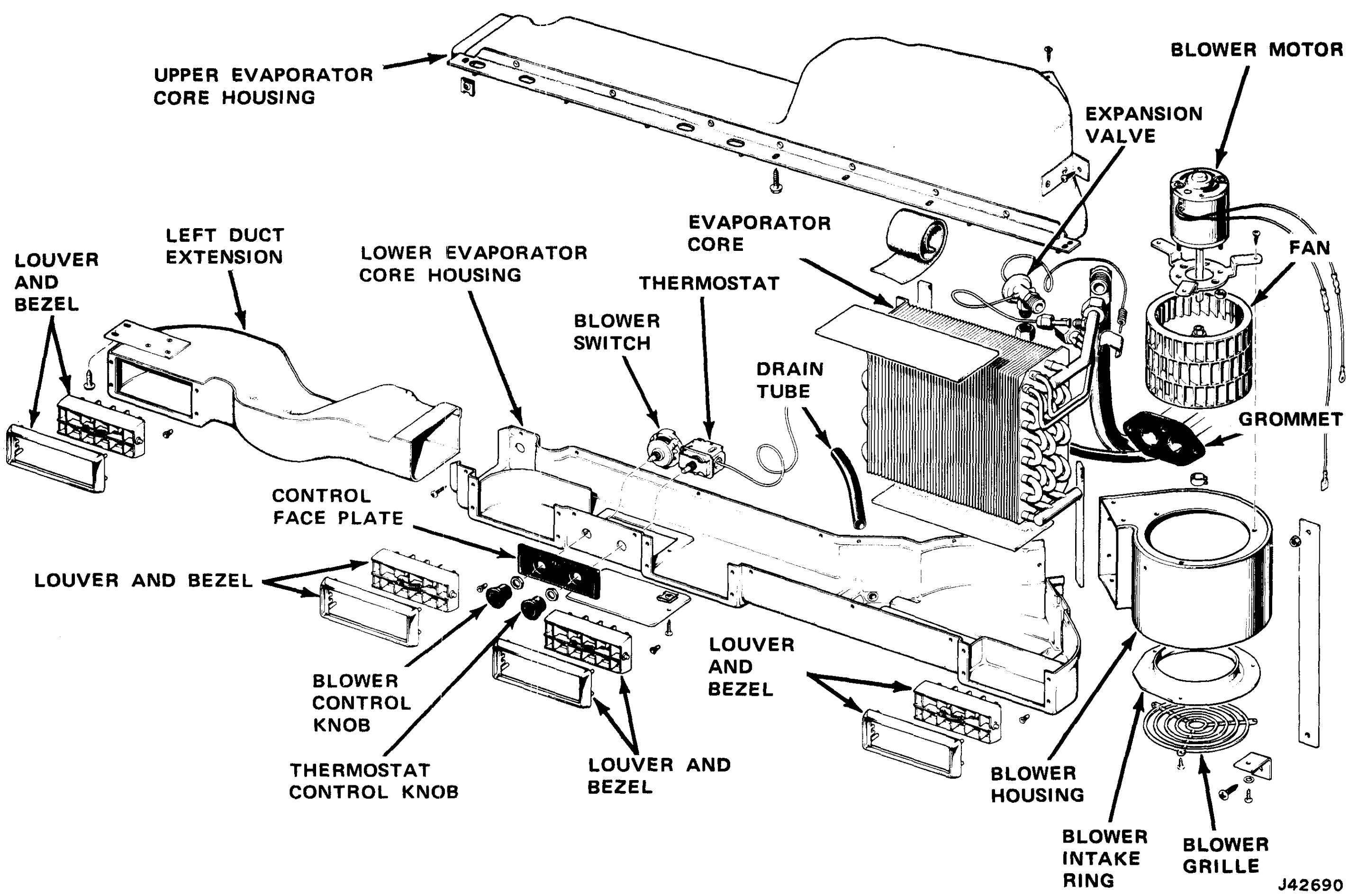

Fig. 13A-21 Evaporator Housing Assembly—Cherokee-Wagoneer-Truck

(2) Raise evaporator and install evaporator-housing-to-instrument-panel attaching screws and the evaporator-to-mounting-bracket screw.

(3) Install hose clamps and grommet attaching 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 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) Connect 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 system.

SYSTEM CONTROLS SERVICE

Fan Switch

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

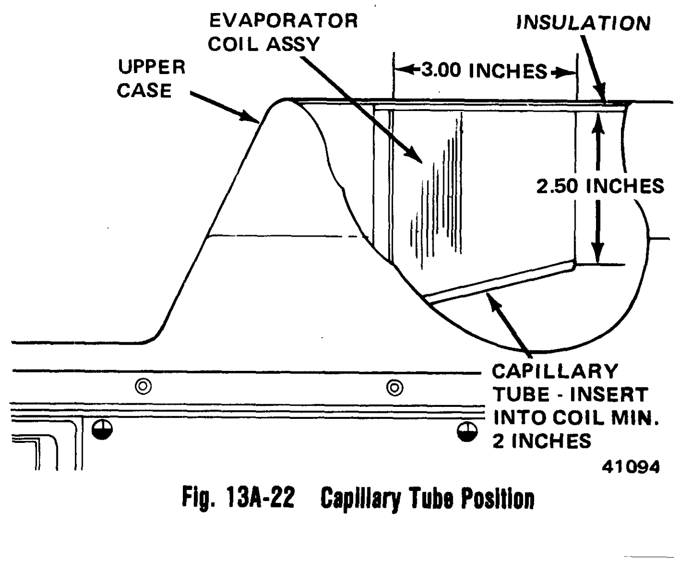

Fig. 13A-22 Capillary Tube Position

Temperature Control Thermostat

To service the temperature control thermostat, the evaporator core housing must be disassembled.

When installing a new temperature control thermostat, insert the capillary tube into the evaporator coil a minimum of two inches (fig. 13A-22).

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

Special Tools