SECTION 11-C
AIR CONDITIONER

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11-10 SPECIFICATIONS

a. Compressor

Type	Five Piston Axial
Make	Frigidaire
Displacement - (cu. in.)	9.28
Oil	Frigidaire 1000 viscosity
Oil Content (New)	13 oz. Fluid
Air gap between rotor plate and coil housing outer rim with clutch energized	.025" - .035"
Clutch Type	Magnetic
Belt Tension	See Fig. 2-53

b. Miscellaneous

Refrigerant	Freon 12, Ucon 12, Genetron 12, Isotron 12
System Capacity (Fully Charged)	2 3/4 lbs.
Evaporator Location	Under center of Instrument Panel
Blower Motor Fuse	20 Amp located on Fuse Block
Relay Number	1116959

11-11 DESCRIPTION AND OPERATION OF AIR CONDITIONER

NOTE: The heater and ventilation systems are the same as on non-air conditioner cars as described in Section 11-B and are completely separate from air conditioner.

The Buick Cool Pack type air conditioner is available on both 4000 and 4100 Series as optional equipment. The air conditioner is entirely independent of the heater and ventilation systems.

The compressor, condenser, receiver-dehydrator and hot gas by-pass valve are located in the engine compartment. See Figure 11-11. The evaporator assembly which includes the controls for the air conditioner is centrally located under the instrument panel. The air conditioner blower is located under the right side of instrument panel. Duct work located at air intake of blower permits outside air to be drawn into the air system to be mixed with car interior air. There are three main air outlets, one located in evaporator assembly and one located at each end of instrument panel.

A larger capacity radiator and fan to increase cooling system efficiently are included on all cars equipped with the air conditioner. Also a fan clutch is used.

All air condition equipped cars will have the fuel vapor by-pass system. This consists of a special fuel filter and fuel return lines which allows a constant flow of fuel from gas tank to filter and back to tank. This reduces the possibility of vapor lock when operating in extreme hot weather.

Any service work that requires loosening a pipe connection should be performed only by qualified service personnel who have attended

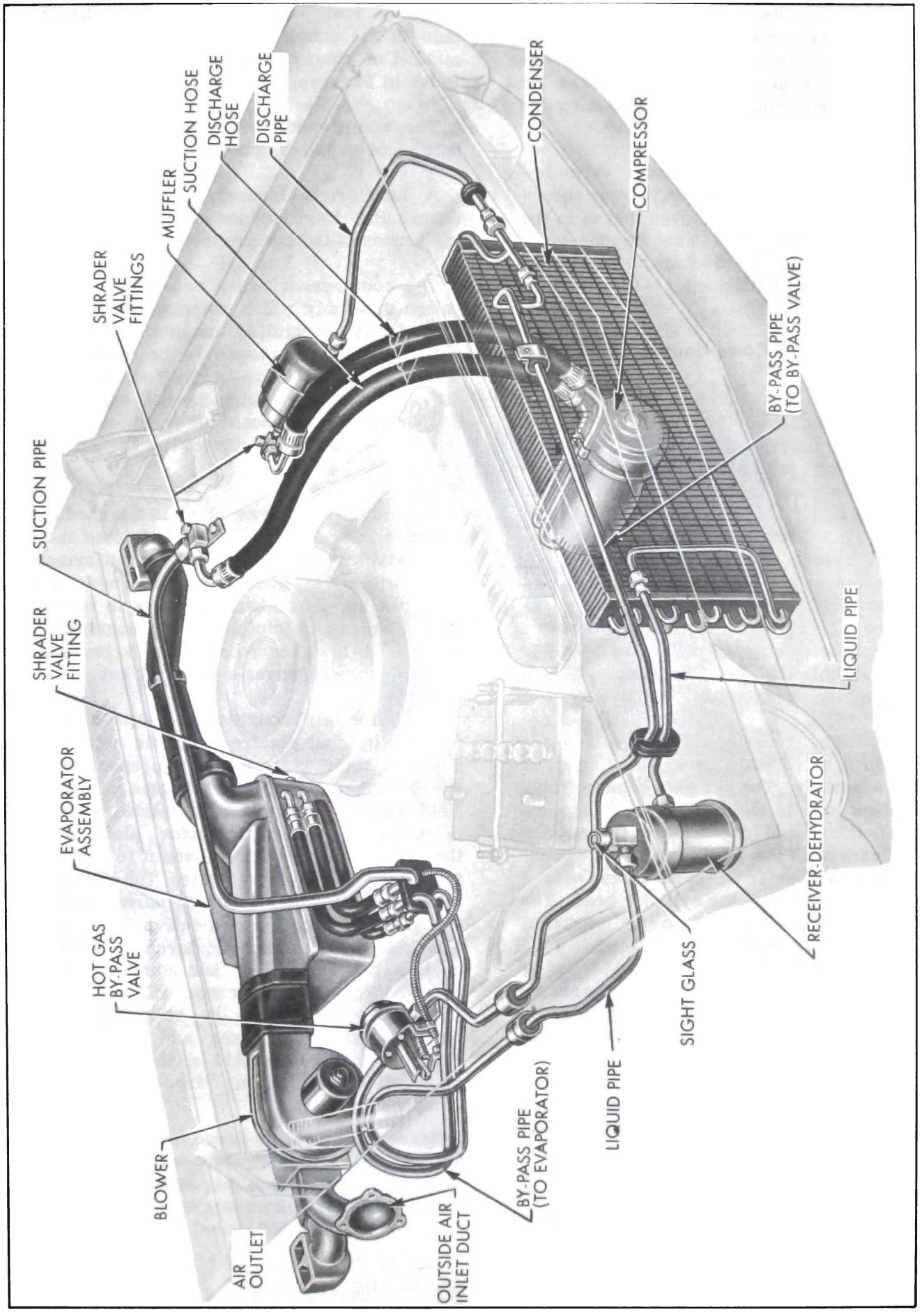


Figure 11-11—Air Conditioner Installation

either Buick or other automotive air conditioner training schools. Whenever a hose or pipe is disconnected from any unit, refrigerant will escape. Any work involving the handling of refrigerants require special equipment and a knowledge of its proper use.

The air conditioner uses shrader valve fittings instead of shut-off service valves; therefore, whenever a part is removed that is in the refrigeration circuit or a line disconnected, the refrigerant must be discharged from system as described in Paragraph 11-12.

a. Description of Components

1. Compressor and Clutch. The compressor is located at the lower left front side of the engine and is driven with one belt directly from crankshaft pulley. Belt adjustment is obtained by moving compressor assembly on its pivot bolts.

The compressor is a five cylinder, horizontal, reciprocating type. The cylinders are mounted axially around the compressor shaft. See Figure 11-12. The pistons are actuated by rods connected to a socket plate which is caused to wobble or wave by a special cam type ball bearing on the shaft.

Reed type suction and discharge valves are mounted on a valve plate between the cylinder and head assembly. The cylinder head contains two cavities, one in the center which indexes with the suction and one around the outside which indexes with the discharge reeds. These cavities are sealed from each other with a teflon seal molded onto the cylinder head. The discharge cavity is sealed by an "O" ring seal located in a groove in the cylinder head.

An oil pump at the front of the compressor, picks up oil from the bottom of compressor and provides lubrication for the internal parts.

The compressor has a pressure relief valve located near discharge hose shrader valve which opens at approximately 440 psi discharge pressure to relieve this pressure. The valve automatically closes again when the pressure is reduced. Opening of the valve will cause a loud buzzing noise and the ejection of some oil along with the refrigerant will occur. Any condition that causes this valve to open must be corrected immediately and compressor oil level should be checked.

An oil test outlet is located on the under side of the compressor housing. The correct method of checking oil level must be followed. Refer to Paragraph 11-12.

The compressor serial number is located on a plate on top of compressor housing.

A muffler is located in compressor discharge line to reduce the characteristic pumping sounds of the compressor.

The compressor has a two-piece, split type pulley assembly which completely encloses an electrically controlled magnetic clutch that permits the compressor to be operated only when refrigerated air is desired. See Figure 11-13. When the clutch is not engaged, the compressor shaft does not turn even though the pulley is being rotated by the compressor belt.

The clutch armature plate is attached to the pulley and bearing assembly by rivets and flat leaf driver springs. The pulley and armature plate will "free-wheel" over the bearing and compressor shaft when engine is in operation and compressor clutch is not engaged. See Figure 11-13. The rotor plate is pressed on compressor shaft over a woodruff key.

When the air conditioner controls are set for cooling, an electro-magnetic coil, housed between rotor plate and compressor housing is energized. The coil creates a magnetic field which causes the rotor plate to be magnetized. The magnetic rotor plate attracts the armature plate and causes it to contact the front face of the rotor plate. The flat springs allow the armature plate to move. When the two plate surfaces are in full metallic contact and held by the magnetic force, a solid connection between pulley and compressor shaft is obtained and compressor will be operated. When the clutch coil is de-energized, the magnetic field collapses and the armature plate is no longer held against rotor plate and pulley will again "free-wheel" around compressor shaft.

Spacers and shims are used to obtain an air gap of .025" to .035" between the face of the outer rim of coil-seal housing and face of rotor plate when the coil is energized with 12 volts D.C. and no shaft deflection.

Due to the location of compressor on car, a splash ring is mounted around the coil-seal housing and is held together with a screw.

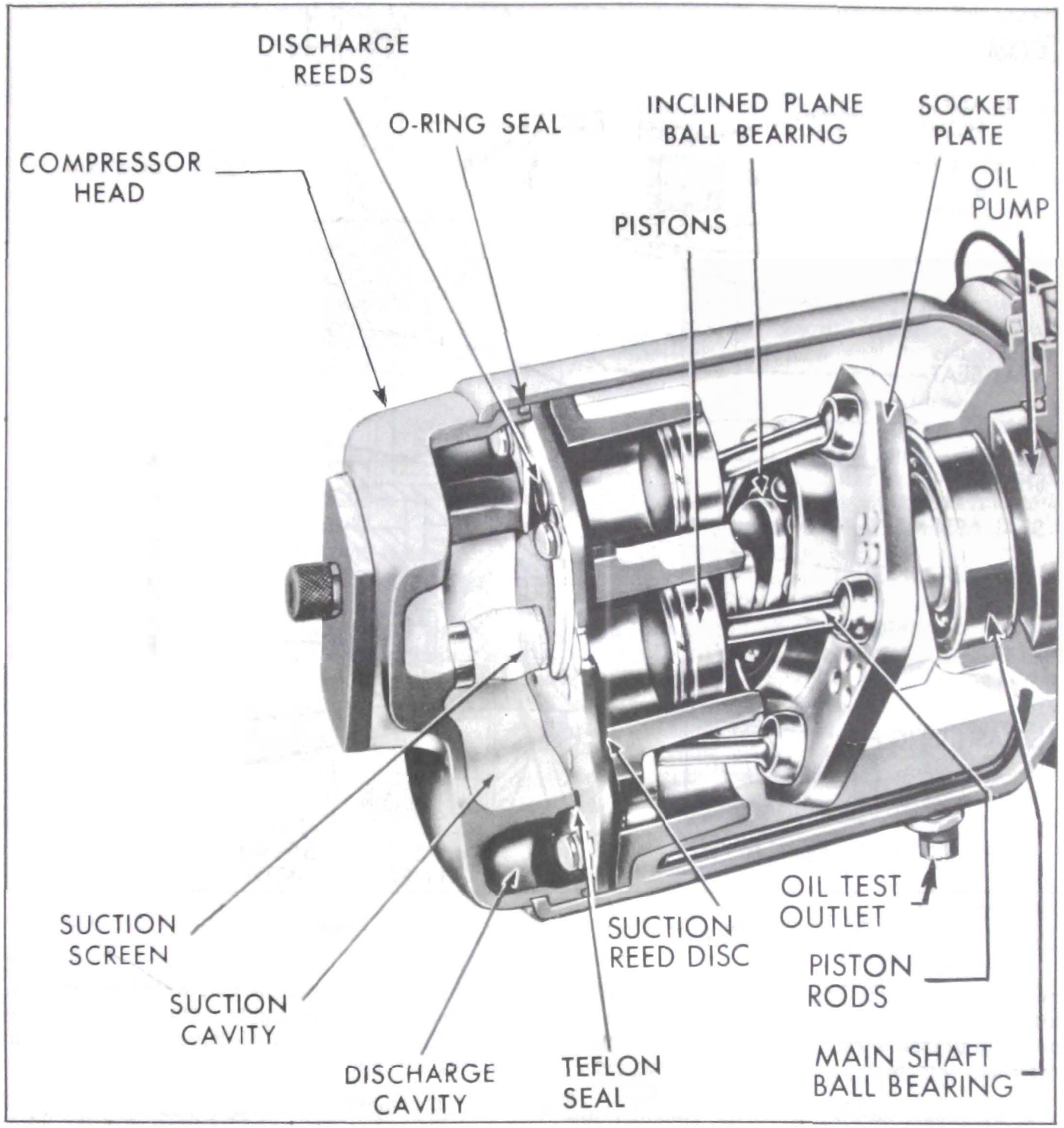


Figure 11-12—Compressor - Sectional View

2. Hoses. The connecting hoses are made from a high temperature, high pressure synthetic rubber with double cord reinforcements. All hose and pipe ends are fitted with O-ring fittings.

The discharge and suction hoses are part of an adapter which attaches to rear of compressor.

3. Condenser. The condenser is similar to the ordinary car radiator but is designed to withstand much higher pressures. The condenser is constructed out of aluminum for less weight and is mounted in front of the

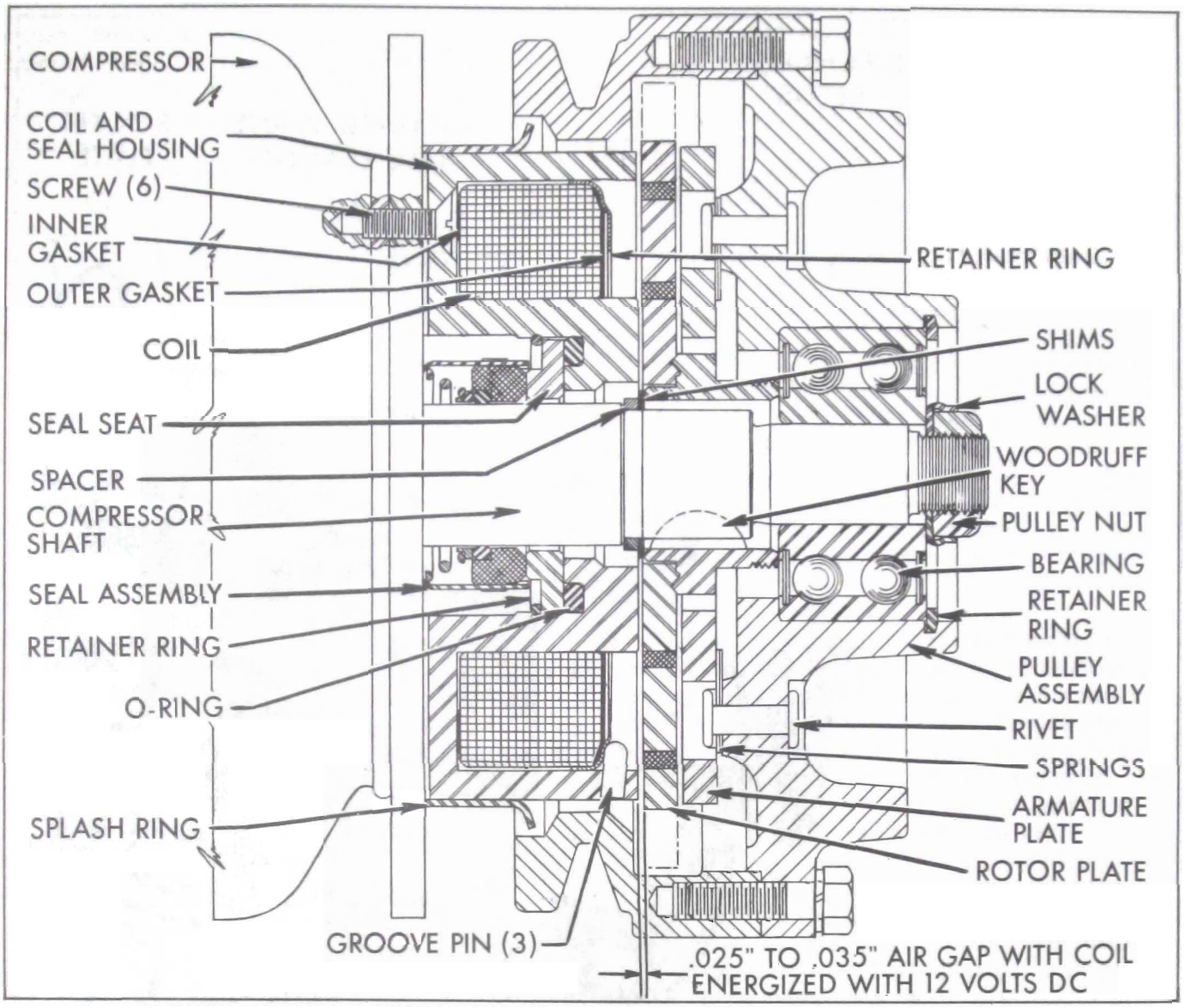


Figure 11-13—Compressor Clutch and Pulley Assembly

radiator so that it receives a high volume of air. Air passing over the condenser cools the hot high pressure refrigerant gas, causing it to condense into high pressure liquid refrigerant.

4. Receiver-dehydrator. The receiver-dehydrator is located at the right front of engine compartment. A liquid indicator or sight glass is an integral part of the outlet pipe of the receiver-dehydrator. The sight glass serves as an aid to diagnosis. The appearance of bubbles or foam beneath the sight glass indicates air or a shortage of refrigerant in the system.

The purpose of the receiver part of assembly is to insure a solid column of liquid refrigerant to the thermostatic expansion valve at all times, provided the system is properly charged. The dehydrator part of assembly is to absorb any moisture that might be present in system after assembly. Also, it traps foreign material which may have entered system during assembly.

5. Thermostatic Expansion Valve. The thermostatic expansion valve is located at the inlet to the evaporator core inside the evaporator case. The purpose of the valve is to regulate the flow of liquid refrigerant into the evaporator automatically in accordance to the requirements of the evaporator. The temperature in the evaporator must be controlled so that the water collecting on the core surface will not freeze in the fins and block off the air passages. The valve consists of a capillary bulb and tube that are connected to an operating diaphragm inside the valve. See Figure 11-14. The capillary tube bulb is fastened to low pressure line

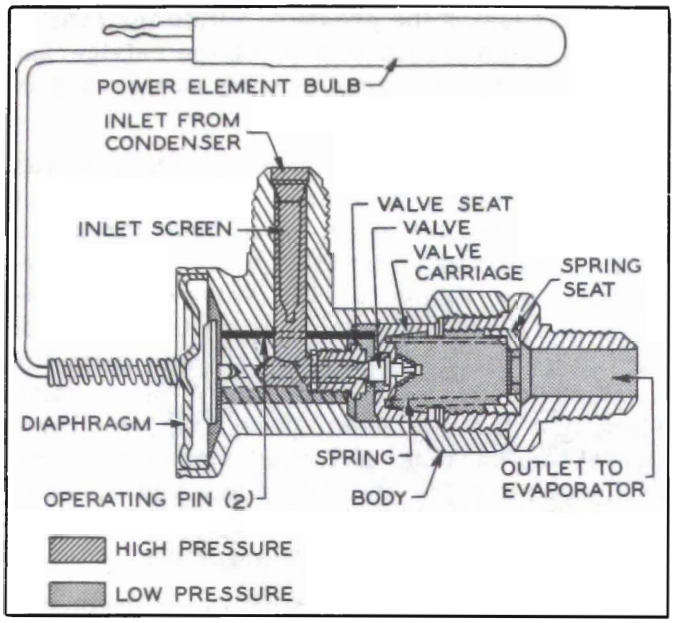


Figure 11-14—Thermostatic Expansion Valve

coming out of evaporator so that it communicates the temperature of the refrigerant at this point to the expansion valve. This valve is the dividing point in the system between high pressure liquid refrigerant supplied from the receiver and relatively low pressure liquid and gaseous refrigerant in the evaporator.

There is no service adjustment on the thermostatic expansion valve.

6. Evaporator Assembly. The evaporator plastic case which is located under center of instrument panel, contains the evaporator core, the thermostatic expansion valve, the blower and compressor switch, the resistor, the hot gas by-pass valve control and outside air valve lever and center air outlet. The case also has provisions for two drain hoses, for an air inlet duct from blower and for the ducts to each of the air outlets located under each end of instrument panel. See Figure 11-5. The evaporator has a shrader valve used for checking evaporator suction pressure if right air outlet temperature is not within limits on Figure 11-33.

The drain hoses for the evaporator go through holes in floor of car. The evaporator core is aluminum tube and fin construction.

The purpose of the evaporator core is to cool and dehumidify the air that is flowing through it when the system air conditioner is in operation. High pressure liquid refrigerant flows through the orifice in the thermostatic expansion valve into the low pressure area of the evaporator. This regulated flow of refrigerant boils immediately. Heat from the core surface is lost to the boiling and vaporizing refrigerant which is cooler than the core, thereby cooling the core. The air passing over the evaporator loses its heat to the cooler surface of the core. As the process of heat loss from the air to the evaporator core surface is taking place, moisture in the air condenses on the outside surface of the evaporator core and is drained off.

7. Hot Gas By-Pass Valve. The hot gas

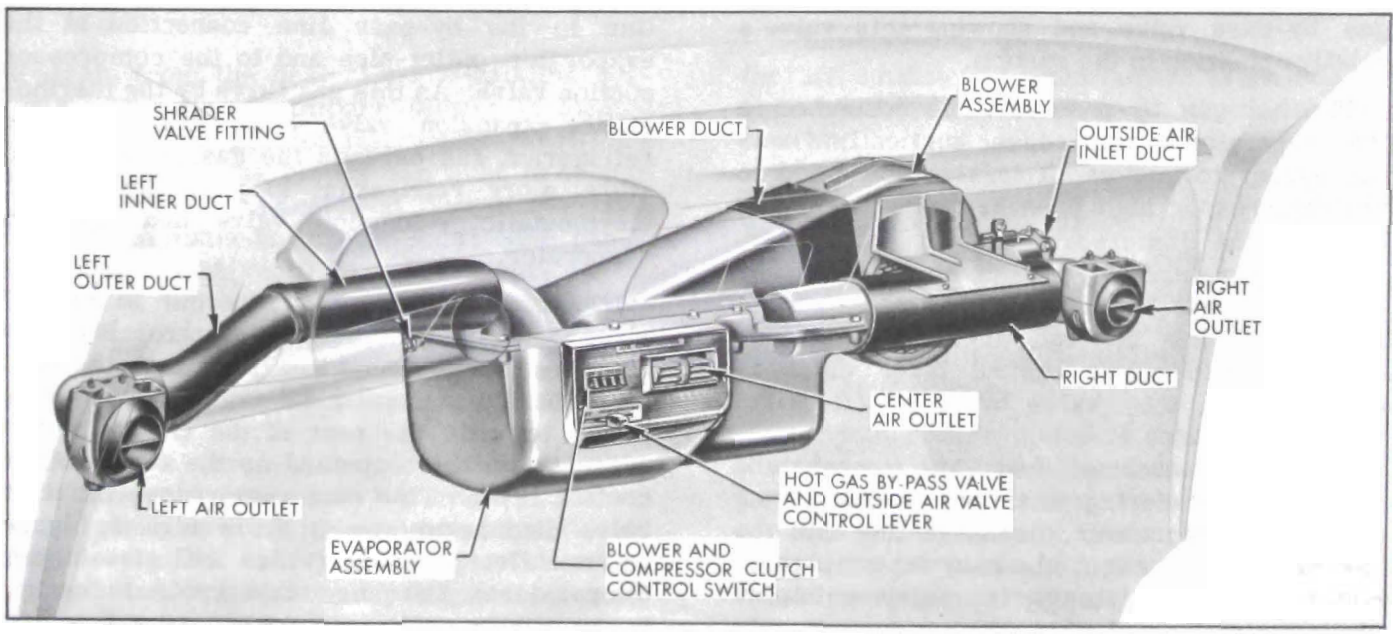


Figure 11-15—Evaporator Assembly and Air Outlets

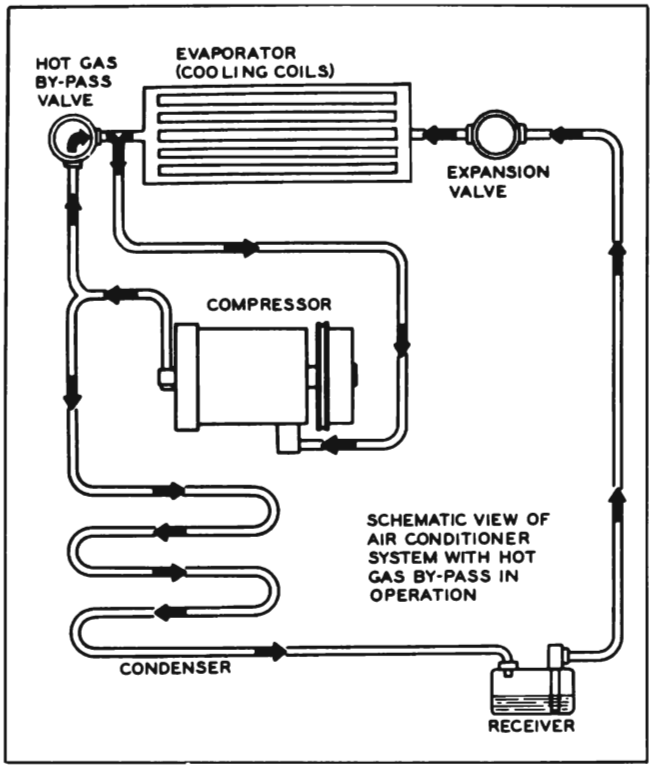


Figure 11-16—Air Conditioning System - Schematic

by-pass valve located on the right front wheelhouse in the engine compartment determines the amount of cooling the air conditioner system will deliver. This valve is manually controlled by the temperature lever located in the evaporator case.

Figure 11-16 is a schematic view of the operating refrigeration cycle using the hot gas by-pass valve and showing this valve's relative position in the system.

The hot gas by-pass valve is connected to the evaporator to compressor suction line near the evaporator outlet. It is also connected to the compressor high pressure (discharge) line between the compressor and the condenser. The temperature of air coming out of the evaporator may be controlled between approximately 43^{o} and 60^{o} by varying the air conditioner temperature control lever which is connected to this valve by a bowden wire.

The valve accomplishes this temperature control by metering hot high pressure gas from the compressor discharge line into the low pressure (suction) line near the evaporator outlet. By this metering the valve maintains any pre-determined minimum evaporator outlet (refrigerant) pressure between approximately 23 and 55 psi.

By increasing the pressure within the evaporator, the temperature at which the refrigerant evaporates is increased causing an increase in discharge air temperature.

Hot gas valve outlet pressure refrigerant gas is transmitted to the area between the pilot diaphragm and the main valve body through a drilled passage from the valve outlet connection. See Figure 11-17. Valve outlet pressure gas is also transmitted to the inside of the cover through a drilled passage from the evaporator outlet, to the hollow main valve stem and through a hollow screw (which secures the back-up plate and main diaphragm to the main valve stem) and into the cover to assist the main spring in applying pressure against the main valve stem assembly.

When the hot gas outlet pressure drops below the corresponding evaporator pressure that provides the desired temperature in the car, the pilot valve diaphragm springs will overcome suction pressure to move the diaphragm against the pilot valve to unseat the valve. High pressure refrigerant gas flows through this opening into the drilled passage through the main valve body and to the main diaphragm to oppose main diaphragm spring tension and suction pressure in the cover. High pressure refrigerant gas will move the diaphragm against main spring tension to compress the spring and thus move the main valve stem assembly face off its seat to permit the high pressure hot refrigerant gas to flow through the valve.

Hot refrigerant gas flows through the by-pass line to the by-pass line connection at the evaporator outlet pipe and to the compressor suction valve. As this gas flows by the thermostatic expansion valve bulb, heat from the refrigerant gas expands the gas in the bulb to allow more refrigerant to pass through the thermostatic expansion valve and into the evaporator.

If maximum cooling in the car is not desired and the temperature control lever is positioned to a warmer setting, then the cam lever on the temperature regulation valve is pulled towards the rear of the car by means of control cable attached to the temperature control lever. This cam compresses the pilot valve diaphragm spring to require a higher valve outlet pressure (which will give higher temperature) to cause this cycle to occur.

8. Air Distribution System. The air conditioner air distribution system is entirely

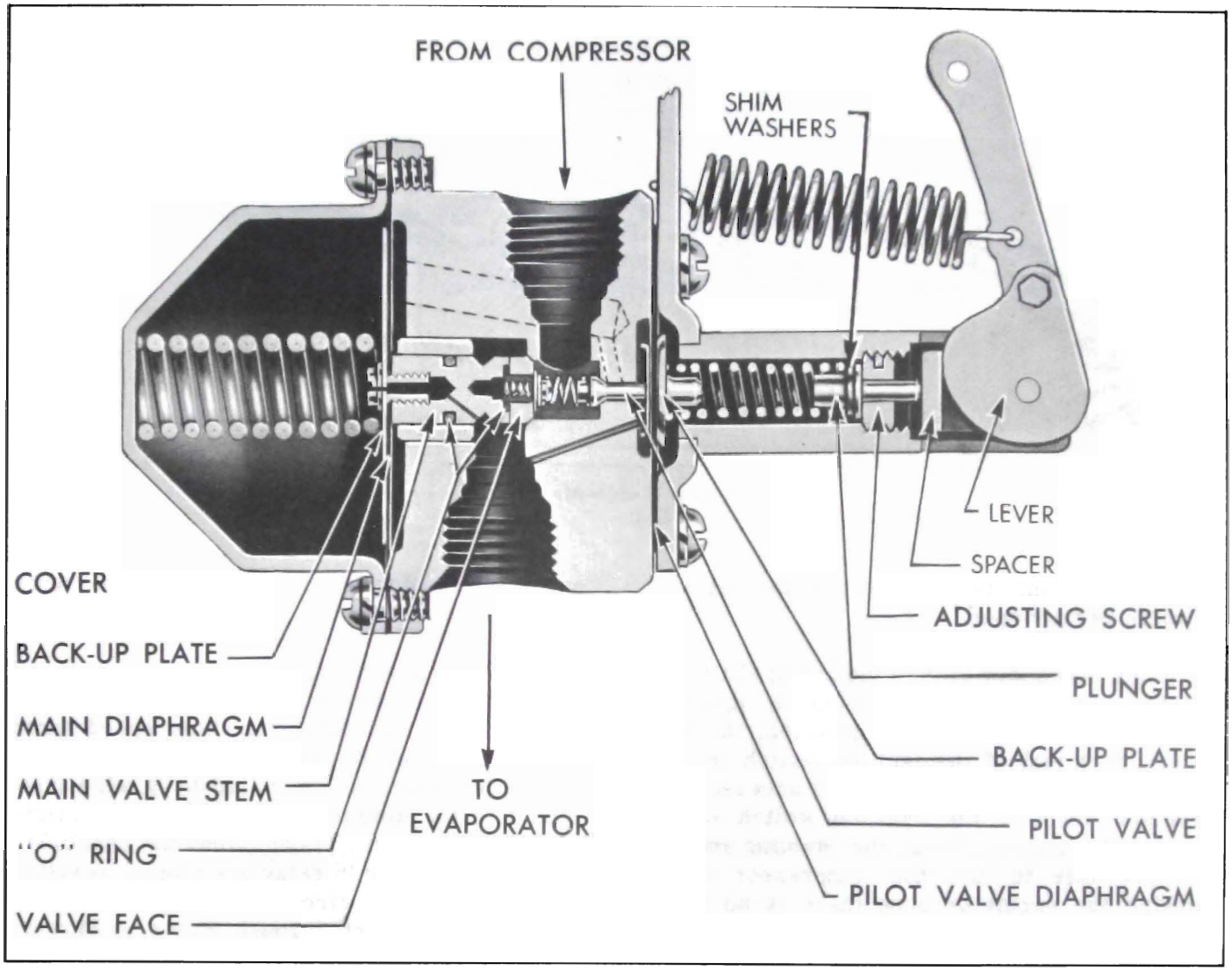


Figure 11-17—Hot Gas By-Pass Valve - Sectional View

separate from the heater and ventilation systems. The air conditioner blower is located under the right side of instrument panel. See Figure 11-28. The blower air inlet is open to the car interior. Located at blower inlet is a duct which extends through cowl side panel, just above right ventilator. See Figure 11-29. This duct which is provided with a shut-off valve that is controlled by temperature control lever on evaporator case, allows outside air to be drawn into air conditioner air system.

There are three main air outlets. A vane type outlet is located in the evaporator case which gives vertical adjustment of the air and may be shut off and two ball type outlets, one at each end of instrument panel which may be adjusted in any given direction. Also a group of small holes in the ducts from evaporator provide front floor cooling. Air flows through the air conditioner when blower is on and the outside air valve is open is shown in Figure 11-18.

9. Controls. The air conditioner controls which are located in the evaporator case consists of four push buttons and a lever. See Figure 11-19. The push buttons provide an "Off" and three blower speeds (low, medium and high) and control the operation of the compressor clutch.

The compressor clutch is engaged whenever the blower is turned on. Located under the push buttons is the temperature and outside air valve control lever. When this lever is at the extreme left, the hot gas by-pass valve is at the minimum cooling position and the outside air valve is closed. Moving this lever to the right increases cooling and opens the outside air valve. When at the extreme right,

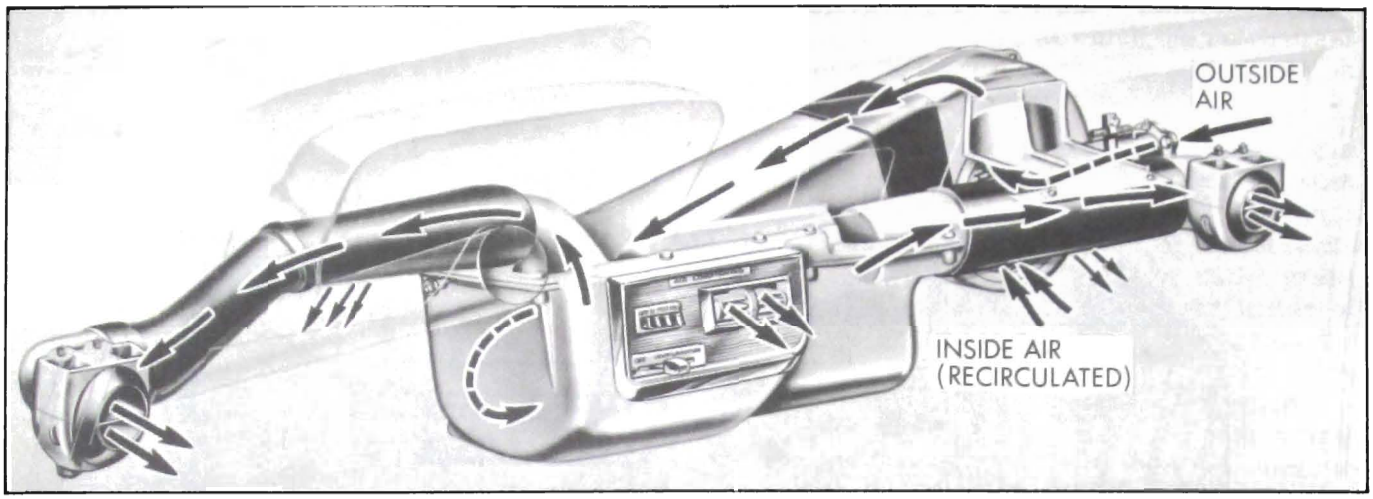


Figure 11-18—Air Flow

maximum cooling is obtained and the outside air valve is fully open.

It is not necessary to turn the air conditioner off when cranking engine as when the ignition switch is turned to the start position, the accessory terminal of the ignition switch is cut out. This prevents operation of the accessories connected through the ignition switch while starting the engine. Thus, the starting motor does not have to turn the compressor while cranking the engine because there is no current to the air conditioning electrical system.

If the air conditioner blower is on high speed and the car head lights are turned on, a relay and a resistor located at the upper inboard portion of blower will change blower speed to medium. See Figure 11-34. Only low and medium blower speeds are available when headlights are on.

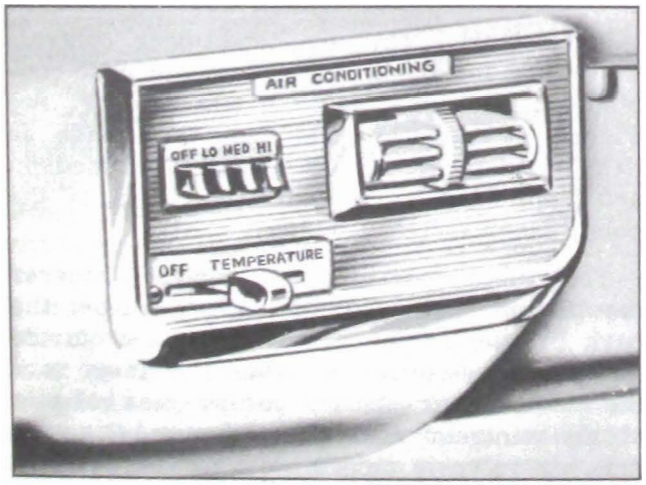


Figure 11-19—Air Conditioner Controls

Also if blower is on medium speed and headlights are turned on, blower will go on low speed. When this occurs medium speed again may be obtained by pushing "Hi" control button. The relay is controlled by a wire connected to the dimmer switch terminal on light switch. See Figure 11-20. When the headlights are off, the points in relay are closed, resistor is in parallel in circuit and current flow is from blower switch through points to blower. When the headlights are on, the relay points are opened and the resistor is in series in blower circuit. Current flow is then from blower switch through resistor to blower.

b. Operation of Air Conditioner Refrigeration Circuit

Cool refrigerant gas is drawn into the compressor from the evaporator and pumped from the compressor to the condenser and hot gas by-pass valve under high pressure. See Figure 11-21. This high pressure gas will also have a high temperature as a result of being subjected to compression. As this gas passes through the condenser, the high pressure, high temperature gas rejects its heat to the outside air as the air passes over the aluminum surfaces of the condenser. This cooling of the gas causes it to condense into liquid refrigerant. The liquid refrigerant, still under high pressure passes from the bottom of the condenser into the receiver-dehydrator. The receiver acts as a reservoir for the liquid.

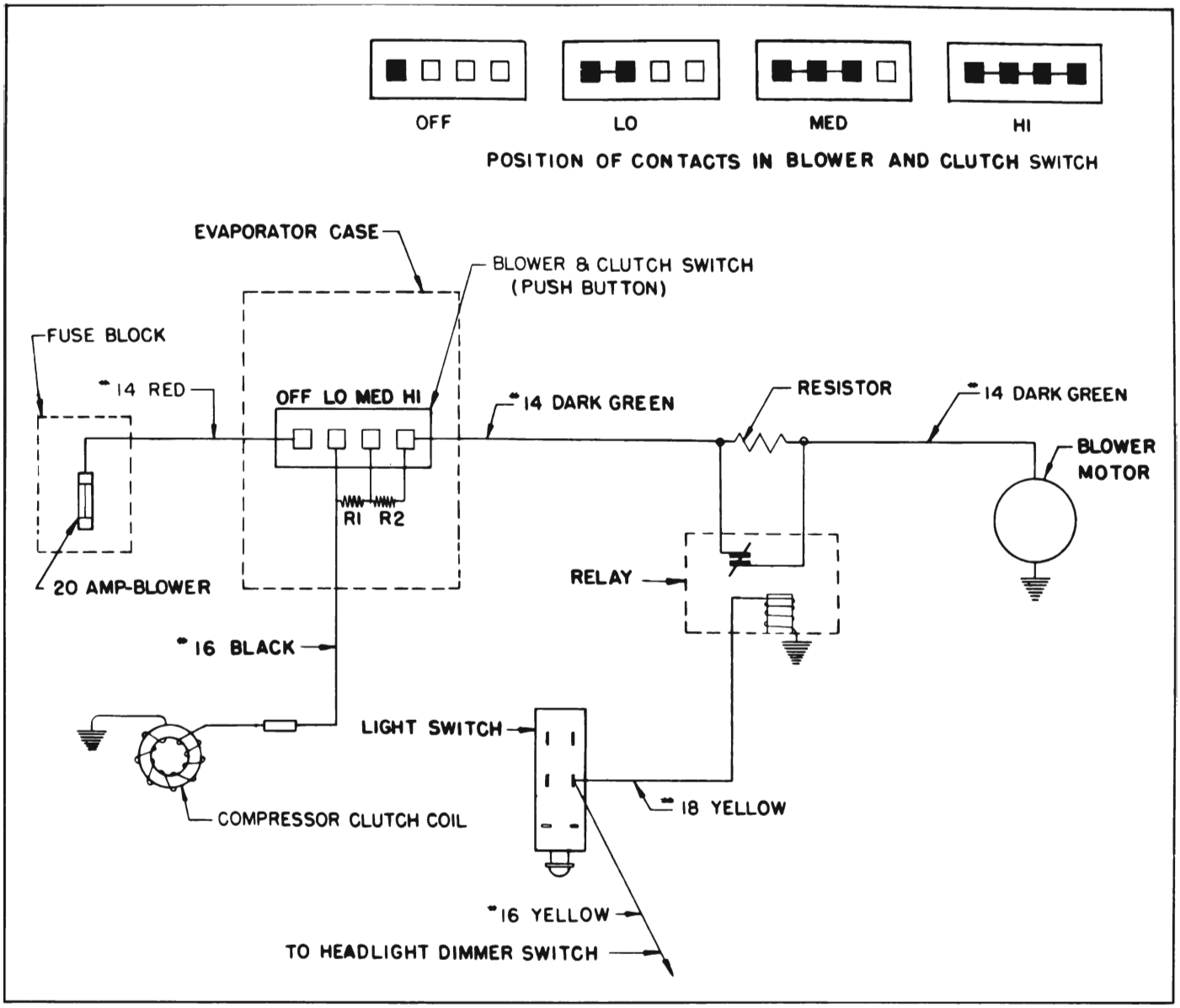


Figure 11-20—Air Conditioner Wiring Circuit Schematic

The liquid refrigerant flows from receiver-dehydrator to the thermostatic expansion valve. The thermostatic expansion valve meters the high pressure refrigerant flow into the evaporator. Since the pressure in the evaporator is relatively low, the refrigerant immediately begins to boil. As the refrigerant passes through the evaporator, it continues to boil, drawing heat from the surface of the evaporator core warmed by the air passing over the surfaces of evaporator core. In addition to the warm air passing over the evaporator rejecting its heat to the cooler surfaces of the evaporator core, any moisture in the air condenses on the cool surfaces of the core, resulting in cool dehydrated air entering inside the car. By the time the gas leaves the evaporator, it has completely vaporized and is slightly superheated.

Refrigerant passing through the evaporator is returned to the compressor where the refrigeration cycle is repeated. Superheat is an increase in temperature of the gaseous refrigerant above the temperature at which the refrigerant vaporized.

When the pressure in the evaporator becomes low enough to cause any moisture condensing on the evaporator surface to freeze, the hot gas by-pass valve opens. As this valve opens, hot high pressure refrigerant gas enters the system between the evaporator core outlet and the thermostatic expansion valve capillary bulb. This increases the suction pressure and warms the evaporator outlet pipe and the bulb which in turn signals the thermostatic expansion valve to open further allowing more refrigerant to

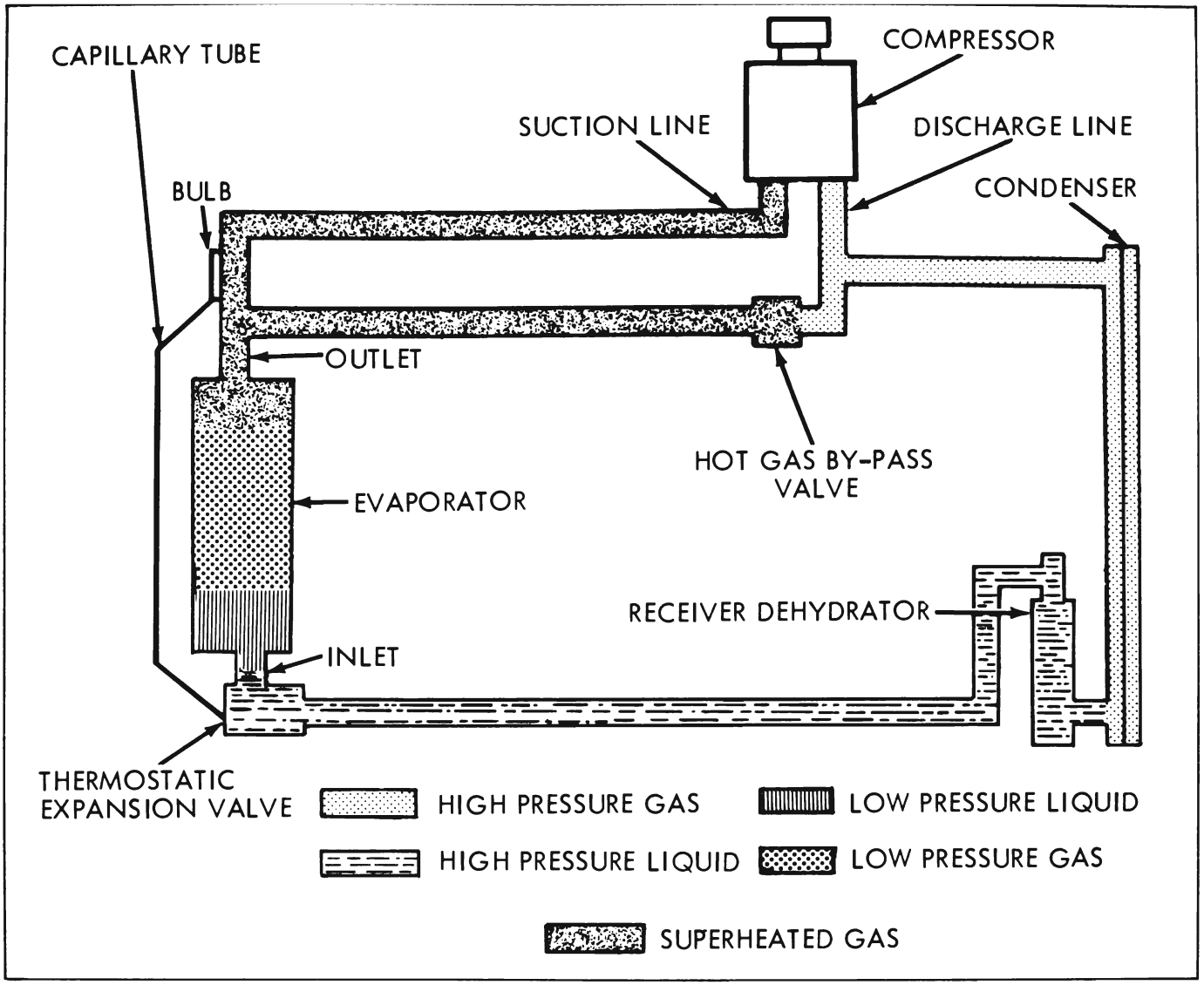


Figure 11-21—Air Conditioner Refrigeration Circuit

enter the evaporator. As suction pressure builds up to a value where the moisture depositing on the evaporator core will not freeze, the hot gas by-pass valve closes.

c. Operation of Air Conditioner Controls

To place air conditioner in operation for maximum cooling:

1. Make sure heater and ventilation systems are off. Close all car windows.

2. Depress "Hi" button on evaporator case. See Figure 11-19. (This turns blower on high speed and starts compressor.)

3. Move temperature control lever to extreme right (Maximum cooling) position. (This positions hot gas by-pass valve and fully opens outside air inlet valve.)

4. When desired car interior temperature has been reached, reduce blower speed to maintain temperature at a satisfactory level by pushing either medium or low button.

It also may be desirable to reposition temperature control lever.

It is not necessary to turn air conditioner off when cranking engine.

NOTE: When car headlamps are on, only low and medium blower speeds are available.

Operate air conditioner for a few minutes several times a month during the winter months or when it has not been in operation for a period of time. This will lubricate the compressor seal and prevent possible loss of refrigerant.

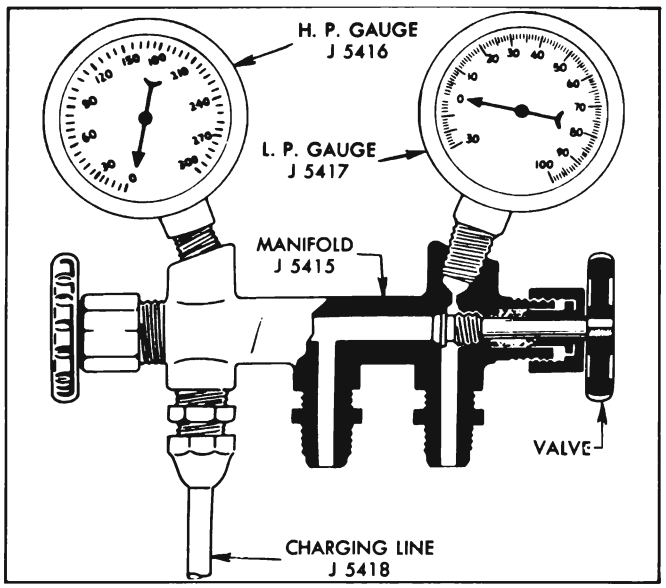


Figure 11-22—Pressure Gauge Set

11-12 SERVICE PROCEDURES

a. Discharging Refrigerant from Air Conditioner System

When a part is removed or disconnected that is in the Air Conditioner refrigeration circuit, the refrigerant must be discharged from system using the following procedure.

1. Remove protective caps from shrader valve gauge fittings of suction and discharge lines located on left wheelhouse. See Figure 11-11.

2. Using adapters J-5420, connect charging lines of pressure gauge set and Manifold J-5415 to shrader valves with both valves of manifold closed. See Figure 11-22.

3. Slowly open valves on Manifold and discharge all pressure from system.

CAUTION: Do not open valves too fast as excessive oil will be blown out of system. Place rag over end of discharge service line to prevent oil or liquid refrigerant from spraying on car or person.

b. Adjustments

1. Hot Gas By-Pass Valve Control Adjustment. To adjust the temperature control linkage, set the "Temp" lever on evaporator case in the maximum cooling (extreme right) position. Loosen control wire sheath clamp at hot gas by-pass valve, push valve lever forward beyond normal travel and release slowly. Valve lever will return to maximum cold position. Clamp control wire sheath.

2. Hot Gas By-Pass Valve Suction Pressure Adjustment. In the event it becomes necessary, adjust the hot gas by-pass valve adjusting screw to correct the suction pressure. The following procedure should be used:

(a) Disconnect valve control wire.

(b) Remove valve control lever, counter balance spring and spacer. See Figure 11-24.

(c) Turn adjusting screw with adjuster J-7727.

(d) With engine speed set at 1600 RPM, adjust suction pressure as specified in functional test chart, Figure 11-33. In the case of a rebuilt valve, it may be necessary to add or remove plunger shims to obtain proper adjustment of valve. See Figure 11-24.

IMPORTANT: When adjusting hot-gas by-pass valve, low pressure gauge line must be connected to shrader valve fittings on evaporator case. See Figure 11-15.

3. Outside Air Valve Adjustment. To insure outside air valve will be completely closed when air conditioner is not in operation:

(a) Loosen valve control wire sheath at valve.

(b) Set "Temperature" lever on evaporator case 1/16" from off position.

(c) Completely close outside air valve and clamp control wire sheath.

c. Removal and Installation of Hot Gas By-Pass Valve

1. Discharge refrigerant from system as described in subparagraph a.

2. Disconnect control wire from valve at clamp and lever.

3. Disconnect by-pass pipes from valve.

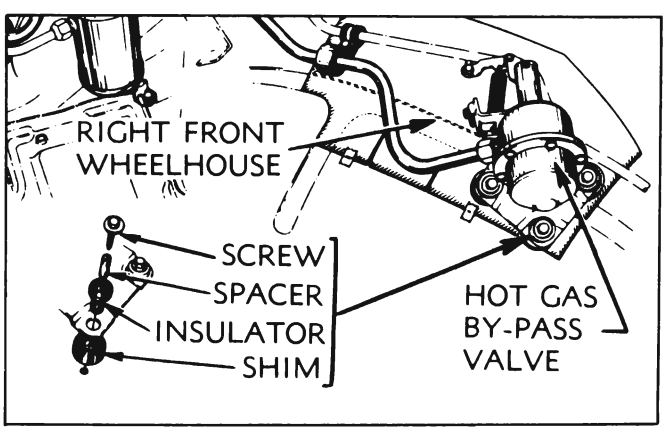


Figure 11-23—Hot Gas By-Pass Valve Installation

4. Remove valve mounting screws, insulators, spacers and shims. Remove valve. See Figure 11-23.

5. Install valve by reversing procedure for removal, paying attention to the following:

(a) Install new O-rings on line fittings.

(b) Adjust hot gas by-pass valve control wire (subpar. b., Step 1).

(c) Evacuate and charge the system. Leak test valve and connections. Correct any leaks.

d. Disassembly and Assembly of Hot Gas By-Pass Valve

If test has indicated the hot gas by-pass valve is defective, the valve may be overhauled using the repair kit available through any Buick parts warehouse under Group 9.212. Use Figure 11-24 as a guide during disassembly and assembly of valve.

1. Remove counter balance spring, lever and spacer from mounting bracket assembly.

2. With a special slotted screwdriver or tool J-7727, remove adjusting screw from mounting bracket.

3. Remove plunger, shim washer (or washers), and adjusting spring from mounting bracket.

4. Mark both mounting bracket and valve body with a center punch to identify assembled position of this bracket on the valve body; this will insure proper location of mounting bracket when reassembling.

5. Remove four attaching screws and lockwashers, mounting bracket, back-up plate and pilot diaphragm.

CAUTION: Due to the strong compressive force of the main valve spring, the cover should be removed with extreme care; remove the six attaching screws and lockwashers.

6. Remove cover, main valve spring, main valve and diaphragm assembly, pilot valve spring and pilot valve.

7. Thoroughly clean valve body in a volatile solvent. Blow all gas passages in valve body dry.

8. Dip valve end of main valve and diaphragm assembly from kit in compressor (or refrigeration) oil far enough to cover "O" ring.

9. Push new pilot valve spring onto head of screw in end of main valve, and place new pilot valve into other end of pilot valve spring.

10. Insert this assembly (main valve and

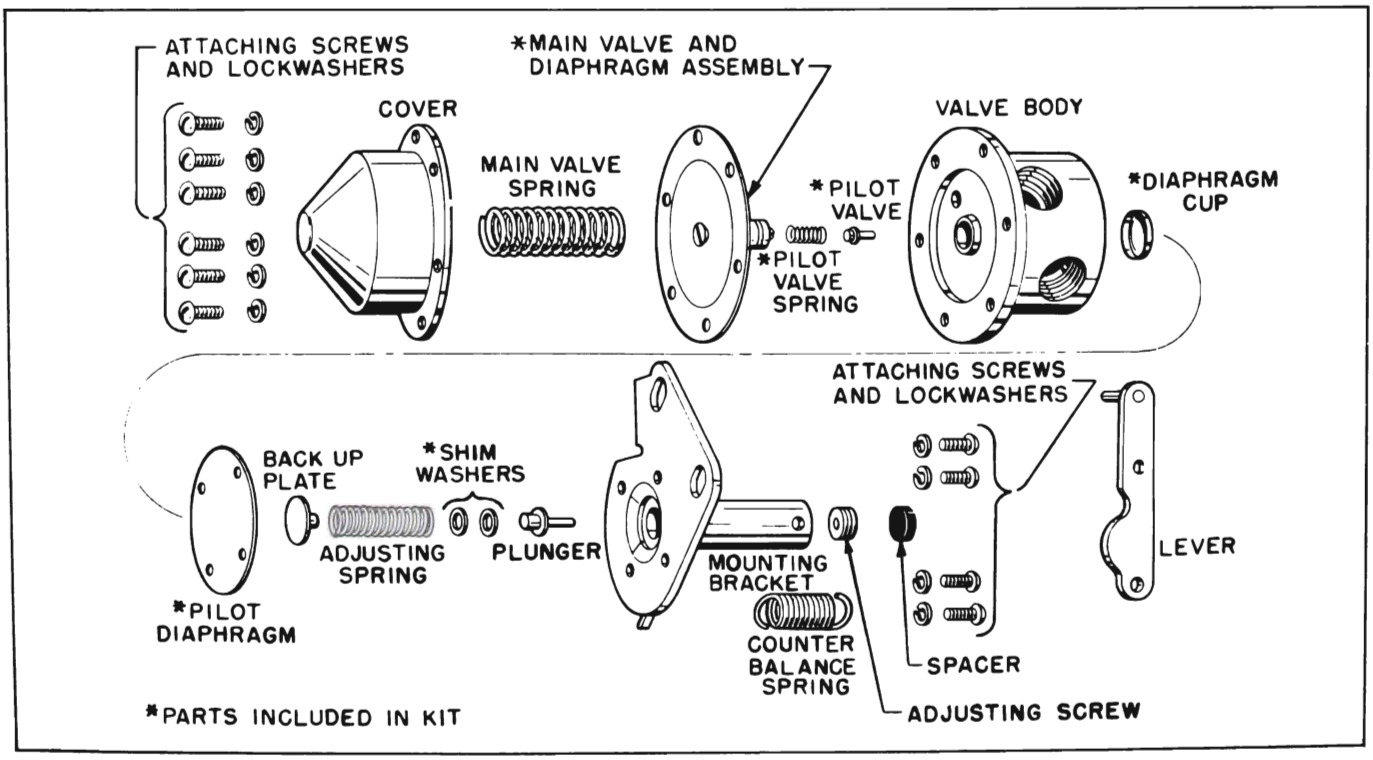


Figure 11-24—Exploded View of Hot Gas By-Pass Valve

diaphragm assembly, pilot valve spring and pilot valve) into the valve body.

CAUTION: Make sure the pilot valve stem enters its seat in the valve body. The pilot valve stem should protrude from the valve body as shown in cross section of valve, Figure 11-17.

11. Place main valve spring on top of main valve and diaphragm assembly and the cover over main valve spring.

12. Align holes in main diaphragm with screw holes in valve body, compress main valve spring with cover, and attach with screws and lockwashers. Tighten screws securely.

13. Place diaphragm cup over end of the pilot valve stem which protrudes from valve body as shown in Figure 11-17.

14. Place new pilot diaphragm over diaphragm cup and align holes in diaphragm with screw holes in bottom of valve body.

15. Place back-up plate next to pilot diaphragm, and place mounting bracket into position by matching up punch marks which identifies the proper position for mounting bracket, and attach with four screws and lockwashers.

16. Place shim washers (see note below) over the large diameter of the plunger and adjusting spring next to the shim washers; insert this assembly into threaded cavity of the mounting bracket.

NOTE: Two size shim washers are included in this package. Use as required to obtain proper range of adjustment. See by-pass valve adjustment, subparagraph (b).

17. Insert and install adjusting screw into threaded cavity in mounting bracket. Do not complete assembly of valve at this time.

18. Install valve as described in subparagraph c, step 5.

19. Adjust valve suction pressure (subparagraph b, step 2).

e. Removal and Installation of Compressor

CAUTION: Observe precautions in handling refrigerant outlined in Buick Air Conditioning Manuals.

1. Discharge refrigerant from system as described in subparagraph a.

2. Disconnect discharge and suction hoses at schrader valves.

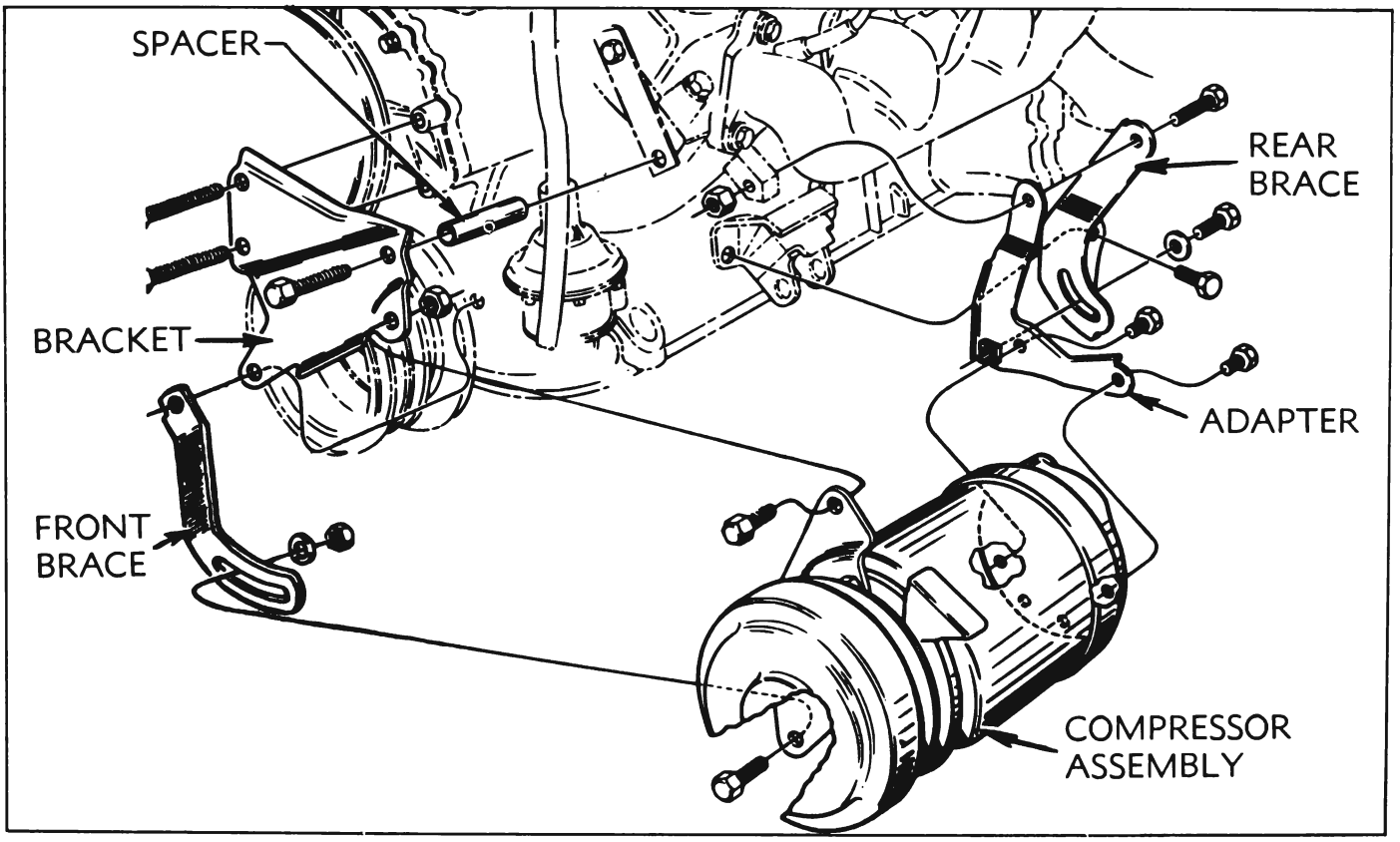


Figure 11-25—Compressor Installation

3. Pull clutch wire out of connector located on wheelhouse.

4. Cover openings in fittings and ends of hoses with tape to exclude dirt.

5. Raise front of car and remove front stabilizer bar assembly.

6. Remove two bolts and nuts that attach front of compressor to front brace and front bracket. See Figures 11-25 and 11-26.

7. Loosen bolt that attaches rear brace to engine mount and remove the bolt and nut that retains rear brace and adapter to cylinder block.

8. Remove bolt that retains adapter to rear brace.

9. Loosen bolt that retains front brace to timing chain cover and push brace as far out of way as possible.

10. Remove belt from pulley and lower compressor out from under car.

NOTE: It may be necessary to remove engine left side filler plate to have sufficient clearance to remove compressor (right side shown in Figure 12-2).

IMPORTANT NOTE: Whenever a compressor replacement is being made the oil in the original compressor should be drained and measured. The new compressor should contain the same amount of new 1000 viscosity oil as was drained from the original compressor. This step is necessary as some of the oil from the original compressor remains in the system. The addition of a complete charge of oil, in addition to the oil remaining in the system, would impair the cooling ability of the unit.

11. If a replacement compressor is being installed, the following parts must be transferred from original compressor onto replacement compressor.

(a) The splash ring mounted around coil seal housing.

(b) The adapter bracket and pipe bracket located on front of compressor.

(c) The discharge and suction hose assembly.

12. Install compressor by reversing pro-

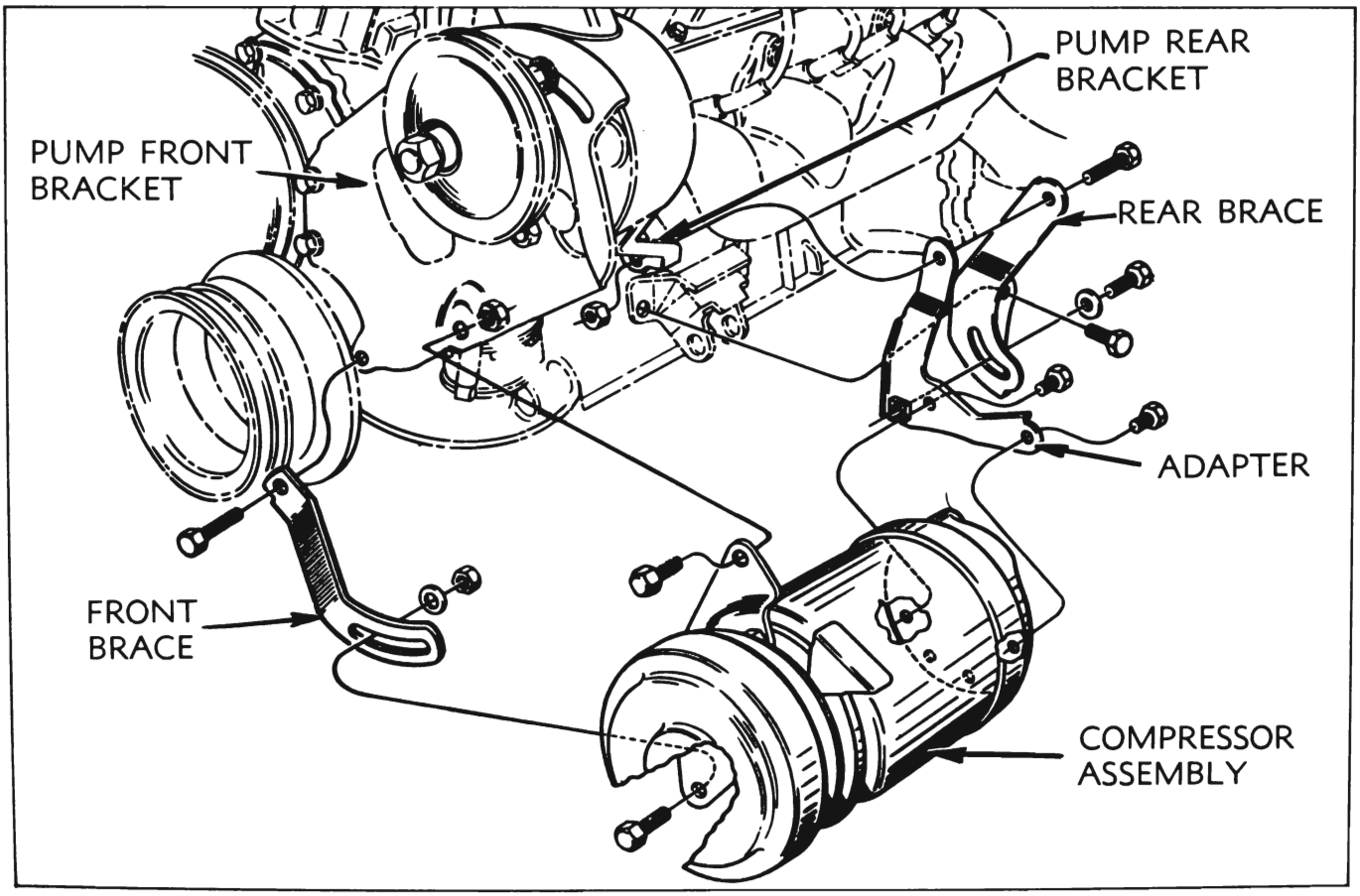


Figure 11-26—Compressor Installation With Power Steering

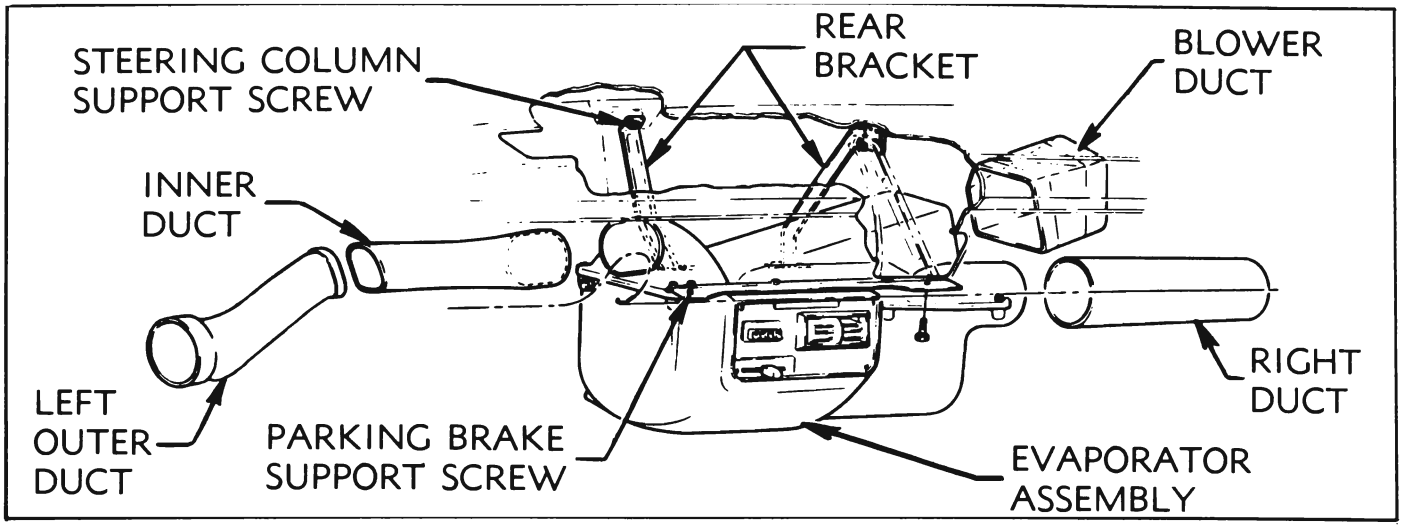


Figure 11-27—Evaporator Assembly Installation

cedure for removal, paying attention to the following:

(a) Inspect drive belt and pulley groove for conditions that might cause slippage. If belt is cracked, frayed, or oil soaked, or is worn so that it bottoms in pulley groove, replace.

(b) Use new O-rings when attaching hoses.

(c) Adjust compressor belt tension. See Figure 2-53.

(d) Evacuate, leak test and charge air conditioner system (par. 11-13).

f. Removal of Evaporator and Air Distribution System Parts

The evaporator assembly may be moved out far enough to service radio without disconnecting refrigerant lines. Blower-compressor switch, center air outlet and temperature lever are accessible by removing bezel on front of evaporator case.

Figures 11-27, 11-28 and 11-29 show installation of evaporator assembly, blower, inlet air duct and side outlet, and are to be used as a guide for removing and installing these parts.

g. Removal and Installation of Compressor Clutch Pulley and Rotor Plate Assembly

Observing all precautions on handling refrigerant, remove compressor as per instruc-

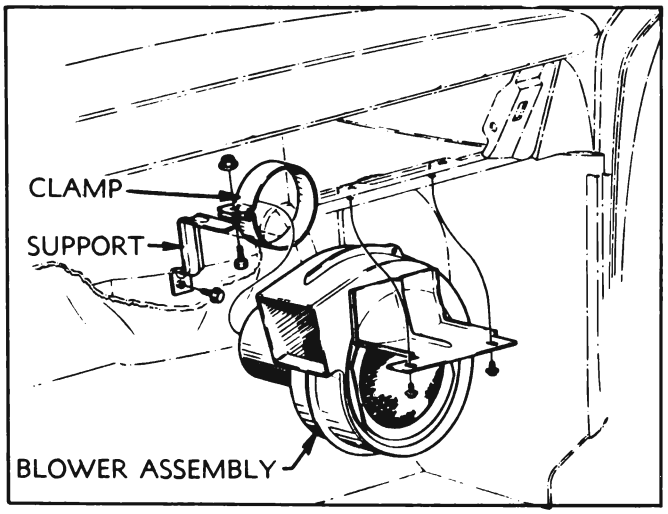


Figure 11-28—Air Conditioner Blower Installation

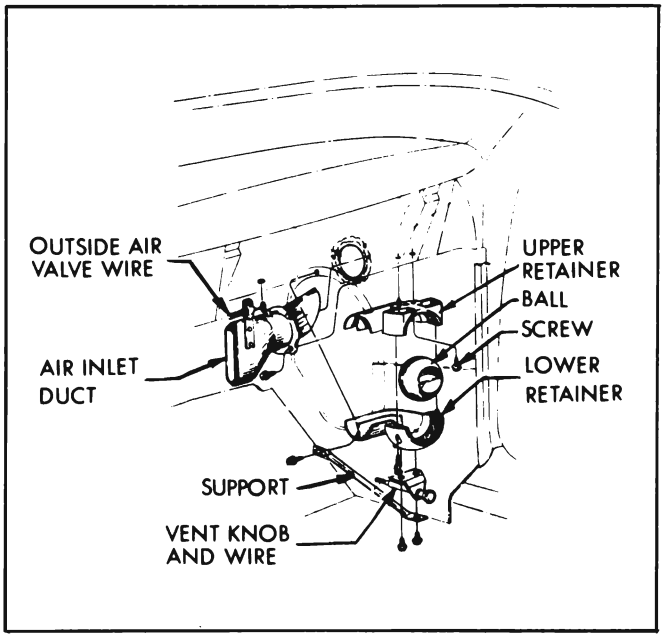


Figure 11-29—Air Inlet Duct and Right Air Outlet Installation

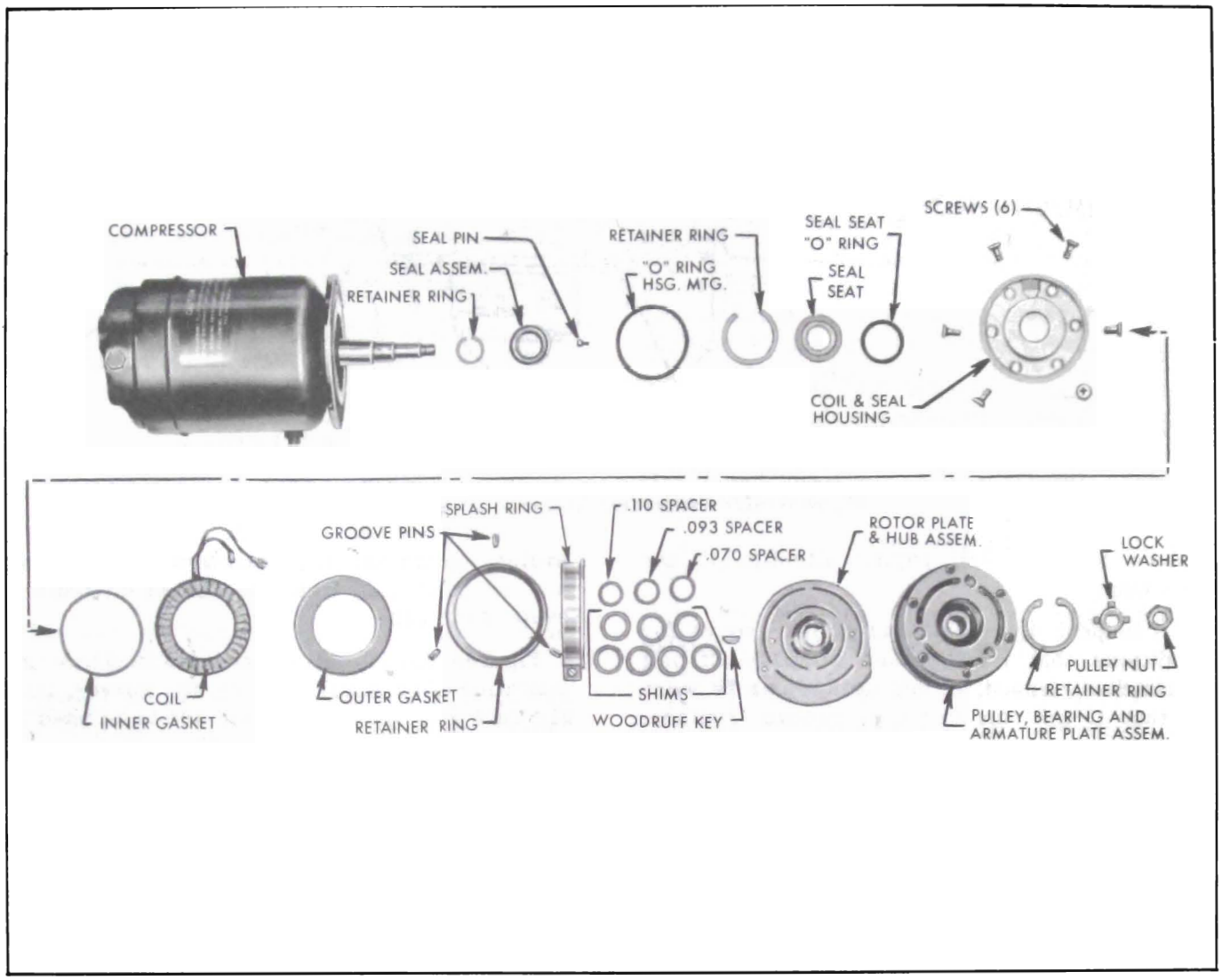


Figure 11-30—Compressor and Clutch Assembly

tions contained in subparagraph e and transfer compressor to work bench.

1. Bend the tangs on the shaft lock washer to clear the flats on the shaft mounting nut. Remove the nut from compressor shaft.

2. Remove the pulley and armature plate assembly with compressor pulley puller J-8433.

NOTE: Provisions have been made for jaws of puller J-8433 in pulley.

3. Remove the rotor plate assembly with clutch plate remover J-6322.

4. To replace the ball bearing, remove the retaining ring, using Truarc pliers #3. Press out the ball bearing from the pulley and replace by pressing in a new bearing. NOTE: It is important upon reassembly to have the beveled side of the snap ring to the outside, or away from the ball bearing.

NOTE: Do not remove spacer or shims on shaft unless other parts are to be removed or a different compressor is to be used.

5. Install rotor plate assembly on shaft using compressor clutch plate and Pulley Installer J-8446.

6. Energize clutch coil with 12 volts DC. Check the air gap between coil housing outer rim and face of rotor plate using non-magnetic Feeler Gauge J 7151-01. Gap should be .025" to .035" with no shaft deflection. Adjust with shims if necessary to obtain correct reading.

7. Assemble armature plate and pulley assembly on to shaft using Installer J-8446 and Free washer J-6323-5.

8. Position lock washer on shaft and install nut. Tighten nut 5 to 7 ft. lbs. torque and bend tangs on lock washer.

h. Removal and Installation of Clutch Coil and Shaft Seal

NOTE: Use Figures 11-13 and 11-30 as a guide.

1. Remove clutch pulley and rotor plate assembly (sub par. g).

2. Remove shims and spacer from shaft. Remove splash ring.

3. Remove the three coil retaining groove pins.

4. Remove coil retainer, outer gasket, coil and inner gasket.

5. Remove the coil and seal housing which is retained to compressor housing by 6 screws. Discard O-ring between housing and compressor.

6. Remove and discard seal assembly.

7. Remove seal retainer ring, seal seat and O-ring from seal and coil housing. Discard O-ring and seal seat.

8. Remove and discard seal pin.

The carbon block face of the shaft seal and the polished metal seal seat in replacement package should be handled very carefully to avoid damage to the fine finishes on their surfaces. When the seal seat retainer ring is replaced, use care not to scratch or mar the polished surface. Even when the seal surfaces are coated with oil, use care not to contact the seal surfaces with any metallic object, such as tip of oil can, rod, screwdriver, etc.

The lint-free tissues included in the replacement unit package should be used for the final cleaning of the shaft, seal cavity and parts. The seal cavity in the coil housing should be flooded with clean, fresh Frigidaire 1000 viscosity oil prior to assembly. This oil should be taken out of the glass container, in which it is supplied. It is the same oil that is used in the compressor. No other oil should be used for this purpose. Coat all "O" rings, seal faces and parts with this oil.

9. Install shaft seal and clutch coil by reversing procedure for removal, paying attention to the following points:

(a) Seal pin is properly installed in shaft.

(b) Seal will not go on pin unless pin is correctly aligned with groove in seal.

(c) All O-rings are installed in correct position.

(d) The compressor seal should now be given a refrigerant-12 leak test after coil-seal housing has been installed to be sure the assembly has been properly made and is leak-tight prior to reassembly on the car.

It is suggested that a bar of metal similar to the service compressor shipping plate be made up for a cover plate over the suction and discharge openings. Drill and tap plate in the area that will cover the suction or low pressure opening for either 1/8" or 1/4" pipe thread and screw in a 1/8" pipe to a 1/4" flare or 1/4" pipe to 1/4" flare fitting and use two O-rings and the plate mounting bolt to seal the opening.

Connect a drum of refrigerant-12 to the fitting with a charging hose or copper line, which will pressurize the interior of the compressor and the compressor shaft seal. Leak test with leak detecting torch, around the shaft seal and large diameter O-ring in the seal housing and the compressor flange.

i. Adding Oil to Compressor and Checking Oil Level

A stud fitting is welded into the compressor shell at the forward end, just behind mounting ring. The fitting is placed 43 degrees to the side of the vertical centerline. It is threaded on the inside to receive a screw that has a hole drilled in the center. Another hole is drilled at right angles to the center hole, and is just under the screw head. A copper gasket is used to seal the head to the stud.

The end of the stud and screw project through the shell and the opening into the screw is at the 4 ounce oil level.

The production compressor was originally charged with 13 ounces of 1000 viscosity Frigidaire oil.

It is not necessary to check compressor oil unless a large amount of oil has been lost. This could happen only with a sudden breaking of a line or some other serious break in system. If a leak has occurred in the system and there is a question to the amount of oil in compressor, first repair and recharge air conditioner, then check oil after system has been operated.

Operate the engine at idle for 10 to 15 minutes with the air conditioning system turned on and the blower operating in High. Stop the engine and compressor.

To check oil, loosen the screw in the oil test fitting and allow a slight seepage of oil to escape. Then retighten the screw for a moment, then "crack" open slightly again. If a steady flow of oil is evident, the oil level is either at the safe minimum level of 4 ounces, or the compressor contains oil in excess of this, and could be a full oil charge up to 13 ounces.

IMPORTANT: A service replacement compressor contains 13 ounces of 1000 viscosity oil. Whenever a compressor replacement is being made the oil in the original compressor should be drained and measured. The new compressor should contain the same amount of new 1000 viscosity oil as was drained from the original compressor. This step is necessary as some of the oil from the original compressor remains in the system The addition of a complete charge of oil, in addition to the oil remaining in the system, would impair the cooling ability of the unit.

When the oil test screw was "cracked" open the second time and there was no oil escaping or a hissing or vapor only was evident, this indicates that the oil is below the safe minimum level and oil should be added to the compressor as per following instructions.

1. Discharge refrigerant from system (subpar. a).

2. Remove compressor assembly (subpar. e).

3. Drain oil out of compressor into clean container. If oil is clean proceed with Step 4; if oil is dirty flush both compressor and condenser with liquid refrigerant until clean.

4. Pour 13 ounces of new 1000 viscosity Frigidaire compressor oil into compressor through oil check fitting.

5. Install compressor.

6. Evacuate and charge system.

7. Perform functional test.

11-13 EVACUATION, LEAK TESTING AND CHARGING AIR CONDITIONER

NOTE: Tool J-8393 Portable Air Conditioner Service Station is a Kent-Moore unit designed specifically for servicing automobile air conditioners. J-8393 provides a means of measuring refrigerant without the use of scales. The unit also makes it possible to charge a system without heating the refrigerant tank. As complete instructions are printed on the control panel of J-8393 and the instructions differ from those used with conventional equipment, only conventional equipment will be considered in this paragraph.

a. Evacuation and Leak Testing of System

1. Attach gauge lines, adapters and vacuum pump set-up as shown in Figure 11-31 and discharge any refrigerant that may be in system.

2. Start the vacuum pump, open both valves on gauge set, then slowly open the shut off valve on the vacuum pump. CAUTION: If valve on the vacuum pump is opened too quickly, oil may be forced out of pump.

3. Operate vacuum pump until at least 28 inches vacuum (at sea level) is registered on the "Low" pressure gauge, then continue to run pump for ten minutes.

NOTE: Allowance should be made for elevation when obtaining a vacuum. A vacuum of 28 inches of mercury at or near sea level is required. For higher levels, the required vacuum may be reduced by 1 inch of mercury for each 1,000 feet of elevation.

4. If a 28 inch vacuum cannot be obtained, close pump shut off valve and stop pump, then open the refrigerant-12 cylinder valve to charge the system at cylinder pressure. After closing the cylinder valve, leak test the complete system including gauge connections and correct any leaks found. Then re-evacuate system.

5. After 28 inches vacuum has been maintained for ten minutes, close the vacuum pump shut-off valve, stop the pump, and charge the system with refrigerant-12 at cylinder pressure.

6. With refrigerant-12 cylinder valve closed, again evacuate the system with pump at 28 inches of vacuum for ten minutes. This charging and second evacuation is for the purpose of removing any air or moisture that may have entered the system.

7. After maintaining the 28 inches of vacuum for ten minutes, close the vacuum pump shut-off valve and stop the pump. The refrigeration system is now ready for charging.

b. Charging the System

1. With the vacuum pump, refrigerant-12

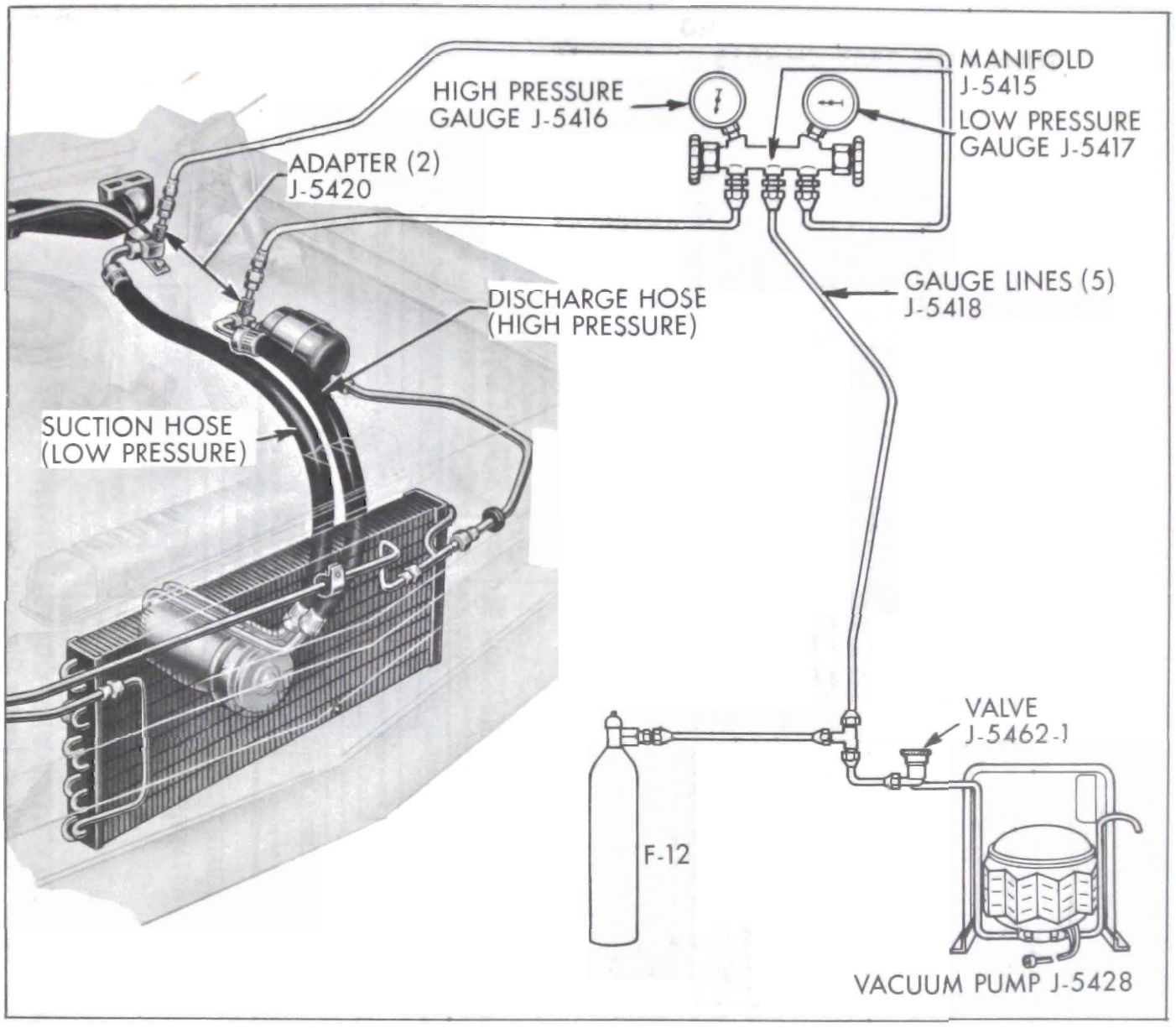


Figure 11-31—Air Conditioner Service Hook-Up

cylinder and gauge set connected to the compressor as shown in Figure 11-31, place the cylinder in a bucket of hot water which does not exceed 125°F.

CAUTION: Never heat refrigerant cylinder above 125°F. as tremendous hydrostatic pressures will develop, capable of rupturing cylinder. When there is a possibility of overheating cylinder, the cylinder must be opened to a suitable pressure relief mechanism at all times.

2. Place cylinder and bucket on a suitable scale and record the total weight.

3. Open the low pressure valve on the gauge set. (High pressure valve on gauge set closed.)

4. Wearing goggles to protect eyes, fully open the refrigerant-12 cylinder valve and allow refrigerant-12 vapor to flow into the refrigerating system.

5. Operate engine and compressor at slow idling speed until a total of 2 3/4 pounds of refrigerant-12 have been charged into the sytem.

NOTE: It may be necessary to reheat the water in bucket to maintain required pressure.

6. Close both valves on gauge set, close valve on refrigerant-12 cylinder, and remove cylinder from bucket of water.

7. Perform functional test. See Figure 11-33.

8. Replace protective caps over shrader valve fittings and tighten securely.

11-14 TROUBLE DIAGNOSIS AND FUNCTION TEST CHARTS

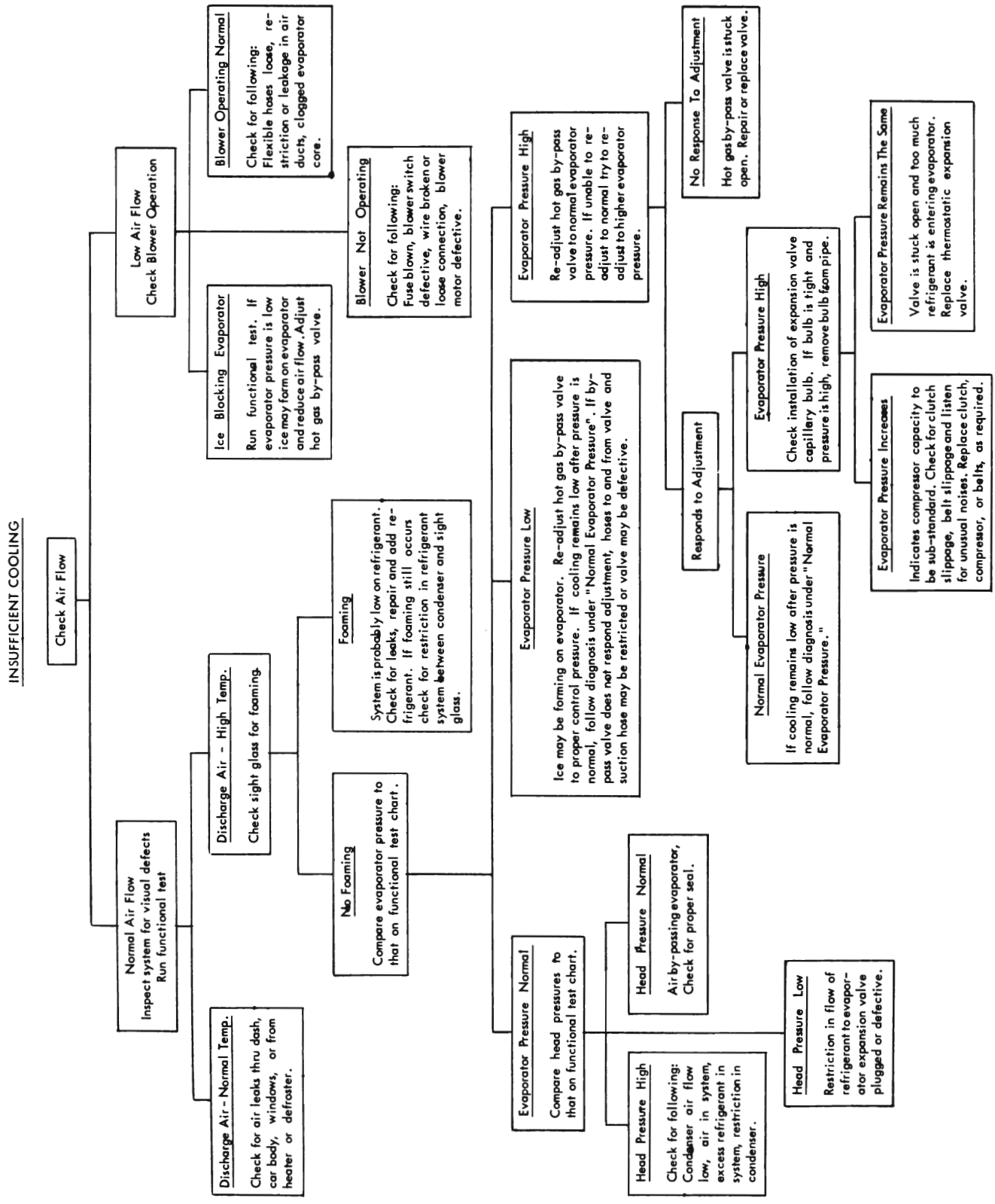


Figure 11-32—Air Conditioner Trouble Diagnosis Chart

FUNCTIONAL TEST FOR AIR CONDITIONER

TEST CONDITIONS:

1. Doors and hood open.
2. Temperature lever maximum cooling position (extreme right) and blower on high.
3. Gage set connected as shown in Figure 11-31.
4. Heater and defroster levers "off".

TEST

Set engine speed at 1600 RPM.

The table below lists ambient temperatures with right air outlet temperatures that can be expected from a normally functioning unit. If right air outlet temperatures are above those shown in table, change gage set low pressure line from suction line fitting to evaporator shrader valve fitting (located at upper left of evaporator case, see figure 11-15) and adjust hot gas valve (Par. 11-12) to table.

CAUTION: Cover end of gauge line with rag when connecting and disconnecting line to evaporator fitting on evaporator case to prevent refrigerant and oil from spraying on inside of car.

Ambient Temperature	Evaporator Suction Pressure PSIG	Compressor Head Pressure PSIG	Right Air Outlet Temp.
70°F.	24.5 - 27	155 - 195	36 - 42°F.
80°F.	25 - 32	210 - 270	38 - 48°F.
90°F.	26 - 40	235 - 310	40 - 54°F.
100°F.	30 - 46	230 - 390	44 - 70°F.
110°F.	35 - 50	325 - 400	52 - 75°F.

NOTE: The lower suction pressure and outlet temperature can be achieved on very dry days and the higher on humid days.

Figure 11-33—Air Conditioner Functional Test Chart

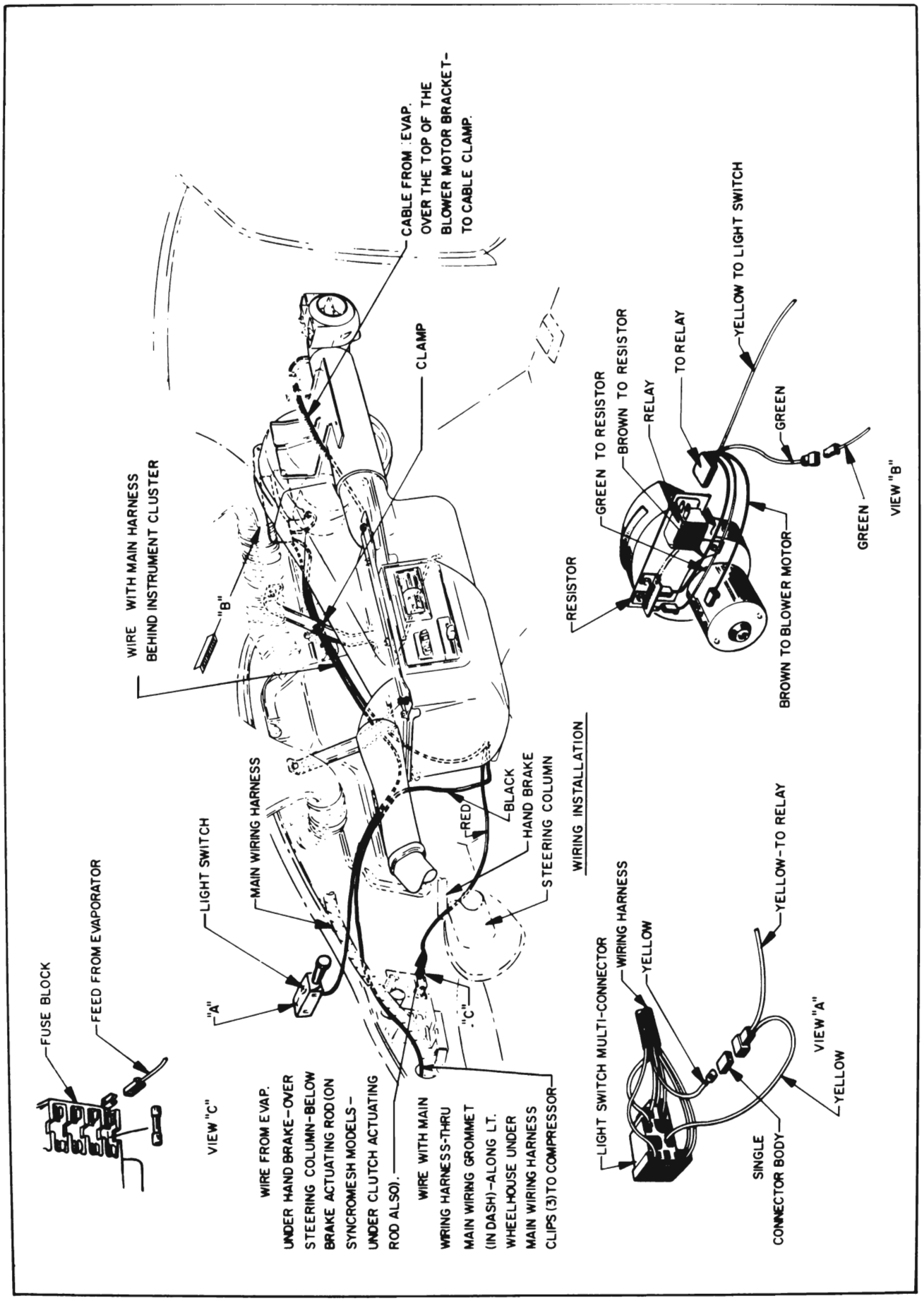
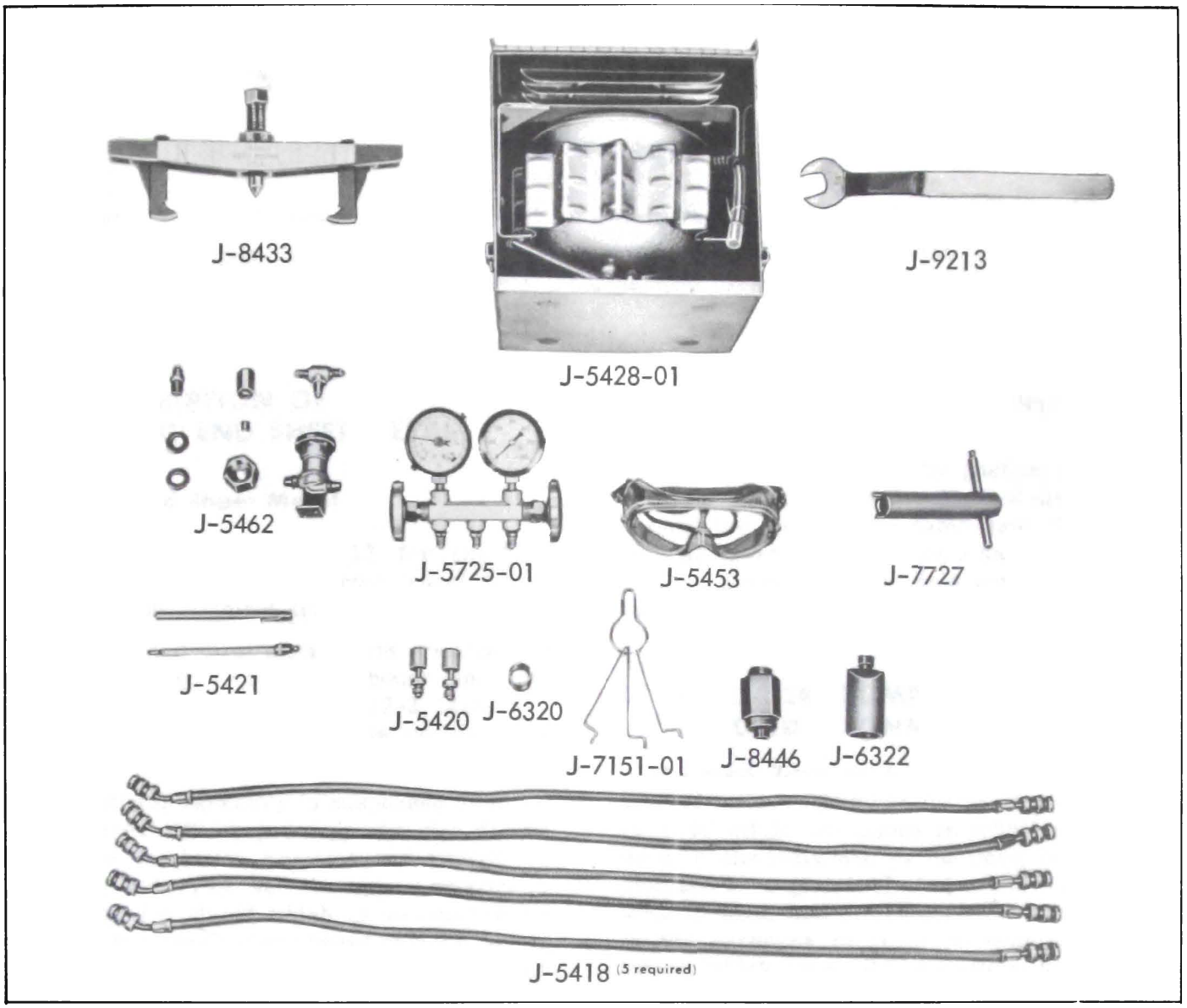


Figure 11-34—Air Conditioner Wiring Installation



AIR CONDITIONER TOOLS

J-5418	Gauge Charging Line (5 Required)
J-5420	Gauge Adapter (2 Required)
J-5421	Pocket Thermometer (0° to 220° F.) (Glass)
J-5428-01	Vacuum Pump in Metal Carrying Case
J-5453	Goggles
J-5462	Gauge Hook-Up Set
J-5725-01	Manifold and Gauge Set
J-6320	Compressor Seal Protector
J-6322	Compressor Clutch Plate Remover
J-7151-01	.025" .035" - .045" Feeler Gauge (Non-Magnetic)
J-7727	Hot Gas By-Pass Valve Adjuster
J-8433	Compressor Pulley Remover
J-8446	Compressor Clutch Plate and Pulley Installer
J-9213	Air Conditioning Bracket Nut Wrench

Figure 11-35—Air Conditioner Special Tools