SECTION 11-B
HEATER, AIR CONDITIONER

CONTENTS OF SECTION 11-B

11-8 HEATER (STANDARD)

a. Heater Installation Description

The heater assembly, which utilizes outside air entirely is optional equipment on all series. The air inlet and blower assembly is mounted on the right front side of the cowl and it directs the incoming air to the heater core located under the right side of the instrument panel. Attached to the heater core and enclosed in the main heater distribution duct is the temperature control valve which regulates the flow of water through the heater core. Incoming water from the thermostat housing flows through the heater core when the temperature control valve is in the "Open" position, and returns to the suction side of the water pump.

All heater air is circulated from the heater core through the main distribution duct. Front seat heating is achieved through slots and openings in the bottom of the main distribution duct. A rear seat heater distribution duct is connected to the main distribution duct and runs down the toe-board and along the transmission tunnel hump to a point just ahead of the front seat where it divides into 2 legs supplying equal heat to each side of the rear floor.

Controls for the heater assembly are housed in the right instrument cluster in the instrument panel.

b. Air Flow

Incoming air enters the cowl through the air scoops forward of the windshield reveal

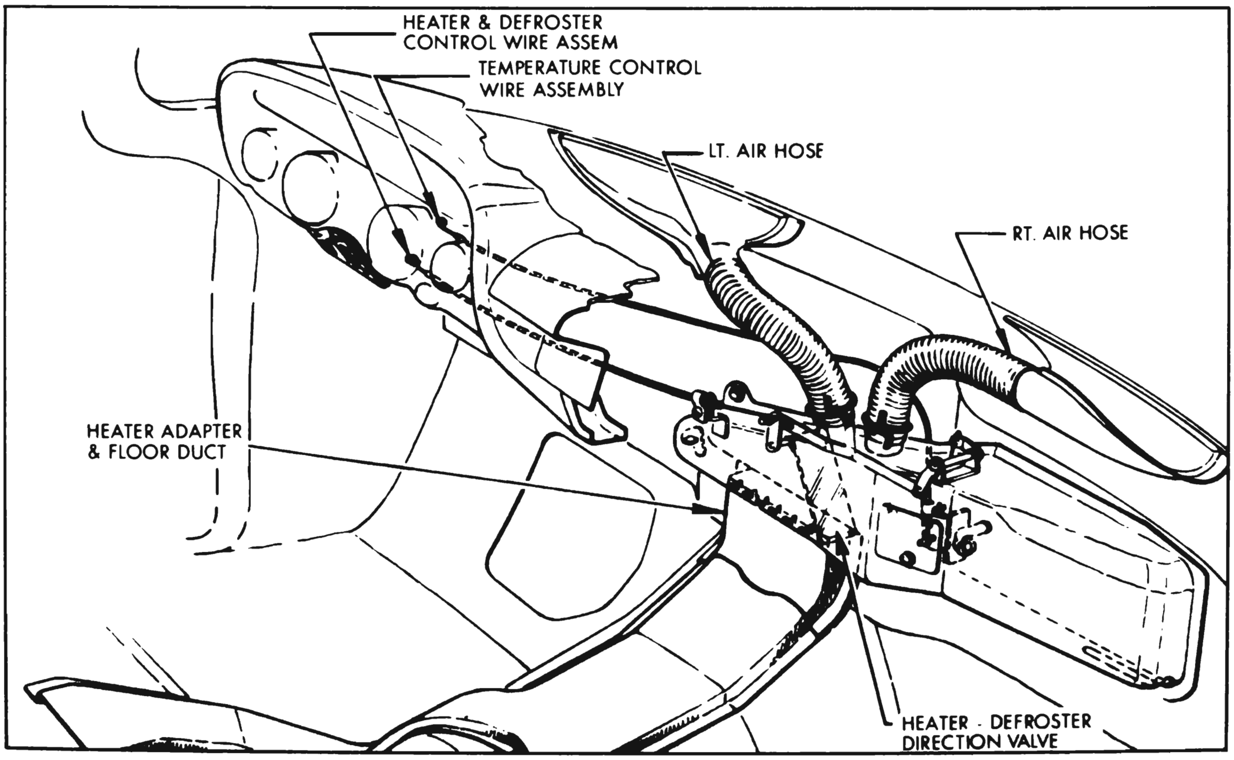


Figure 11-16—Heater—Defroster Air Distribution System

moulding; and flows down into chambers on each side of the cowl. The air is drawn through the blower assembly on right side, and routed into the heater core through a diaphragm operated valve. From the heater core the air flows directly into the main distribution duct.

Slots in the bottom of the duct direct warm air to the center and right side of the front seat and an opening at the left end of the duct directs warm air to the driver's side. Warm air is supplied to the rear seat through the duct which runs down the toe-board and along the transmission hump. Forward of the front seat it is divided forming a "Y" to supply equal heat to each side of the rear compartment.

c. Water Flow and Temperature Control Valve

The hot water flows from the engine water manifold to the lower pipe of the heater core.

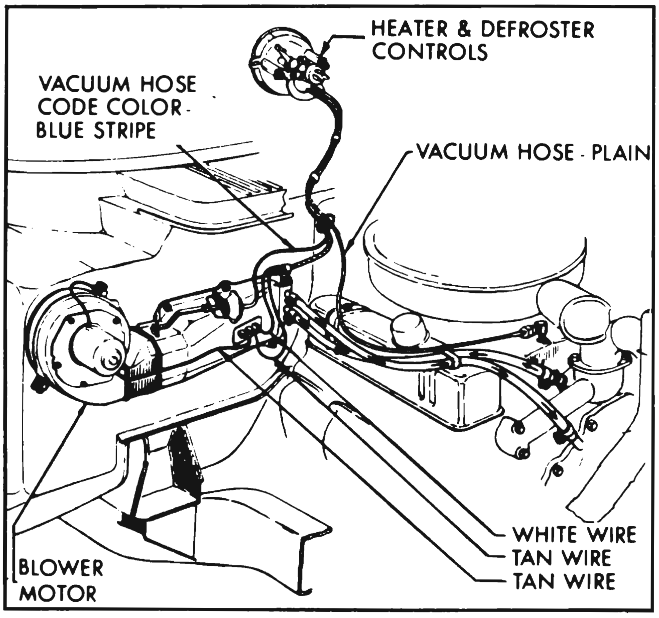


Figure 11-17—Standard Heater Water Flow & Wiring System

The hot water flows through the core and out the upper hose directly to the suction side of the engine water pump. The core is of the "U" flow type. The water enters an inlet tank on the lower half of one end, flows through the core in the lower passages to another tank at the opposite end where the water flow is reversed to allow passage through the upper half of the core to an outlet tank. The lower fitting of the core is part of the temperature control valve which is mounted on the inlet tank of the core.

All water hoses and fittings are ¾" diameter.

The heater temperature control valve controls the temperature of the heater air entering the passenger compartment by regulating the flow of hot water through the heater and defroster core. This flow of hot water is regulated automatically by the signal from a capillary tube stretched across the inner side of the heater-defroster core. See Figure 11-21. As a result, for any selected setting of the heat range control, relatively constant heater air temperature will be maintained at all car speeds.

A "jiggle pin" in the bleed hole of the engine thermostat allows air to escape through the bleed hole when filling the system, but seats, closing off the bleed hole when the water pump creates a small amount of pressure, thereby resulting in more rapid engine water and heater warm-up. A 170° F. thermostat is used as standard equipment on all jobs to provide ample heating capacity particularly under idle conditions.

11-9 DEFROSTER

a. Description

The defrosting system utilizes the same intake and blower assembly, and heater core as that of the heater assembly. The distribution of the warm air from the heater core into the distribution ducts to the windshield is accomplished by a valve within the main distribution duct which permits full heater distribution, defroster-heater distribution, and full defroster distribution. See Figure 11-16.

In addition to the normal full defrosting position, a "De-ice" position is provided for on the instrument panel control which gives maximum temperature and blower speed for optimum output to the windshield on days in which severe fogging or icing has occurred.

The controls for the defroster assembly are in the right instrument panel cluster.

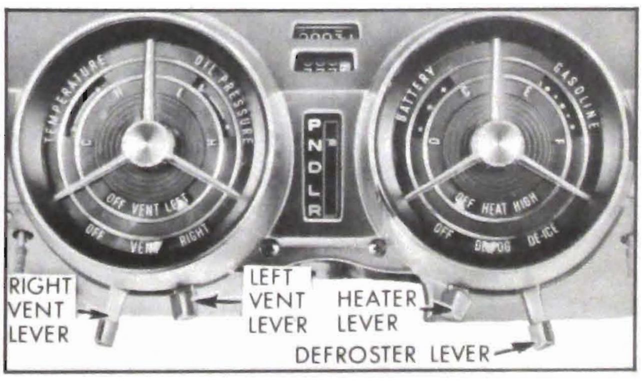


Figure 11-18—Heater Defroster & Ventilation Controls

b. Air Flow

The air flow for the defroster is the same as that of the heater. A valve in the left end of the duct controls the directional flow of warm air. When this valve is raised, warm air will flow through the passenger compartment only. When the valve is in its mid-position, the control lever on the instrument cluster points to the "De-fog" position. In this position defrosting will occur as warm air flows to the windshield ducts and to the passenger compartment. When the valve is completely lowered as occurs when "De-icing" is called for, the windshield defroster ducts receive all but a small amount of the warm air from the heater core.

c. Controls

Two levers, located beneath the right instrument panel cluster, control the operation of the heater and defroster. See Figure 11-18. The upper lever controls the heater, while the lower lever controls the defroster air. Both controls have pointers attached visible through the cluster windows, visually locating various settings. Either or both levers will operate the blower when moved from the "Off" position. As each lever is moved toward its maximum position, the blower speed is increased. Connected to the levers are Bowden wires, vacuum control plates for operating outside air valves and the blower switch.

Movement of the heater lever will do the following: Open the outside air valve (located between the blower and heater air inlet) by channeling engine vacuum through vacuum control plates to a vacuum diaphragm which is in turn attached to the air valve; turn on blower motor; and set heater temperature.

Movement of the defroster lever will do the following: Open the outside air valve (located between the blower and heater air inlet); turn on blower motor; and operate water temperature valve only if it is turned to "De-ice" position.

The position of a control lever determines blower speed from "Off" to low to high corresponding to setting of lever control.

The upper knob controls the temperature of heater air by regulating the water temperature control valve in addition to the previously described functions.

The lower knob will regulate the amount of air to the defroster by positioning the valve in the main distribution duct, that directs air to defroster or the floor outlets. By positioning the defroster lever to extreme right, an over-ride condition called "De-ice" is provided. In this position the blower speed is on high, the defroster valve in the main distribution duct allows maximum air to enter the windshield outlets, and the temperature control valve is repositioned to give maximum heat. When the defroster lever is returned to "Off" or "De-fog," which is the normal partial heater and defroster position, the temperature is once again regulated by the original setting of the temperature control valve.

The addition of automatic heating requires the addition of the equipment as described in the Description and Operation of the Automatic Heater plus a different vacuum valve assembly and blower switch. The vacuum valve assembly contains a control over-ride arm which is inserted into the third slot of the lever guide bracket on the cluster assembly. The blower switch has different contacts for this application.

The purpose of the control over-ride is to obtain blower air to the defroster before the automatic units have been satisfied by temperature requirements as described in par. 11-10. Also, the over-ride will turn the blower on high speed and over-ride the low blower speed if the automatic heat controls call for higher heater temperature.

The control over-ride operates only by movement of the defroster to the "De-ice" position. The water temperature valve over-ride is operated in the "De-ice" position as previously described for all heater jobs. The control over-ride is contacted by the Bowden wire pin as the defroster lever approaches the "De-ice" position and is designed to pivot about the end slot of the lever guide bracket. See Figure 11-19. When this pivot point is reached the movable plate of the vacuum controls is moved beyond its normal position to turn the blower on and open the outside air valve. These functions are accomplished by the blower switch. The automatic controls are also over-ridden by turning the air conditioner controls on.

d. Heater and Defroster Operation (Standard)

When either control lever is moved from the "Off" position, an air valve, located between the blower and the heater core, is opened and the blower is turned on low speed. This is accomplished by vacuum supplied from the intake manifold through a tube to the back of the instrument panel cluster. Attached to the back of the instrument panel cluster is a vacuum valve assembly which is made of 2 plates joined together in such a way that rotation of the one plate is permitted. The control wire levers actuate the rear plate while the inlet tube from the intake manifold is attached to the front plate. As the levers are repositioned the rear plate of the cluster rotates and, in doing so, passages in the face of the rear plate are connected to the vacuum supply.

The vacuum is then routed through the passages to the diaphragm by means of another vacuum hose. The vacuum operated diaphragm on the heater has no intermediate setting, it is either fully opened or completely closed. The diaphragm is vacuum applied, and spring released. Attached to the rear of the vacuum valve assembly just above the vacuum inlet and outlet tubes, is the blower switch assembly. An arm on the blower switch assembly slides in a hole in a protruding tang of the rear plate. Then as the rear plate rotates the blower speed is changed. The temperature control valve will also be moved to a hotter setting as the lever is moved farther. When the defroster knob is moved from the "Off" position, the valve which can direct air to the defroster or to the heater floor ducts is opened by a Bowden wire and, if the heater lever is in the "Off" position, the vacuum controlled air valve is opened and the blower is turned on low. As the lever is moved to the "De-ice" position, the blower is turned on high, and maximum available heat is obtained, regardless of the setting of the heater lever. Tempered air for defrosting can only be procured when the heater lever has been moved from the "Off" position.

11-10 AUTOMATIC HEATER

a. Description

The heater temperature control valve has two diaphragms and a bellows to which is connected three capillary tubes instead of one each as used in the standard heater. This valve allows "sensing" of temperatures of incoming air, air discharged from the heater core and temperature within the car interior. Thus, much greater control can be accomplished by this valve.

The use of this valve allows the heater to anticipate heat requirements. When the car is cold, it also allows the heater to put out all the heat it can, rather than regulating it merely to the setting of the temperature control valve. This allows faster warm-up of the car interior without the driver's having to make a series of adjustment changes. It also allows the temperature control to be left in a single desired position for the majority of all weather and

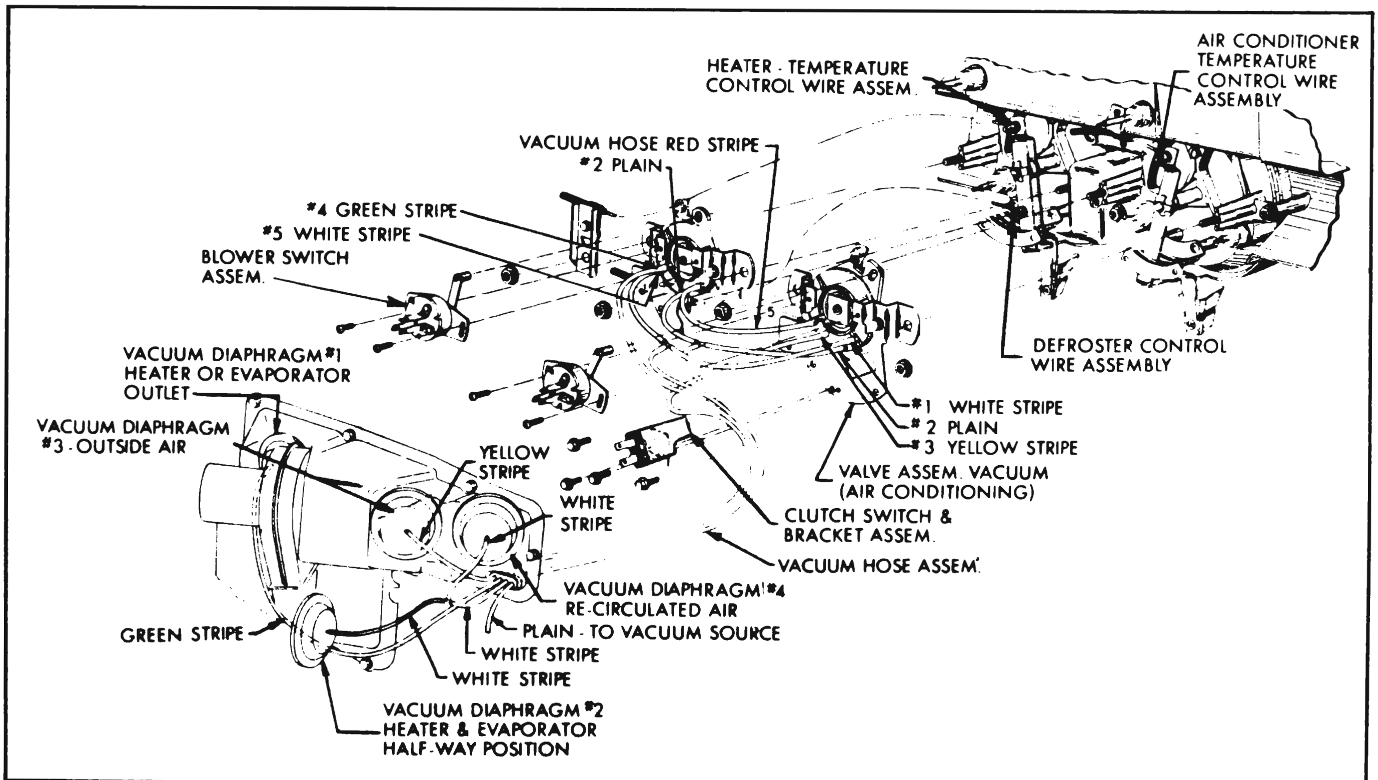


Figure 11-19—Heater & Air Conditioning Control System

driving conditions.

In addition to the temperature control valve, there is also a water temperature control thermo switch which automatically turns the blower on when the engine water is hot enough to supply heat. This switch is located in the heater hose leading to the temperature control valve.

b. Operation

When starting a cold car with the heater lever in any position except off (and the defroster lever anywhere except "De-ice") the heater blower will not turn on immediately. When the water temperature reaches a predetermined point the outside air valve will open and the blower will turn on low speed. Then when a higher water temperature is reached, the blower will turn on high speed.

This is accomplished by a temperature control thermo switch which is connected in the inlet water hose to the heater core. The hot water in the hose from the water manifold circulates around the plastic enclosed thermo switches. See Figure 11-20.

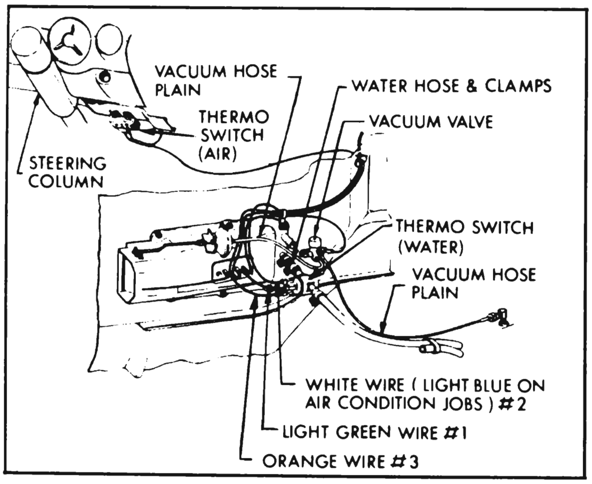


Figure 11-20—Automatic Heater Control System

When the water temperature reaches approximately 100° F., the 1st thermo switch closes by moving against the center contact to which the hot lead is connected. This completes the circuit to the heater blower motor, through the blower resistor putting the blower on "low." It also energizes the solenoid valve in the vacuum line to the outside air inlet valve diaphragm, and the solenoid valve opens allowing the engine vacuum to open the air valve which allows air to flow through the heater system.

The vacuum solenoid valve is mounted on the engine compartment side of the dash panel assembly.

When the heater inlet water temperature reaches approximately 120° F. the second thermo switch closes against the center contact. A direct circuit is completed to the blower motor and the motor goes on high speed.

When the car interior reaches approximately 73° F., the direct circuit to the blower motor is broken by an air thermo switch under the instrument panel resulting again in low blower speed.

Three capillary tubes connected to the temperature control valve accomplish uniform temperature control. The inlet air capillary tube

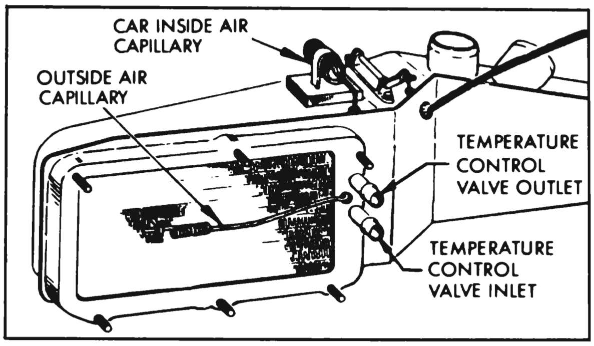


Figure 11-21—Automatic Heater Core and Temperature Control Valve

on the front face of the heater core compensates for the temperature of the incoming air and provides for higher discharge air temperature on colder days. The discharge air capillary tube on the inside core face prevents cycling of the discharge air temperature and provides a uniform delivery setting regardless of any reduction in engine water pump delivery. The car inside air capillary tube is mounted on the top of the heater main distribution duct and is separated from the duct by insulation. This capillary senses the car interior temperature and cuts back the discharge air temperature as the passenger compartment warms up.

Temperature level is adjustable to the individual operator's desire through setting of the heater lever, just as in the standard heater. Once the control is set at a comfortable level, it should not be necessary to readjust it because of the compensating effect of the 3 capillary tubes.

In the "De-ice" position, the automatic controls are overridden and the blower is turned on high speed, the defroster valve is fully opened, and the temperature control valve is set on full, regardless of water or air temperature.

11-11 HEATER (AIR CONDITIONED JOBS)

a. Description

The heating system on air conditioner equipped cars is similar to the standard unit, except that a larger housing is used having two valves opened and closed by 4 vacuum operated diaphragms. These valves—outside-recirculating air valve and the heater-evaporator air valve direct the incoming air into the blower and into either the evaporator housing or the heater core.

The air flow on the air conditioned equipped cars is the same once the warmed air enters the distribution duct, but because of a different housing and cowl assembly the lead-in of air is different. Air conditioner equipped cars use the same water flow as standard heater jobs. The two vent control levers on the left instrument panel control board are combined into one to control the temperature setting for cooling air.

b. Air Flow

A different cowl is used on air conditioner equipped cars to combine the flow of recirculating air used in air conditioning with the outside air from the intake grille which the heater uses.

The incoming outside air enters the car forward of the windshield reveal moulding, and flows into the cowl assembly. It then flows through an opening between the cowl and the

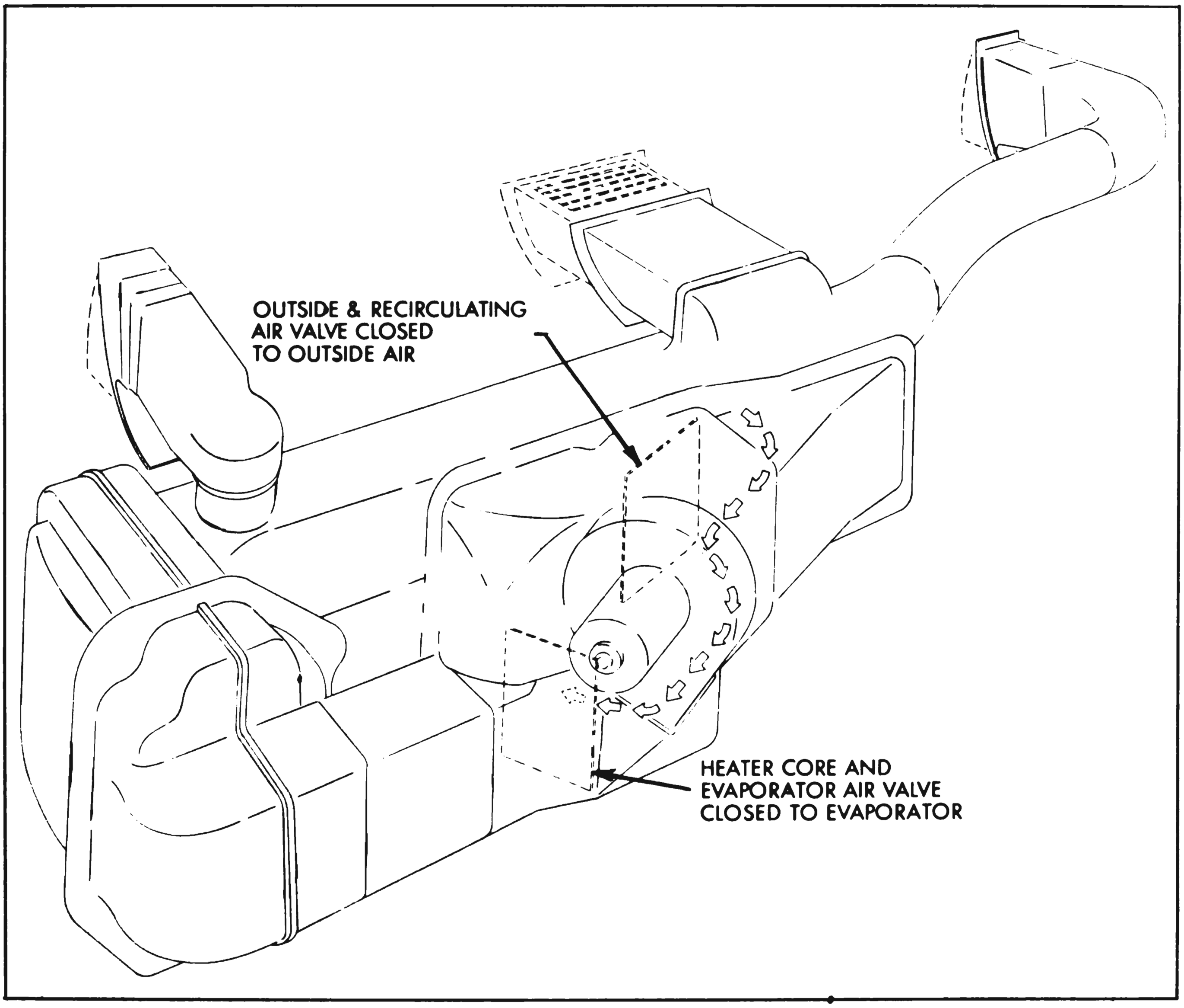


Figure 11-22—Air Valves in Released Positions

upper right side of the blower and air valve housing. From the inlet air chamber of the cowl, the air flows through the cowl and blower assembly. From the blower assembly the air is routed downward and out into the heater core through an opening in the lower right side of the housing. Once the heated air enters the main distribution duct, the air flow becomes the same as that of the heater.

c. Controls

The vent control cluster is replaced by one containing air conditioning components. This cluster is similar to the right cluster except it has only one lever. This lever is moved from the off position toward the cool position to turn on the air conditioner. See Figure 11-23.

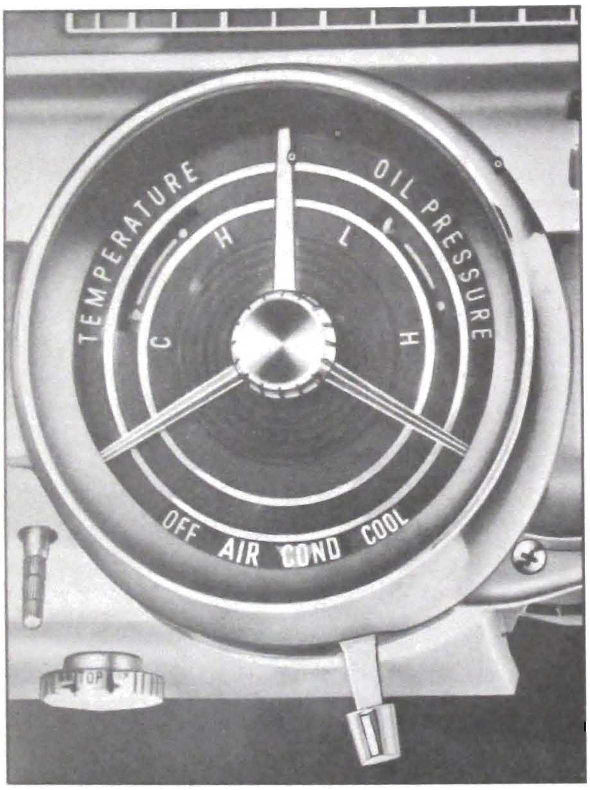


Figure 11-23—Air Conditioner Controls

The lever controls the engagement of the compressor clutch, blower speed, the vacuum valve and the hot gas by-pass valve.

On cars equipped with air conditioner and heater, the vacuum valve controls four diaphragms which are located on the housing assembly. See Figure 11-24. These diaphragms are connected to two air valves. These valves are the outside-recirculated and the heater-evaporator. Two diaphragms are used in operating each air valve to provide three valve positions. Figure 11-25 is a schematic of these valves with both air conditioner and heater in the "Off" position.

d. Diaphragm Operation

Four vacuum operated diaphragms are used to open the two valves on air conditioner and heater equipped cars. See Figure 11-24. These diaphragms are bolted to the outside of the blower and valve housing and they work in pairs. One diaphragm in each pair acts directly upon each valve so that when vacuum moves the diaphragm, the wire connected to it moves the valve the same distance. The other diaphragm in each pair controls only the intermediate position holding the valve ¼ or ½ open through a linkage arrangement. The two diaphragms which operate the outside and recirculating air valve are the number 3 and 4 diaphragms. The number 4 diaphragm is the ¼ open outside and recirculating air valve diaphragm, which opens the valve through the linkage arrangement, and the number 3 diaphragm is the full open outside and recirculating air valve diaphragm which works directly. The other two diaphragms are the No. 1, which is the full open heater and evaporator valve diaphragm that works directly, and the No. 2, which holds the valve in the intermediate position. The number 2 diaphragm is the half open heater core and evaporator air valve diaphragm. Each of these valves operate in three positions —open, intermediate and closed. The vacuum diaphragms operate the valve in the "open" and

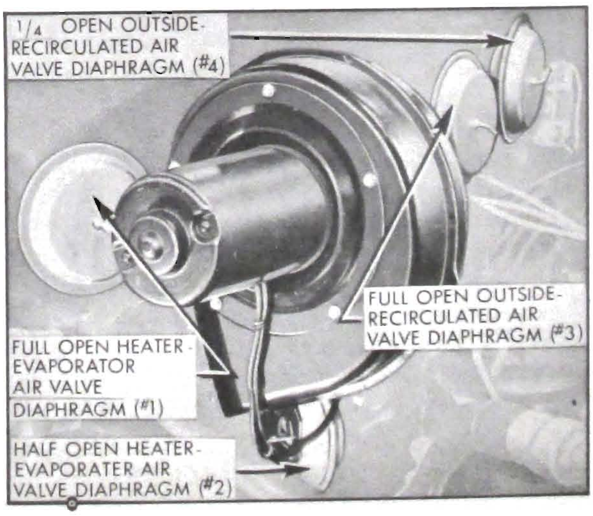


Figure 11-24—Functions of the Vacuum Controlled Diaphragms

"intermediate" positions, while spring pressure holds the valve closed. After each operation the vacuum diaphragms are vented back through the vacuum control plates of the vacuum valve assembly.

e. Vacuum Source

The vacuum source is located at the front of the intake manifold. At this point the source tube to the back of the instrument cluster is pushed onto the tapered port of a fitting which screws into a 90° elbow (for cars not equipped with power brakes) or into a tee (for cars having power brakes) which opens into the intake manifold. To prevent air valve fluttering in the housing, a check valve is used in the fitting which holds the vacuum in the diaphragms and in the lines when the engine vacuum drops, as when climbing a steep grade.

f. Operation

When operating the air conditioner, the movement of the control lever away from the "Off" position energizes the compressor clutch, turns the blower on low speed, and operates the hot gas by-pass valve. It also opens the outside-recirculated air valve by means of diaphragm No. 3. See Figure 11-27. As the lever is moved farther from the off position, the hot gas by-pass valve is set for greater cooling.

When the control lever is moved fully to the right (cool position) the blower is turned on high speed and the outside-recirculated air valve is moved to the ¼ open position by means of diaphragm No. 4. See Figure 11-24. This allows (approximately 25%) outside air and (approximately 75%) recirculated air to enter the blower, thus maximum cooling will occur. See Figure 11-28.

The cars equipped with heater and air conditioner use four diaphragms. Two of these diaphragms operate the heater-evaporator air valve, which is located between the heater core and the evaporator. (The other two diaphragms operate the outside-recirculated air valve). When heat and no cooling is desired, the spring pressure holds the heater-evaporator air valve in position so as to allow air to flow only to the heater core. No air will be directed to the evaporator with the valve in this position.

With the air conditioner on and heater off, diaphragm No. 1 moves the air valve so as to shut off air to the heater and allow all air to flow to the evaporator.

With the automatic heater controls, operation is the same as described except that heat cannot be obtained until the water temperature is high enough to activate the water control switch. The "De-ice" position on defroster control lever will override the automatic heater controls as previously described.

The automatic heater and air conditioner are separately controlled units, therefore the automatic controls do not affect the operation of the air conditioner. Although for standard operation of the air conditioner, the heater controls should be turned off. When de-humidification is needed, the heater controls may be turned on. When air conditioner is on and either heater or defroster is on, the heater-evaporator air valve will be positioned by diaphragm No. 2 to allow approximately half of the blower air to be directed to the car heater assembly and the other half to the evaporator. See Figure 11-29.

11-12 OUTSIDE AIR VENTILATION (NON AIR CONDITIONED JOBS)

a. Description

Ventilation outlets in each cowl kick pad provide for outside air circulation directly to the passenger compartment. The controls for the vents are located in the left instrument cluster.

b. Air Flow

For outside air ventilation, the air flow is directed from the air scoops forward of the windshield to the chambers on the sides of the cowl. From here the air enters the car through the inlets on the kick pads. Incoming air can be directed at the inlets to provide maximum passenger comfort.

Water drawn through the air intake scoops is separated from the air stream in the cowl side chambers by baffles and by centrifugal force which throws the water toward the outer wall and allows drainage at the bottom of the chamber.

c. Controls

The left cluster contains the ventilation controls. See Figure 11-18. The cluster is similar to the right cluster except that the 2 knobs connected to the levers, upper and lower, control left and right vents. On air conditioner equipped cars, the 2 knobs are combined into 1. This single knob controls the temperature setting for cooling air. See Figure 11-23.

d. Operation

Vent operation is controlled by the control wire assemblies running from the left instrument panel cluster to the vents in the kick pads. The ends of the control assemblies slip over the ends of the control levers and are held in place by spring grip washers. The control wire sheath is clamped to the speedo drum housing 1/8" from the edge of the clamp allowing the control wire to be run to the control lever. The levers are then moved to 1/16" from the full "Off" position, and the wires are then routed to the respective vents through the vent housings and the wire loop placed over the vent door pin. The vent door is then closed by hand and the control wire sheath clamped.

11-13 OPERATION OF AIR VALVES (See Figures 11-25-30)

Air Conditioner and Heater Off

When both the heater and air conditioner controls are off, the heater-evaporator and the outside-recirculated air valves are held in their respective closed positions by spring tension. Outside air will be closed off and the blower will not be operating. By the position of the valves, no air will be circulated through either of them. See Figure 11-25.

Air Conditioner Off, Heater On

With the heater controls on, the heater-evaporator air valve remains in its natural position (being fully open to heater core) and the outside-recirculated air valve will fully open bringing in all outside air, which will circulate into the heater core. See Figure 11-26.

Air Conditioner Normal, Heater Off

With the air conditioner controls turned to normal, the outside recirculated air valve will be fully open allowing 100% outside air for normal cooling. Under this condition, the heater-evaporator air valve will fully open allowing all air to be directed into the evaporator. See Figure 11-27.

Air Conditioning Maximum, Heater Off

The heater-evaporator air valve will remain fully open to the evaporator and closed to the heater core with the air conditioning controls on maximum. The outside-recirculated air valve will be 1/4 open. This will allow approximately 25% outside air and 75% recirculated air to mix and be directed to the evaporator. See Figure 11-28.

Air Conditioning Normal, Heater On

With both controls on, the heater-evaporator air valve will half open allowing air to be directed to both the evaporator and the heater core. For normal cooling position the outside recirculated air valve will fully open allowing all outside air to be distributed to the evaporator and heater core. See Figure 11-29.

Air Conditioning Maximum, Heater On

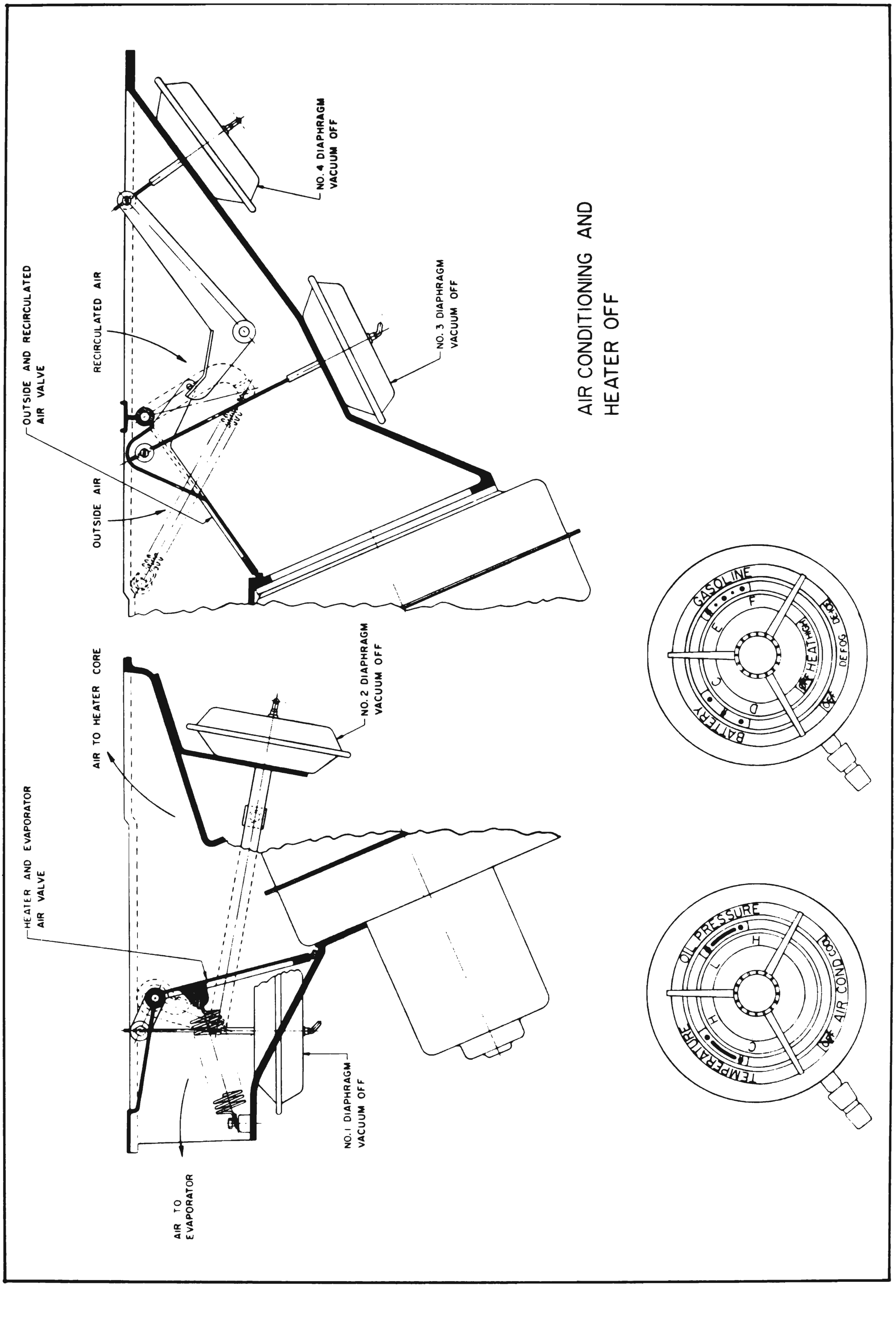
With the heater on and the air conditioner turned on to maximum, the outside-recirculated air valve will be 1/4 open allowing 25% outside and 75% recirculated air to be distributed through the heater-evaporator air valve to both the evaporator and the heater core. See Figure 11-30.

11-14 VACUUM VALVE AND DIAPHRAGM TROUBLE DIAGNOSIS

b. As an aid to diagnosis, listed below are the positions of the control levers and which diaphragms are in operation for each position when both heater and air conditioner are installed.

Heater	Air Conditioner	Diaphragms Applied
Off	Off	None
On	Off	#3
Off	On (Norm.)	#3, #1
Off	On (Max.)	#4, #1
On	On (Norm.)	#3, #2
On	On (Max.)	#4, #2

NOTE: *Although applied diaphragms are diaphragms actually holding air valves in proper positions, vacuum may also be present to one or two other diaphragms. For example: When #3 diaphragm (*full *open cowl and recirculated air valve) is shown as applied, vacuum is also present at #4 diaphragm (*half *open cowl and recirculated air valve). This in no way affects operation of #3 diaphragm. Likewise, when #1 diaphragm (*full *open heater and evaporator valve) is applied, vacuum is also present at #2 diaphragm (*half *open heater and evaporator valve). As the full open diaphragm overrides the half open diaphragm, vacuum applied to #2 has no effect on #1 diaphragm. On normal cooling with no heater operation, vacuum is applied to all four diaphragms. However, only #1 and #3 diaphragms (full open) are holding the valves in their proper positions.*


NO.4 DIAPHRAGM
VACUUM OFF
OUTSIDE AND RECIRCULATED
AIR VALVE
RECIRCULATED AIR
NO.3 DIAPHRAGM
VACUUM OFF
OUTSIDE AIR
AIR CONDITIONING AND
HEATER OFF
AIR TO HEATER CORE
NO.2 DIAPHRAGM
VACUUM OFF
HEATER AND EVAPORATOR
AIR VALVE
NO.1 DIAPHRAGM
VACUUM OFF
AIR TO
EVAPORATOR
GASOLINE
E
F
HEAT
DEFOG
BATTERY
OIL PRESSURE
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TEMPERATURE
C
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AIR COND

Figure 11-25

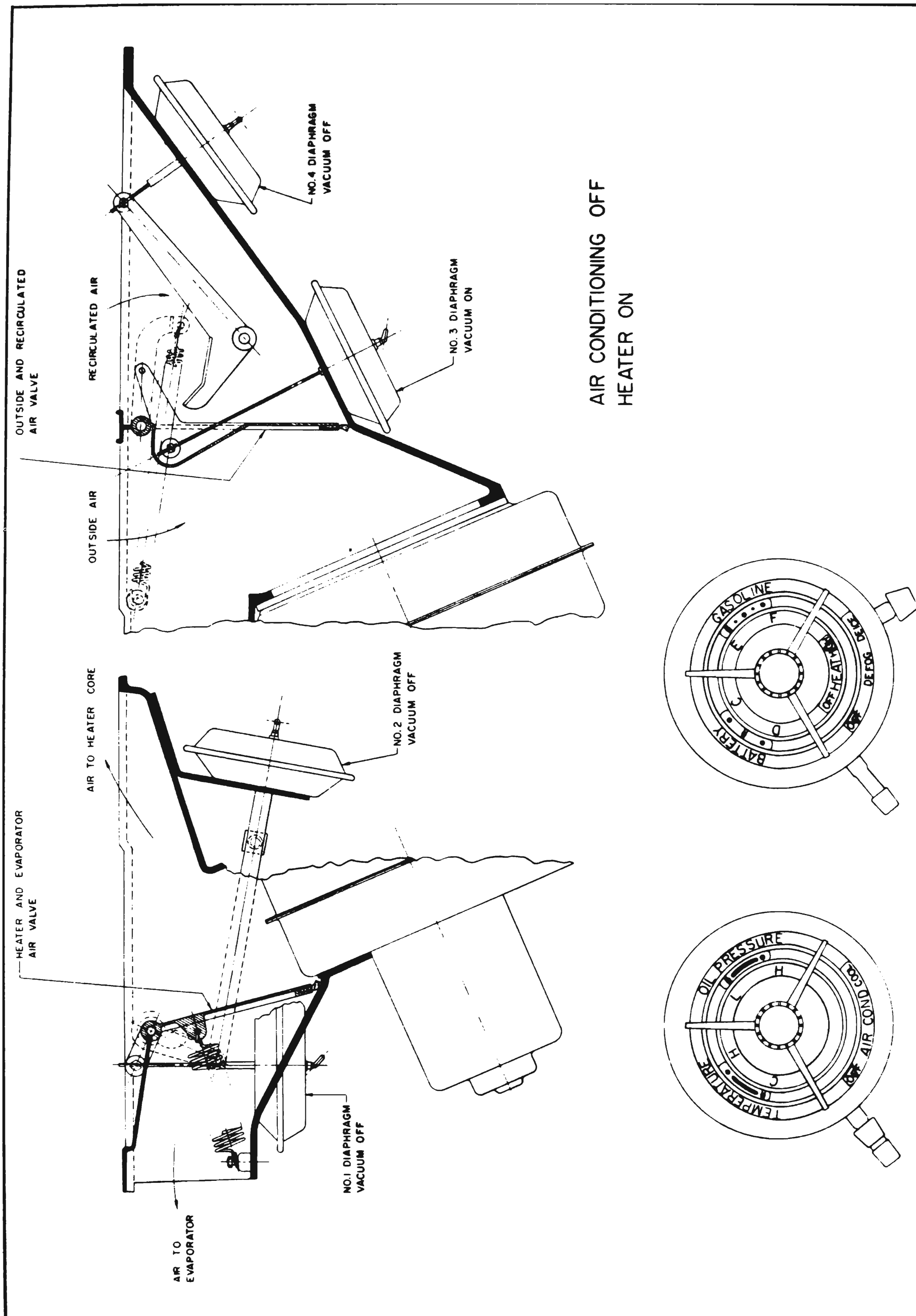
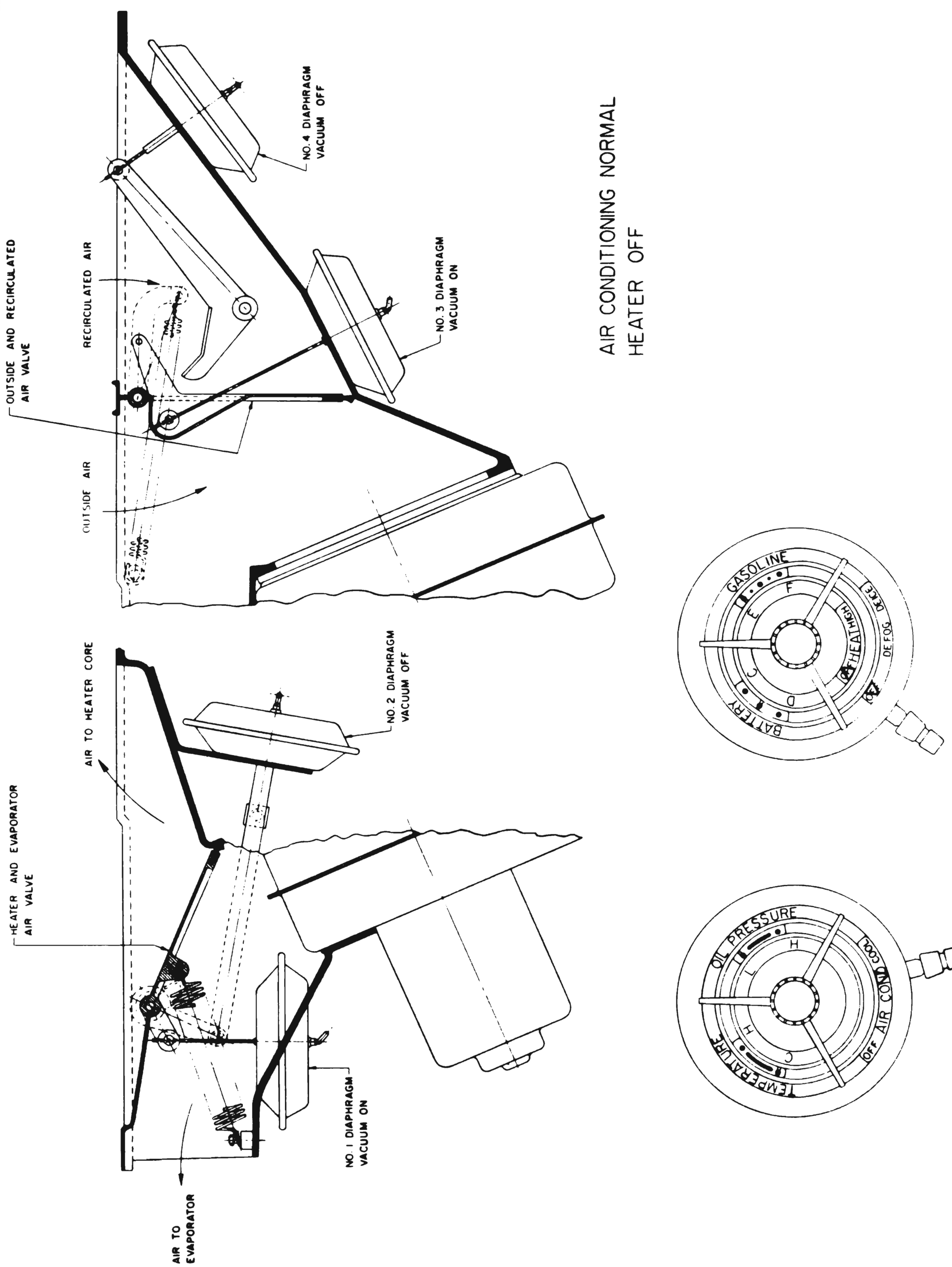

AIR CONDITIONING OFF
HEATER ON
NO.4 DIAPHRAGM
VACUUM OFF
NO.3 DIAPHRAGM
VACUUM ON
OUTSIDE AND RECIRCULATED
AIR VALVE
RECIRCULATED AIR
OUTSIDE AIR
AIR TO HEATER CORE
NO.2 DIAPHRAGM
VACUUM OFF
HEATER AND EVAPORATOR
AIR VALVE
NO.1 DIAPHRAGM
VACUUM OFF
AIR TO
EVAPORATOR
GASOLINE
BATTERY
OFF HEAT
DEFOG
OIL PRESSURE
TEMPERATURE
AIR COND

Figure 11-26


AIR CONDITIONING NORMAL
HEATER OFF
NO.4 DIAPHRAGM VACUUM OFF
NO.3 DIAPHRAGM VACUUM ON
OUTSIDE AND RECIRCULATED AIR VALVE
RECIRCULATED AIR
OUTSIDE AIR
NO.2 DIAPHRAGM VACUUM OFF
AIR TO HEATER CORE
HEATER AND EVAPORATOR AIR VALVE
NO.1 DIAPHRAGM VACUUM ON
AIR TO EVAPORATOR
GASOLINE
E
F
BATTERY
C
D
HEAT
HIGH
DEFOG
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OFF

Figure 11-27

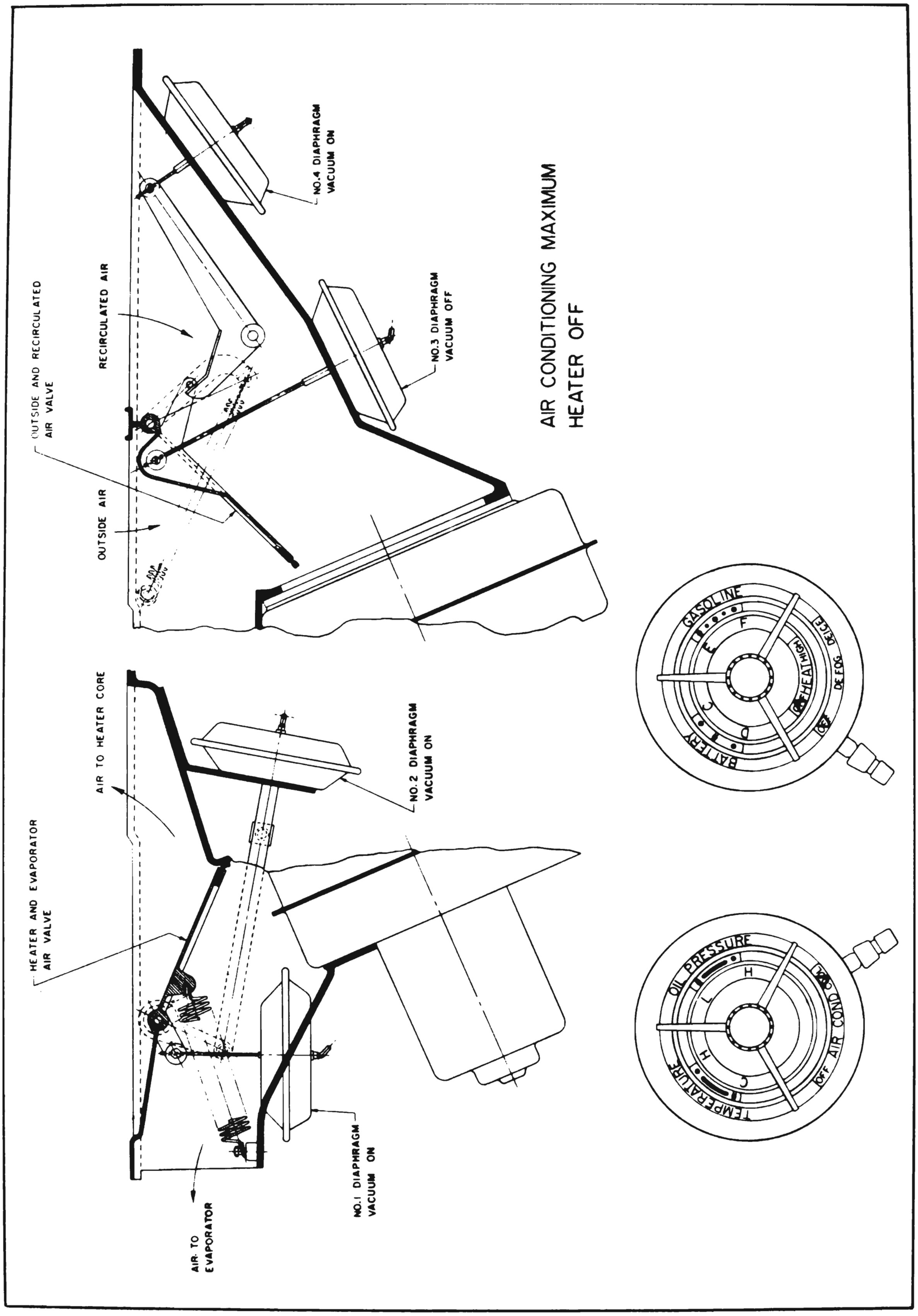
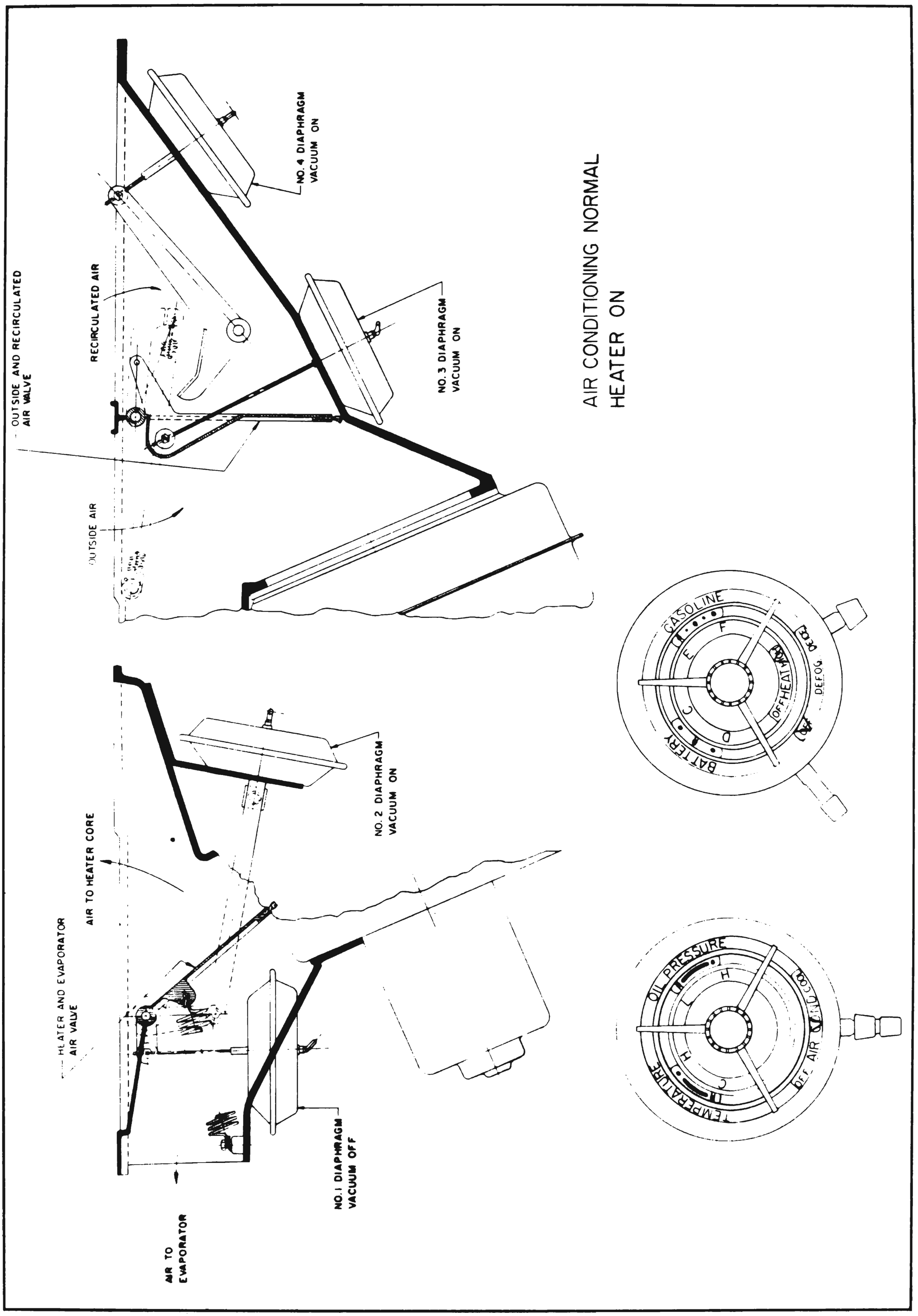

NO.4 DIAPHRAGM
VACUUM ON
OUTSIDE AND RECIRCULATED
AIR VALVE
RECIRCULATED AIR
NO.3 DIAPHRAGM
VACUUM OFF
OUTSIDE AIR
AIR CONDITIONING MAXIMUM
HEATER OFF
AIR TO HEATER CORE
HEATER AND EVAPORATOR
AIR VALVE
NO.2 DIAPHRAGM
VACUUM ON
NO.1 DIAPHRAGM
VACUUM ON
AIR TO
EVAPORATOR
GASOLINE
E
F
BATTERY
C
D
HEAT
HIGH
DE FOG
DE-ICE
OFF
OIL PRESSURE
L
H
TEMPERATURE
C
H
AIR COND
OFF

Figure 11-28


AIR CONDITIONING NORMAL
HEATER ON
NO.4 DIAPHRAGM VACUUM ON
NO.3 DIAPHRAGM VACUUM ON
OUTSIDE AND RECIRCULATED AIR VALVE
RECIRCULATED AIR
OUTSIDE AIR
NO. 2 DIAPHRAGM VACUUM ON
AIR TO HEATER CORE
HEATER AND EVAPORATOR AIR VALVE
NO.1 DIAPHRAGM VACUUM OFF
AIR TO EVAPORATOR
GASOLINE
E
F
BATTERY
C
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HEAT
DEFOG
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OIL PRESSURE
TEMPERATURE
H
C
OFF
AIR
COOL

Figure 11-29

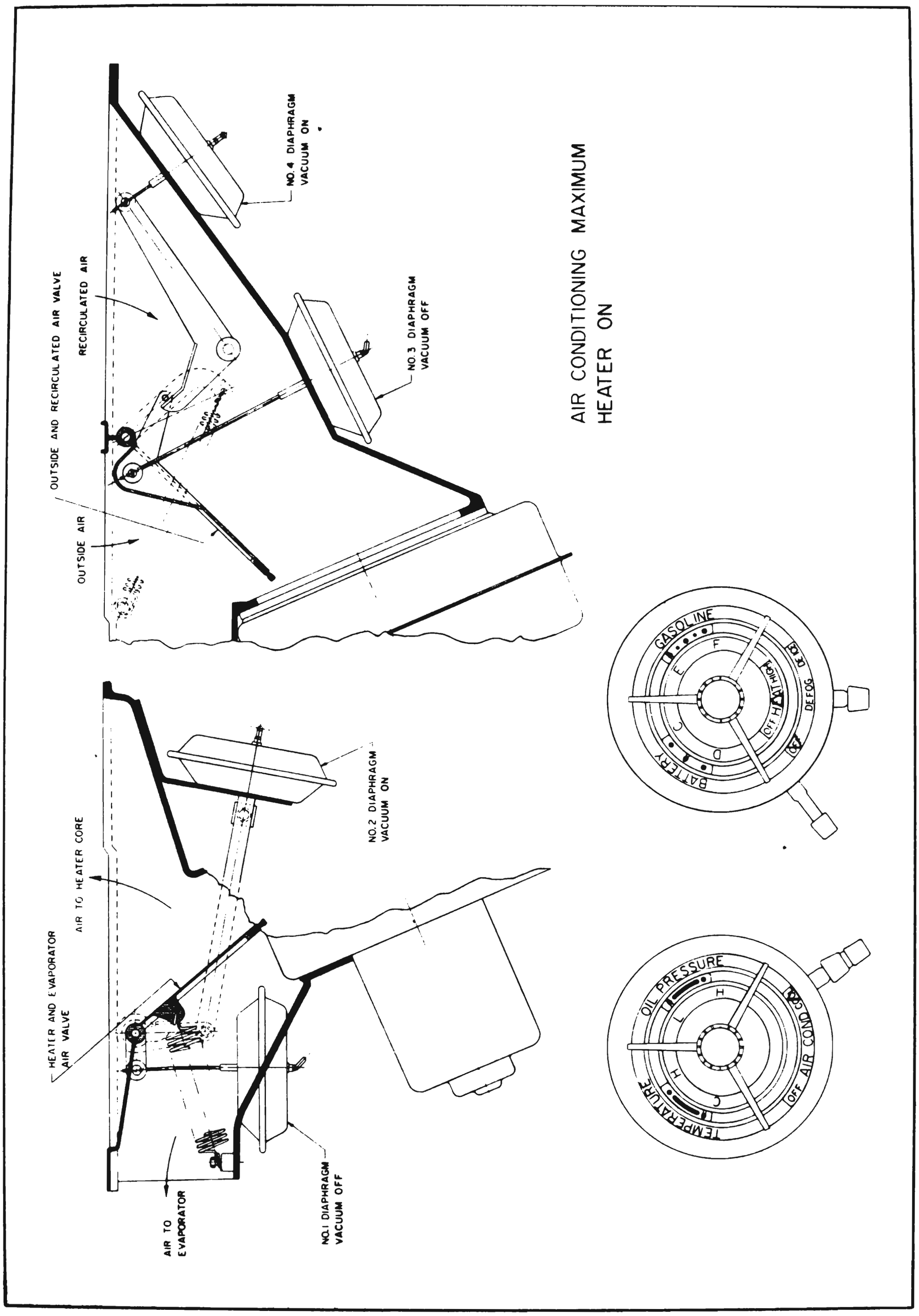

NO.4 DIAPHRAGM
VACUUM ON
AIR CONDITIONING MAXIMUM
HEATER ON
OUTSIDE AND RECIRCULATED AIR VALVE
RECIRCULATED AIR
NO.3 DIAPHRAGM
VACUUM OFF
OUTSIDE AIR
NO.2 DIAPHRAGM
VACUUM ON
AIR TO HEATER CORE
HEATER AND EVAPORATOR
AIR VALVE
AIR TO
EVAPORATOR
NO.1 DIAPHRAGM
VACUUM OFF
GASOLINE
BATTERY
DEFOG
OIL PRESSURE
TEMPERATURE
AIR COND

Figure 11-30

b. Listed below are possible troubles along with possible causes for each condition:

1. Heater will not turn on (no air).

(a) Blower turns on

No vacuum to diaphragm #3
Diaphragm defective
Diaphragm connected wrong

(b) Blower will not turn on

Blower fuse blown or blower motor burned out
Blower switch inoperative

(c) Blower turns on "Hi" speed only (No "Lo" speed)

Resistor defective
Resistor wires disconnected

2. Heater will not supply warm or hot air (with air flow)

Temperature control valve defective
Temperature control valve Bowden wire improperly adjusted

3. Air conditioner will not supply cooling (no air)

(a) Blower turns on

No vacuum to diaphragm #1
No vacuum to diaphragm #3 (norm. setting)
No vacuum to diaphragm #4 (max. setting)
Diaphragm defective

(b) Blower will not turn on

Blower fuse blown or blower burned out
Blower switch inoperative

4. Air conditioner does not supply maximum cooling

Hot gas by-pass valve not properly adjusted
Compressor clutch slipping
No vacuum to diaphragm #4 but #3 diaphragm in operation
Diaphragm defective
Blower switch does not switch to "Hi" speed—defective switch or switch adjustment

5. Cooled air blows out of heater outlets and not out of air conditioner outlets with air conditioning on and heater off

No vacuum to diaphragm #2
Defective diaphragm

6. Valves appear to open at wrong lever positions

Vacuum valves defective
Vacuum hoses improperly installed (See Figures 11-19 and 11-20 for proper assembly)

11-15 REPLACEMENT AND/OR ADJUSTMENT OF DIAPHRAGMS, HEATER CORE, AND TEMPERATURE CONTROL VALVE

a. Replacement of Diaphragms

On cars equipped with heater only, the air valve diaphragm may be replaced by working from the engine compartment.

On air conditioner and heater equipped jobs, the half open position heater evaporator air valve diaphragm #2 may be changed from the engine compartment.

The other three diaphragms (#1, #3 and #4) can only be changed when the blower housing is removed from the cowl. The diaphragms may then be disconnected from the valve operating levers and the nuts removed from the mounting screws. Assembly may be accomplished by reversing the procedure.

b. Removal of Heater Core and Heater Temperature Control Valve

1. Disconnect heater inlet and outlet water hoses.

2. Remove nuts on front of dash retaining air inlet assembly and car heater assembly to dash.

3. Remove cover plate on rear face of car heater assembly and disconnect control cable to temperature control valve. NOTE: *Do not disconnect control cable to de-ice override lever. Also, disconnect control wire to defroster valve lever at top of case.*

4. Remove connector between floor duct and heater assembly.

5. Remove screw at left end of car heater assembly and pull assembly away from dash. (Take care not to spill coolant out of core onto carpet.)

6. Remove right end of heater case by removing sheet metal screws on flange of assembly. (It is advisable to have assembly on bench to prevent spillage of engine coolant on front carpet.)

7. Remove 4 sheet metal retaining screws located under flange gasket holding core and valve assembly to car heater assembly mount-

ing plate. At this point the heater temperature control valve may be removed from core.

8. For installation – reverse process. Make certain that "O" ring seal between valve flange and core mounting seat is in place to prevent coolant leakage. Pressure check core and valve assembly prior to installation.

c. Temperature Control Valve Wire Adjustment

The temperature control valve is operated by a lever through a sheathed operating wire. To insure full range of temperature control, the valve must act as the stop at both ends of lever travel. Since the operating wire is of fixed length with loops at each end, full range of operation is obtained by clamping the operating wire sheath in proper location on the control lever support and the temperature control valve assembly as follows:

1. Connect operating wire to control lever and clamp end of sheath approximately 1/8" from edge of clamp on lever support. Move lever to 1/16" of extreme "OFF" position.

2. Turn temperature control valve all the way clockwise until the cam locks against the roller. This is the extreme "OFF" position. Connect operating wire to brass post on valve and clamp the sheath to valve assembly.

3. Operate the control lever through full range to make certain that the valve provides the stop at both ends.

NOTE: *To keep out offensive traffic odors and exhaust gases when traveling in conjested traffic or when parked behind a car having its engine running, all ventilator and defroster valves must be closed.*

11-16 AIR CONDITIONER

The Buick Air Conditioner is dash mounted with all the components located in or ahead of the dash. The compressor is mounted over the right cylinder head and is connected to the evaporator and condenser by flexible synthetic rubber hoses. The condenser and receiver-dehydrator are mounted forward of the radiator core with the receiver-dehydrator mounted vertically to the right of the condenser. The evaporator is mounted at the extreme right end of the dash panel beneath the fender. The blower and air valve housing is mounted on the dash panel to the rear of the right cylinder head. See Figure 11-31.

The blower and air valve housing is mounted forward of the dash panel in such a manner that the car can be equipped with a heater or not, without affecting the air conditioner operation. The air conditioner uses an air distribution system entirely separate from the heater and defroster. If the car is equipped with a heater and defroster, however, the same blower and blower housing is used to force air through the air conditioner ducts or the heater ducts or both systems simultaneously. Air conditioner air distribution system is shown in Figure 11-32.

Locations of the various units of the air conditioner and their connecting hoses are shown in Figure 11-31. Figure 11-59 shows the electrical circuit which is separate from other chassis wiring. Figures 11-60 and 61 are wiring diagrams for air conditioner and standard heater or automatic heater.

Any service work that requires breaking a pipe connection should be performed only by qualified service personnel who have attended either Buick or other automotive air conditioner training schools. Whenever a hose is disconnected from any unit, refrigerant will escape unless the proper precautions are used. Any work involving the handling of refrigerants require special equipment and a knowledge of its proper use.

a. Description of Components

1. *Compressor and Clutch.* The axial piston type compressor is mounted on the right-front of the engine, over the generator. The compressor to engine speed ratio is approximately 1.25 to 1.

The oil checking fitting is a fitting similar to a brake bleeding screw.

The main shaft seal seat is located ahead of the seal body. The clutch hub is retained to the main shaft by a woodruff key and a press fit. The pulley bearing is also a press fit to the shaft and is retained in the pulley by a snap ring. See Figure 11-33.

The compressor clutch is actuated by an electro-magnetic coil housed between the clutch and pulley assembly and the compressor housing. Two dry disk clutch plates, separated by three nylon balls, are used. Each plate has a flat ring of frictional material bonded to its

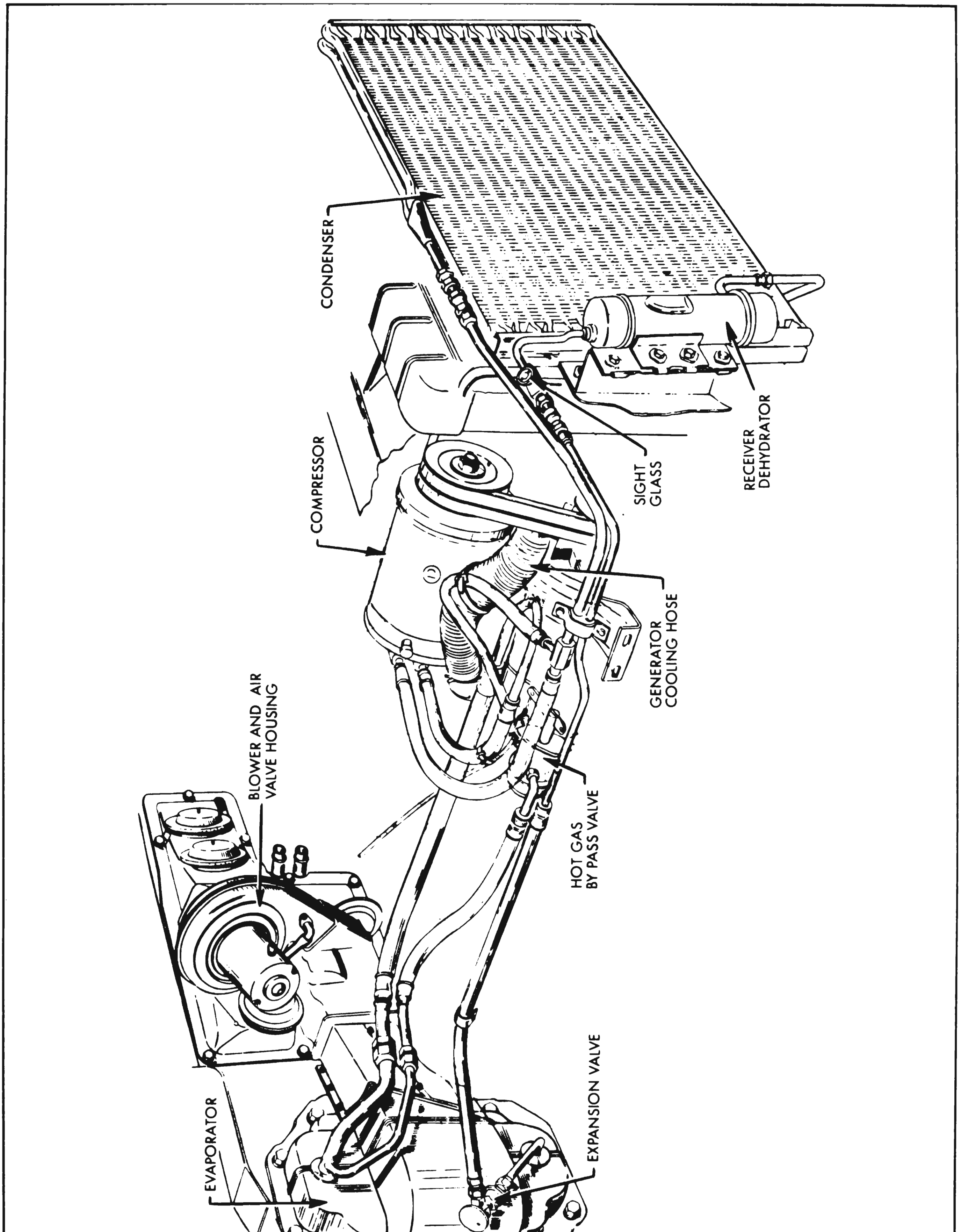


Figure 11-31—Air Conditioner Installation

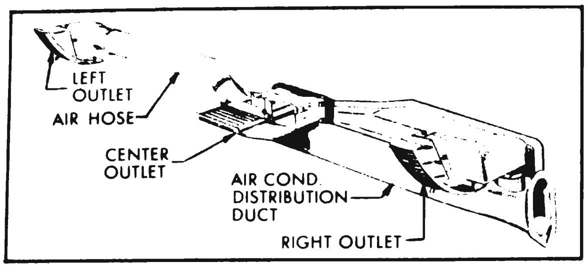


Figure 11-32—Air Conditioner Air Distribution System

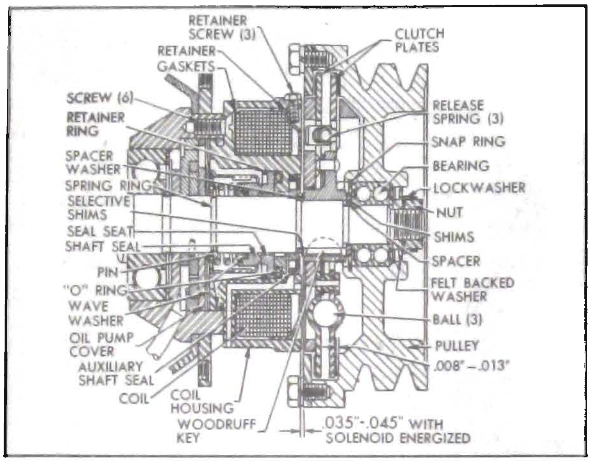


Figure 11-33—Compressor Clutch and Pulley

contact face. The forward clutch plate is fixed to the compressor main shaft by a woodruff key and press fit. The clutch plates are connected to each other only through three small coil springs, positioned to oppose the torsion of the driving force.

When the coil is energized a magnetic field is created which attracts the rear clutch plate and pulls it into contact with the clutch cover ring. The frictional forces overcome the three torsion springs (See figure 11-34) and cause enough relative rotation between the clutch plates to make the nylon balls roll up their ramps, spreading the clutch plates apart and forcing them into firm contact with their mating surfaces. This provides a solid connection between the pulley and the compressor main shaft.

When the clutch coil is de-energized, the magnetic field collapses and the rear clutch plate is no longer held against the clutch cover ring. The three coil springs overcome the servo-action of the nylon balls and force the clutch plates into a neutral position, disengaging the pulley from the main shaft.

2. *Hoses.* The connecting elements are made from a high temperature, high pressure synthetic rubber hose with double cord reinforcements. The hose ends are fitted with double-flare fittings, except those at the condenser inlet and receiver outlet, which are fitted with self-sealing couplings.

3. *Condenser and Receiver-Dehydrator.* The condenser is mounted ahead of the radiator. The receiver-dehydrator tank is attached directly to the right side of the condenser frame.

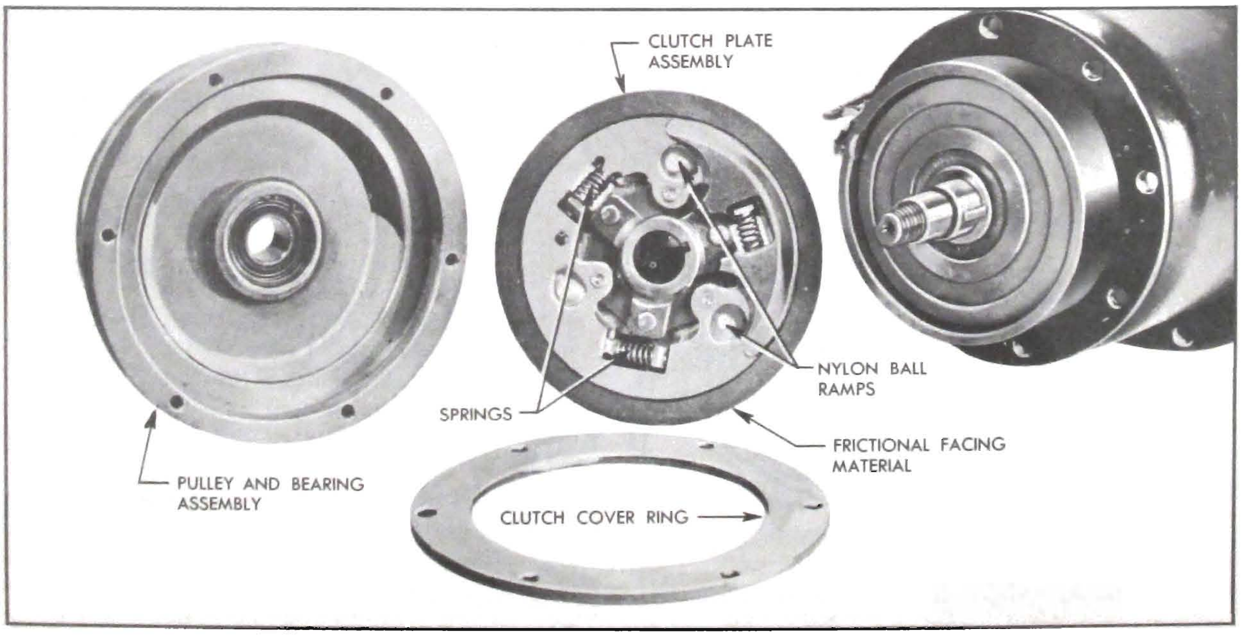


Figure 11-34—Compressor Clutch and Disc Assembly

A sight glass is an integral part of the outlet pipe of the receiver-dehydrator.

4. *Thermostatic Expansion Valve.* The expansion valve is located at the bottom of the evaporator core on the outside of the case. The liquid enters the valve at the 3/8" flare fitting, passes through the needle seat orifice, and leaves the valve at the 1/2" flare connection and enters the evaporator. See figure 11-35.

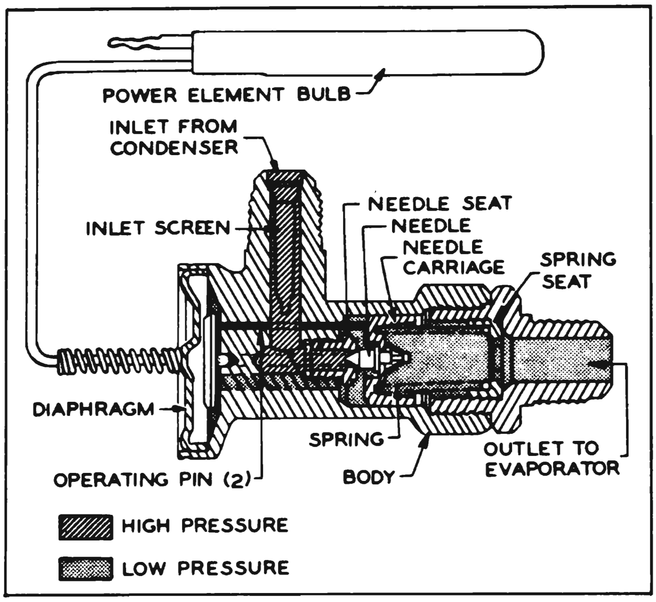


Figure 11-35—Non-adjustable Expansion Valve

The power element or bellows cap of the valve is connected by a capillary line to a thermobulb which is clamped on the low pressure line near the evaporator coil.

5. *Evaporator.* The evaporator core measures approximately 13 x 11 x 3" thick. The core consists of an aluminum brazed plate type coil. The evaporator core is housed in an insulating plastic case mounted at the extreme right side of the dash panel beneath the right fender.

6. *Blower.* The blower is mounted on the blower and air valve housing in position to force outside air or both outside air and recirculated air through the evaporator core and into the car. The blower outlet is connected to the evaporator housing by an insulating duct.

7. *Hot Gas By-pass Valve.* Figure 11-36 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 manually controlled hot gas by-pass valve is connected to the evaporator to compressor suction line near the evaporator outlet.

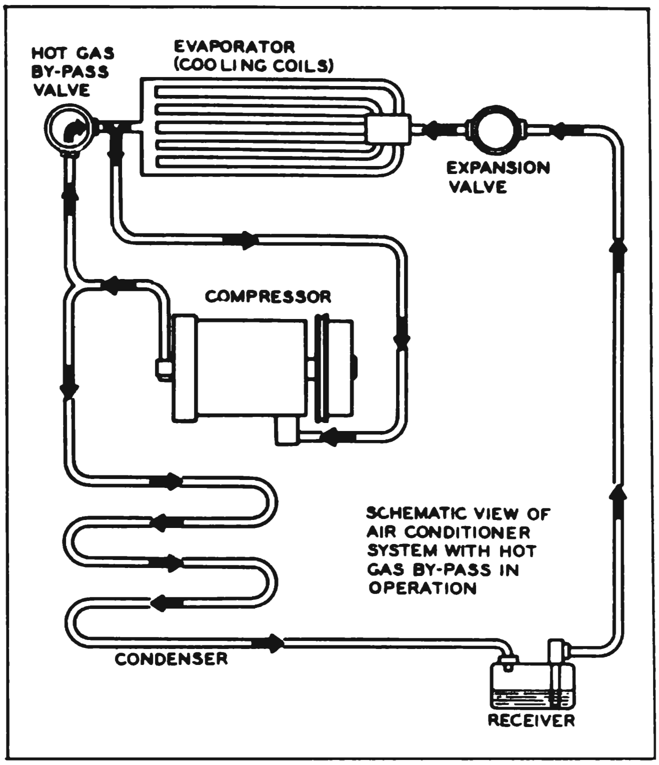


Figure 11-36—Air Conditioning System—Schematic

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° and 60° by varying the air conditioner temperature control lever which is connected to this valve.

The valve accomplishes this temperature control by metering hot high pressure Freon 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 (Freon) pressure between approximately 23 and 55 psi. The pressure regulation in turn affects the thermostatic expansion valve which varies the metering of liquid Freon into the evaporator coil. As the cooling of the air passing through the evaporator coil depends directly upon the quantity of liquid Freon that is allowed to expand (evaporate) in the coil, the conditioned air temperature is effectively controlled.

Hot high pressure Freon gas from the compressor entering the temperature regulation valve is directed around the pilot valve spring and against the end of the pilot valve and also against the main valve stem face.

Suction pressure Freon gas from the evaporator top tank outlet entering the temperature regulation valve is transmitted to the area between the pilot diaphragm and the main valve body through a drilled passage from the evaporator outlet connection. (See Fig. 11-37.) Suction pressure Freon 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.

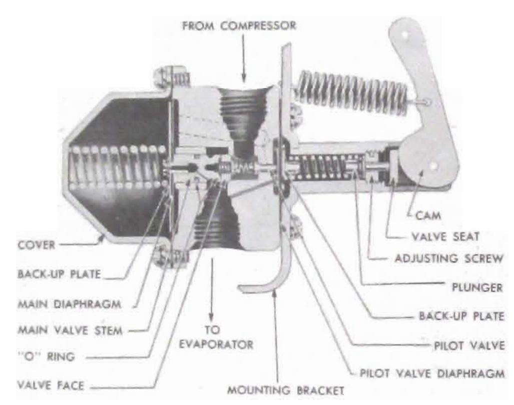


Figure 11-37—Cross Section of Hot Gas By-Pass Valve

Whenever suction pressure remains at or above the minimum desired evaporator pressure (pressure below 25 psi will cause evaporator freezing), the suction pressure against the pilot valve diaphragm will compress the pilot diaphragm spring to permit the pilot valve spring to hold the pilot valve closed. This position of the pilot valve prevents the hot gas from the discharge line from passing through the valve.

When the evaporator pressure drops below the pressure which 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 hot Freon 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 Freon 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 Freon gas to flow through the valve.

Hot Freon 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 hot Freon gas expands the gas in the bulb to allow more Freon 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 suction pressure (which will give higher temperature) to cause this cycle to occur.

8. *Air Distribution System.* The air conditioner air distribution system is entirely separate from the car heater air distribution system. The air conditioner air distribution duct mounts forward of the car heater duct with the right end positioned against what would be the right outside air grille on a non-air conditioned job. See Figure 11-32. Air is introduced into the car through three outlets—one at each end of the instrument panel and one in the center of the lower roll of the instrument panel directly below the radio dial. See Figures 11-38 and 11-39.

The knob of the outer outlets can be pulled rearward to direct air flow "up" or the knob can be rotated to the right or left to direct air flow to the right or left. The center outlet normally directs air to the rear, however, if a passenger in the center of the front seat finds this uncomfortable, the center outlet can be

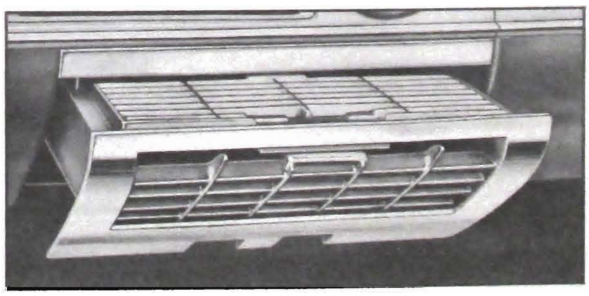


Figure 11-38—Air Conditioner Center Outlet

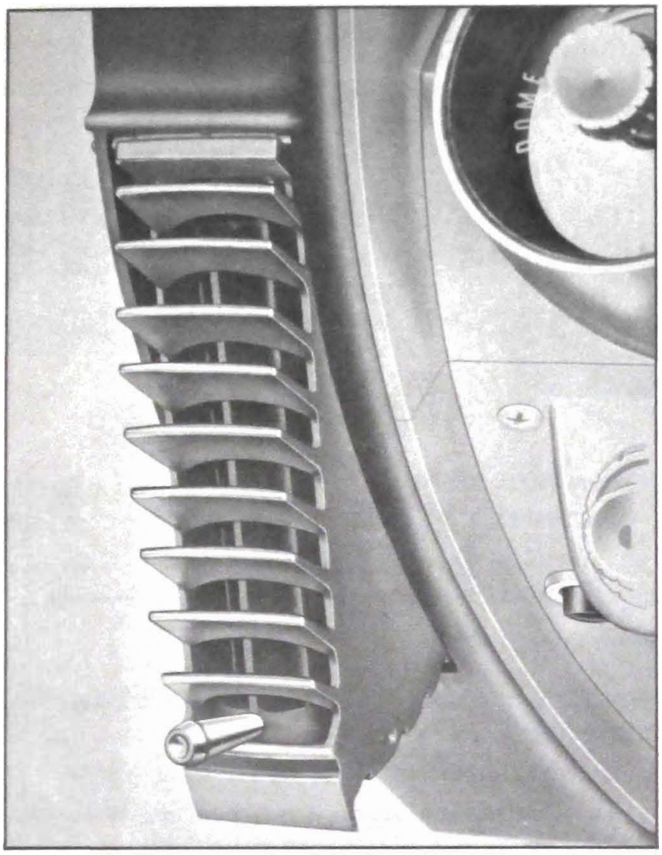


Figure 11-39—Air Conditioner Side Outlet

pulled out to direct the air flow "up".

The air conditioner uses 100% outside air except when the control lever is moved to the extreme right. In the extreme right (cool) position, the valves are positioned to admit 25% outside air and recirculate 75% car interior air.

9. *Controls.* The single lever shown in Figure 11-23 is the only air conditioner control. Movement of the lever from the "off" position sets the air conditioner in operation and further movement to the right lowers air temperature at the air outlets until maximum cooling is reached at the extreme right position. Air outlet temperature can be lowered to approximately 45° on a 90° day.

b. Operation

To place the air conditioner in operation (cooling):

1. Make sure heater (if car is so equipped) is off.

2. Move control lever to extreme right "cool" position.

3. Start engine. See note below.

4. When desired car temperature has been reached, move lever to the left to maintain car interior temperature at a comfortable level. Maximum air conditioner performance is achieved with all windows and ventilators closed.

NOTE: *The wiring to the compressor clutch coil is so arranged that during cranking a normally closed relay disengages the compressor clutch, thus eliminating the necessity of turning the air conditioner off while starting the engine.*

c. Adjustments

1. *Hot Gas By-Pass Control Adjustment.* To adjust the temperature control linkage, set the control lever in the extreme right "cool" position. Disconnect bowden wire loop from pin on lever of hot gas by-pass valve. Push lever on valve toward dash and release slowly. Lever will stop in Maximum cooling position. Adjust bowden wire sheave so loop matches pin on lever. Clamp sheave in position with loop encircling pin and replace spring grip washer.

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 nylon cam follower.

(c) Connect service gage set to compressor.

(d) Close gage set valves and open compressor valves to gage position.

(e) Turn adjusting screw with adjuster J-7727 or a reworked screwdriver (1/8" wide notch 1/8" deep in center of blade).

(f) With engine speed set at 1600 RPM, adjust suction pressure as specified in functional test chart, Figure 11-57. 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 11-42.

3. *Thermostatic Expansion Valve.* The thermostatic expansion valve is the pre-set non-adjustable type. If diagnosis proves the valve is defective, it must be replaced.

4. *Control Adjustment.* See Figure 11-40.

(a) Adjust hot gas by-pass valve control as described in (1) above.

(b) Adjust compressor clutch switch position so the switch closes when control lever is moved 1/4" from extreme left (off) position.

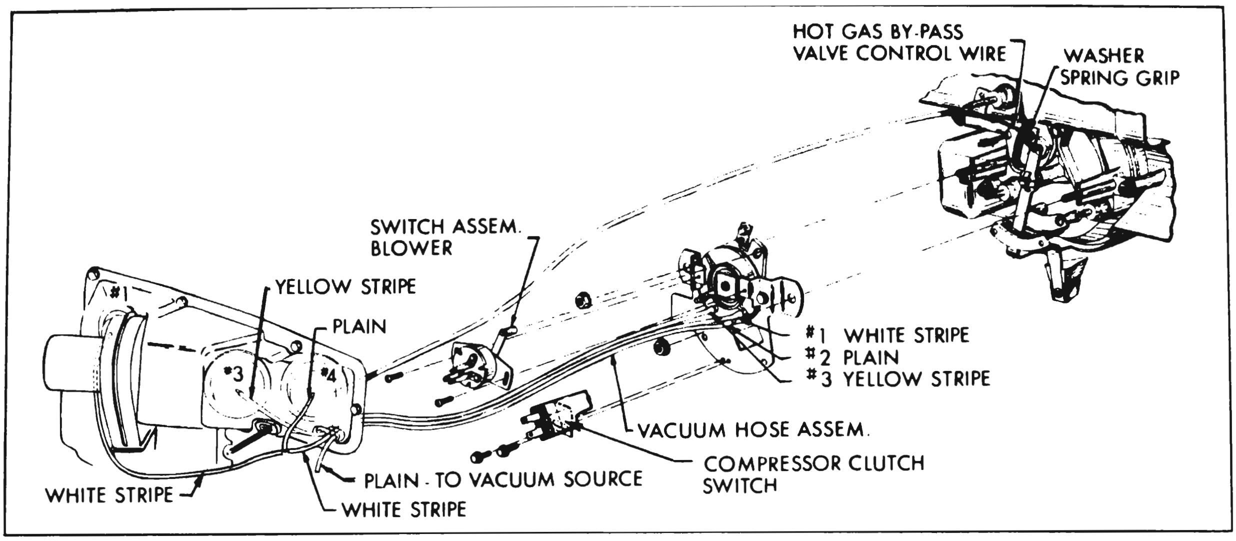


Figure 11-40—Air Conditioner Control System

(c) Adjust blower switch position so blower is turned on at same time compressor clutch coil switch is closed.

(d) Check adjustment in full cooling position. Blower should be on high speed and hot gas by-pass valve should be set at Max. cold. There is no intermediate adjustment of the clutch and blower switch.

(e) Check operation of vacuum control valve by referring to Figures 11-25 through 11-30. Place the control levers in position as shown in each figure and check for vacuum at each diaphragm by pulling the hose off the diaphragm fitting and holding finger over end of hose. If control valve is functioning correctly, vacuum will be present only at those diaphragms indicated by "Vacuum On" in each figure.

11-17 SERVICE PROCEDURES

a. *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.

1. Removal of Hot Gas By-Pass Valve

(a) Discharge freon charge through compressor gage fitting.

(b) Disconnect bowden wire from valve at sheath clamp and lever.

(c) Disconnect compressor and evaporator lines from valve body.

(d) Remove valve mounting screws, plain washers, rubber spacers and insulators. Remove valve.

2. Installation of Hot Gas By-Pass Valve

(a) Mount valve to fender skirt with flat insulators under valve mounting bracket, tubular insulators around mounting screws and flat insulators under mounting screw flat washers. See Figure 11-41.

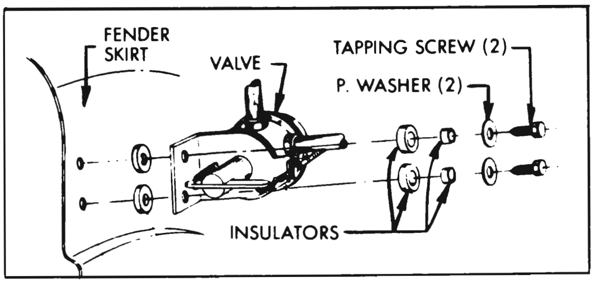


Figure 11-41—Hot Gas By-Pass Valve Installation

(b) Connect bowden control wire as specified in Sub Par. c (1) above (Hot gas by pass control adjustment).

(c) Connect compressor and evaporator lines.

(d) Evacuate and charge the system. Leak test valve and valve connections; correct any leaks found.

3. Disassembly of hot gas by-pass valve

Use the exploded view of the valve as a guide during disassembly.

(a) Remove counter balance spring, retainer, pin, lever and molded spacer from mounting bracket assembly.

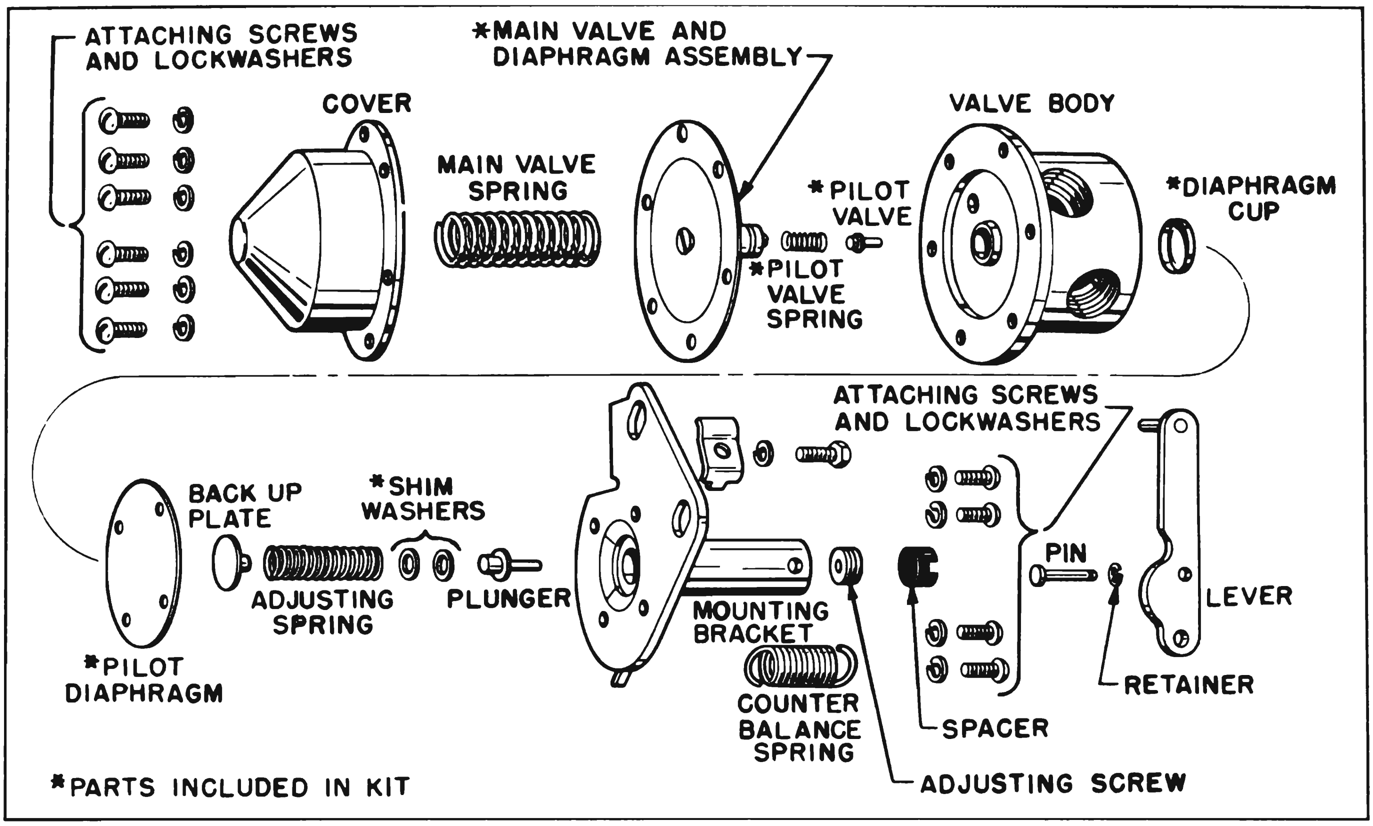


Figure 11-42—Exploded View of Hot Gas By-Pass Valve

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

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

(d) 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.

(e) Remove four attaching screws and lock-washers, mounting bracket, back-up plate and pilot diaphragm.

(f) 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 lock-washers.*

(g) Remove cover, main valve spring, main valve and diaphragm assembly, pilot valve spring and pilot valve.

4. Cleaning the Valve Body

(a) Thoroughly clean valve body in a volatile solvent.

(b) Blow all gas passages in valve body dry.

5. Reassembly of Hot Gas By-Pass Valve

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

(b) 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.

(c) Insert this assembly (main valve and 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 11-37.*

(d) Place main valve spring on top of main valve and diaphragm assembly and the cover over main valve spring.

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

(f) Place diaphragm cup over end of the pilot valve stem which protrudes from valve body as shown in cross section view.

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

(h) 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.

(i) 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, Sub-par (c) adjustments.*

(j) Insert and install adjusting screw into threaded cavity in mounting bracket.

a. Removal and Installation of Compressor

CAUTION: *Observe precautions in handling Freon-12 outlined in Buick Air Conditioning Manuals.*

1. Remove protective caps from gauge fittings of high and low pressure valves on rear end of compressor.

2. Connect charging lines of Pressure Gauge Set (fig. 11-43) to gauge fittings of both valves, with both valves of Manifold J 5415 closed.

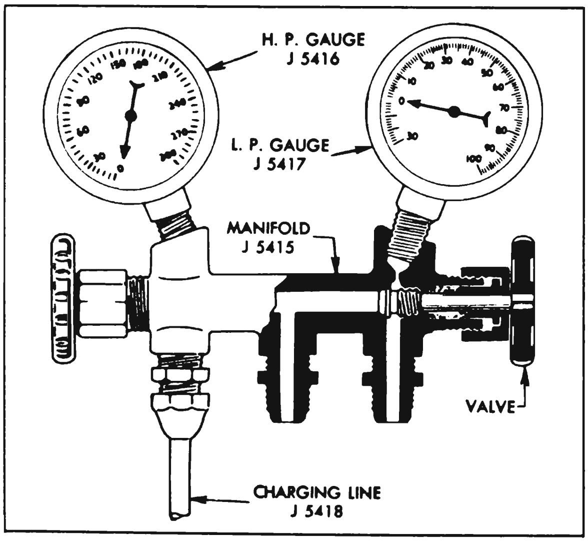


Figure 11-43—Pressure Gauge Set

3. Remove protective caps and firmly shut off both valves on rear of compressor by turning valve stem clockwise. See figure 11-44.

4. Open valves on Manifold J 5415 to discharge all pressure from compressor.

5. Remove retaining bolt and lock washer to remove valve retaining plate from rear end of compressor. It may be necessary to spring the pipes slightly to clear the pilots on the valve assemblies.

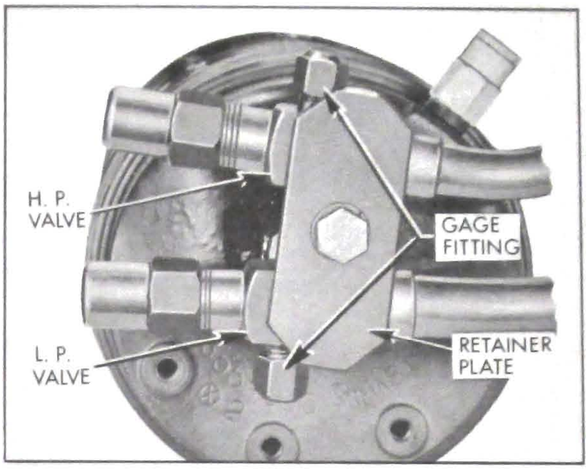


Figure 11-44—High and Low Pressure Service Valves

6. Cover the openings in valves and compressor with tape to exclude dirt.

7. Disconnect clutch solenoid wire, then loosen the belt and remove compressor from its mounting on engine.

Do not place compressor in sun or near heat because it still contains some Freon-12.

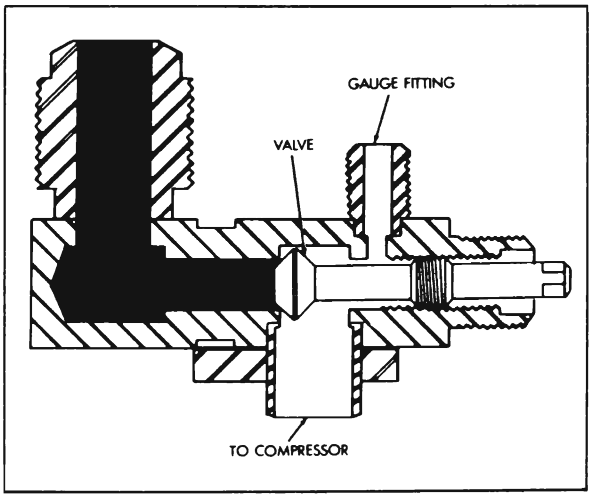


Figure 11-45—Compressor Service Valve in Shut Off Position

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 525 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.

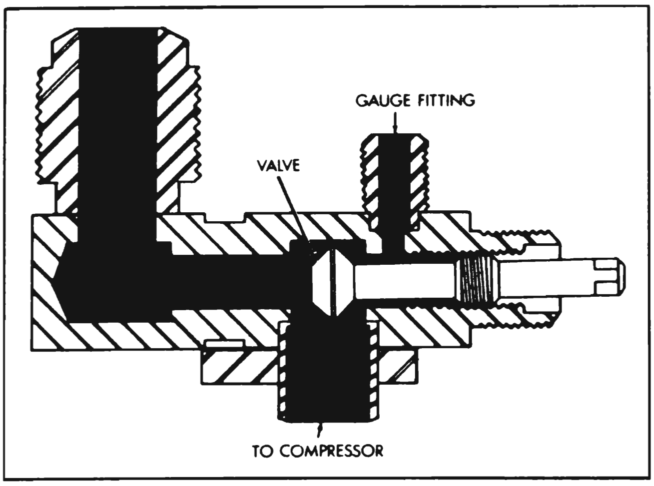


Figure 11-46—Compressor Service Valve in Gage Position

8. Install compressor by reversing procedure for removal, paying attention to the following points.

(a) Inspect drive belts and pulley grooves for conditions that might cause slippage. If a belt is cracked, frayed, or oil soaked, or is worn so that it bottoms in pulley grooves, replace both belts. Belts are furnished in matched sets only, to insure even tension.

(b) Adjust drive belts to ½" deflection midway between fan and compressor pulleys.

(c) Use new "O" rings when attaching valve assemblies to compressor.

(d) Before starting compressor make sure that both valves are fully opened to running position. See figure 11-47.

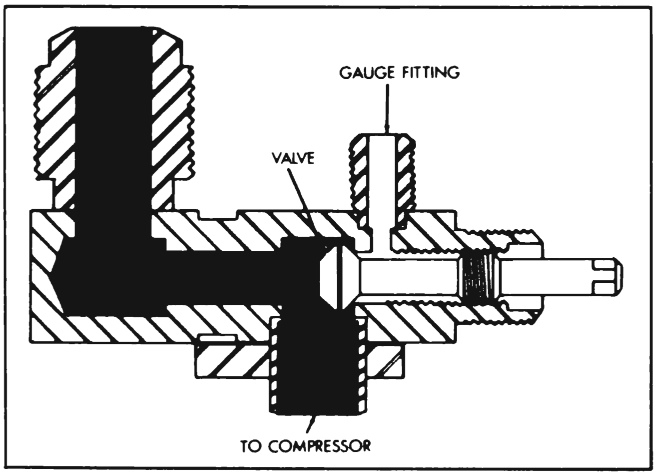


Figure 11-47—Compressor Service Valve in Running Position

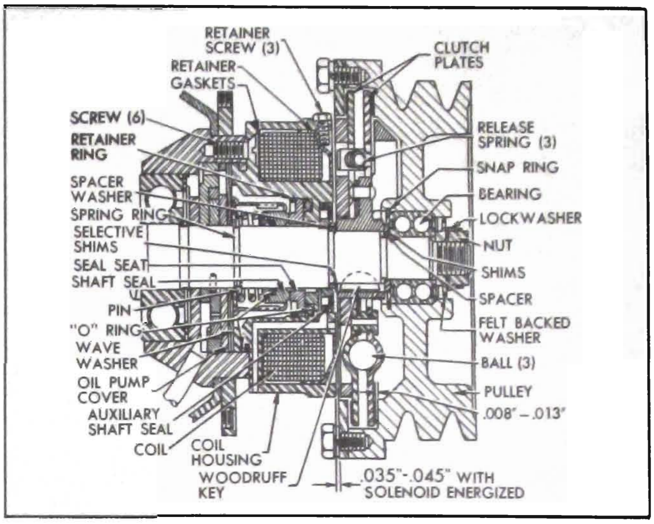


Figure 11-48—Clutch and Shaft Seal—Sectional View

(e) After operating compressor for ten minutes at 1750 RPM, leak test around the valve retaining plate.

b. Removal and Installation of Clutch and Pulley

Observing the precautions on handling Freon, remove compressor as per instructions contained in preceding paragraph, and transfer compressor to work bench. If service work is to be done on the car, see subpar. d.

1. Bend the tangs on the shaft lock washer to clear the flats on the shaft mounting nut. Loosen the six screws in the clutch cover ring. Energize the clutch coil from a 12 volt D.C. source to hold the compressor shaft and clutch assembly. Remove the nut and metal-felt washer.

2. Remove the six screws and lock washers used to mount the clutch cover ring to the pulley casting. NOTE: *It is absolutely necessary that this be done at this time to avoid damage to the internal parts of the clutch. It is also necessary to remove the three coil retaining screws to allow the clutch cover plate to move back. See figure 11-49.*

3. Remove the pulley and ball bearing assembly with Compressor Pulley Puller J-6351.

NOTE: *The I. D. of the ball bearing has a .0001" to .0006" press fit onto the first step of the compressor shaft.*

4. Remove the hub to pulley bearing spacer washer and shims and set aside. The clutch hub to bearing spacer washer and shims may be re-used on the assembly providing the original parts are being re-assembled. However,

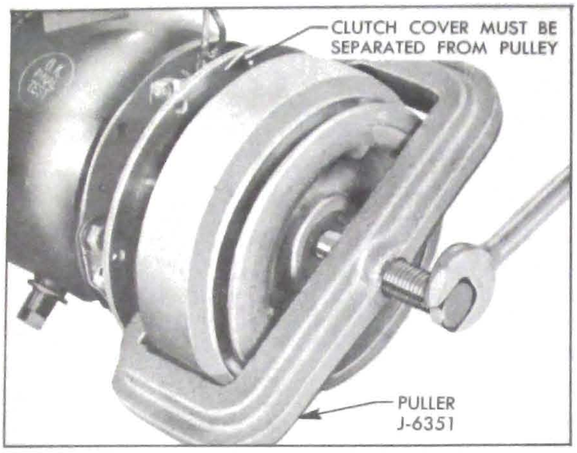


Figure 11-49—Removing Pulley

if it is necessary to replace either clutch plates, pulley, bearing, or if parts are being assembled on a service replacement compressor, a different combination of spacing shims may be required. This shimming is necessary to obtain the .008 to .013 clearance between the friction material on the clutch plate and pulley face, in the disengaged position.

NOTE: *This clearance must be obtained before the clutch assembly and the pulley are pressed onto the shaft.*

To obtain the clearance:

(a) Place the pulley and bearing assembly on a flat surface of the work bench.

(b) A combination of the shims listed here when used with the bearing spacer washer #5918343 (.088 ± .002) will provide the .008 to .013 clearance.

5918366 — .010
5918367 — .015
5918368 — .020
5918369 — .025

(c) Select any suitable combination for trial use, and place these shims on the inner race of the ball bearing, then place the bearing spacer #5918343 on the shims. Now place the clutch plate assembly in the pulley, so that the hub is in contact with the spacer and shims.

Press down firmly at the center of the hub. Rotate the clutch plate assembly. If a *very slight* "drag" of the friction material is noticed, this will indicate that an insufficient thickness of shims is present in the assembly. Select a different combination and repeat check. If a *heavy* "drag" is felt, thicker shims must be selected in order to secure the *very* slight "drag." If no "drag" at all is felt, thinner shims should be selected, to obtain the *very* slight "drag." When this condition is obtained, determine the total thickness of the shims now assembled. Either add an additional .010 shim or replace one of the shims with a .010 thicker shim.

This will be the correct spacer and shim combination to complete the assembly to the compressor. After the clutch assembly is pressed on the shaft, place the thick spacer on first and then the correct thinner shims. This will prevent the shims dropping into the undercut near the shaft shoulder.

5. Examine the O.D. of the shaft and the I.D. of the ball bearing for any evidence of wear, scoring or pitting (fretting corrosion). Replace ball bearing in pulley casting if necessary.

6. To replace the ball bearing, remove the Truarc 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.*

7. The clutch plate assembly can now be removed by screwing on the special Clutch Plate Puller nut into which the Clutch Plate Puller screw has been assembled. (Tool J-6322). The cone point of this screw will center in the end of the compressor shaft. Rotate the screw with a wrench until the clutch plate assembly is pulled off of the shaft and woodruff key. See figure 11-50.

IMPORTANT NOTE: *J-6322 Puller nuts made prior to 1959 production must be reworked to pull 1959 compressor clutch plates. Enlarge the tapped hole to ⅝" for a depth of*

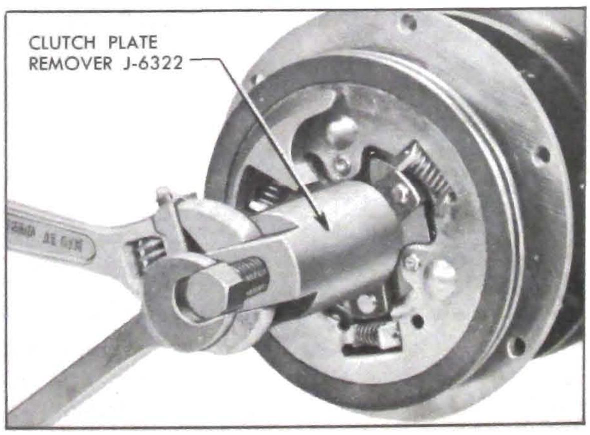


Figure 11-50—Removing Clutch Plates

¼" at the inner end of the tapped hole to allow clearance for the compressor shaft.

8. Remove the woodruff key and air gap adjusting shims and spacer washer. Retain these parts for re-use, if the same clutch pulley parts are being reassembled. If clutch pulley parts are being transferred to a service replacement compressor, a different combination of shims may be required to obtain the .035" to .045" air gap between armature and coil housing when coil is energized by 12 volts D.C. The service replacement compressor clutch will have sufficient number of various thickness shims to obtain the correct air gap.

9. Disassemble the actuating springs from the clutch plates. Examine the frictional surfaces for wear. Replace plate assemblies as necessary. Wipe plates with a clean, dry, oil-free cloth. CAUTION: *Do not use any cleaning solvents on the frictional surfaces, as it will result in unsatisfactory operation of the clutch upon reassembly. Examine the nylon balls that actuate the clutch. If any of the balls are deformed, excessively worn or damaged, replace all three.*

10. Install the three coil retaining screws, place the clutch cover ring against the coil and seal housing.

11. Install the clutch spacer and air gap control shims on the shaft against the shoulder. Replace the woodruff key, tapping it lightly to seat and properly align it.

12. Reassemble the nylon balls and clutch plate springs to complete the assembly of the clutch plates.

13. Align the key slot of the clutch hub with the woodruff key in the shaft of the compressor. Make very certain that this alignment is maintained during the next four steps.

14. The clutch plate assembly is now ready to be pressed on the shaft, using Tool J-6323. See figure 11-51.

15. Screw the threaded stud into the adapter.

16. Screw the adapter and stud on the threaded end of the compressor shaft, to its full travel.

17. Apply a wrench to the hexagonal faces of the adapter. (NOTE: *The adapter and stud have a LEFT hand thread.*) Turn the adapter off the stud. Hold the stud with a wrench and continue turning until the clutch plate assembly is pressed onto the shaft and woodruff key,

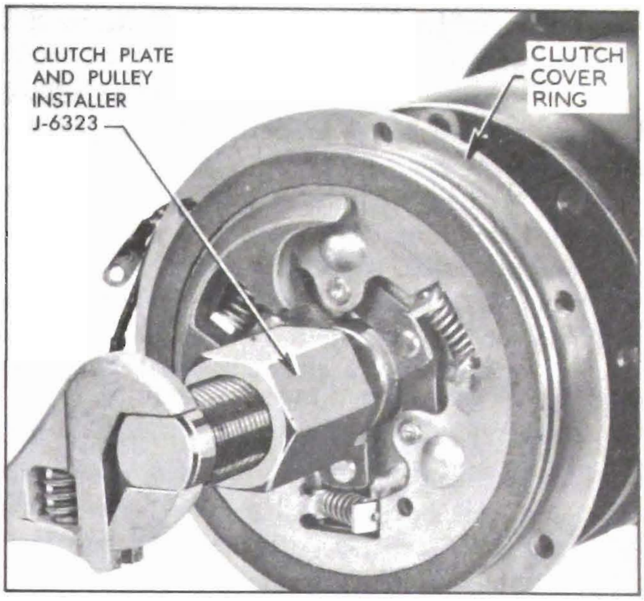


Figure 11-51—Installing Clutch Plates

making certain that the clutch cover ring does not get caught between the coil housing and the rear clutch plate. Remove the assembly tool.

18. Replace the clutch hub and pulley bearing washer and shims on the compressor shaft, observing instructions in step 4 to obtain proper clutch clearance.

19. Place the "free" washer of Tool J-6323 over the small end of the stud so that the *small* diameter of the washer will contact the *inner* race of the bearing. NOTE: *This is important to prevent distorting or damaging the ball bearing, the grease seals, and prevent brinelling of the ball bearing.* Screw the stud onto the threaded end of the compressor shaft. Turn the adapter with a wrench until the bearing and pulley assembly has been firmly pressed

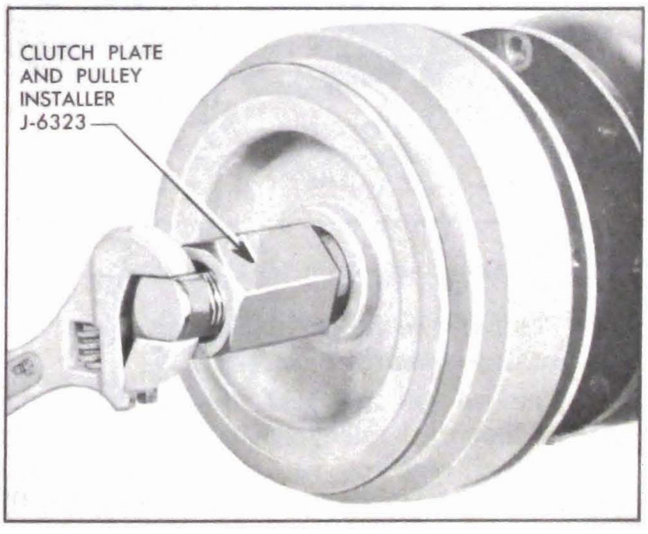


Figure 11-52—Installing Pulley

onto the shaft and into proper position. Remove assembly tool.

20. Assemble felt and metal washer. Since the tabs on the shaft lock washer will be deformed from bending at the time of assembly and during the service removal, a new lock washer should be used. Assemble shaft nut, tighten to 5-7 lbs. torque and bend up tabs on lockwasher. Assemble clutch cover ring, screws and lockwashers. Tighten to 2 ft. lbs. (24 in. lbs.) torque. Energize clutch coil with 12 volts D.C.

21. Use a non-magnetic feeler gauge (J-7151) and check the air gap between the armature and coil housing. It should be between .035" and .045". Adjust with correct shims until it is obtained. Replace assembly on car.

c. Removal and Installation of Clutch Coil and Shaft Seal

1. Following instructions contained in preceeding steps 1 through 9 remove pulley and clutch.

2. Disconnect the electrical leads of the coil from the terminal clip and ground screw.

3. Remove the three coil retaining screws from the seal and coil housing.

4. Remove coil retainer and insulating gasket.

5. Carefully insert a thin screwdriver or other suitable tool through wire opening in rear of coil housing and pry coil forward to remove coil from coil and seal housing.

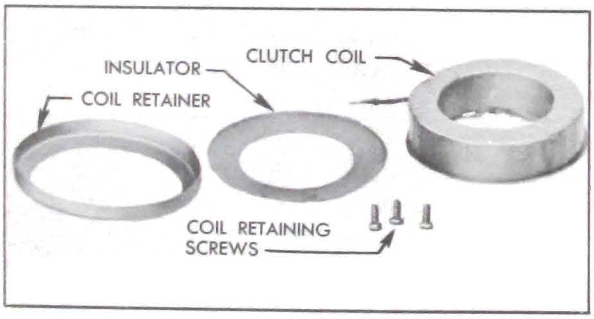


Figure 11-53—Clutch Coil Disassembled

6. Remove the inner insulating gasket and six housing mounting screws.

7. Remove coil and seal housing from compressor flange. Remove seal seat retainer ring. Remove seal seat and "O" ring from behind it. Remove the large diameter "O" ring from the outer flange of the seal-coil housing. Remove the shaft seal assembly. Make certain the seal drive pin and retainer ring remain in place on the shaft. Remove the auxiliary shaft seal from the seal housing.

The service replacement shaft seal assembly is supplied in a unit package. It contains the shaft seal, and seal seat, pin and retainer ring, and "O" rings and auxiliary shaft seal, wiping tissues and packing list.

The old "O" rings removed from the compressor should be discarded and replaced with the fresh ones contained in the unit package.

The shaft seal having the carbon block face and the polished metal seal seat 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, screw driver 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 and around the auxiliary seal should be flooded with clean, fresh Frigidaire 525 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.

The shaft seal has an "O" ring on the inside of it and will contact the O.D. of the compressor shaft when assembled. It must be protected

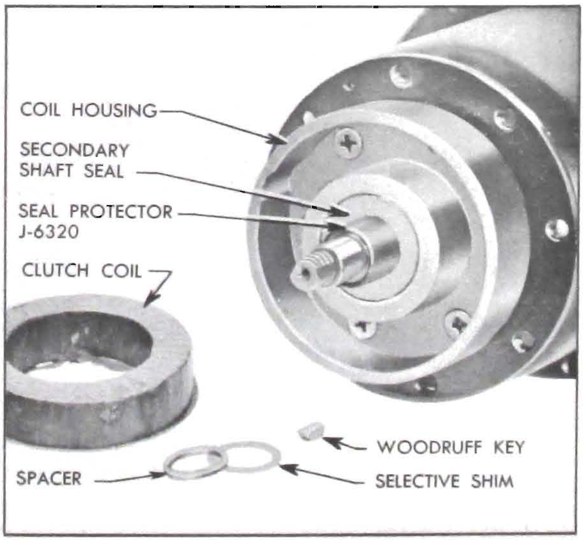


Figure 11-54—Secondary Shaft Seal and Protector

when it is being placed over the shaft. To do this, place the shaft "O" ring pilot bushing, J-6320, over the shaft against the second step. Apply a light coating of oil to the surface before sliding the seal and "O" ring in place.

The auxiliary seal has a coating on the outer surface to effect a seal with the coil and seal housing when it is pressed into the coil housing. The inner flexible seal has a "V" shaped edge and is provided with a ring-shaped spring to apply the necessary sealing pressure to the shaft.

The inner lip of the auxiliary seal should be given a heavy coating of Frigidaire compressor oil and the space between the seal seat and the auxiliary seal in the coil housing should be flooded with the same oil.

Assemble the special pilot bushing, J-6320, into the auxiliary seal before assembling the coil and seal housing over the compressor shaft and to the compressor flange. Use care during this operation and also when removing the pilot bushing so as not to disturb the spring behind the "V" lip of the auxiliary seal. The inner lip of the auxiliary seal should be given a heavy coating of oil prior to assembly into the housing. Carefully slide housing over shaft to compressor body, making certain that the small oil drain-back passage "O" ring is not dislodged.

After the housing has been placed over the shaft and the "O" ring end assembled to the compressor flange, install the six mounting screws.

The compressor seal should now be given a Freon-12 leak test 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 ⅛" or ¼" pipe thread and screw in a ⅛" pipe to a ¼" flare or ¼" pipe to ¼" flare fitting and use two "O" rings and the

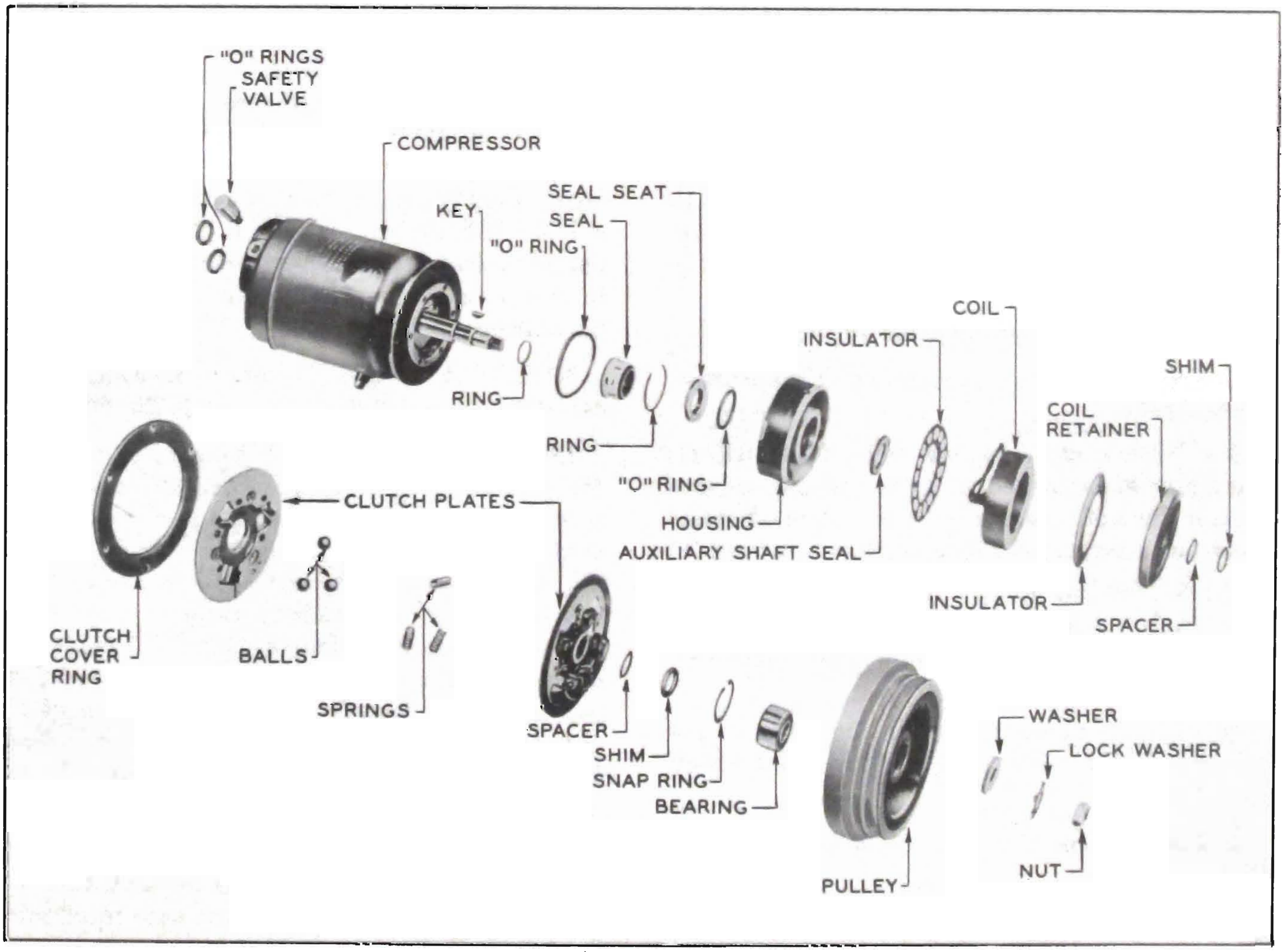


Figure 11-55—Clutch and Seal—Exploded View

plate mounting bolt to seal the opening.

Connect a drum of Freon-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, auxiliary seal and large diameter "O" ring in the seal housing and the compressor flange.

Correct any leaks that may be found and proceed with reassembly of parts.

Assemble the inner insulator, actuating coil, outer insulator, coil retainer and the three screws in the coil housing.

The coil leads should be sealed with the sealing compound that was removed from the opening in the coil-seal housing.

The compressor is now ready to be replaced on the engine mounting brackets. Connect the suction-discharge valve assembly to the compressor using new "O" rings from stock.

Proceed to evacuate or purge the air from the compressor, in accordance with instructions in par. 11-18.

Operate the engine and air conditioning system and check operation.

Position the valves on the compressor properly for normal operation. Cap the test gauge fittings and replace the caps on the valve stem end, making certain the copper gaskets are in place.

d. Servicing the Compressor on the Car

1. *Preparation for Removing Compressor Shaft Seal.*

(a) With engine at low idle (550 RPM) and gauge set attached, close low pressure compressor shut-off (service) valve (shut off position) and energize clutch coil (turn unit on).

(b) When low gauge reading reaches "O" turn engine and air conditioner switches off and close high pressure compressor (service) valve (shut-off position).

(c) Loosen generator mounting bolts to relax belts; then remove belts from compressor pulley.

2. *Preparation for Removing Compressor Clutch Only.*

When just the pulley and clutch and/or clutch coil are to be removed, only step c of the preceding section need be observed.

e. 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 12 ounces of 525 viscosity Frigidaire oil.

If an unknown quantity of oil has been lost through accident, or a leak of Freon and oil at any of the fittings has occurred, it is advisable to check the oil supply in the compressor.

Operate the engine at slow idle for 5 to 7 minutes with the air conditioning system turned on and the blower operating in High. Stop the engine and compressor.

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 12 ounces.

NOTE: *A service replacement compressor contains 12 ounces of 525 viscosity oil.*

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 525 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.

Attach a gauge set to the proper connections on the compressor. Follow previous instructions on precautions about purging air from all gauge lines, prior to operating the engine and compressor. Close the low pressure valve on the compressor (shut-off position) and close both high and low pressure hand shut-off valves on gage manifold.

Operate the engine at a slow idle until 10 to 20 inches of vacuum is obtained. Connect a charging line and copper tube to the center connection on the gauge manifold and insert the copper tube to the bottom of the oil bottle.

Slowly open the high pressure hand shutoff valve on the gauge manifold. This will permit high pressure vapor to purge the air from the charging line and copper tube and bubble it slowly through the oil. Close hand shutoff valve on gauge manifold and also close the high pressure valve on the compressor (shutoff position).

Open the low side hand shutoff on the gauge manifold. This will cause the oil in the bottle to be drawn into the low side of the compressor. Add oil in two ounces increments until sufficient oil has been added to the compressor to produce a satisfactory level when checked at the test screw. Return both high and low pressure valves on the compressor to running position.

11-18 EVACUATION AND CHARGING

a. Evacuation of System with Vacuum Pump

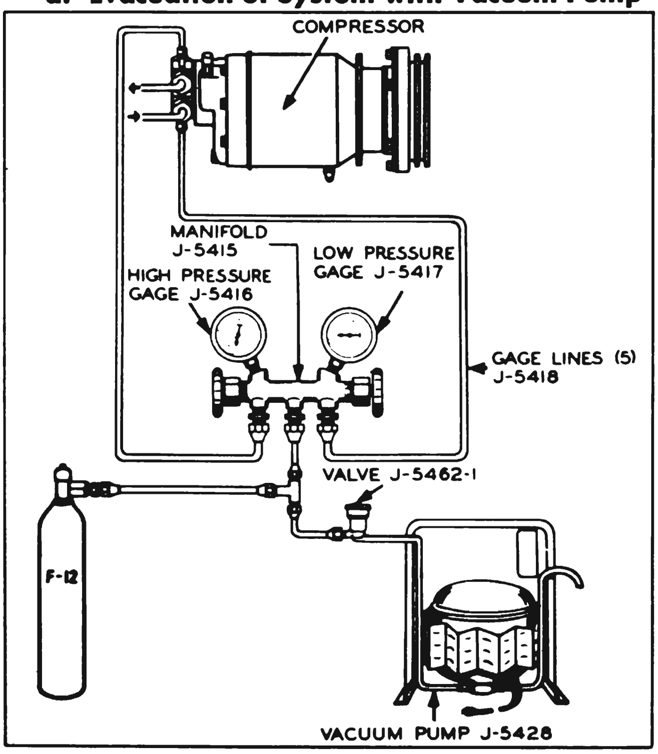


Figure 11-56—Service Charging Hook-Up

1. Attach gauge lines and vacuum pump set-up as shown in figure 11-56.

2. Turn both high and low pressure valves on compressor clockwise to gage position.

3. 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.*

4. Operate vacuum pump until at least 26" vacuum (at sea level) is registered on the "Low" pressure gauge, then continue to run pump for ten minutes.

5. If a 26" vacuum cannot be obtained, close pump shut off valve and stop pump, then open the Freon 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.

6. After 26" vacuum has been maintained for ten minutes, close the vacuum pump shut-off valve, stop the pump, and charge the system with Freon 12 at cylinder pressure.

7. With Freon 12 cylinder valve closed, again evacuate the system with pump at 26" 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.

8. After maintaining the 26" vacuum for ten minutes close the vacuum pump shut-off valve and stop the pump. The refrigerating system is now ready for charging.

CAUTION: *The foregoing steps for hooking up gauge lines should be followed whenever evacuating or charging the system. Firmly back-seating the (service) shut-off valves (First Par.) will prevent escape of Freon when the smaller protective caps are removed from the rear end of compressor.*

b. Evacuation of System without Vacuum Pump

In cases where it becomes necessary to evacuate the Air Conditioner and it is impossible to obtain the proper pump for this evacuation, the following procedure may be followed.

1. Hook up gauges, lines and Freon 12 Cylinder as shown in Figure 11-56, but substitute a bottle or other suitable container in place of the vacuum pump. The container is to catch the

evacuated oil so it may be measured and a like amount of clean oil replaced. Be sure that the fitting on the discharge valve is open to the compressor with no restriction from valve closures, caps, or plugs in the attached line before starting the engine.

2. Turn both high and low pressure valves on compressor clockwise to gauge position.

3. Leaving low pressure gauge valve tightly closed, carefully open the high pressure gauge valve and hand shut-off valve (vacuum line valve), being careful to avoid any accidental discharge of liquid Freon 12. Discharge Freon, air, and any oil into bottle.

4. Start engine and set at low idle (550) rpm) and turn Air Conditioner Blower switch on "Hi" and "Max." cooling. Maintain engine speed at slow idle at all times during evacuation. Turn high pressure service valve to shut-off position.

5. Operate system at low idle for 5 minutes then turn off engine and air conditioner and close hand shut-off valve immediately. If system holds 25" vacuum for 10 minutes, proceed to Step 6; if not, locate and correct leak and repeat steps 2, 3, 4 and 5.

6. Close high pressure gauge valve, open low pressure gauge valve, and charge system with Freon at cylinder pressure. Then evacuate again as in steps 1, 2, 3, 4 and 5 for 5 minutes.

7. Again close high pressure gauge valve, and open low pressure gauge valve and then complete charging with 5 lbs. of Freon.

8. Turn both high and low pressure valves on compressor counterclockwise to running position.

9. Following the procedure outlined, replace an amount of clean (Frigidaire 525 viscosity) compressor oil equal to that discharged in steps 3, 4 and 5. Then perform oil level check.

10. Remove gauge lines and oil charging lines, cap the fittings, and check the performance of the unit.

CAUTION: *Under no circumstances should it be assumed that the foregoing procedure will remove water from the system. Where a leak has occurred and there is a possibility that the system has been operated in a discharged condition, it is essential that the receiver-dehydrator be changed.*

c. Charging the System

1. With the vacuum pump, Freon-12 cylinder and gauge set connected to the compressor as shown in Figure 11-56, place the cylinder in a bucket of hot water which does not exceed 125°F.

CAUTION: *Do not heat Freon-12 cylinder above 125°F. because the fusible safety plug in cylinder valve melts at 157°F. and softens at a slightly lower temperature.*

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. Set both high and low pressure service valves on compressor in gauge position.

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

6. Operate engine and compressor at slow idling speed until a total of 5 pounds of Freon-12 have been charged into the system.

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

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

8. Operate the compressor with engine running at 1600 RPM (using tachometer) and observe general performance of Air Conditioner. If performance is satisfactory, stop the engine.

9. With engine off, firmly back-seat both high and low shut-off (service) valves on compressor to running position, then remove gauge lines.

10. Replace protective caps over gauge connectors and shut-off valves, then tighten securely.

11. Check oil level in compressor as described in paragraph 11-17 (e).

12. Perform Functional Test. See figure 11-57.

FUNCTIONAL TESTS FOR AIR CONDITIONER

TEST CONDITIONS:

1. Car doors and hood open.
2. Air Conditioner Lever at Max. Counterclockwise Position (Cool).
3. Gage set connected and compressor service valves in "gage" position with gage set valves shut off.
4. Heater and Defroster Levers at "Off."

TEST NO. 1.

Set engine speed at *1600* RPM.

The table below lists ambient temperature, suction pressures and right air outlet temperatures that can be expected from a normally functioning unit.

NOTE: If suction pressure is not correct for indicated ambient temperature, adjust hot gas by-pass valve with re-worked screwdriver (1/8" wide notch cut 1/8" deep in end of blade) or J-7727.

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

Ambient Temperature	Suction Pressure PSIG	Head Pressure PSIG	Right Air Outlet Temp.
70° F.	24 - 27	120 - 180	36 - 42° F.
80° F.	25 - 28	150 - 225	38 - 43° F.
90° F.	25 - 28	180 - 255	42 - 49° F.
100° F.	25 - 30	210 - 285	44 - 55° F.
110° F.	27 - 37	240 - 325	47 - 58° F.

At temperatures above 100° F. with very high humidity, engine speed should be increased by 500 RPM.

TEST NO. 2.

A further test to be made on jobs which will pass test #1 but do not perform in a satisfactory manner on the road.

This test can disclose a malfunctioning compressor or expansion valve. In this test the engine speed is adjusted to the ambient temperature and humidity.

Ambient Temperature	Humidity	Engine Speed	Suction Pressure PSIG	Head Pressure PSIG	Right Air Outlet Temp.
70° F.	Dry	500 - 550 RPM	34	110 - 150	44° F.
70° F.	Humid	650 - 700 RPM	34	120 - 160	45° F.
80° F.	Dry	600 - 650 RPM	34	140 - 180	46° F.
80° F.	Humid	750 - 800 RPM	33	150 - 190	48° F.
90° F.	Dry	800 - 850 RPM	33	170 - 210	48° F.
90° F.	Humid	1100 - 1200 RPM	32	190 - 230	51° F.
100° F.	Dry	1000 - 1050 RPM	32	200 - 240	51° F.
100° F.	Humid	1500 - 1600 RPM	31	240 - 290	56° F.

The suction pressures and outlet temperatures should be equal to or *lower* than those given in the above table.

NOTE: Head pressure in excess of maximum indicated on chart may indicate:

1. Air in system.
2. Overcharge of freon.
3. Defective expansion valve.
4. Restriction in high pressure system.
5. Defective Receiver-Dehydrator.

Suction pressure higher than indicated on chart may indicate:

1. Defective hot gas by-pass valve.
2. Defective expansion valve.
3. Defective compressor.

Figure 11-57—Functional Test Data

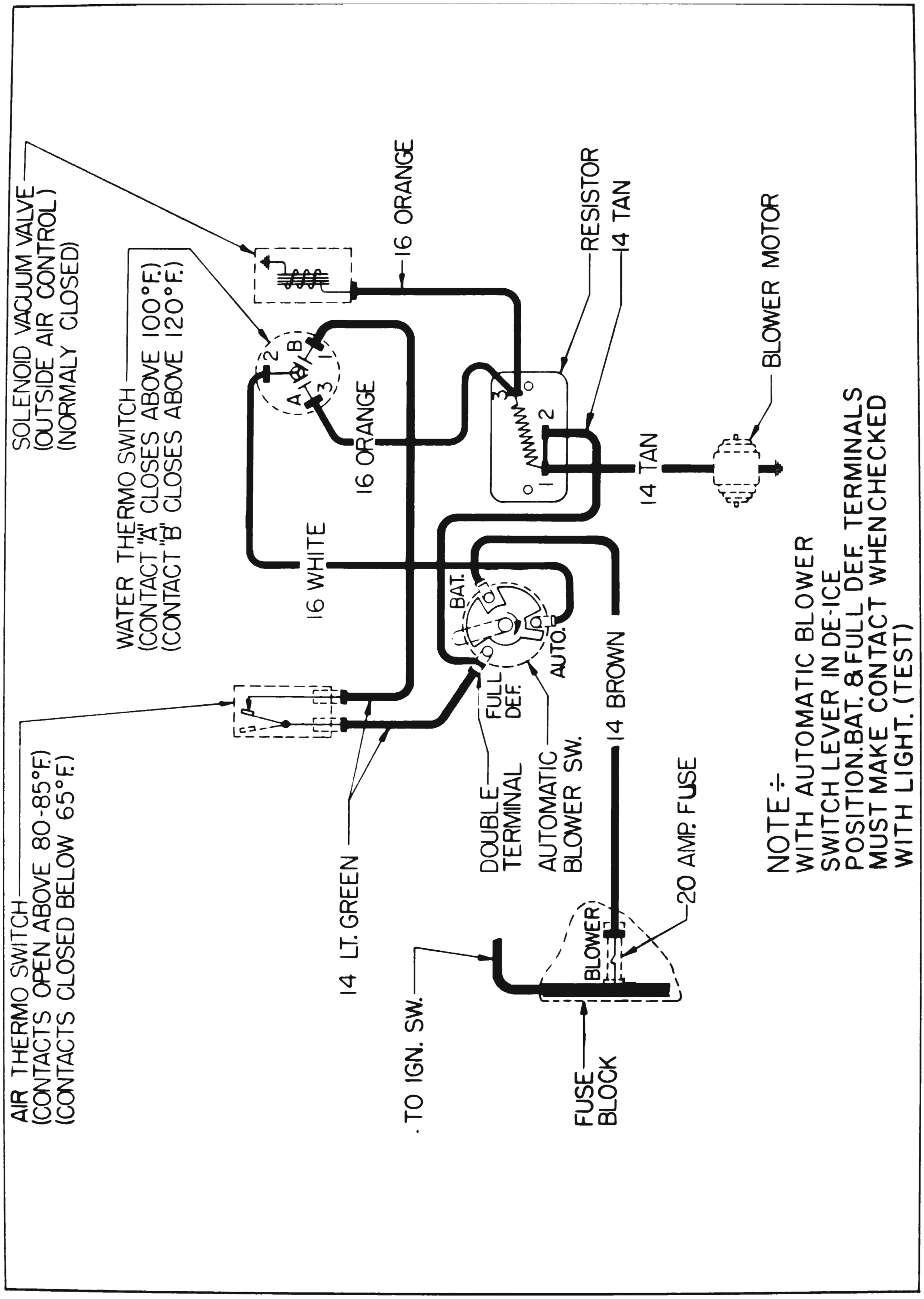


Figure 11-58—Wiring Diagram Automatic Heater

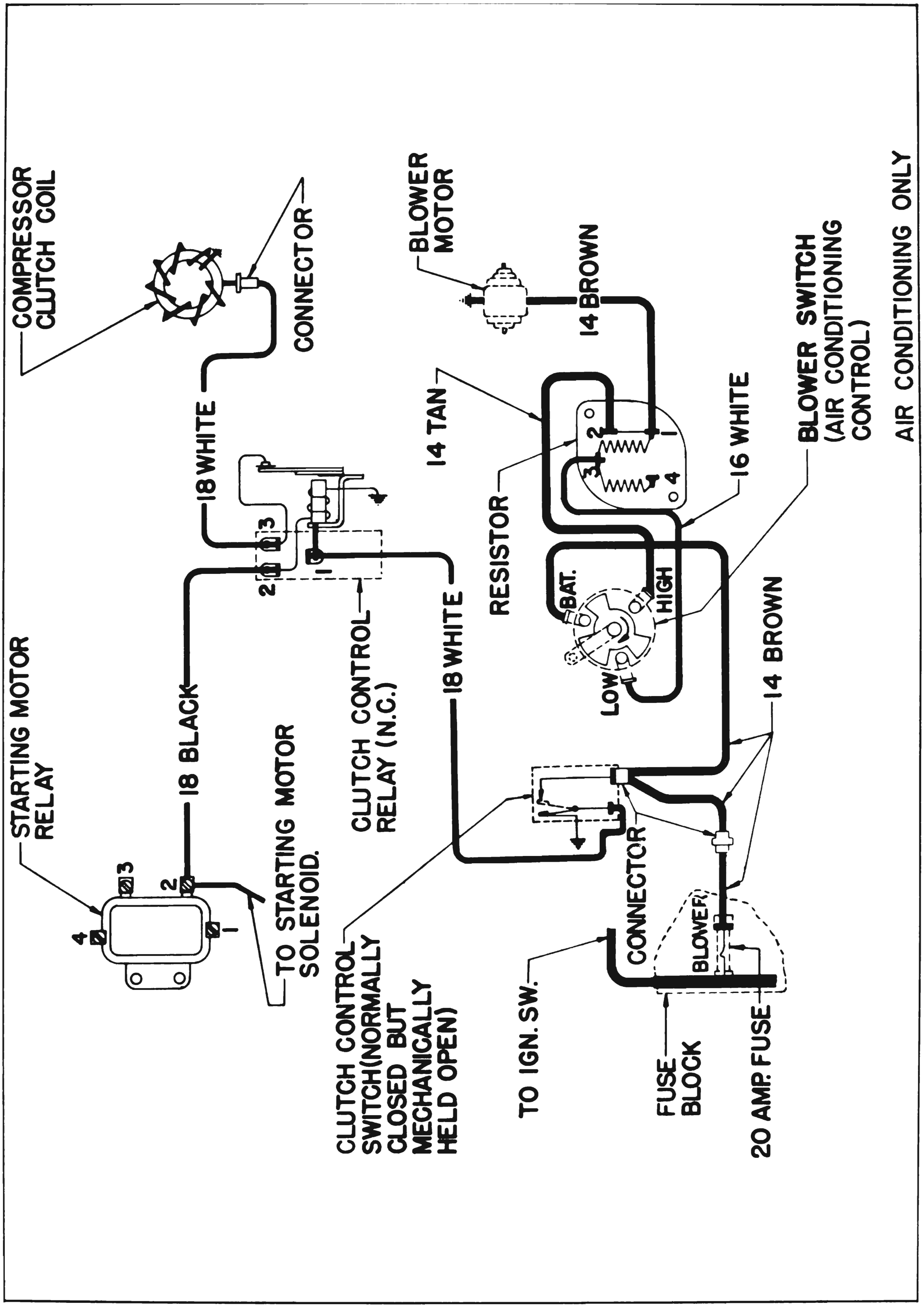


Figure 11-59—Wiring Diagram Air Conditioner

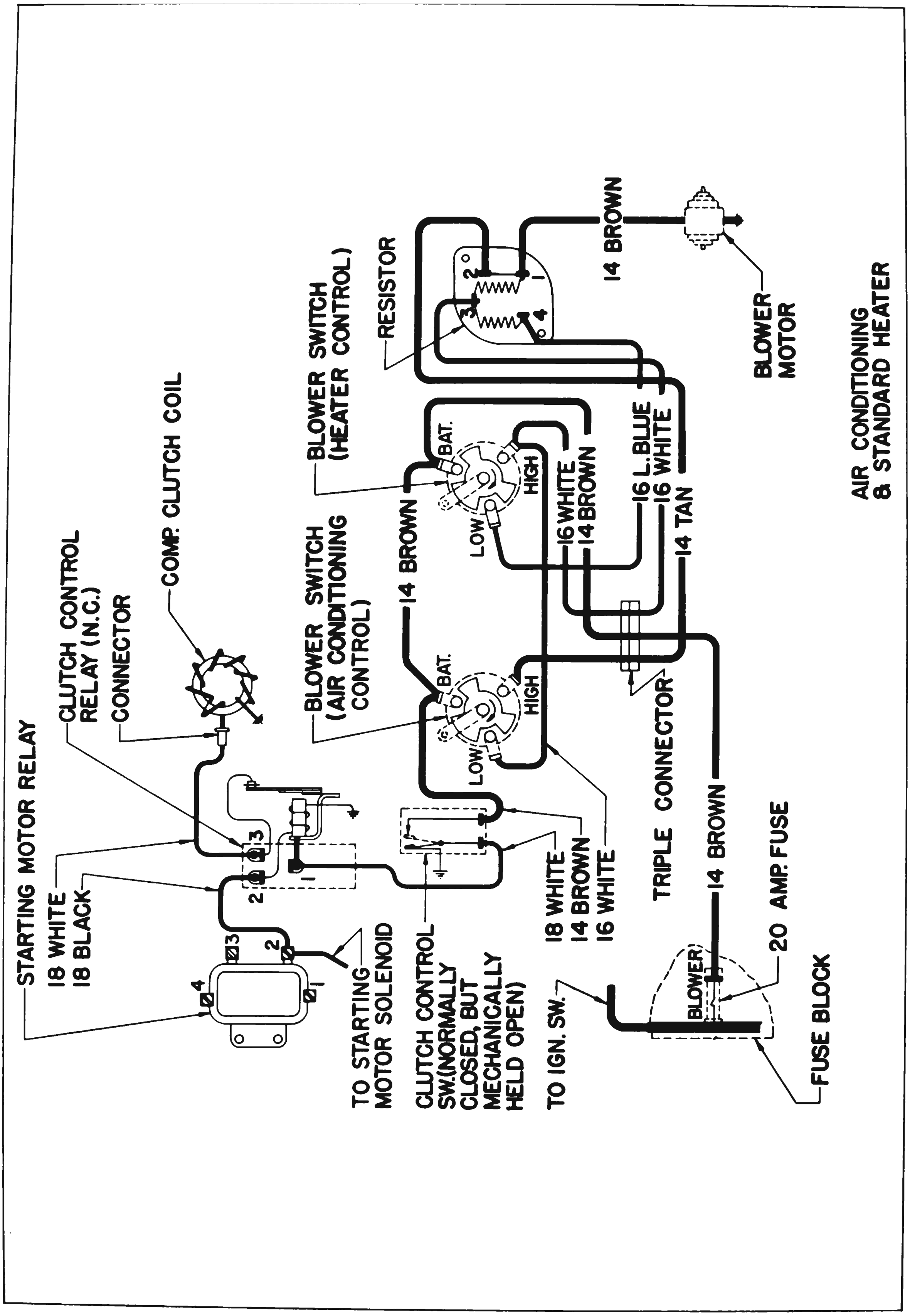


Figure 11-60—Wiring Diagram Air Conditioner—Standard Heater

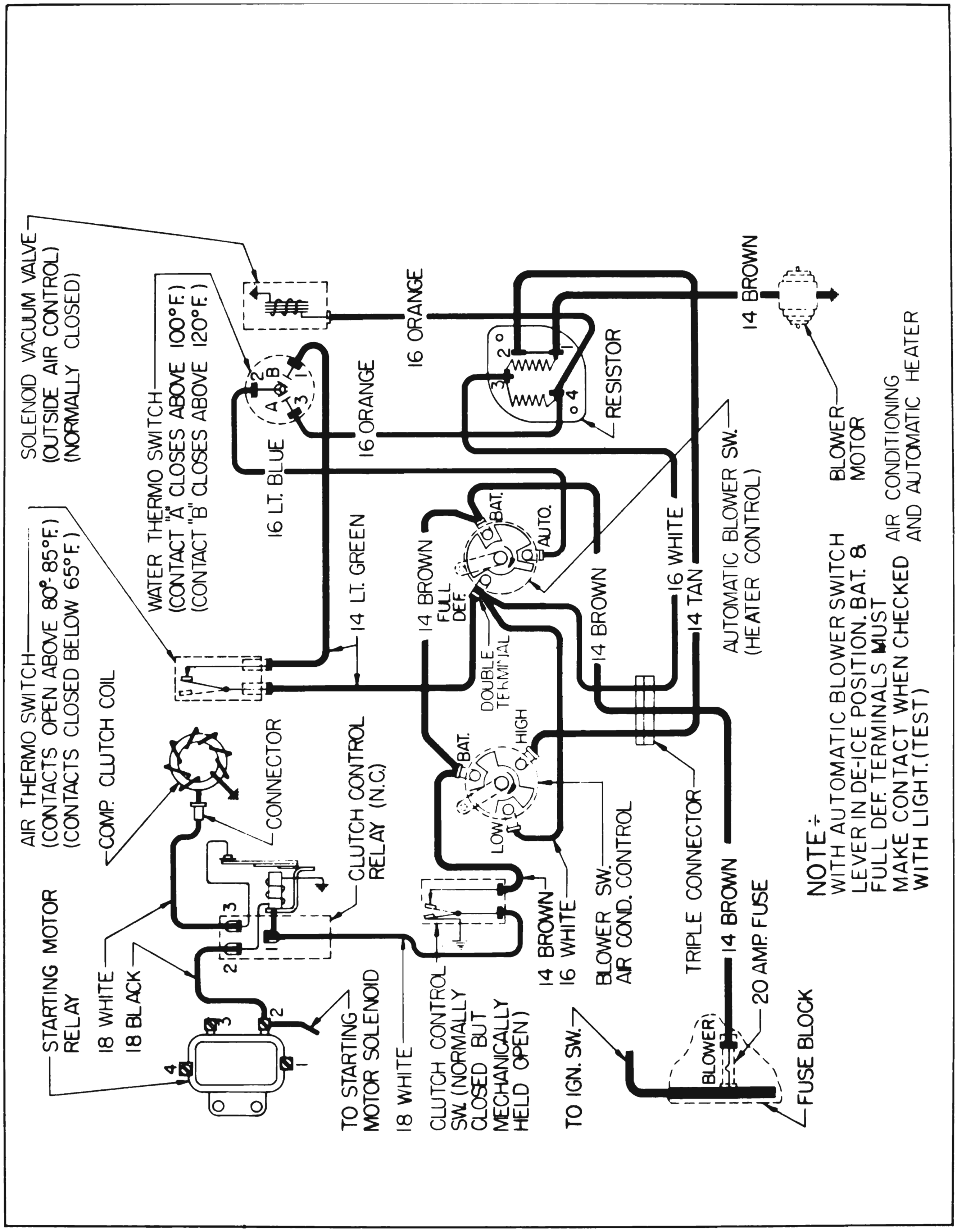
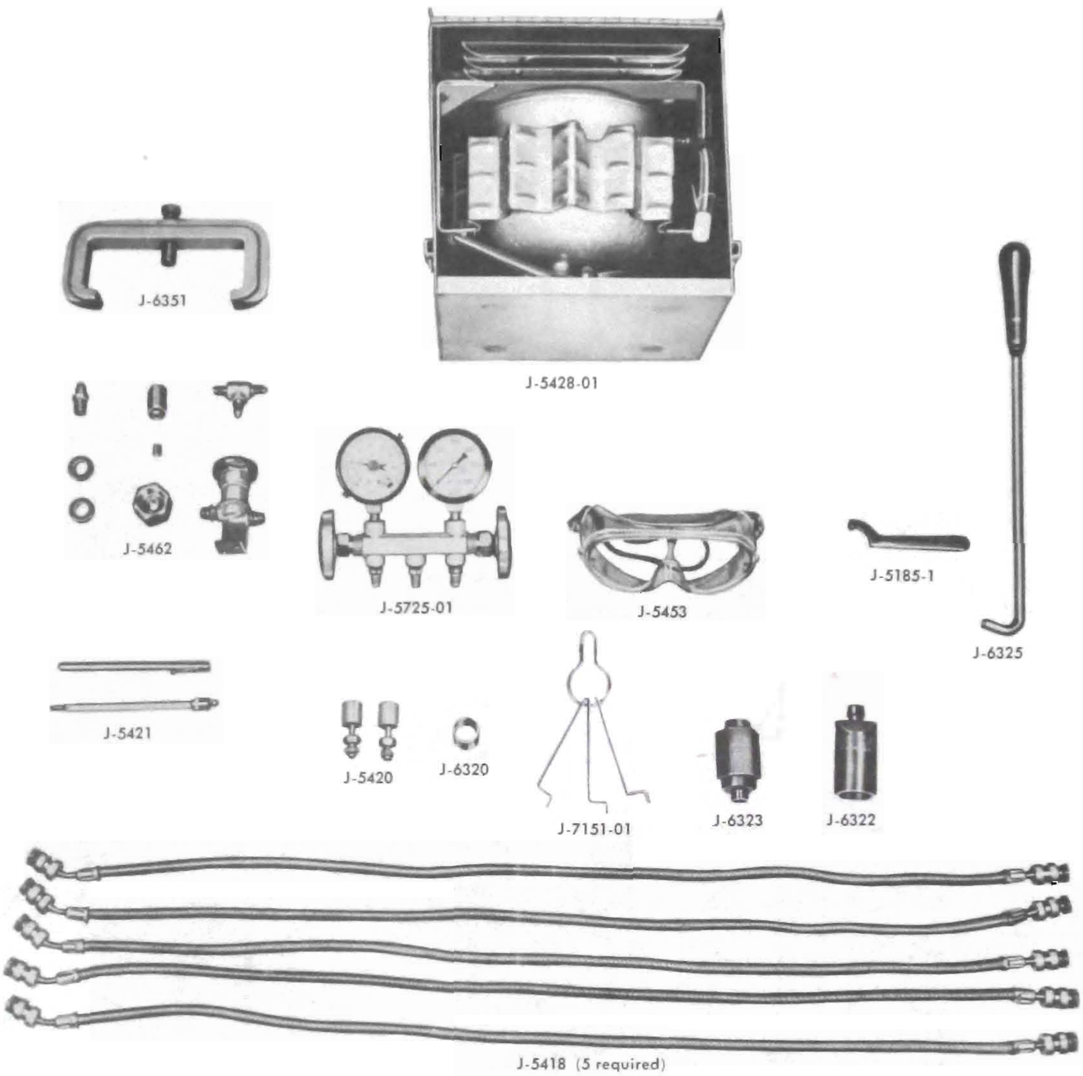


Figure 11-61—Wiring Diagram Air Conditioner—Automatic Heater



ACCESSORY TOOLS

J-5185-1	Antenna Nut Wrench
J-6325	Hood Hinge Spring Remover and Installer
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-6323	Compressor Clutch Plate and Pulley Installer
J-6351	Compressor Pulley Remover
J-7151-01	.025"-.035"-.045" Feeler Gauge (Non-Magnetic)

Figure 11-62—Accessory Special Tools