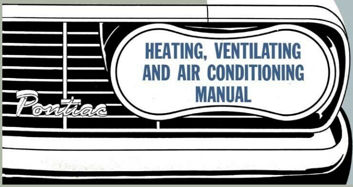
1961

Pontiac and Tempest



HEATING, VENTILATING AND AIR CONDITIONING MANUAL

1961 PONTIAC AND TEMPEST
HEATING, VENTILATING AND AIR CONDITIONING MANUAL

GENERAL

This shop manual applies to 1961 models and includes all pertinent subject matter available at the time it was prepared for publication.

CONTENTS

Arrangement of the material is shown by the table of contents on the right side of this page. Black tabs on the first page of each section can be seen on the edge of the book below the section title. More detailed table of contents precedes each section, and an index is included in the back of the manual.

AIR CONDITIONING CAUTION

Air conditioning, like many other things, is fairly simple to service once it is understood. If proper methods and precautions are not followed, *repairs may be complicated* and equipment damage and personal injury could result. For this reason, it is strongly urged that the information herein be studied thoroughly before attempting to service an air conditioning system.

PONTIAC MOTOR DIVISION

GENERAL MOTORS CORPORATION

PONTIAC 11, MICHIGAN

Table of Contents

HEATING

CONTENTS OF THIS SECTION

CIRC-L-AIRE HEATER

DESCRIPTION AND OPERATING INSTRUCTIONS

GENERAL DESCRIPTION

Pontiac's heating and defroster system provides rapid warm-up sensation and even distribution of warmed air to all parts of the car. All air entering the system is taken through hood high cowl vents providing air with a minimum of dust, foreign material and undesirable fumes.

The use of outside air exclusively provides constant and rapidly changing air inside the car, eliminating a smoke-filled interior and keeps the occupants comfortable.

The driver has fingertip control of the temperature of the warmed air entering the car. When heated air is desired, the blower forces air taken from the hood high cowl air inlet housing through the heater core and then through an air distributing system to the air outlets.

The design of the heater and defroster system, its valves and controls permits a method of obtaining three different amounts of forced air flow for ventilation.

AIR OUTLETS AND CONTROLS

AIR OUTLETS

Heated air enters the interior of the car and is distributed by a center outlet under the heater duct which disperses air over the front floor area and to the rear passenger compartment.

Additional air distribution outlets are provided; one each on the left and right end of the heater outlet air duct. These direct air to the driver and front seat passenger side respectively.

CONTROL PANEL PUSH BUTTONS

The heater control panel is located to the right of the steering column on the lower section of the instrument panel. Three push buttons across the top of the panel control air flow through the system. These positions are "OFF", "NORMAL" and "DE-ICE" (Fig. 1-2).

This push button selector panel directs vacuum to diaphragms which, by mechanical linkage, cause air control valves to function in the following manner:

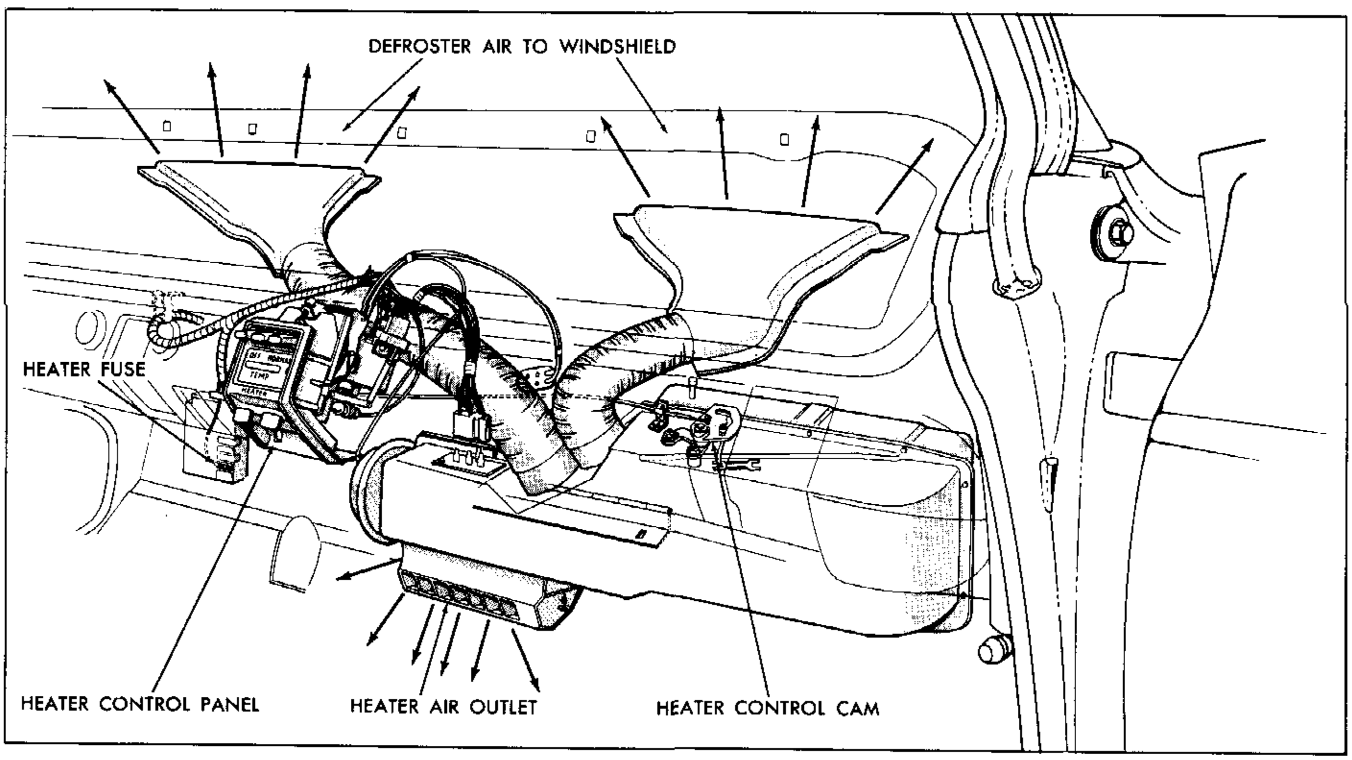


Fig. 1-1 Circ-L-Aire Heater Air Outlets and Controls

"OFF" button pushed in ("NORMAL" and "DE-ICE" buttons in out position): No air flow, no heating.

"NORMAL" button pushed in ("OFF" and "DE-ICE" buttons in out position): Outside air valve opens to admit outside air into the car through heater air outlets, with a limited amount directed to the defroster nozzles.

"DE-ICE" button pushed in ("OFF" and "NORMAL" buttons in out position): Outside air valve opens to admit outside air into the heater air system. Defroster air valve swings down to direct most of heater air to the air outlets at the windshield. At the same time, depressing this button causes the blower to operate at super speed.

NOTE: When the defroster air valve swings down, it directs all but approximately 20% of the air to the air outlets at the windshield. The remainder of the air passes through the heater air outlets to keep occupants comfortable.

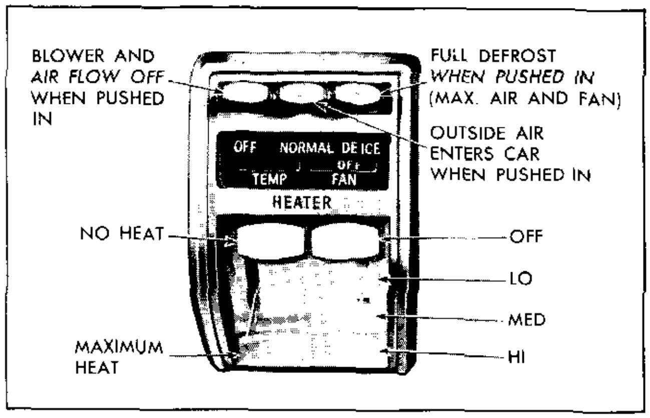


Fig. 1-2 Circ-L-Aire Heater Control Panel

During winter months, "de-icing" or "de-fogging" may be somewhat accelerated by opening the front door vent window or lowering the door window approximately ½"; however, this practice may cause objectionable cold air drafts to rear seat passengers.

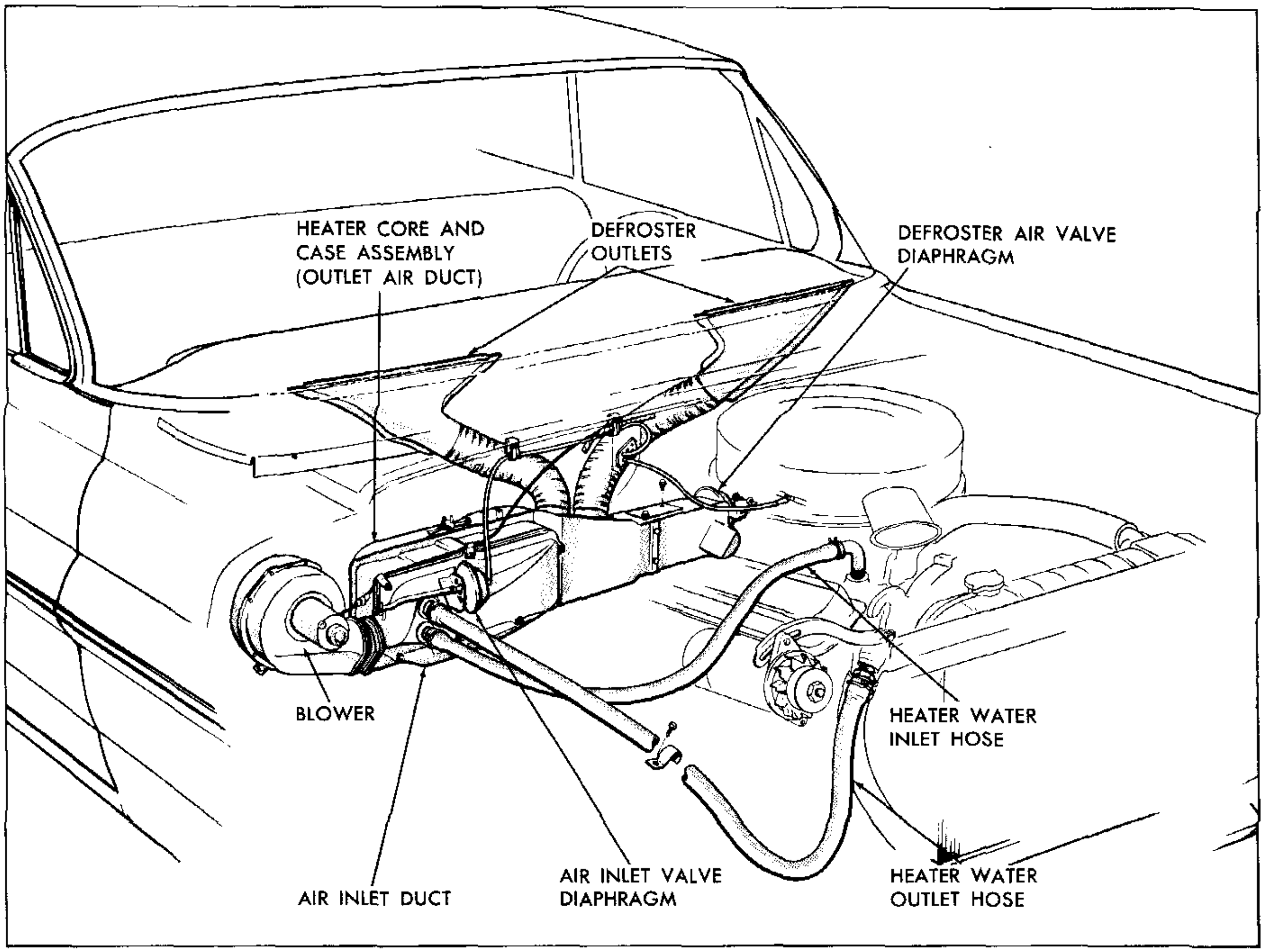


Fig. 1-3 Location of Units in Pontiac's Circ-L-Aire Heater System

BLOWER CONTROL

The blower control lever is located in the lower right part of the control panel and moves vertically to control three blower speeds to regulate the amount of forced air movement.

When the blower control lever is in the up position and letters "OFF" appear in the "FAN" window, the blower will not operate. As the blower control lever is moved down, the letters "LO", "MED" and "HI" appear in the "FAN" window to operate the blower at these various speeds. Moving the blower control lever to the full down position reveals the letters "HI" in the window and the blower will operate at high speed.

The blower will operate at "LO", "MED" and "HI" speed only when the "NORMAL" push button is depressed.

TEMPERATURE CONTROL

The temperature control lever is located in the lower left part of the heater control panel and moves vertically to tailor the temperature of heated air entering the interior of the car.

In the extreme up position no heated air enters the car because the temperature air valve is closed. This feature permits forced air for ventilation without warming this air.

As the temperature control lever is depressed the temperature control valve permits more and more warmed air to mix with outside air as it passes through the heater air mixing chamber—at the same time a dial opening in the panel above the lever shows progressively increasing bands of red color to indicate increased heating. Maximum heating is obtained when the lever is in the full down position.

Depress the temperature control lever to the full down position during engine warm up. After the inside of the car is at the desired level adjust the "TEMP" lever to maintain desired temperature.

OPERATING INSTRUCTIONS

To warm a car under various weather and driving conditions, use the following control settings after the green light indicating a "COLD" engine goes out:

FAST WARM-UP

(CAR WHICH HAS BEEN STANDING IN COLD)

CONTROL	SETTING
Push button	"DE-ICE" pushed in until windshield is de-iced or de-fogged, then "NORMAL"
Blower control lever	down, for high speed
Temperature control lever	down, for maximum heating, then adjusted for occupant comfort
Car windows	front door vent and door window open slightly to assist in de-icing or de-fogging, then closed or positioned to provide comfort for all occupants

SLOW CITY DRIVING IN COLD WEATHER

CONTROL	SETTING
Push button	"NORMAL" pushed in
Blower control lever	down, for high speed
Temperature control lever	down, for maximum heating, then adjusted for comfort
Car windows	closed

NORMAL COOL WEATHER HIGHWAY CRUISING

CONTROL	SETTING
Push button	"NORMAL" pushed in
Blower control lever	"LO" or "MED" for low or medium speed
Temperature control lever	position to obtain desired temperature
Car windows	closed, door vent(s) may be opened to suit occupant comfort

COLD WEATHER HIGHWAY CRUISING

CONTROL	SETTING
Push button	"NORMAL" pushed in
Blower control lever	"MED" or "HI", for medium or high blower speed
Temperature control lever	down, for maximum heating, then adjusted for occupant comfort
Car windows	closed

TIPS ON USE OF HEATER AND DEFROSTER SYSTEM

KEEPING COMFORTABLE IN EXTREMELY HUMID "MUGGY" WEATHER

When the relative humidity is extremely high, causing discomfort on a day when the temperature is 55°F.-70°F., depress the "NORMAL" button and move the temperature control lever down slightly. This will provide minimum heating. Move the blower control lever to the low or medium speed position.

KEEPING COMFORTABLE IN MILD WEATHER

When the weather is cool, but the sun is very bright, as in spring or fall or at high altitudes, use both the heater and the cowl ventilators at the same time, setting the temperature control and blower speed for desired comfort.

CONTROLLING TEMPERATURE IN CAR

The most satisfactory method of controlling the temperature in the car is to:

1. Depress "NORMAL" push button.

2. Position temperature control lever down for maximum heating, then adjust to maintain the desired temperature in the car.

3. Set blower speed for your personal comfort.

USING THE HEATING SYSTEM FOR VENTILATION

The heating system is designed so that it can also be used for ventilation when it is not necessary to warm the air. Ventilation may be obtained by placing the temperature control lever in the extreme up position, depressing the "NORMAL" push button, and selecting the amount of air flow desired by positioning the blower control lever to "LO", "MED" or "HI" speed.

PRINCIPLES OF OPERATION

CONTENTS OF THIS SECTION

DESCRIPTION OF HEATER CORE

The copper heater core is of "tube and center" construction and is designed to permit the engine water (coolant) to flow in a "U" path through the core (Fig. 1-4). This core construction permits a high volume of air to pass through the core as well as a rapid heat dissipation from the water to the core surfaces, which provides for rapid transfer of heat to the air.

The heater is located on the right side center of the dash (inside the car body). Its location permits maximum heating of all air passing over the heater core with this heated air remaining inside the car.

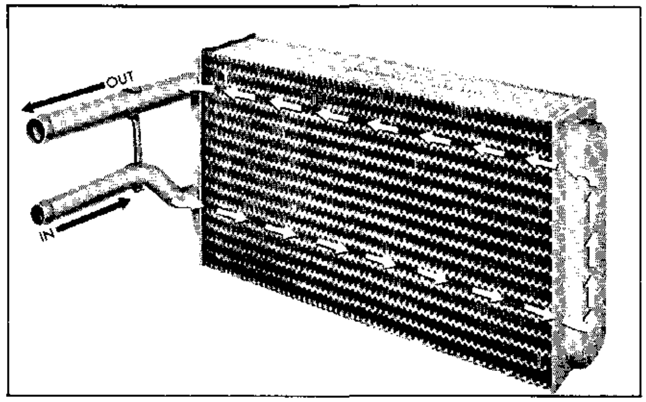


Fig. 1-4 Flow of Engine Coolant Through Heater Core

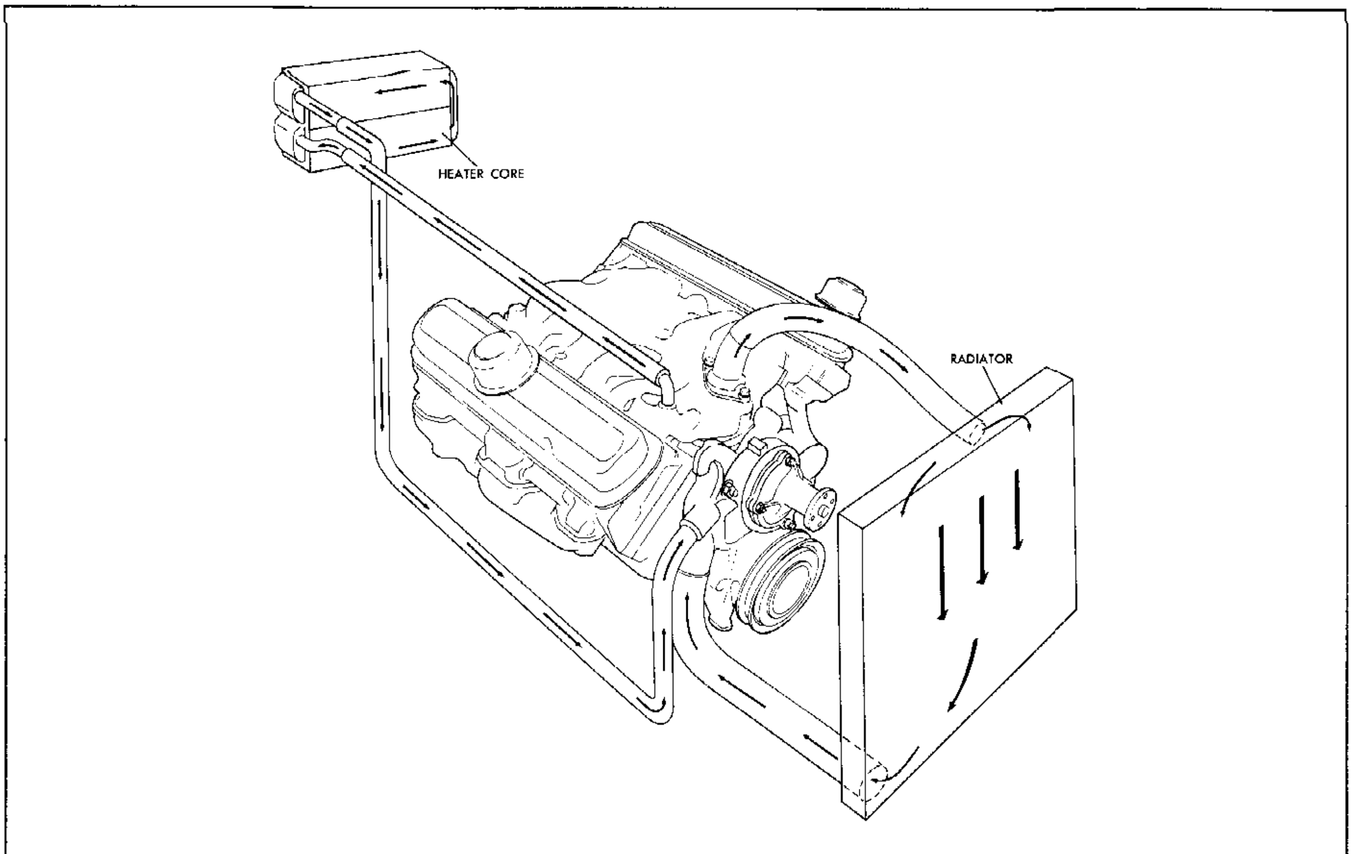


Fig. 1-5 Water Flow Through the Circ-L-Aire Heater System

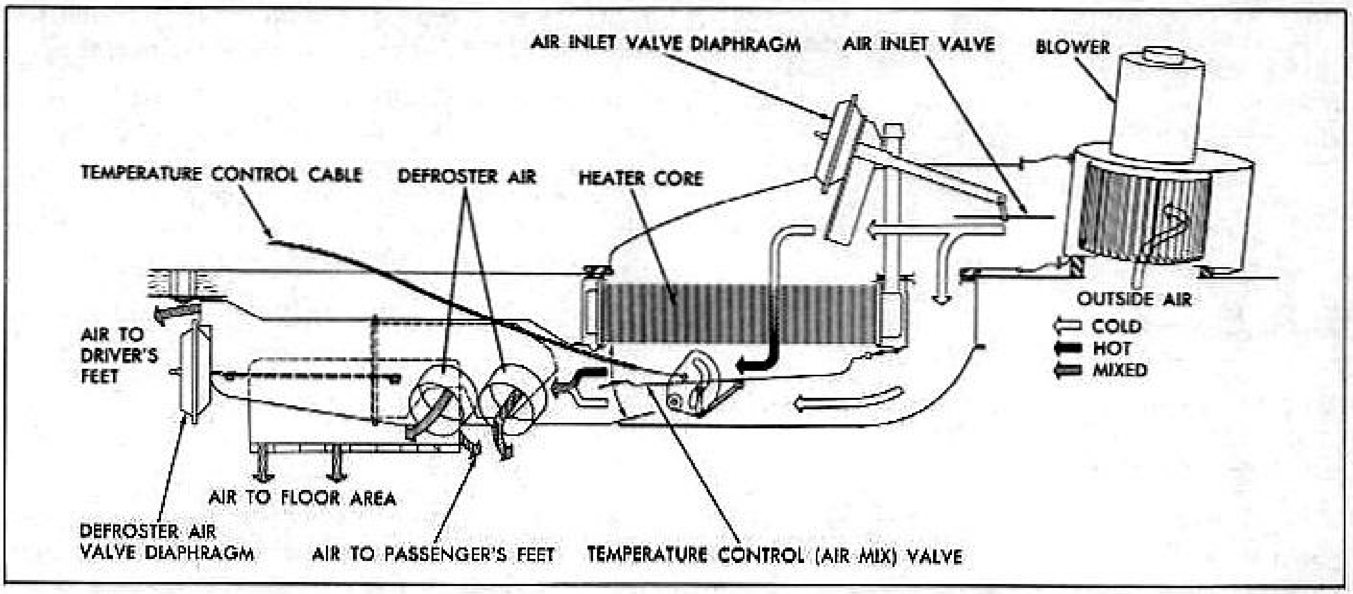


Fig. 1-6 Circ-L-Aire Heater Air Flow

The air passing over the hot heater core is warmed and also cools the hot engine coolant which returns to the intake area of the water pump.

WATER FLOW

Water flow in the heater system is taken from the engine cooling system from a water passage in the engine intake manifold, via a hose to the heater core inlet (on the dash shroud), through the heater core, via a hose to the intake area of the water pump, and back to the engine cooling system (Fig. 1-5).

Water entering the core from the intake manifold fills the lower half of the core and flows to the left where it enters a chamber connecting the lower half of the core with the upper half. Engine cooling system pressure (created by heat and the water pump) forces the water into the upper half of the core and then back to the intake area of the water pump.

The hot water flowing through the heater core is constant and is controlled by the engine water pump.

AIR SYSTEM

Outside air enters through an intake grille mounted flush with the hood directly below the windshield. Air in this chamber is pulled by the blower and forced to the heater air inlet duct assembly positioned on the right side of the dash in the engine compartment. The air then enters the body through the heater core and case assembly; part of the air by-passes the heater core and part of the air is directed through the heater core (Figs. 1-6 and 1-7). The amount of the by-pass air versus the amount of air flow through the

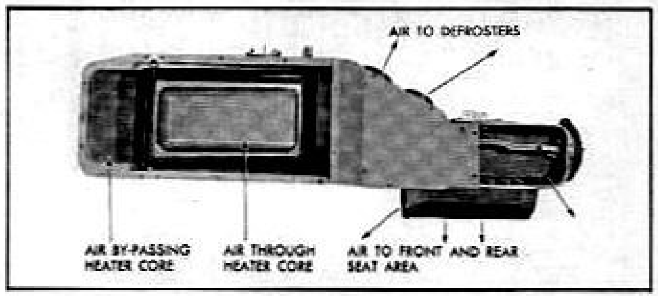


Fig. 1-7 Air Flow into Heater Core Case

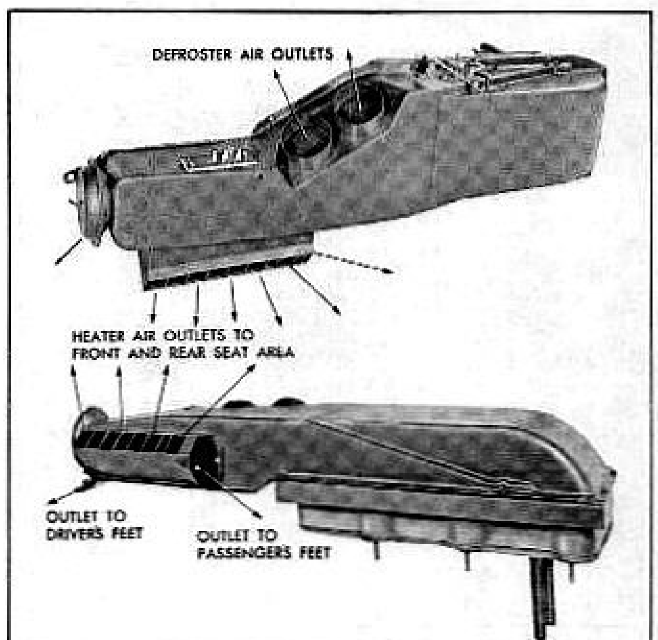


Fig. 1-8 Air Outlets in Circ-L-Aire Heater Core Case

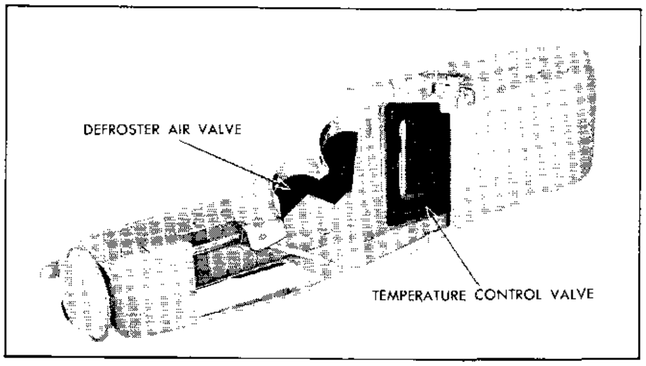


Fig. 1-9 Defroster Air Valve in "NORMAL" (Up) Position

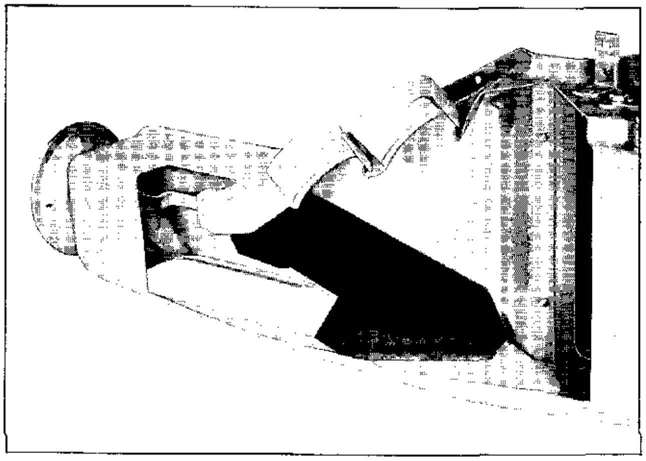


Fig. 1-10 Defroster Air Valve in "DE-ICE" (Down) Position

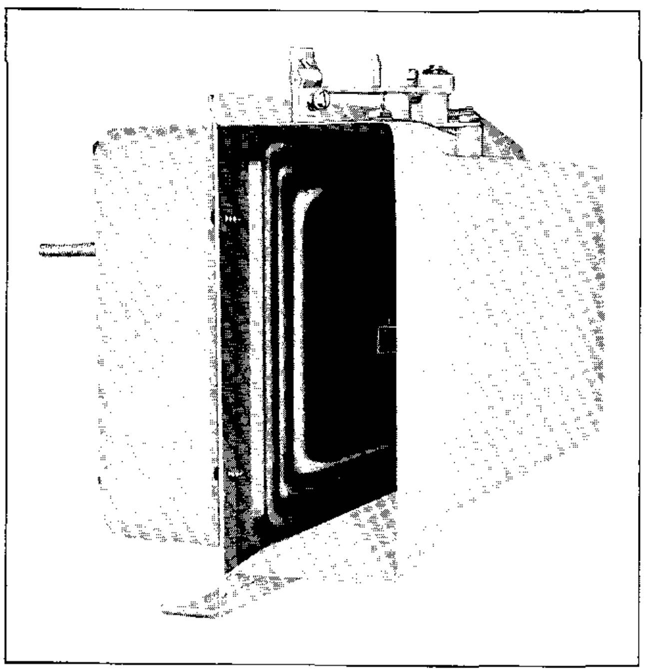


Fig. 1-11 Temperature Control Valve at Full Cold Position

heater core will depend upon the outside air temperature and the comfort or desired temperature in the car.

Heater air is distributed by a center outlet under the heater duct which disperses air over the front floor area and to the rear passenger compartment. An outlet on each side of the heater air outlet duct directs air to the driver and passenger side for additional air distribution to the front seat floor area (Fig. 1-8).

Flexible hoses, extending from the heater duct, are attached to two nozzles located along the base of the windshield for effective defrosting. The defroster air valve is designed to allow some heater air to go to the defroster outlets, at all times, for de-fogging purposes (Fig. 1-9).

Air flow through Pontiac's Circ-L-Aire Heater system is controlled by push buttons and a blower control switch in the heater control panel (located to the right of the steering column). These buttons operate a vacuum switch which appropriately applies vacuum to diaphragms that operate the heater inlet air valve in the heater air inlet duct assembly (located on the engine side of the dash shroud) and the defroster valve in the heater core case duct assembly (located on the passenger side of the dash shroud).

A defroster valve is hinged to the top of the duct assembly and operates to direct maximum amount of air from the duct to the windshield whenever "de-icing" the windshield (Fig. 1-10).

Since coolant flows through the heater core at all times, warmed air is allowed to mix with outside air by moving the temperature control lever which in turn moves a temperature air valve in the heater air duct; no heated air—all by-pass air with the temperature control lever in the full up position, all heated air—no by-pass air in the full down position (Figs. 1-11 and 1-12).

The amount of air flow through the heater air system can be varied with the "FAN" switch which is the right vertical control lever in the heater control panel. The "FAN" and "DE-ICE" switches are connected to the electrical system through the chassis wiring harness. Their purpose is explained in ELECTRICAL SYSTEM and their operation can be traced in the wiring schematic illustrations.

VACUUM SYSTEM

Vacuum input to the heater vacuum switch is through a tee connection fed from the vacuum connector on the carburetor throttle body. This vacuum is applied through a blue tipped hose to the No. 1 post of the heater vacuum switch (Fig. 1-13).

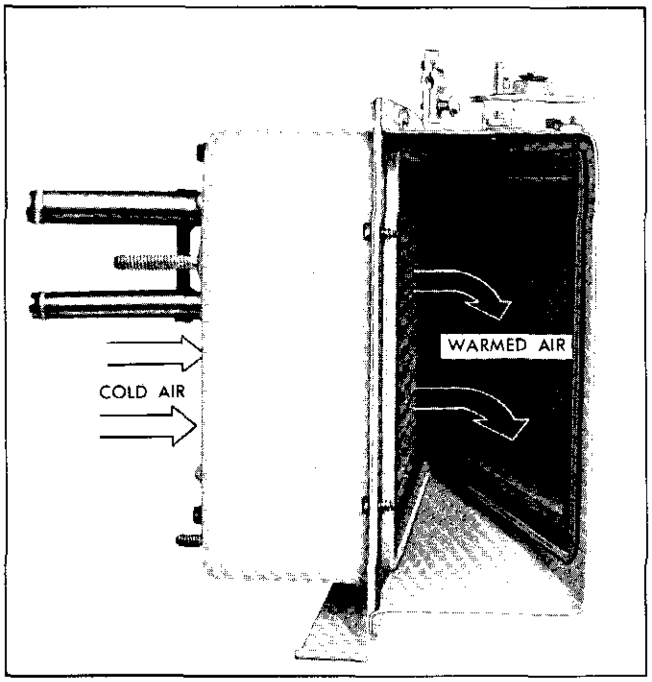


Fig. 1-12 Temperature Control Valve at Maximum Heat Position

NOTE: The heater vacuum switch has five vacuum post outlets. Cars equipped with heater only use No. 1, No. 2 and No. 3 vacuum posts; No. 4 and No. 5 are capped on cars equipped with heater only. Posts No. 4 and No. 5 are provided for use with the Circ-L-Aire conditioning system.

"OFF" POSITION

With the engine running and the heater control "OFF" push button placed in the "OFF" position, the off slide bar positions the vacuum switch so no vacuum passes through the switch. Atmospheric pressure is on both sides of the heater inlet air valve diaphragm and spring tension holds the inlet air valve (at the dash shroud) in a position to close the opening for air to enter the heater air system. Atmospheric pressure is also on both sides of the defroster air valve diaphragm and spring tension holds this valve tight against the underside of the air outlets to the defroster ducts in the heater core case and duct assembly.

"NORMAL" POSITION

When the "NORMAL" button is pushed, the normal slide bar moves the vacuum control switch to apply vacuum coming to the switch through the blue tipped hose to the No. 1 post of the vacuum switch, through the switch and the No. 3 post, through the red tipped hose which connects this vacuum post to

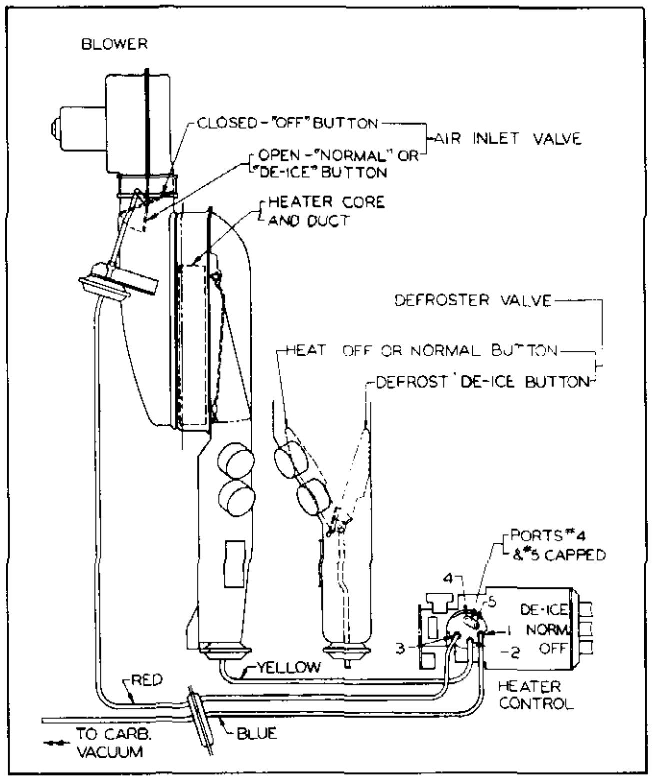


Fig. 1-13 Circ-L-Aire Heater Vacuum Hose Diagram

the heater inlet air valve diaphragm. Atmospheric pressure which is now only on one side of this diaphragm is sufficient to overcome spring tension and turns the heater inlet air valve to open position. Atmospheric pressure is on both sides of the defroster air valve diaphragm and spring tension holds this valve tight against the underside of the air outlets to the defroster ducts in the heater core case and duct assembly.

All air entering the heater system passes through the heater air inlet duct. It is then divided so part of the air by-passes the heater core and part of the air passes through the heater core. Warmed air mixes with the by-pass air and is directed to the floor of the front seat and to the windshield.

"DE-ICE" POSITION

Pushing the "DE-ICE" button moves the de-ice slide bar to position the vacuum switch to apply vacuum coming to the switch through the blue tipped hose to the No. 1 post of the vacuum switch, through the switch and the No. 3 post, through the red tipped hose which connects this vacuum post to the heater inlet air valve diaphragm. Atmospheric pressure which is now only on one side of this diaphragm is sufficient to overcome spring tension and turns the heater inlet air valve to the open position.

The vacuum switch also permits vacuum to enter the No. 2 post of the vacuum switch, through the yellow tipped hose which connects this vacuum post to the defroster air valve diaphragm. Atmospheric pressure which is now on only one side of the diaphragm is sufficient to overcome spring tension and swings the defroster air valve downward.

All air entering the heater system passes through the heater air inlet duct. It is then divided so part of the air by-passes the heater core and part of the air passes through the heater core where warmed air mixes with the by-passed air. With the defroster valve down, the valve acts as a ramp to permit more air to be directed to the area above the baffle and to the windshield. A small amount of air is permitted to pass through the irregular shaped valve to be directed to the front and rear floor area.

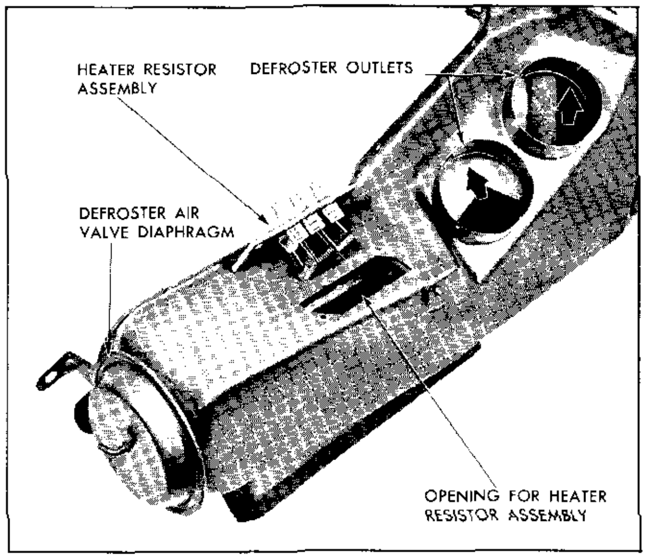


Fig. 1-14 Location of Circ-L-Aire Heater Resistor

ELECTRICAL SYSTEM

The heater control panel lamp is fed from the instrument panel rheostat output circuit which is protected by a 4 amp. fuse in the lower left corner of the fuse block.

The blower circuit of the heater system receives its electrical supply from the heater terminal on the fuse block. Overload protection of the heater electrical systems is provided by a 14 amp. fuse located in the lower right corner of the fuse block.

When the ignition switch is turned to the start position, the accessory terminal of the ignition switch is cut out. This prevents operation of the accessories connected through the ignition switch while starting the engine. Thus, the starting motor receives maximum battery current while cranking the engine because there is no current to the heater electrical system.

When the "OFF" push button is depressed, the heater master switch is opened and no current reaches the blower or defroster switches.

When either the "NORMAL" or "DE-ICE" push button is depressed the master switch is closed. Current will not flow to the blower in "NORMAL" position unless the blower switch is in the "LO", "MED" or "HI" speed position. When the "DE-ICE" button is depressed the circuit is closed to the blower to operate it at superspeed.

The heater blower switch is a four position switch but only provides for three blower speeds; low, medium and high. The blower is fed through a single connection at its input; a black colored wire.

CURRENT FLOW THROUGH HEATER CONTROL POSITIONS

Four positions of the heater blower switch control current flow to the blower as follows:

"OFF" position opens the heater blower switch and prevents the flow of current to the blower motor.

"LO" position closes the heater blower switch which closes the circuit to the blower motor. This allows current from the "HTR" terminal on the fuse block to flow through the heater master control switch to the blower switch via a tan colored wire, through the blower switch "LO" terminal and through a yellow wire to the resistor assembly (located in the heater air outlet duct as shown in Fig. 1-14). Current flows through all the resistors in the resistor block (.60 ohm, .50 ohm and .30 ohm) then through a black wire to the defroster (DE-ICE) switch terminal and to the blower via a black wire. See Figs. 1-15 and 1-16.

"MED" position closes the heater blower switch which closes the circuit to the blower motor. This allows current from the "HTR" terminal on the fuse block to flow through the heater master control switch to the blower switch via a tan colored wire, through the blower switch "MED" terminal and through a brown colored wire to the resistor assembly (located in the heater air outlet duct). Current flows through two resistors (.50 ohm and .30 ohm) then through a black colored wire to the defroster (DE-ICE) switch and to the blower via a black colored wire (Fig. 1-15).

"HI" position closes the heater blower switch which closes the circuit to the blower motor. This allows

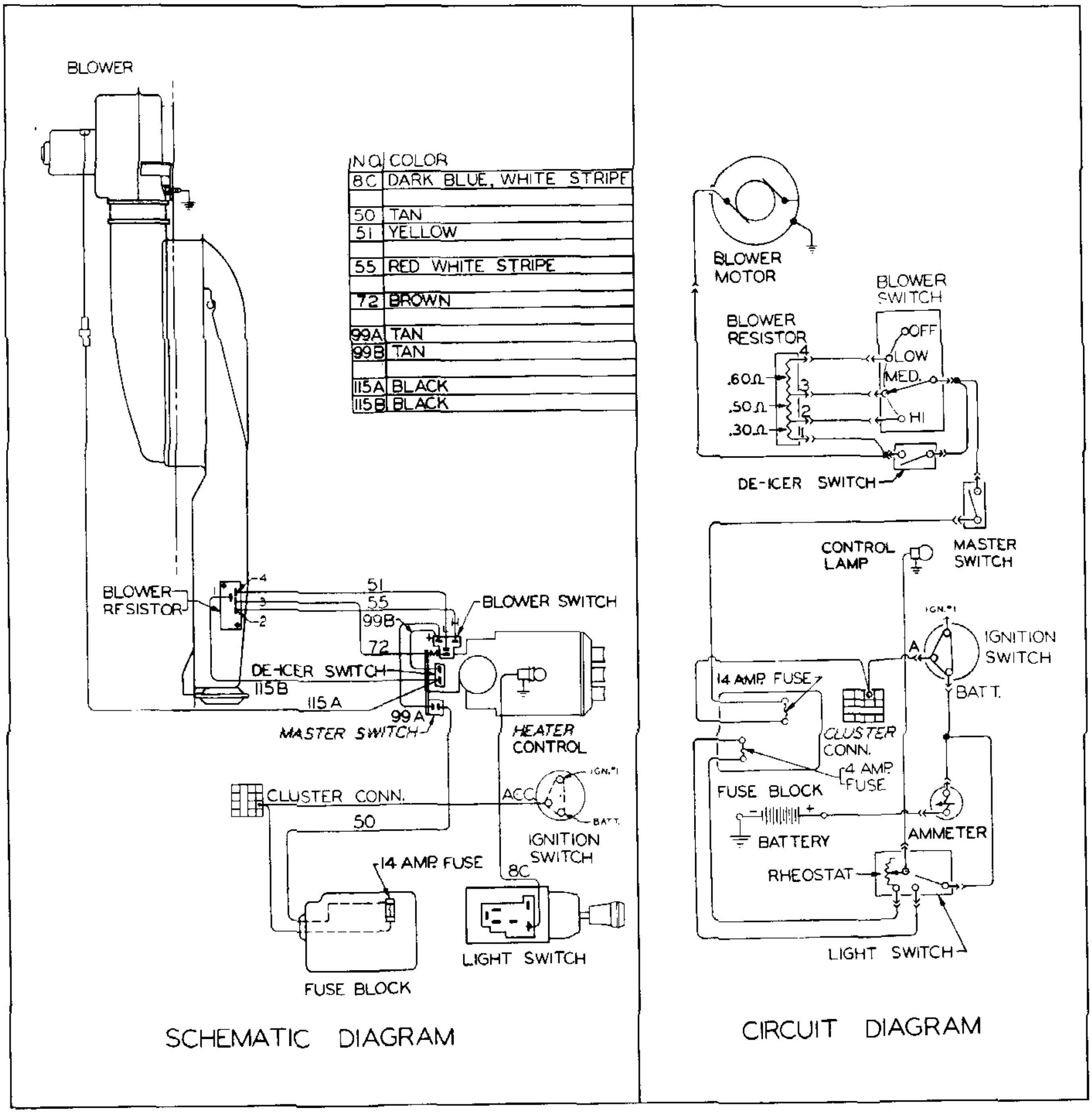


Fig. 1-15 Schematic and Circuit Diagrams of Circ-L-Aire Heater Electrical System

current from the "HTR" terminal on the fuse block to flow through the heater master control switch to the blower switch via a tan colored wire, through the blower switch "HI" terminal and through a red wire with a white stripe to the resistor assembly (located in the heater air outlet duct). Current flows through one resistor (.30 ohm), then through a black wire to the defroster switch and to the blower via a black wire.

CURRENT FLOW THROUGH DEFROSTER (DE-ICE) CONTROL POSITION

When the "DE-ICE" (defroster) button is pushed in, the heater blower switch is by-passed. Current flows from the "HTR" terminal of the fuse block through the heater master control switch to the blower switch at the input terminal, back to the defroster switch and through a single input connection. The

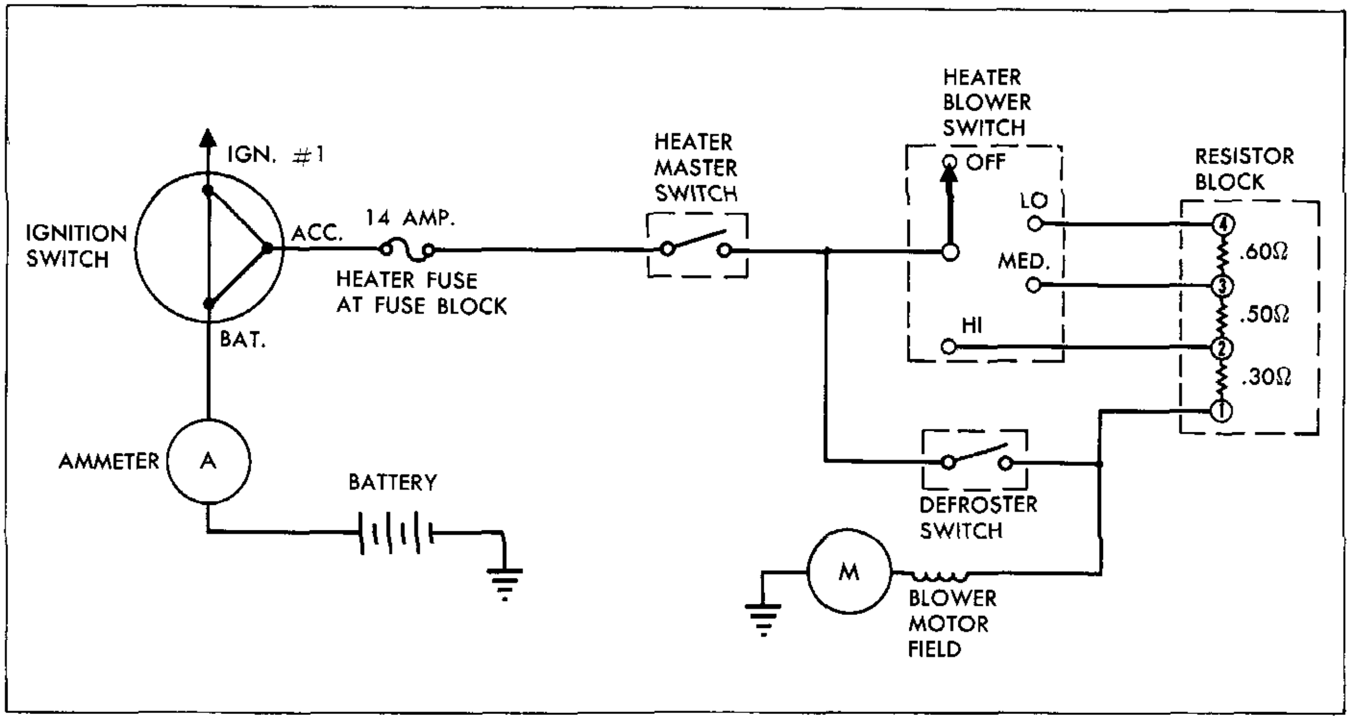


Fig. 1-16 Simplified Circuit Diagram of the Circ-L-Aire Heater Electrical System

outlet portion of the switch has a two wire connection; one black colored wire to the resistor assembly at the output side of the .30 ohm resistor (located in the heater air outlet duct); the other is through a black colored wire to the blower.

In the "DE-ICE" position, there is no "fixed" resistor in the circuit and therefore the blower operates faster than it does in the blower "HI" position.

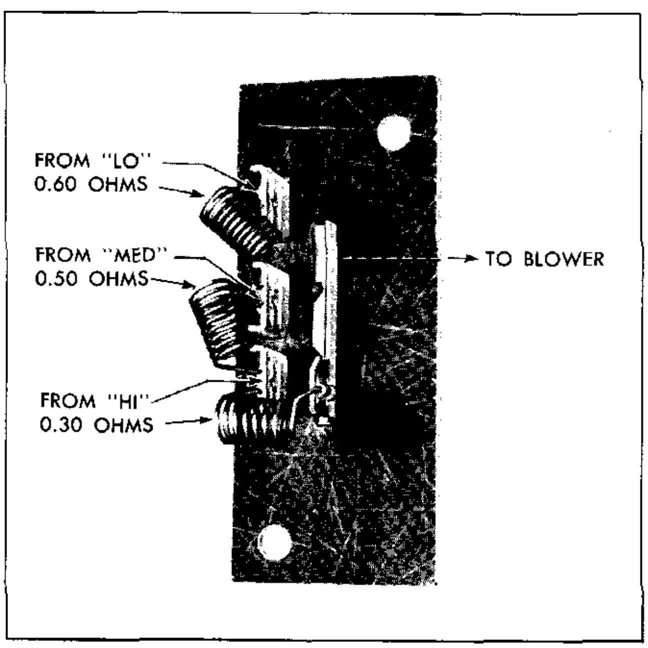


Fig. 1-17 Circ-L-Aire Heater Resistance Values at Coils

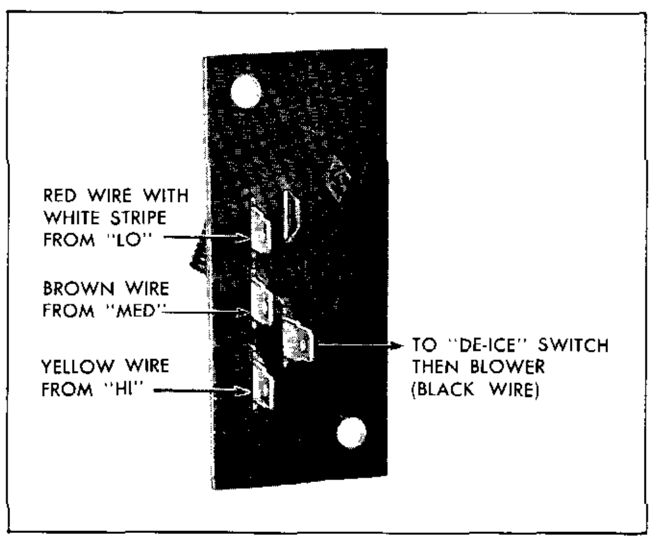


Fig. 1-18 Circ-L-Aire Heater Resistor Terminal Identification

MINOR SERVICES AND REPAIRS

CONTENTS OF THIS SECTION

ADJUSTMENTS ON CAR

TEMPERATURE CONTROL CABLE

NOTE: This adjustment should be checked when slightly warmed air leaves the heater outlets when the "OFF" button is depressed or the temperature control lever is in the full up (OFF) position, or when insufficient heat is obtained with the temperature control lever in the full down position.

1. Remove the glove box.

2. Move "TEMP" lever (at the heater control panel) making sure lever moves up against its stop.

NOTE: The "TEMP" lever and heater "FAN" lever should be in alignment when the "FAN" lever is in the "OFF" position.

a. If "TEMP" lever requires adjustment, loosen cable clamp screw at heater control panel and move cable assembly as necessary to adjust.

b. Holding cable housing, move "TEMP" lever to full down position and slide the temperature control cable housing away from the heater control panel front face (toward front of car) as necessary to remove any slack in the cable and tighten housing clamp screw securely.

c. Recheck "TEMP" lever in the full up position.

3. Insert dowel pin through heater cam into cam bracket (Fig. 1-19).

4. Install looped end of cable on heater cam pin with cable housing passing through cable clamp on heater duct.

5. Hold the "TEMP" lever in the full up (cold) position and tighten cable clamp on the heater duct.

TEMPERATURE AIR VALVE

NOTE: This adjustment should be made only if adjustment of the temperature control cable does not prevent warm air from coming into the car when the heater is "OFF" or the "TEMP" lever is in the full up (cold or off) position, or does not give sufficient heat with the "TEMP" lever in the full down position.

1. Remove glove box.

2. Remove heater outlet nozzle left screw and rotate outlet to the right. (Remove outlet nozzle on cars equipped with Circ-L-Aire Conditioning.)

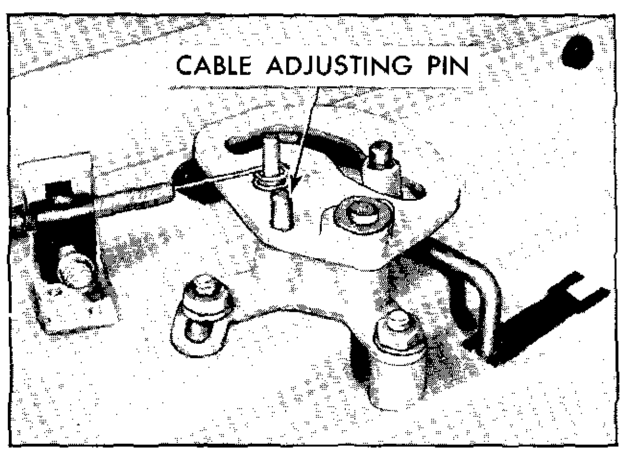


Fig. 1-19 Temperature Control Cable Adjusting Pin in Position

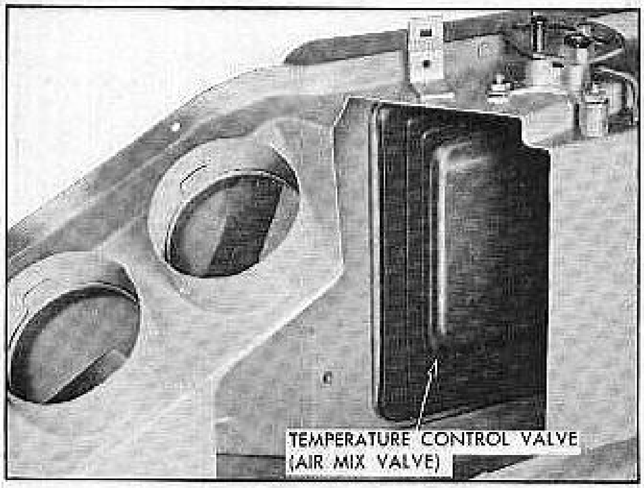


Fig. 1-20 Temperature Control Valve Crush to Heater Core

3. Disconnect defroster nozzle hoses at heater outlet duct.

4. Loosen the two heater temperature control valve cam mounting bracket to outlet duct nuts using 3/8" wrench.

5. Insert a 3/16" dowel pin (approximately 1" long) through the heater cam into the cam bracket as shown in Fig. 1-19.

6. Shine a light through the defroster outlets and using a mirror in the heater outlet nozzle opening move bracket and cam assembly (with pin installed) so the rubber edge of valve *just contacts* the heater core flange. Continue to move this assembly in the same direction slightly to place a slight "crush" (approx. 3/32") on the rubber portion of the valve (Fig. 1-20).

7. Hold the cam and bracket assembly in this position and tighten bracket nuts.

8. Adjust temperature "TEMP" control cable.

a. Align "TEMP" lever with "FAN" lever in full up (no heated air) position.

b. Loosen cable clamp screw at heater control panel and slide coiled conduit away from the heater control assembly to remove cable slack. Tighten retaining clamp securely.

c. Loosen cable conduit retaining clamp at heater assembly.

d. Insert a 3/16" dowel pin (approximately 1" long) through the heater cam and into the cam bracket.

e. Holding "TEMP" lever in full up position (no heated air), tighten cable clamp securely at heater.

f. Remove dowel pin.

9. Operate "TEMP" lever observing valve to see that the rubber is crushed when the lever is in the full up position (no heated air) as well as the full down position (maximum heat) and correct as necessary to obtain a slight crush of the rubber at both ends of the cable travel.

10. Attach defroster outlet hoses and replace glove box.

11. Replace heater air outlet nozzle.

HEATER CONTROL PANEL ASSEMBLY

REMOVE AND REPLACE

1. Completely detach temperature control cable at the heater control panel.

2. Disconnect wire connectors from the control panel assembly.

3. Back off screw which retains top of control assembly to back side of instrument panel.

4. Remove two control panel to instrument panel screws at lower edge of heater control panel.

5. Move heater control assembly out from instrument panel part way.

6. Remove control panel lamp and disconnect vacuum hoses.

7. Remove heater control assembly.

8. Replace by reversing the above procedure.

NOTE: When replacing vacuum hoses, connect them as follows:

Connect blue tipped hose to the No. 1 vacuum post, the yellow tipped hose to the No. 2 vacuum post, and the red tipped hose to the No. 3 vacuum post.

Number 4 and 5 posts are for use with Circ-L-Aire Conditioning and are to be capped on cars equipped with Circ-L-Aire Heater only.

9. Adjust temperature control cable.

HEATER VACUUM SWITCH ASSEMBLY

REMOVE AND REPLACE

1. Remove heater control panel assembly.

2. Remove heater vacuum switch assembly.

3. Replace switch by reversing the above procedure using a new switch retainer.

4. Adjust temperature control cable.

HEATER MASTER SWITCH

REMOVE AND REPLACE

1. Disconnect wire connector at heater master switch.

2. Remove two nuts securing heater master switch and remove switch (Fig. 1-21).

3. Replace switch and check to make sure plastic end of switch arm contacts the "OFF" push button sliding bar.

4. Connect wire connector to switch.

HEATER BLOWER SWITCH

REMOVE AND REPLACE

1. Disconnect wire connector at switch.

2. Remove blower switch arm plastic rivet. Push the plastic center pin (Fig. 1-22) out of the plastic rivet and then the rivet can be slid out of the switch lever.

3. Remove two screws retaining heater blower switch and remove switch.

4. Replace heater blower switch (connecting arm with the plastic rivet by inserting the rivet and then the plastic center pin, Fig. 1-22).

5. Check operation of heater switch control lever making sure switch moves freely in all positions and that the "OFF", "LO", "MED" and "HI" letters are centered in the "FAN" window. Adjust switch as necessary.

DEFROSTER SWITCH

REMOVE AND REPLACE

1. Disconnect wire connector at defroster switch.

2. Remove two nuts securing defroster switch and remove switch.

3. Replace switch and check to make sure plastic end of switch properly contacts the "DE-ICE" push button sliding bar.

NOTE: The switch should be closed when the "DE-ICE" push button is pushed in and open when either the "NORMAL" or "OFF" button is depressed. Adjust by moving switch in line with the heater control panel sliding selector bars.

4. Connect wire connector to switch.

TEMPERATURE CONTROL CABLE

REMOVE AND REPLACE

1. Remove glove box.

2. Disconnect temperature control cable at top of heater core and air outlet duct.

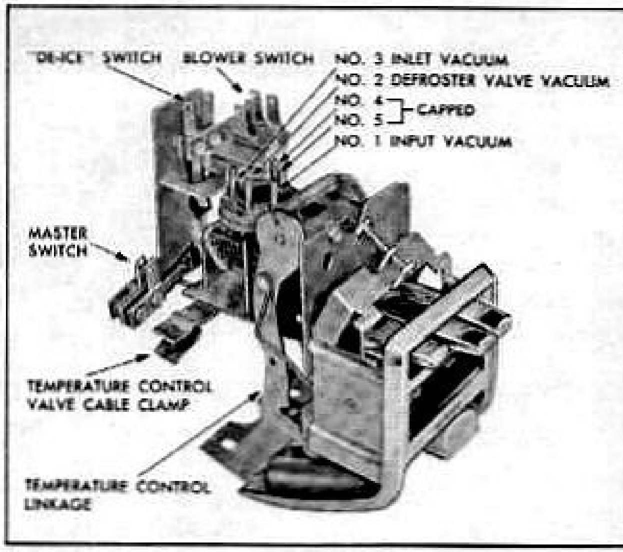


Fig. 1-21 Control Panel Switch Identification

3. Disconnect cable from heater control panel.

4. Move temperature control lever to full down position and remove temperature control cable.

5. Replace cable by reversing the above procedure.

6. Adjust temperature control cable.

BLOWER MOTOR

REMOVE AND REPLACE

1. Hoist front end.

2. Remove right front wheel assembly.

3. Remove right front headlamp assembly.

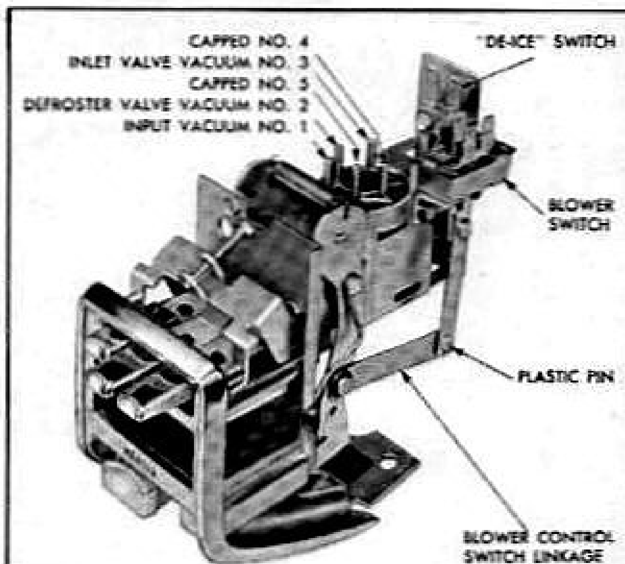


Fig. 1-22 Blower Control Linkage at Control Panel

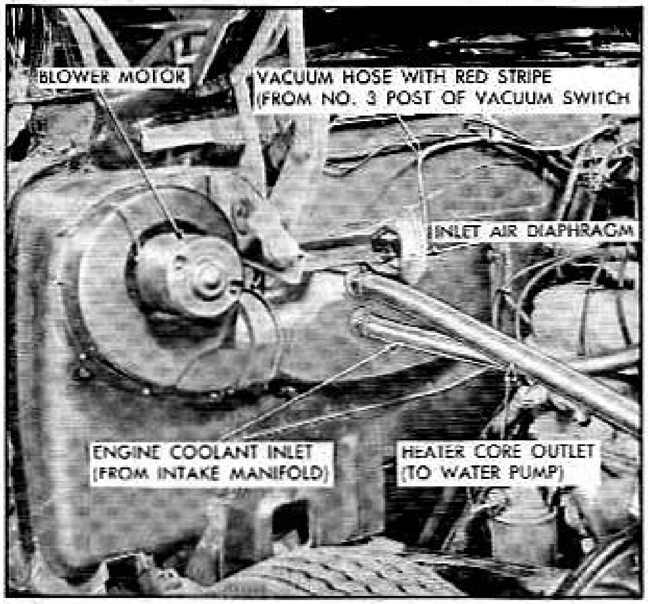


Fig. 1-23 Circ-L-Aire Heater Air Inlet Duct Assembly on Dash Shroud

4. Disconnect right front fender skirt assembly; move skirt toward rear of car and downward.

5. Disconnect wires at blower motor (Fig. 1-23).

6. Remove blower motor assembly.

7. Replace by reversing the above procedure.

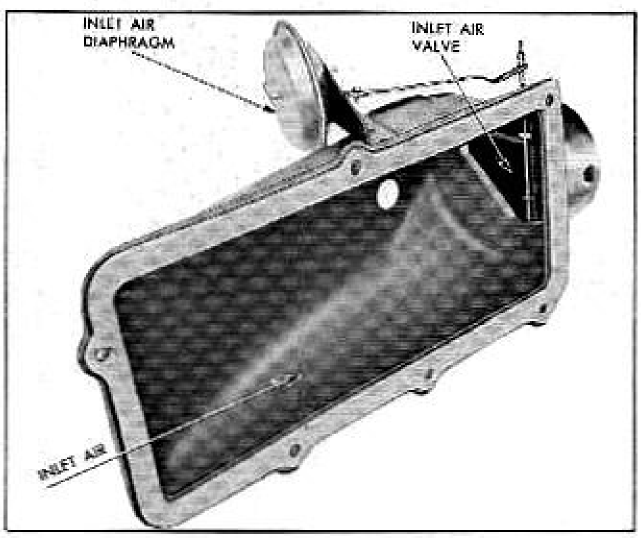


Fig. 1-24 Air Inlet Duct Assembly

AIR INLET DUCT ASSEMBLY

REMOVE AND REPLACE TO SERVICE ASSEMBLY

1. Drain radiator.

2. Disconnect vacuum hose at air inlet duct diaphragm.

3. Disconnect heater inlet and outlet water hoses at heater.

4. Remove six nuts securing air inlet duct assembly and remove assembly and duct to housing sleeve. See Fig. 1-24.

5. Replace by reversing the above procedure.

HEATER CORE

REMOVE AND REPLACE

1. Drain radiator.

2. Disconnect vacuum hose at air inlet duct diaphragm.

3. Disconnect heater inlet and outlet water hoses at heater.

4. Remove six nuts securing air inlet duct assembly and remove assembly and duct to housing sleeve.

5. Remove glove box.

6. Disconnect temperature control cable at top of heater core and air outlet duct.

7. Disconnect vacuum hose from defroster air valve diaphragm.

8. Disconnect air outlet hoses to defroster outlet assemblies.

9. Remove wire connector from resistor assembly at top left side of the heater air outlet duct assembly by prying connector up with flat blade screwdriver.

10. Remove spring retainer on heater core stud at engine side of dash shroud.

11. Remove the heater core and case assembly.

12. Remove the heater core assembly noting position and location of seals (Figs. 1-25 and 1-26).

13. Replace by reversing the above procedure.

14. Adjust temperature control cable.

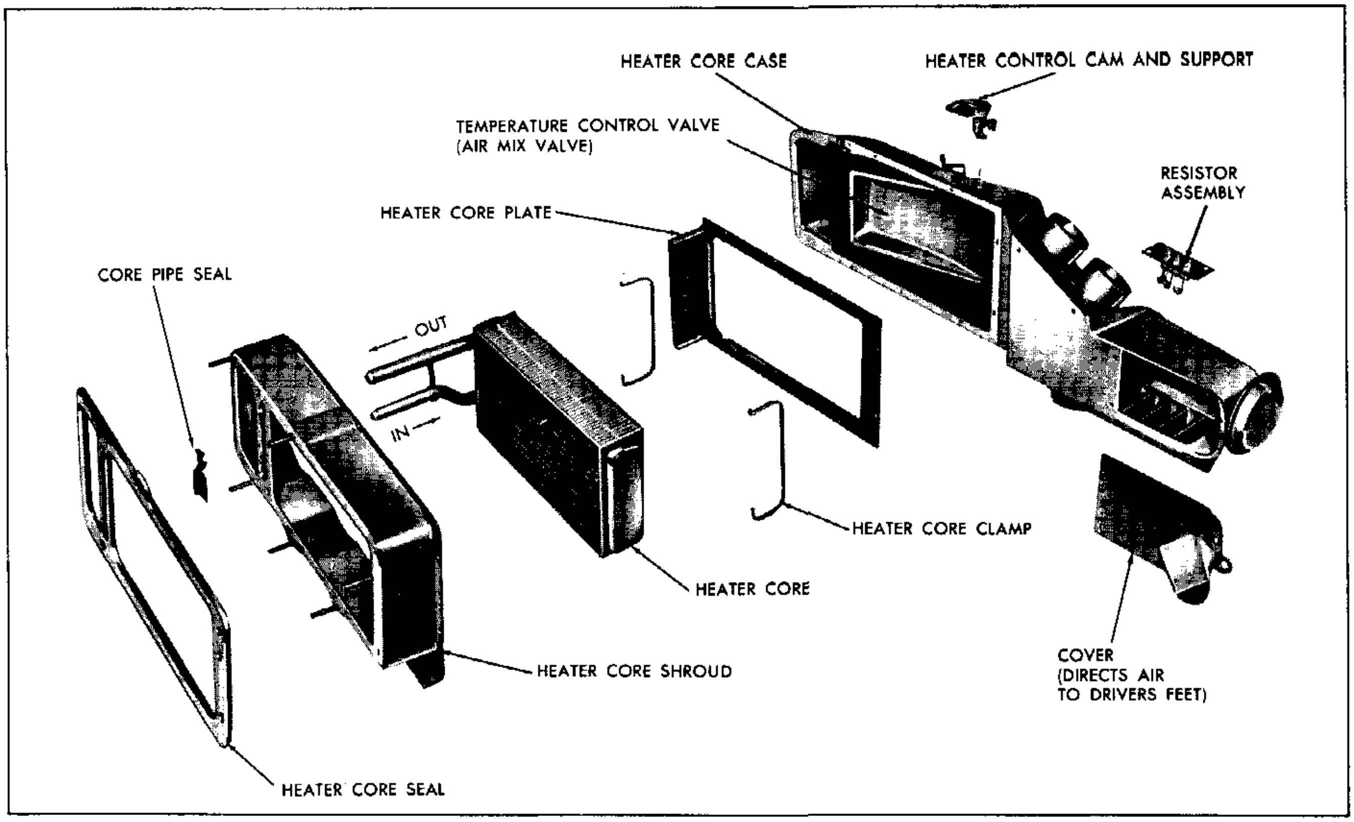


Fig. 1-25 Circ-L-Aire Heater Core and Case Assembly (Heater Only)—Exploded View

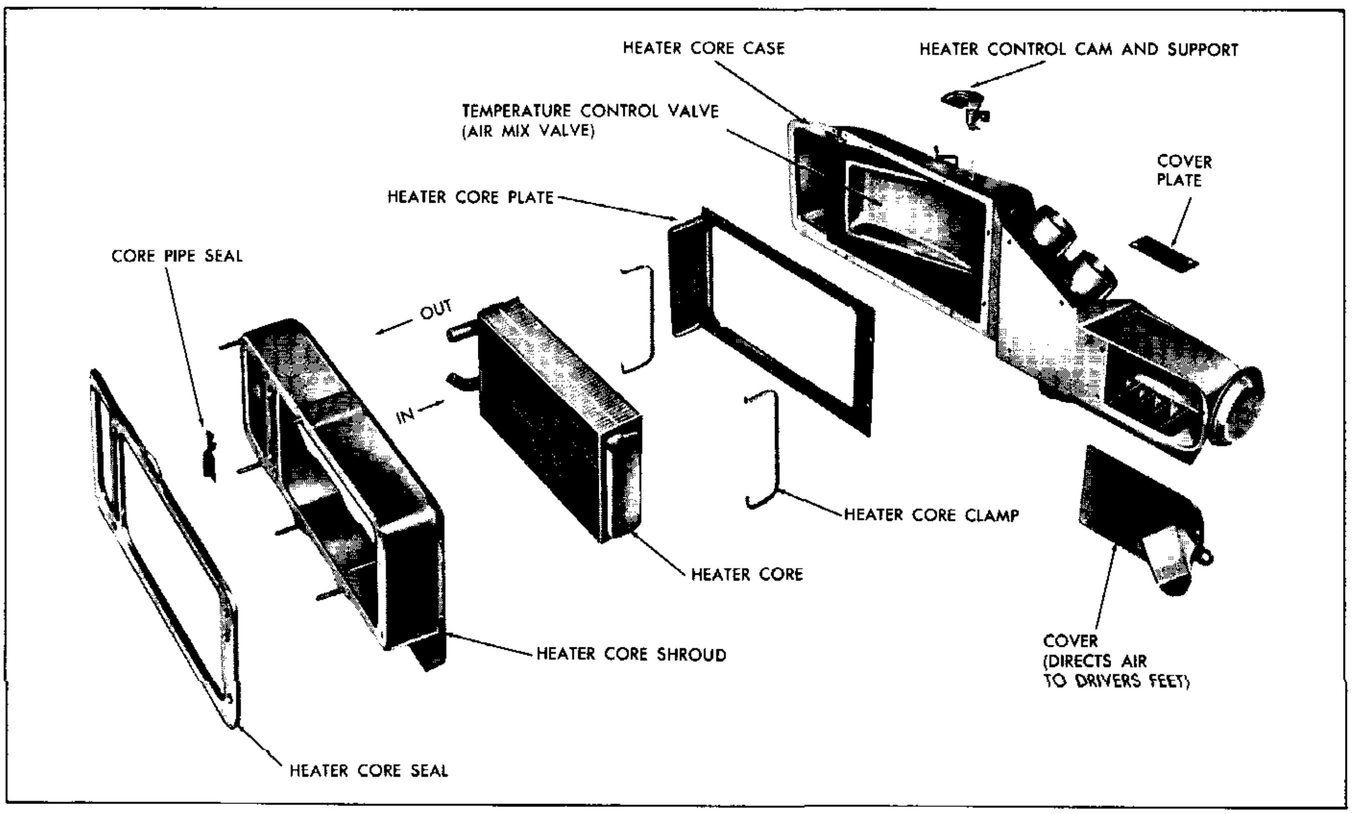


Fig. 1-26 Circ-L-Aire Heater Core and Case Assembly (With Circ-L-Aire Conditioning)—Exploded View

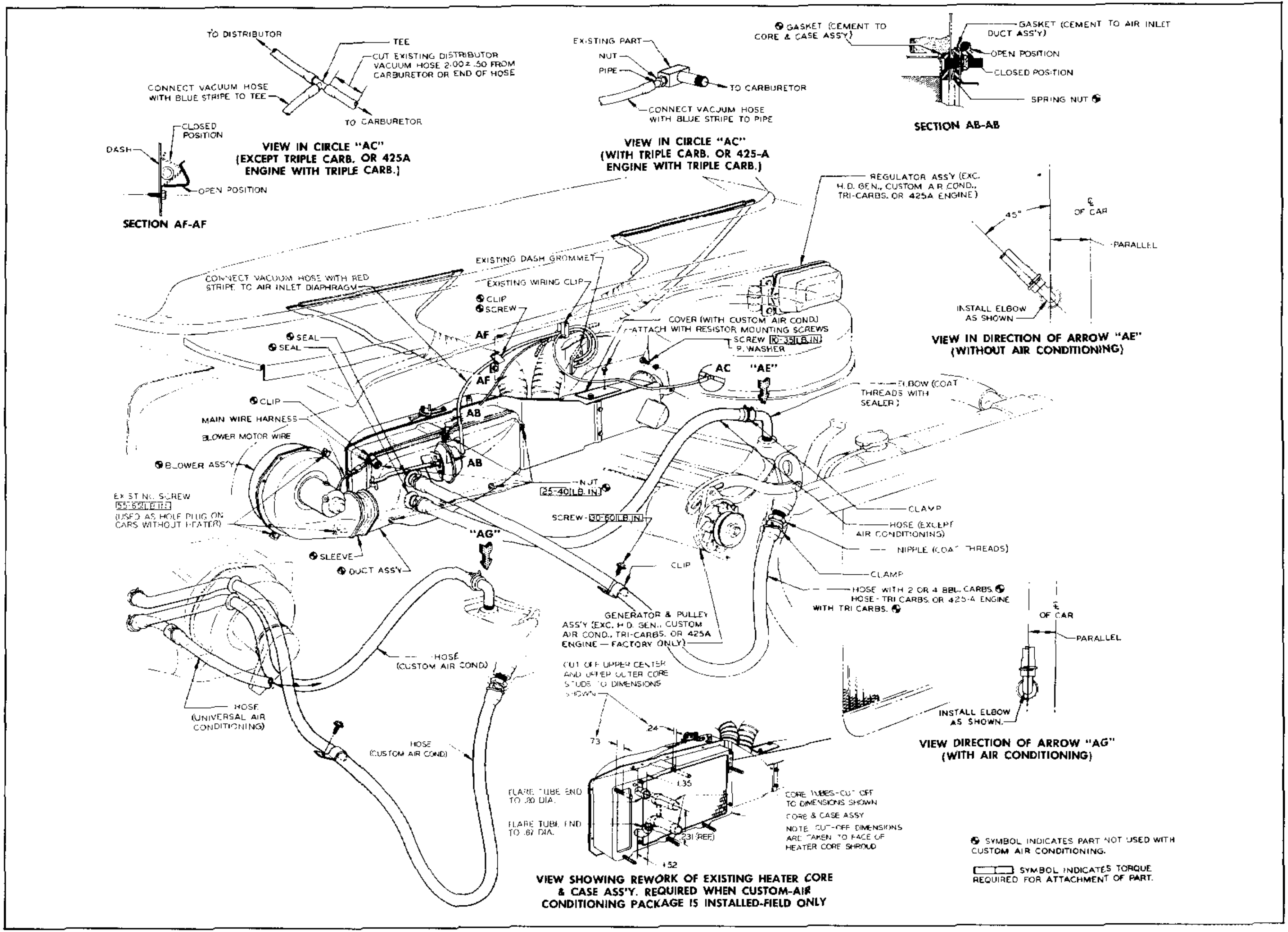


Fig. 1-27 Reference Illustration—Circ-L-Aire Heater Parts in Engine Compartment

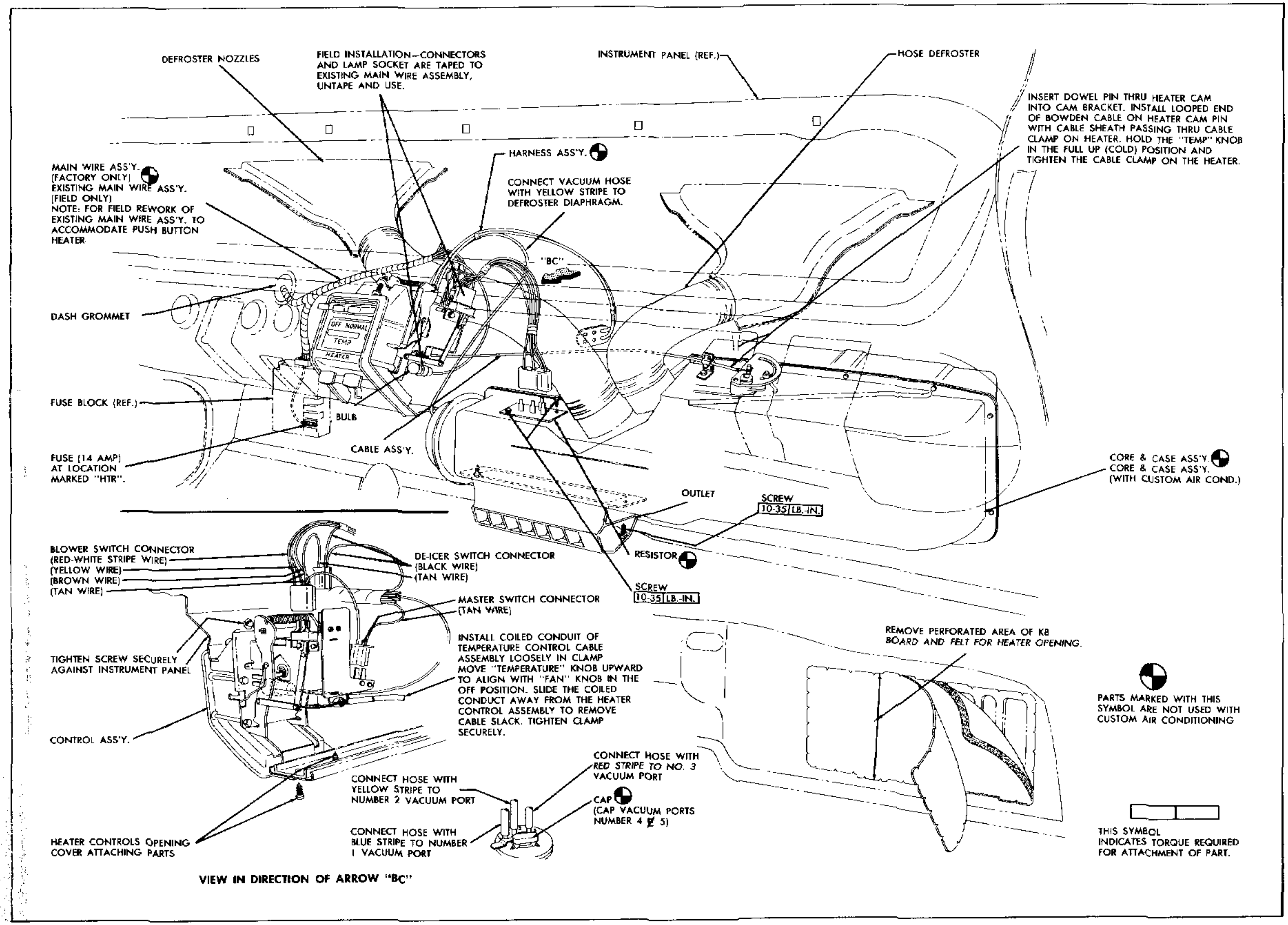


Fig. 1-28 Reference Illustration—Circ-L-Aire Heater Parts in Body Interior

TESTING AND DIAGNOSIS

CONTENTS OF THIS SECTION

TESTING

OPERATIONAL TEST

The purpose of performing a heater operational test is to prove the heater system is operating properly.

PRELIMINARY CHECKS

Engine Compartment

1. Check radiator for proper engine coolant level.

2. Inspect radiator core and heater hoses for leaks, at the same time inspecting for kinked or collapsed heater hoses.

3. Check vacuum hose connection at heater air inlet duct diaphragm for proper installation. This vacuum hose should have a red tip at its end.

4. Inspect the air inlet duct to heater blower sleeve to see that it is not torn or damaged and that it is properly installed (to prevent any air leaks from engine compartment which may have objectionable fumes or odors).

Inside Car Body

1. Check to see that a vacuum hose having a yellow tipped end is attached to the defroster valve diaphragm at the left end of the heater core and case assembly.

2. Start engine.

3. Place "FAN" control lever in up position. Depress heater "OFF" push button and check "FAN" control lever in "OFF", "LO", "MED" and "HI" positions; blower should not operate.

4. Depress "NORMAL" push button and check "FAN" control in "OFF", "LO", "MED" and "HI" positions. Blower should not operate at "OFF", operate at "LO" and increase in speed at "MED" and "HI" directing air through all heater and defroster outlets.

5. Depress the "DE-ICE" push button. Blower should operate faster than the "HI" speed position, directing most of the air through the defroster outlets onto the windshield.

6. Position "FAN" control in the full up position. Blower should continue to operate.

7. Return heater controls to original position and turn engine off.

Should the heater operate satisfactorily during the above checks, it would appear that heater operation is normal. If during the checks irregularities are noted or complaints on heater operation could not be noted or determined, then refer to TROUBLE DIAGNOSIS for the complaint or cause and the remedy.

TROUBLE DIAGNOSIS

INSUFFICIENT HEATING

COMPLAINT OR CAUSE	REMEDY
Slow warming in car.	Incorrect operation of controls. Advise operator of proper operation of heater controls. Explain operation of cowl vents and controls.
	Checks for good seal between hood and cowl.
Objectionable engine or exhaust fumes in car.	Check for seal between vent grille and cowl.
	Check for damaged and/or proper installation of sleeve between air inlet duct and blower motor.

INSUFFICIENT HEATING—Continued

COMPLAINT OR CAUSE	REMEDY
Objectional engine or exhaust fumes in car—continued.	Locate and seal any other air leaks.
	Check and adjust cowl vent control.
Cold drafts on floor.	Check operation and adjustment of cowl vent cables.
	Advise operator of proper operation of heater system.
	Door vents open or improperly adjusted.
	Advise owners to use blower to force air to rear seat area.
	Check to be sure front floor mat is under floor mat retainer.
Insufficient heat to rear seat.	Obstruction on car floor, possibly wrinkled or torn deadener felt between front seat and floor.
Low engine coolant level.	Check radiator and engine cooling system for leaks, correct and fill to proper level. Run engine to clear any air lock.
Failure of engine cooling system to warm up.	Check radiator cap and engine thermostat and replace if required.
Kinked heater hoses.	Remove kink or replace hose.
Foreign material obstructing water flow in or through heater core.	Remove foreign material if possible, otherwise replace core.
Temperature control cable improperly adjusted.	Adjust cable.
Temperature air valve improperly adjusted.	Adjust valve.
Air valves do not operate.	See VACUUM SYSTEM DOES NOT OPERATE AIR VALVES.

INADEQUATE REMOVAL OF FOG OR ICE

CAUSE	REMEDY
Air valve does not open.	See VACUUM SYSTEM DOES NOT OPERATE AIR VALVES.
Defroster valve does not open fully.	Adjust operating linkage.
Obstructions in defroster outlets at windshield.	Remove obstruction. On cars with instrument panel pads, look for and fix loose panel pad cover at defroster outlets.
Dinged defroster outlets.	Reshape outlet flange with pliers. The outlet should have a uniform opening, 5/16" wide.
Blower motor not connected.	Connect wire.
Inoperative blower motor.	Replace motor. Check heater fuse.
Inoperative blower motor switch.	Replace switch.
Inoperative master switch.	Replace switch.

TOO WARM IN CAR

CAUSE	REMEDY
Temperature air valve improperly adjusted.	Adjust valve.
Obstruction in air hoses to defroster outlets.	Check for air flow through these hoses and repair if obstructed.
Incorrect operation of controls.	Advise operator of proper operation of heater system.

VACUUM SYSTEM DOES NOT OPERATE AIR VALVES

CAUSE	REMEDY
Little or no vacuum at valve diaphragm.	Check for vacuum leaks.
Leak in vacuum system.	Check vacuum lines for leaks or obstructions.
	Check heater control panel vacuum switch. Replace if necessary.
Air valve sticking.	Check for bind or obstruction in air valve.

BLOWER INOPERATIVE

CAUSE	REMEDY
Blown fuse.	Replace fuse.
Inoperative motor.	Replace motor.
Open circuit.	Repair circuit between ignition switch, blower switch, and blower motor. See wiring diagrams.
Inoperative blower motor or master switch.	Adjust or replace faulty switch.

MISCELLANEOUS

CAUSE	REMEDY
Control levers not aligned due to incorrect adjustment.	Adjust temperature control cable.
Blown fuses.	Shorts in electrical system; locate and correct short.
	Blower wheel rubbing on case.
	Failed blower motor.
Front floor mat wet under heater.	Windshield improperly sealed. Manual antenna improperly sealed.
	Heater core leaking. Repair if possible, otherwise replace.
	On Circ-L-Aire air conditioned cars, check for proper gasket and/or seal to dash. Check also for leak at hose connection at heater core.
Heater "gurgle".	Check engine coolant level in radiator.

SPECIFICATIONS

Circ-L-Aire Heater Current and Voltages

NOTE: Data for conditions of car windows and doors closed and at room temperature.

Control Position	Input Voltages at Junction Block	Blower Current	Motor Voltage	Impeller Speed
DE-ICE	12.2	6.0	11.7	2025
HI	12.2	6.15	11.65	1965
MED	12.2	4.6	8.4	1575
LO	12.2	3.7	6.45	1305
DE-ICE	13.5	6.65	12.9	2160
HI	13.5	6.85	12.85	2115
MED	13.5	5.0	9.3	1695
LO	13.5	4.05	7.1	1410
DE-ICE	14.5	7.1	13.9	2280
HI	14.5	7.35	13.85	2220
MED	14.5	5.35	10.0	1785
LO	14.5	4.3	7.7	1485

Cooling System Capacity

Engine Less Heater .... 18.5 qts.
Engine With Heater .... 19.5 qts.

Fuse

Heater Electrical System (on fuse block) .... 14 amp.
Heater Control Panel Lamp (on fuse block) .... 4 amp.

	Early Type	Late Type
Generator Model	1102199	1102264
Brush Spring Tension, Oz.	28	28
Cold Output	35 amps., 14 V. 2240 rpm	35 amps., 14 V. 2730 rpm
Field Current Draw	1.69-1.70 amps. 12 V., 80°F.	1.48-1.62 amps. 12 V., 80°F.

Regulator Model	1119264 (Includes 1119002 regulator with 1945172—45 amp. fuse assy.)	
Paint Code Identification (daub)	Yellow	
Cutout Relay:		
Air Gap In	.020	
Point Opening, In	.020	
Closing Voltage, volts	11.8-13.5	
Voltage Regulator:		
Air Gap, In.	.075	
Normal Range (125°F) volts	13.8-14.8	
Current Regulator:	Standard	Hydra-Matic
Air Gap, In.	.075	.075
Allowable Limits (125°F.), ampere	27-33	38-45

DIRECT-AIRE HEATER

CONTENTS OF THIS SECTION

DESCRIPTION AND OPERATING INSTRUCTIONS

GENERAL DESCRIPTION

Pontiac's Direct-Aire Heating and Defrosting System provides rapid warm-up sensation and even distribution of warmed air to all parts of the car. All air entering the system is taken through hood high cowl vents providing air with a minimum of dust, foreign material and undersirable fumes.

The use of outside air exclusively provides constant and rapidly changing air inside the car, eliminating a smoke-filled interior and keeps the occupants comfortable.

The driver has fingertip control of the temperature warmed air entering the car. When heated air is desired, the blower forces air taken from the hood high cowl air inlet housing through the heater core and then through an air distributing system to the air outlets.

The design of the heater and defroster system, its valves and controls permits a method of obtaining different amounts of forced air flow for ventilation.

AIR OUTLETS AND CONTROLS

AIR OUTLETS

Heated air enters the interior of the car and is distributed by a center outlet under the heater duct which disperses air over the front floor area and to the rear passenger compartment.

Additional air distribution outlets are provided: one at each side of the heater outlet air duct. These direct air to the floor of the driver and front seat passenger respectively.

CONTROLS

The heater control panel is located to the right of the steering column on the lower section of the instrument panel. The control panel has three levers sliding in a vertical plane which control temperature and air flow; one each for "TEMP", "AIR" and "DE-ICE". A "FAN" switch at the top of the control panel moves from left to right in a horizontal plane to give "OFF", "LO", "MED" and "HI" blower speed.

When all levers are in the full up position, all valves and control units are closed. The fan blower motor is off when the control is in the full left position.

"TEMP"

The temperature control lever is located in the lower left part of the heater control panel and moves vertically to tailor the temperature of heated air entering the interior of the car.

In the extreme up position no heated air enters the car because the temperature air valve is closed. This feature permits forced air for ventilation without warming this air.

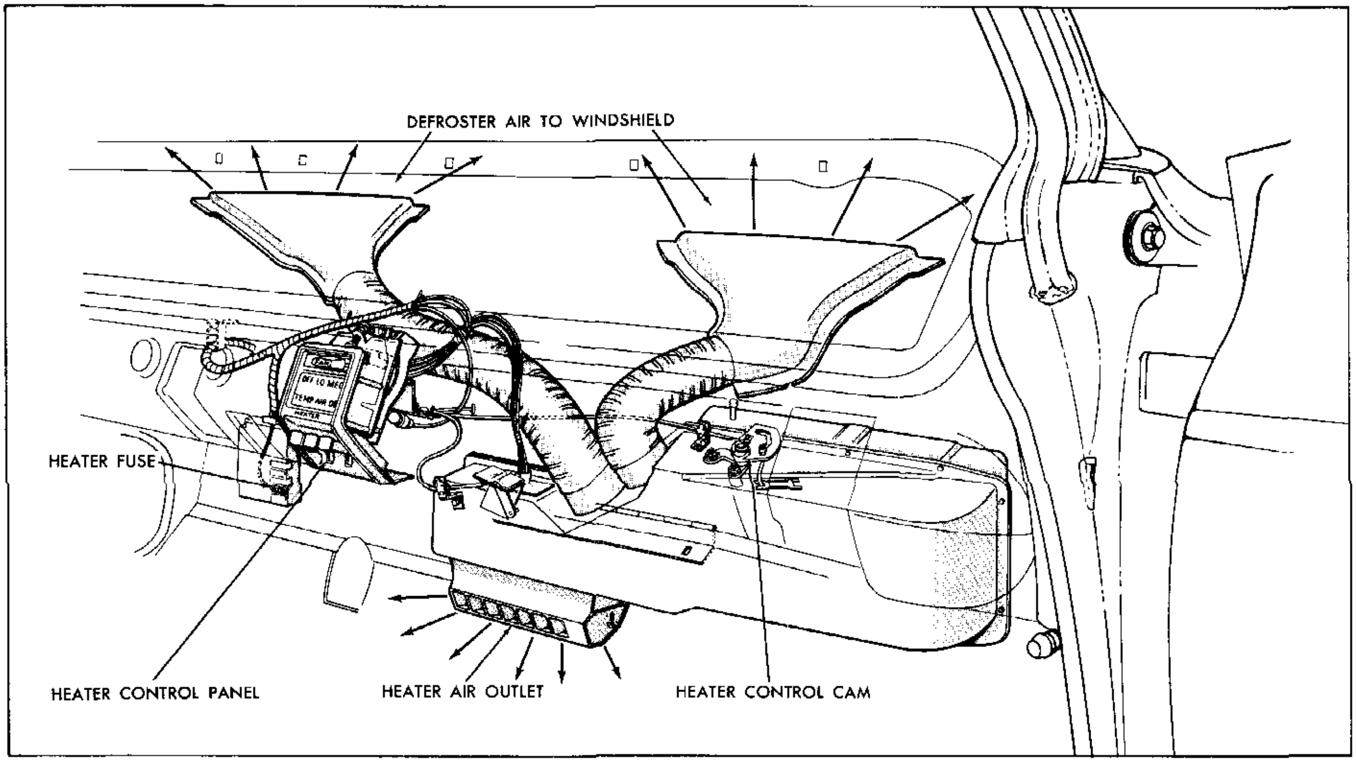


Fig. 2-1 Direct-Aire Heater Outlets and Controls

As the temperature control lever is depressed the temperature control valve permits more and more warmed air to mix with outside air as it passes through the heater air mixing chamber. Maximum heating is obtained when the lever is in the full down position.

Depress the temperature control to be in the full down position during engine warm up. After the inside of the car is at the desired level adjust the "TEMP" lever to maintain desired temperature.

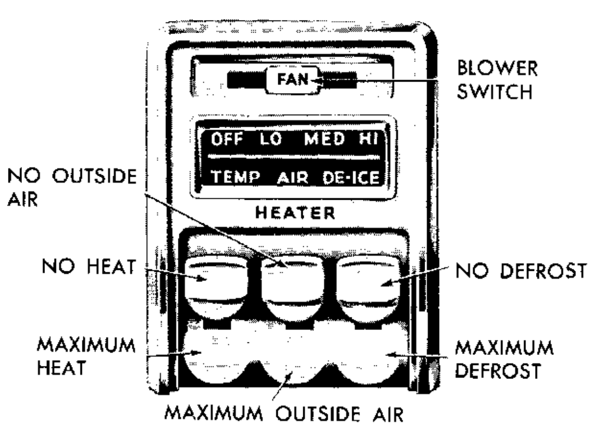


Fig. 2-2 Direct-Aire Heater Control Panel

"AIR"

The air control lever is located in the lower center of the heater control panel. It moves vertically to control the amount of outside air entering the car.

With the air lever in the full up position no air enters the car. As the lever is depressed more and more air is permitted through the heater air system until maximum outside air is admitted when lever is in the full down position.

"DE-ICE"

The "DE-ICE" control lever is located in the lower right side of the heater control panel. It moves vertically to tailor the amount of de-icing (de-fogging) desired.

In the full up position only a nominal amount of air flows thru the defroster air outlets.

Moving the defroster lever downward permits more and more air to be directed to the windshield until in the full down position full defrost air is obtained.

"FAN"

The fan control lever has four distinct positions "OFF", "LO", "MED" and "HI"; "OFF" is in the full left position, "HI" in the full right position.

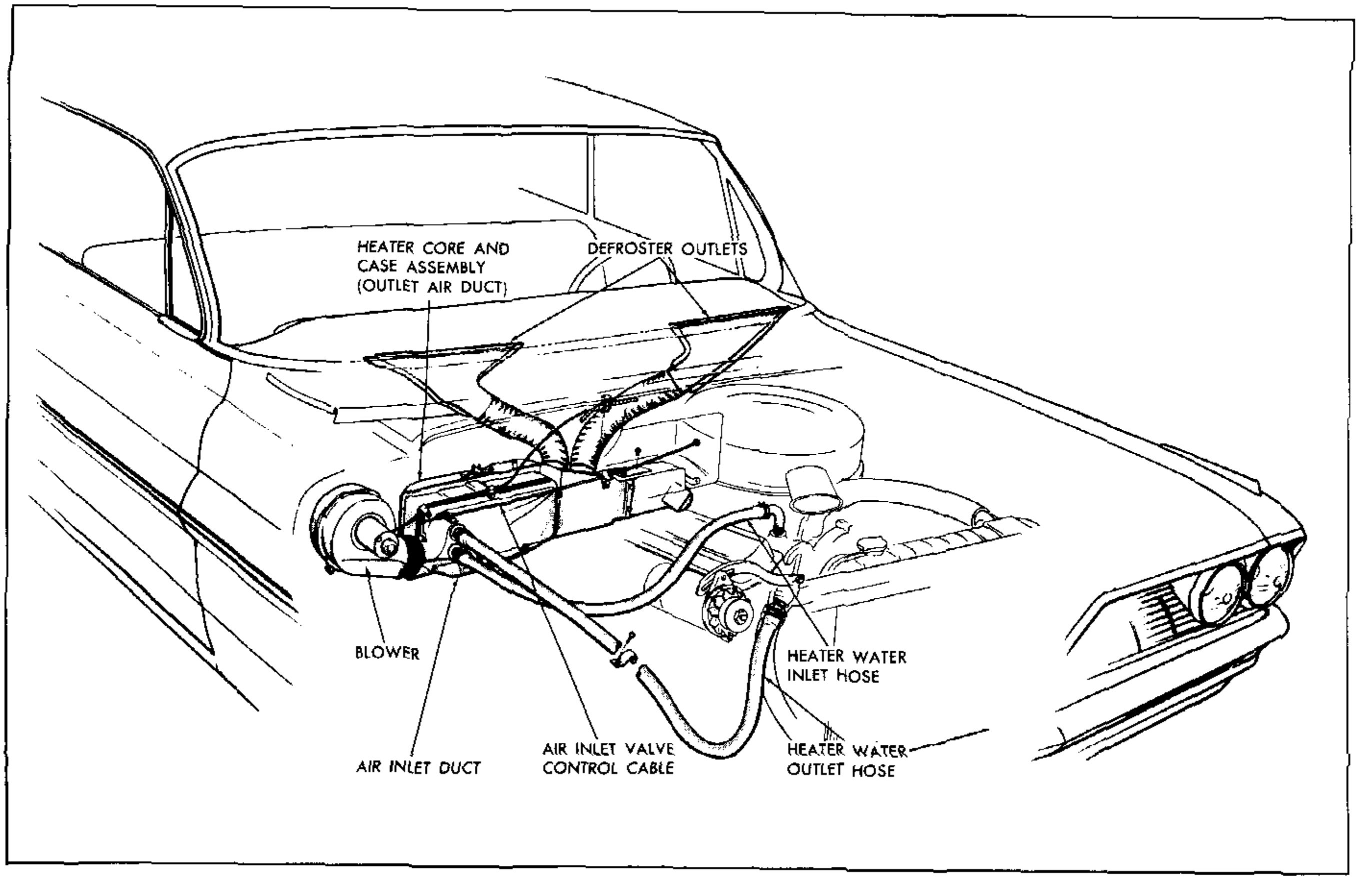


Fig. 2-3 Location of Units in Pontiac's Direct-Aire Heating System

OPERATING INSTRUCTIONS

To warm a car under various weather and driving conditions, use the following control settings after the green light indicating a "COLD" engine goes out:

FAST WARM-UP

(CAR WHICH HAS BEEN STANDING IN COLD)

CONTROL	SETTING
Air control lever	down for maximum air flow after engine has warmed to operating temperature ("COLD" light off).
Temperature control lever	down, for maximum heating, then adjusted for occupant comfort.
De-ice control lever	full down until windshield is "de-iced" or "de-fogged", then up.
Fan control lever	full right for high speed.
Car windows	front door vent and door window open slightly to assist in de-icing or de-fogging, then closed or positioned to provide comfort for all occupants.

SLOW CITY DRIVING IN COLD WEATHER

CONTROL	SETTING
Air control lever	full down for maximum air flow.
Temperature control lever	down, for maximum heating, then adjusted for comfort.
De-ice control lever	up.
Fan control lever	full right for high speed.
Car windows	closed.

NORMAL COOL WEATHER HIGHWAY CRUISING

CONTROL	SETTING
Air control lever	full down for maximum air flow.
Temperature control lever	position to obtain desired temperature.
De-ice control lever	up.
Fan control lever	full right for high speed.
Car windows	closed, door vent(s) may be opened to suit occupant comfort.

COLD WEATHER HIGHWAY CRUISING

CONTROL	SETTING
Air control lever	full down for maximum air flow.
Temperature control lever	down, for maximum heating, then adjusted for occupant comfort.
De-ice control lever	up.
Fan control lever	full right for high speed.
Car windows	closed.

TIPS ON USE OF HEATER AND DEFROSTER SYSTEM

KEEPING COMFORTABLE IN EXTREMELY HUMID "MUGGY" WEATHER

When the relative humidity is extremely high causing discomfort on a day when the temperature is 55°F.-70°F., depress the air control lever fully down, move the temperature control lever down slightly, and position the defrost lever up. This will provide minimum heating. Move the fan control lever to the low speed position.

KEEPING COMFORTABLE IN MILD WEATHER

When the weather is cool, but the sun is very bright, as in spring or fall or at high altitudes, use both the heater and the cowl ventilators at the same time setting the temperature control, and fan speed for desired comfort.

CONTROLLING TEMPERATURE IN CAR

The most satisfactory method of controlling the temperature in the car is to:

1. Set air control lever down for maximum air flow.
2. Position temperature control lever down for maximum heating, then adjust to maintain the desired temperature in the car.
3. Set fan speed for your personal comfort.

USING THE HEATING SYSTEM FOR VENTILATION

The heating system is designed so that it can also be used for ventilation when it is not necessary to warm the air. Ventilation may be obtained by placing the air control lever in the full down position for maximum air flow and the temperature control lever in the extreme up position to prevent the flow of heated air from the heater core. The defroster lever should be in the full up position and select the amount of air flow desired by positioning the fan control lever.

PRINCIPLES OF OPERATION

CONTENTS OF THIS SECTION

DESCRIPTION OF HEATER CORE

The copper heater core is of "tube and center" construction and is designed to permit the engine water (coolant) to flow in a "U" path through the core (Fig. 2-4). This core construction permits a high volume of air to pass through the core as well as a rapid heat dissipation from the water to the core surfaces which provides for rapid transfer of heat to the air.

The heater is located on the right side center of the dash shroud (inside the car body). Its location permits maximum heating of all air passing over the heater core with this heated air remaining inside the car.

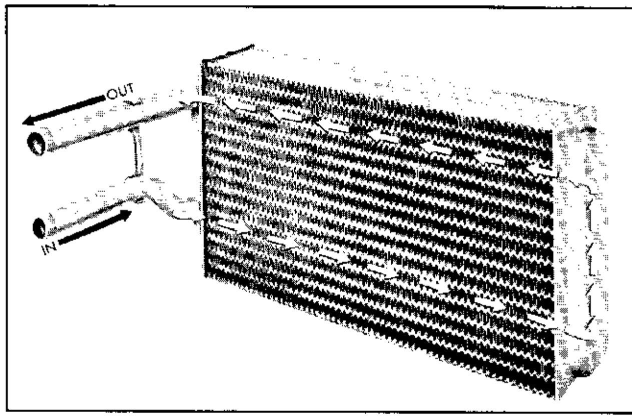


Fig. 2-4 Flow of Engine Coolant Through Heater Core

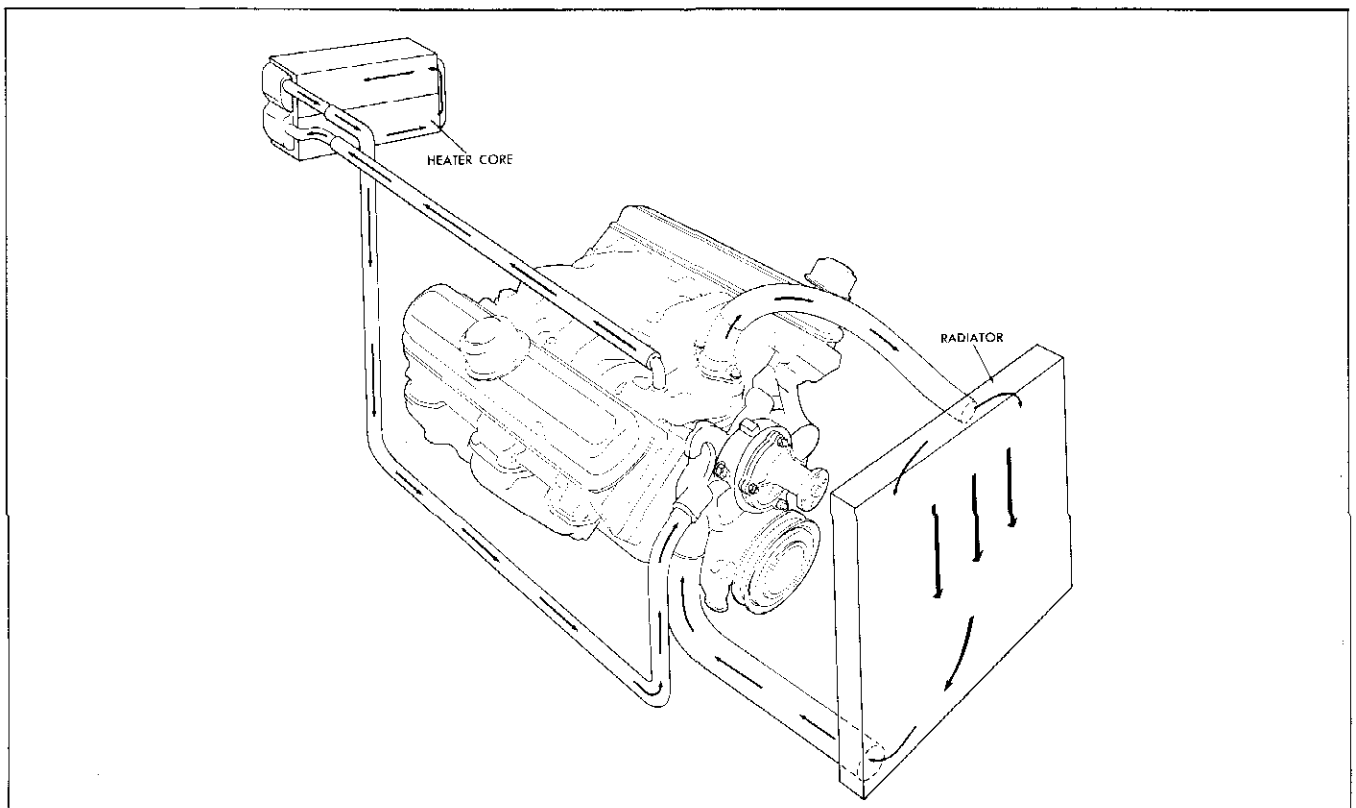


Fig. 2-5 Water Flow Through the Direct-Aire Heater System

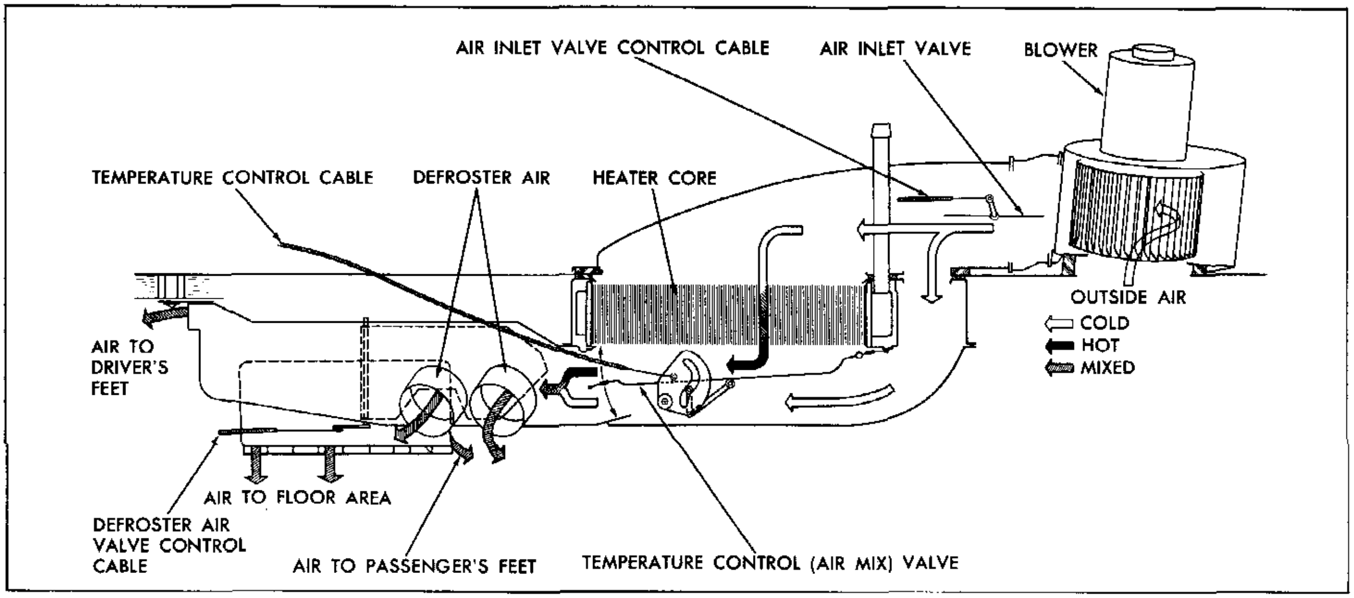


Fig. 2-6 Direct-Aire Heater Air Flow

The air passing over the hot heater core is warmed and also cools the hot engine coolant which returns to the intake area of the water pump.

WATER FLOW

Water flow in the heater system is taken from the engine cooling system from a water passage in the engine intake manifold, via a hose to the heater core inlet (on the dash shroud), through the heater core, via a hose to intake area of the water pump and back to the engine cooling system. See Fig. 2-5.

Water entering the core from the intake manifold fills the lower half of the core and flows to the left where it enters a chamber connecting the lower half of the core with the upper half. Engine cooling system pressure (created by heat and the water pump) forces the water into the upper half of the core and then back to the intake area of the water pump.

The hot water flowing through the heater core is constant and controlled by the engine water pump.

AIR SYSTEM

Outside air enters through an intake grille mounted flush with the hood directly below the windshield. Air in this chamber is pulled by the blower and forced to the heater air inlet duct assembly positioned on the right side of the dash in the engine compartment. The air then enters the body through the heater core and case assembly; part of the air bypasses the heater core and part of the air is directed through the heater core (Figs. 2-6 and 2-7). The amount of bypass air versus the amount of air flow through the heater core will depend upon the outside air temperature and the comfort or desired temperature in the car.

Heater air is distributed by a center outlet under the heater duct which disperses air over the front floor area and to the rear passenger compartment. An outlet on each side of the heater air outlet duct directs air to the driver and passenger side for additional air distribution to the front seat floor area (Fig. 2-8).

Flexible hoses, extending from the heater duct, are attached to two nozzles located along the base of the windshield for effective defrosting. The defroster air valve is designed to allow some heater air to go to the defroster outlets, at all times, for defogging purposes (Fig. 2-9).

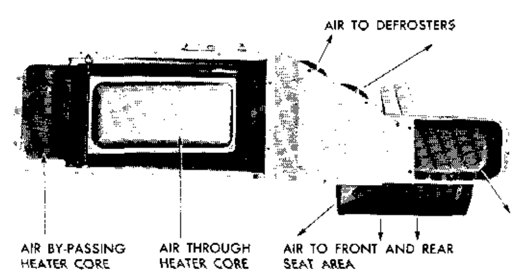


Fig. 2-7 Air Flow into Heater Core Case

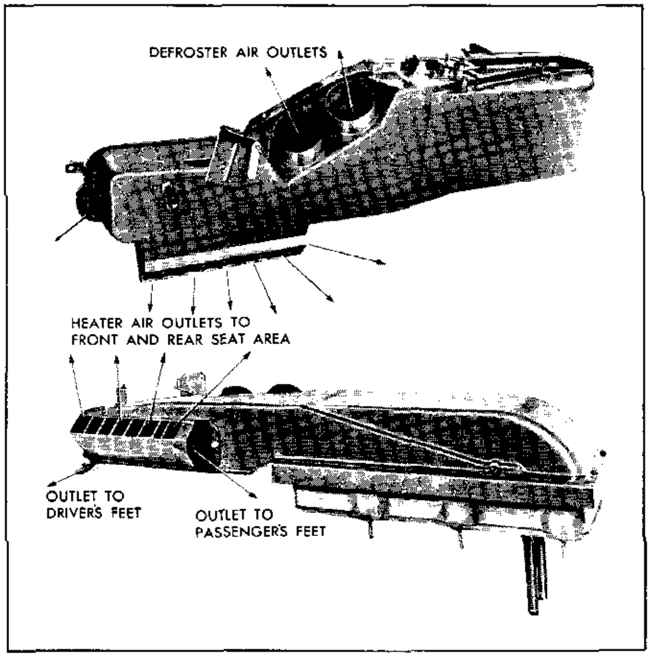


Fig. 2-8 Air Outlets in Direct-Aire Heater Core Case

Air flow through Pontiac's Direct-Aire Heater system is controlled by levers that slide in a vertical plane in the heater control panel which is located to the right of the steering column. These levers control and operate the heater inlet air valve in the heater air inlet duct assembly (located on the engine side of the dash shroud), the temperature air valve (located adjacent to the heater core), the defroster valve in the heater core case duct assembly (located on the passenger side of the dash shroud) and the fan control switch for "OFF", "LO", "MED" and "HI" speed.

A defroster valve is hinged to the top of the duct assembly and operates to direct maximum amount of air from the duct to the windshield whenever "de-icing" the windshield (Fig. 2-10).

Since coolant flows through the heater core at all times, warmed air is allowed to mix with outside air by moving the temperature control lever which in turn moves a temperature air valve in the heater air duct; no heated air—all by-pass air with the temperature control lever in the full up position; all heated air—no by-pass air in the full down position (Figs. 2-11 and 2-12).

The amount of air flow through the heater air system can be varied with the "AIR" control valve lever in the heater control panel and also with the "FAN" lever. When the "FAN" lever is in the full left position the blower is off. With the "FAN" lever in the

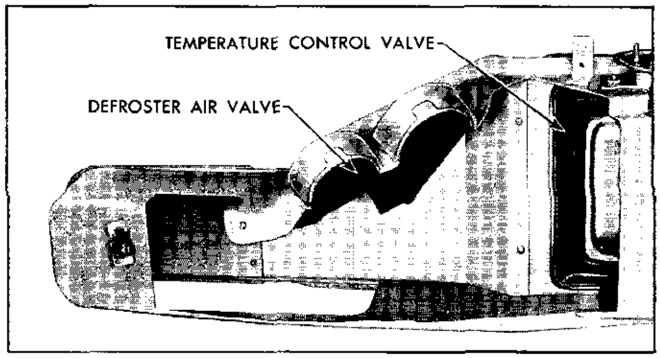


Fig. 2-9 Defroster Air Valve in Up Position

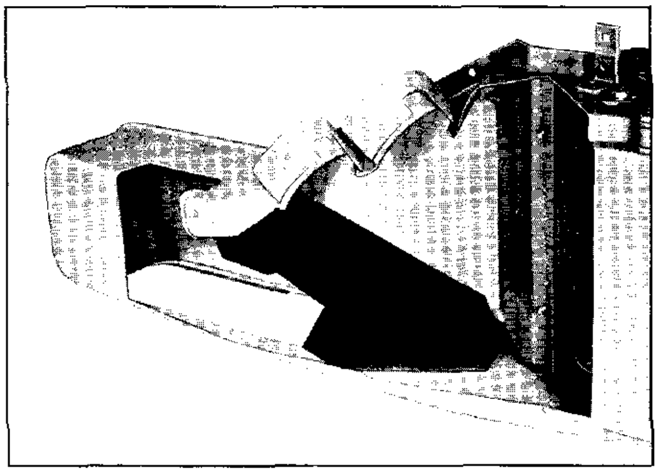


Fig. 2-10 Defroster Air Valve in DE-ICE (down) Position

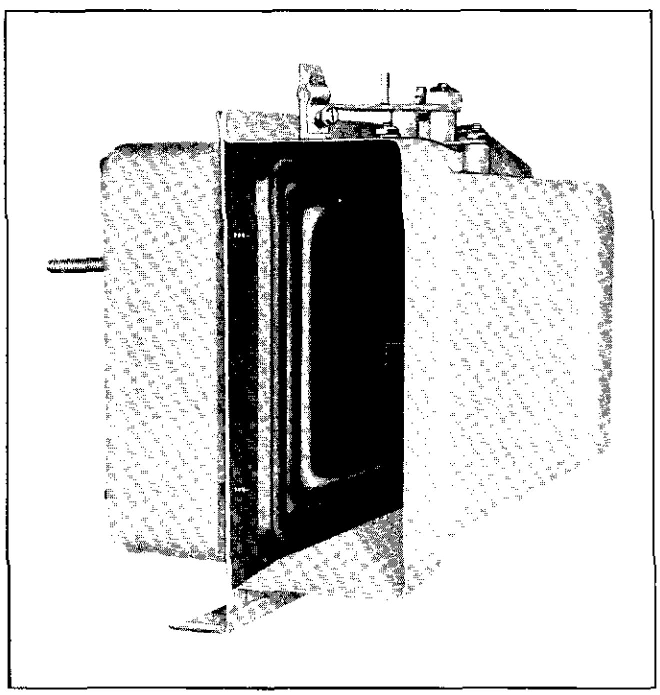


Fig. 2-11 Temperature Control Valve at Full Cold Position

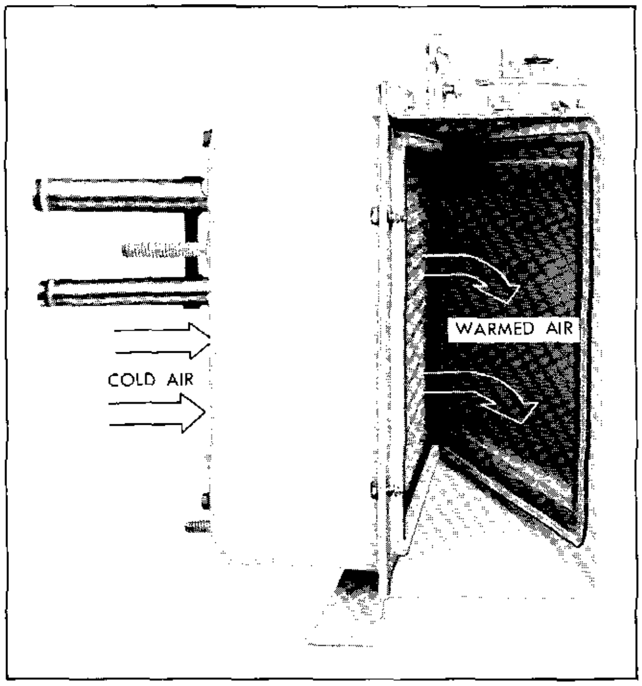


Fig. 2-12 Temperature Control Valve at Maximum Heat Position

full right position, "HI" blower speed is obtained to provide for maximum air flow through the system. This switch is connected to the electrical system through the chassis wiring diagram. Its function is explained under ELECTRICAL SYSTEM.

ELECTRICAL SYSTEM

The heater control panel lamp is fed from the instrument panel rheostat output circuit which is protected by a 4 amp. fuse in the lower left corner of the fuse block.

The blower circuit of the heater system receives its electrical supply from the heater terminal on the fuse block. Overload protection of the heater electrical systems is provided by a 14 amp. fuse located in the lower right corner of the fuse block.

When the ignition switch is turned to the start position, the accessory terminal of the ignition switch is cut out. This prevents operation of the accessories connected through the ignition switch while starting the engine. Thus, the starting motor receives maximum battery current while cranking the engine because there is no current to the heater electrical system.

When the "FAN" control lever is in the full left position, no current flows through the blower switch.

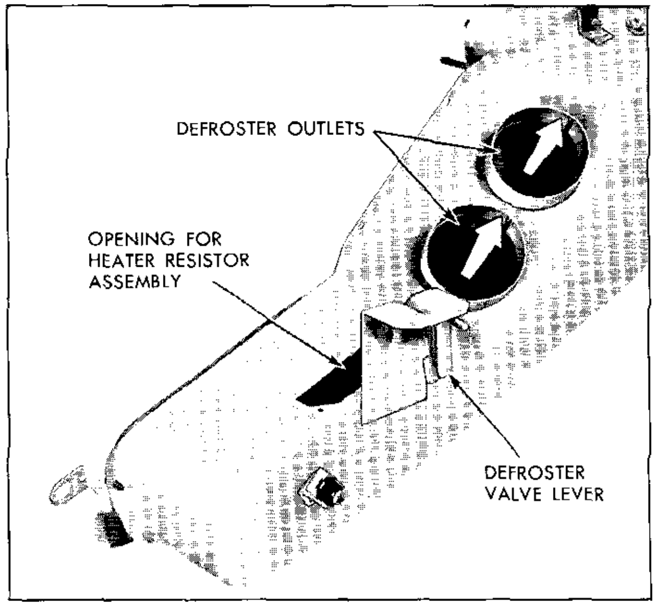


Fig. 2-13 Location of Direct-Aire Heater Resistor

The heater blower switch is a four position switch but only provides for three blower speeds; low, medium and high. The blower is fed through a single connection at its input; a black colored wire.

CURRENT FLOW THROUGH HEATER FAN CONTROL POSITIONS

Four positions of the heater blower switch control current flow to the blower as follows:

"OFF": When the "FAN" control lever is in the full left position, the blower switch is open and no current flows through the switch.

"LO" position closes the heater blower switch which closes the circuit to the blower motor. This allows current from the "HTR" terminal on the fuse block to flow through the heater master control switch to the blower switch via a tan colored wire, through the blower switch "LO" terminal and through a yellow wire with a black stripe to the resistor assembly (located in the heater air outlet duct as shown in Fig. 2-13). Current flows through both .080 ohm resistors through a red wire back to the "HI" terminal of the blower switch and through the black colored wire to the blower motor for low speed. See Fig. 2-14.

"MED" position closes the heater blower switch which closes the circuit to the blower motor. This allows current from the "HTR" terminal on the fuse block to flow through the heater master control switch to the blower switch via a tan colored wire, through

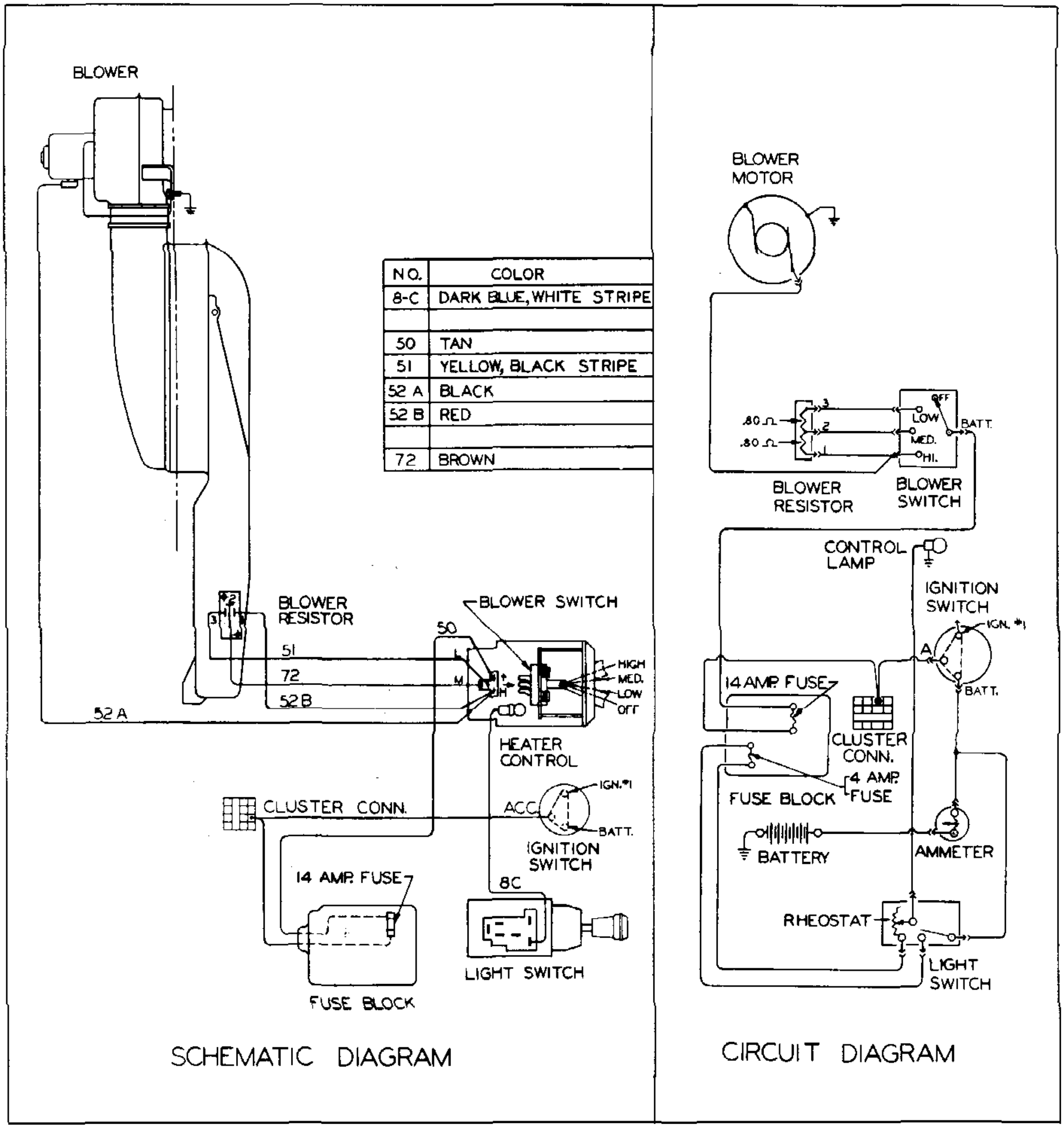


Fig. 2-14 Schematic and Circuit Diagrams of Direct-Aire Heater Electrical System

the blower switch "MED" terminal and through a brown colored wire to the resistor assembly (located in the heater air outlet duct). Current flows through one .80 ohm resistor, through a red wire back to the "HI" terminal of the blower switch and through the black colored wire to the blower motor for "MED" speed.

"HI": In the full right position the "FAN" control lever closes the circuit to the blower motor and allows current to flow from the "HTR" terminal of the fuse block to flow through a tan colored wire to the blower switch. Current flows through the switch to a black colored wire to the blower motor for high speed. See Figs. 2-14 and 2-15.

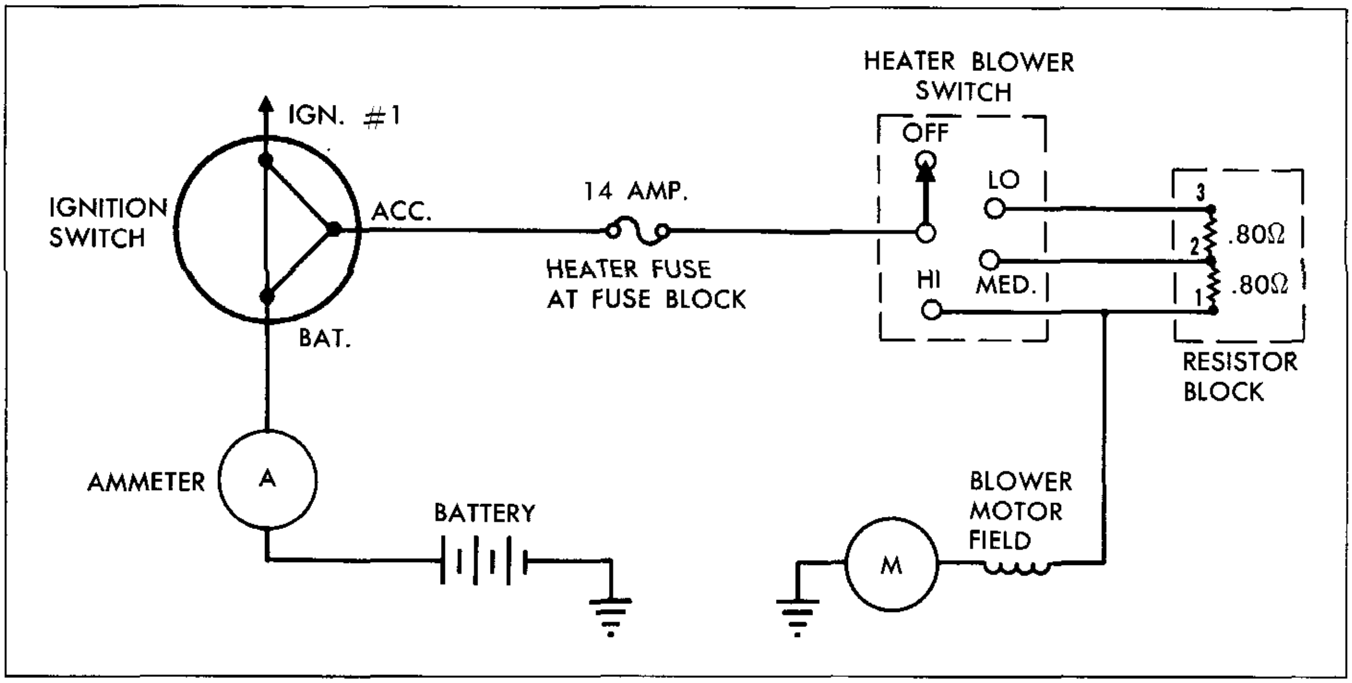


Fig. 2-15 Simplified Schematic Diagram of Direct-Aire Heater Electrical System

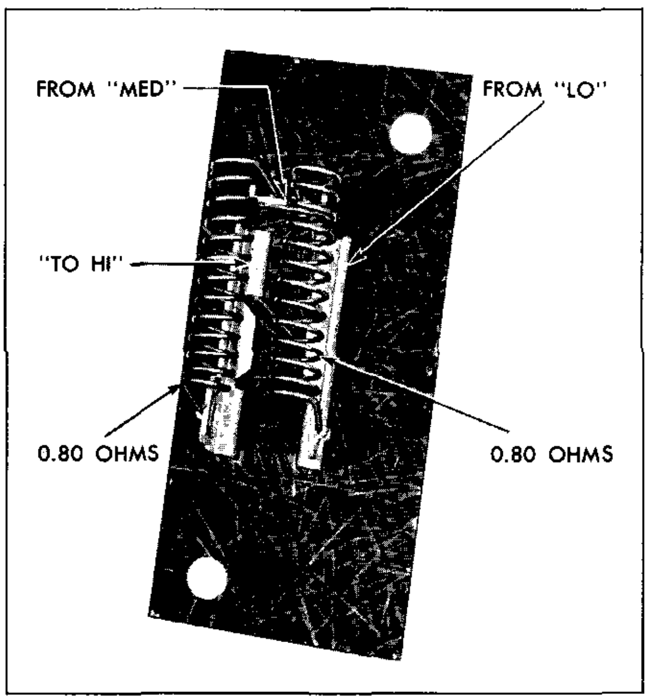


Fig. 2-16 Direct-Aire Heater Resistance Values at Coils

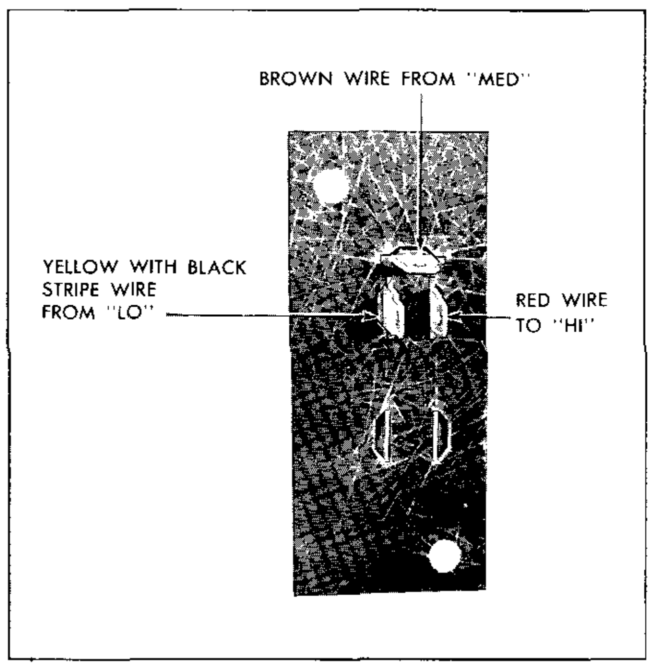


Fig. 2-17 Direct-Aire Heater Resistor Terminal Identification

MINOR SERVICES AND REPAIRS

CONTENTS OF THIS SECTION

ADJUSTMENTS ON CAR

AIR VALVE CONTROL CABLE ADJUSTMENT

1. Place "AIR" control lever in the full up position.

2. Check to see that the air control cable housing extends no more than $\frac{3}{16}'' \pm\frac{1}{16}''$ beyond the cable housing clamp on the control panel assembly.

3. Loosen control cable clamp at heater air inlet duct assembly and cable clip at upper left of air inlet duct (on engine side of dash shroud).

4. Holding air valve lever to the left side of car slide the cable housing to left, remove slack in cable and tighten cable housing clamp screw as well as any clips loosened previously.

NOTE: After adjustment, the "AIR" control lever knob must be in alignment with "TEMP" and "DE-ICE" lever knobs with all in the full up position.

TEMPERATURE CONTROL CABLE ADJUSTMENT

NOTE: This adjustment should be checked when slightly warmed air leaves the heater outlets when the temperature control lever is in the full up (OFF) position, or when insufficient heat is obtained with the temperature control lever in the full down position.

1. Remove the glove box.

2. Move "TEMP" lever (at the heater control panel) making sure lever moves up against its stop.

NOTE: The "TEMP" lever and "DE-ICE" levers should be in alignment with the "AIR" lever in the up position.

a. If "TEMP" lever requires adjustment, loosen cable clamp screw at heater control panel and move cable assembly as necessary to adjust. (The cable housing should extend no more than $\frac{3}{16}'' \pm\frac{1}{16}''$ beyond the housing clamp on the control panel.)

b. Holding cable housing, move "TEMP" lever to full down position and slide the temperature control cable housing away from the heater control panel front face (toward front of car) as necessary to remove any slack in the cable and tighten housing clamp screw securely.

c. Recheck "TEMP" lever in the full up position.

3. Insert dowel pin through heater cam into cam bracket, Fig. 2-18.

4. Install looped end of cable on heater cam pin with cable housing passing through cable clamp on heater duct.

5. Hold the "TEMP" lever in the full up (cold) position and tighten cable clamp on the heater duct.

TEMPERATURE AIR VALVE ADJUSTMENT

NOTE: This adjustment should be made only after adjusting the temperature control cable does not prevent warm air from coming into the car when the heater is off and the "TEMP" lever is in the full up (cold or off) position, or does not give sufficient heat with the "TEMP" lever in the full down position.

1. Remove glove box.

2. Remove heater outlet nozzle left screw and rotate outlet to the right. (Remove outlet nozzle on cars equipped with Circ-L-Aire Conditioning.)

3. Disconnect defroster nozzle hoses at heater outlet duct.

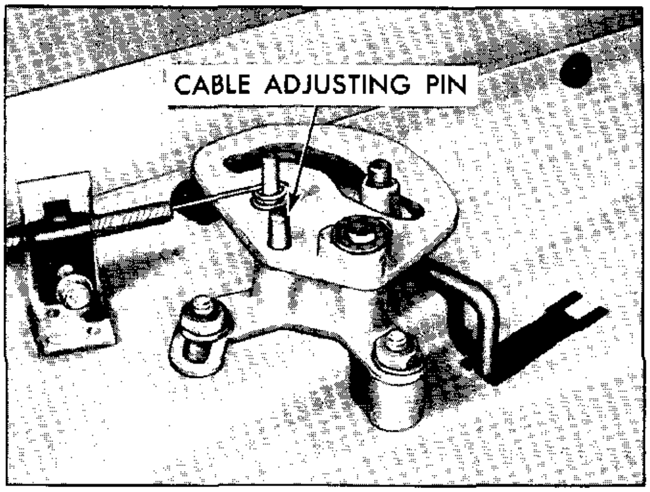


Fig. 2-18 Temperature Control Cable Adjusting Pin in Position

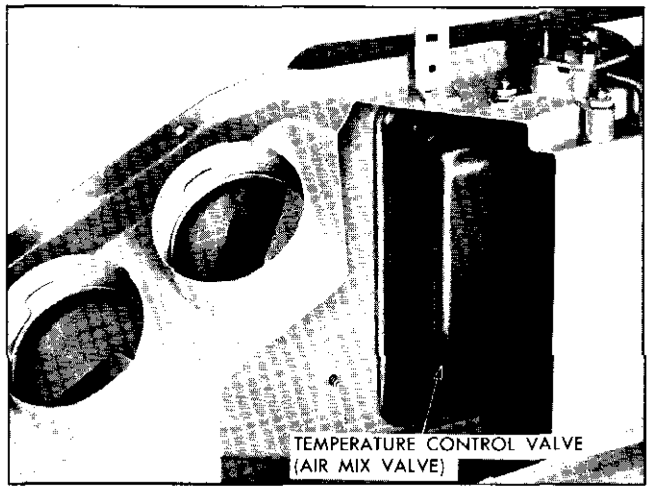


Fig. 2-19 Temperature Control Valve Crush to Heater Core

4. Loosen the two heater temperature control valve cam mounting bracket to outlet duct nuts using ⅜" wrench.

5. Insert a $\frac{3}{16}$" dowel pin (approximately 1" long) through the heater cam into the cam bracket as shown in Fig. 2-18.

6. Shine a light through the defroster outlets and using a mirror in the heater outlet nozzle opening move bracket and cam assembly (with pin installed) so the rubber edge of valve *just contacts* the heater core flange. Continue to move this assembly in the same direction slightly to place a slight "crush" (approx. $\frac{3}{32}$") on the rubber portion of the valve.

7. Hold the cam and bracket assembly in this position and tighten bracket nuts.

8. Adjust temperature control cable.

a. Place "TEMP" lever in up position (no heated air) and loosen cable clamp at rear of heater control panel.

b. Position temperature control cable so that $\frac{3}{16}$" $\pm\frac{1}{16}$" of cable sheath extends past the end of the clamp and tighten clamp securely.

c. Loosen clamp retaining sheath at looped end of cable wire at heater assembly.

d. Insert a $\frac{3}{16}$" dowel pin (approximately 1" long) through the heater cam and into the cam bracket.

e. Hold "TEMP" lever in full up position (no heated air) at heater control panel and tighten cable clamp at heater.

f. Remove dowel pin from heater cam.

9. Operate "TEMP" lever observing valve to see that the rubber is crushed when the lever is in the full up position (no heated air) as well as the full down position (maximum heat) and correct as necessary to obtain a slight crush of the rubber at both ends of the cable travel.

10. Attach defroster outlet hoses and replace glove box.

11. Replace heater air outlet nozzle.

DEFROSTER CONTROL CABLE ADJUSTMENT

1. Place defroster lever in up position and loosen cable clamp at rear of heater control panel.

2. Position defroster cable so that $\frac{3}{16}$" $\pm\frac{1}{16}$" of cable housing extends past the end of the clamp and tighten clamp securely.

3. Loosen clamp retaining housing at looped end of cable wire at defroster valve assembly.

4. With defroster control lever held in full up position, rotate defroster valve lever arm counterclockwise to stop position and secure cable housing with clamp.

NOTE: Temperature, air and defroster levers must be in alignment after cable adjustments are made.

HEATER CONTROL PANEL ASSEMBLY

REMOVE AND REPLACE

1. Disconnect ignition switch assembly from instrument panel.

2. Disconnect control cables by loosening clamps.

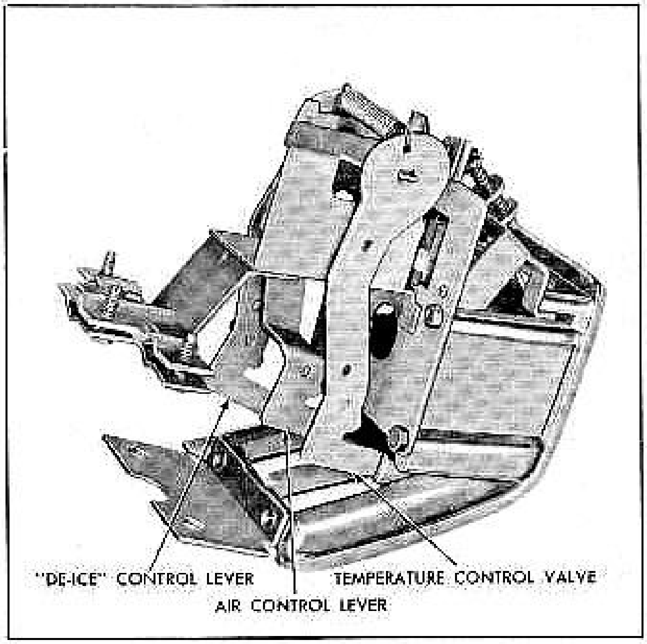


Fig. 2-20 Identification of Control Panel Levers

3. Remove two heater control panel to instrument panel screws at lower edge of heater control panel.

4. Loosen heater control panel to instrument panel screw from behind and at top of control assembly.

5. Disconnect instrument panel lamp, wire connectors from the control panel assembly and remove control panel assembly (Fig. 2-20).

NOTE: On cars with Circ-L-Aire Conditioning a vacuum switch Fig. 2-21 is attached to the Direct-Aire heater control panel assembly as shown in Fig. 2-22.

6. Replace by reversing the above procedure.

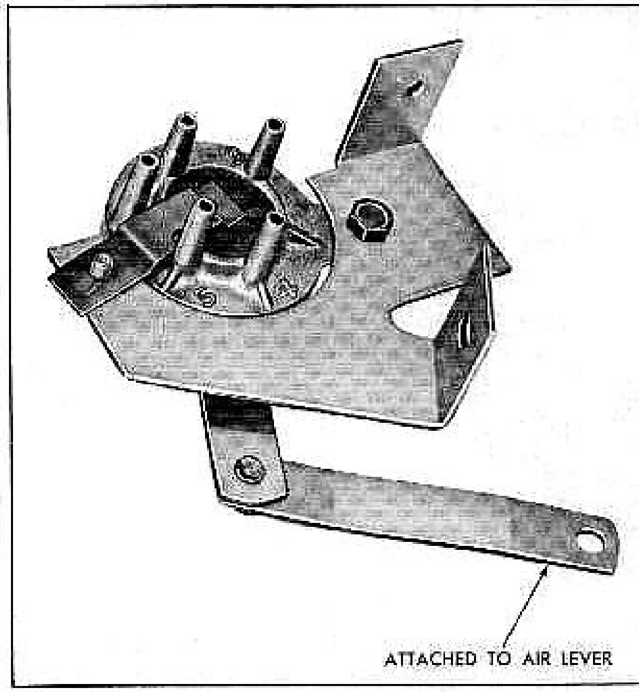


Fig. 2-21 Vacuum Switch for Direct-Aire Heater when used with Circ-L-Aire Conditioning

7. Connect all control cables, making sure cable housings extend $\frac{3}{16}'' \pm \frac{1}{16}''$ beyond housing clamp.

8. Adjust control cables.

HEATER FAN (BLOWER) SWITCH

REMOVE AND REPLACE

1. Remove heater control panel.

2. Disconnect switch arm to control lever.

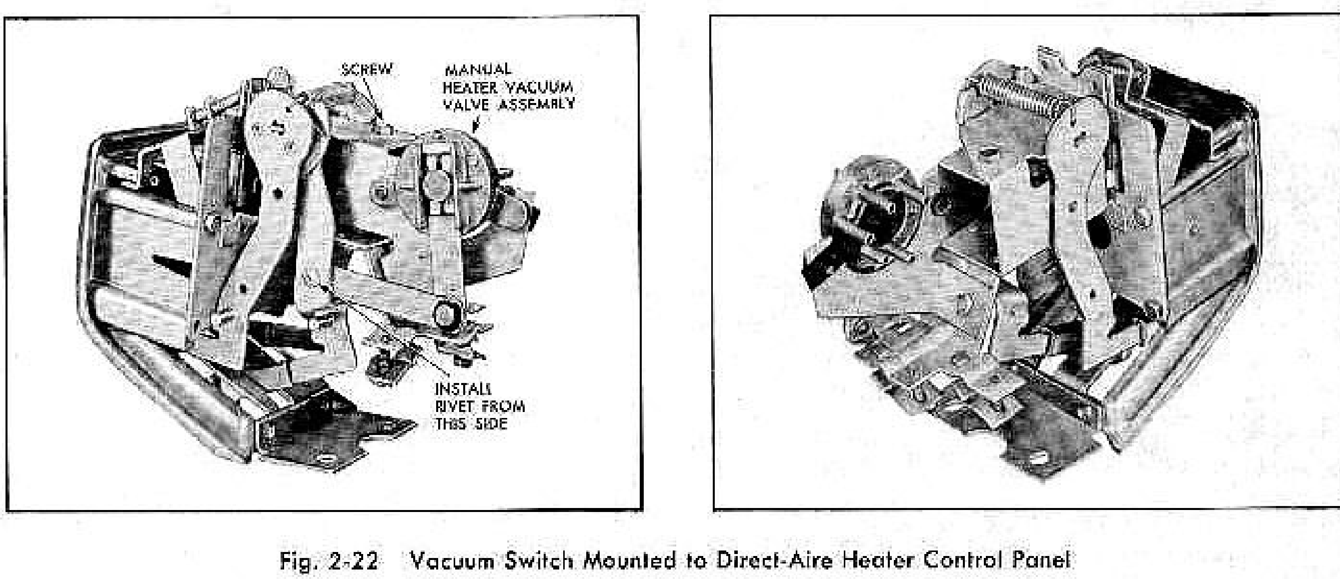


Fig. 2-22 Vacuum Switch Mounted to Direct-Aire Heater Control Panel

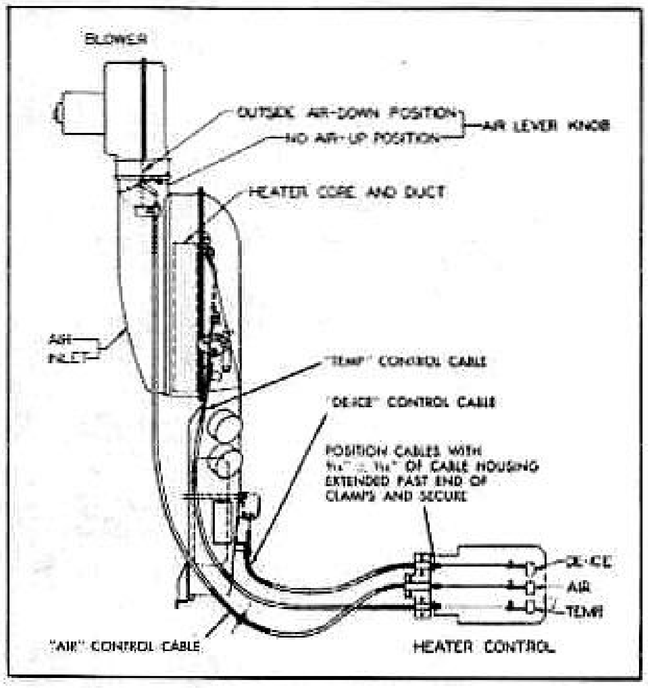


Fig. 2-23 Control Cables—Location and Identification

3. Replace heater blower switch and connect switch arm to control lever.

4. Check operation of heater switch control lever by making sure switch moves freely in all positions and that the "OFF", "LO", "MED", and "HI" detents are felt during this check.

5. Replace heater control panel assembly.

6. Adjust control cables.

AIR VALVE CONTROL CABLE

REMOVE AND REPLACE

1. Disconnect air valve control cable at heater control assembly.

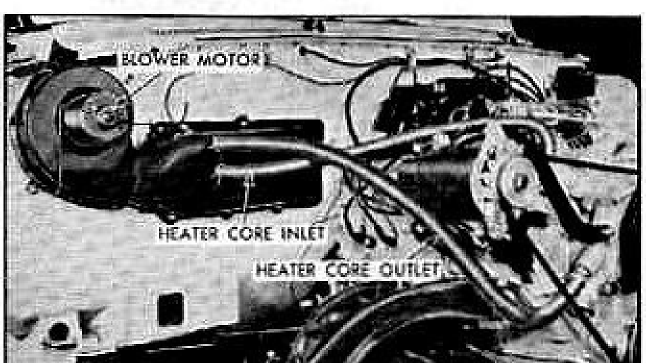


Fig. 2-24 Direct-Aire Heater Air Inlet Duct Assembly on Dash Shroud

2. Disconnect air valve control cable at heater air inlet duct assembly.

3. Remove air valve control cable from retaining clips from dash shroud.

4. Remove air valve control cable assembly.

5. Replace by reversing the above procedure positioning the cable housing to extend $\frac{3}{16}'' \pm \frac{1}{16}''$ beyond the housing clamp at the control panel. See Fig. 2-23.

6. Adjust air valve control cable.

TEMPERATURE CONTROL CABLE

REMOVE AND REPLACE

1. Remove glove box.

2. Disconnect temperature control cable at top of heater core and air outlet duct.

3. Disconnect cable at heater control panel.

4. Remove temperature control cable.

5. Replace cable by reversing the above procedure, positioning cable housing to extend $\frac{3}{16}'' \pm \frac{1}{16}''$ beyond the housing clamp at the control panel. See Fig. 2-23.

6. Adjust temperature control cable.

DEFROSTER VALVE CONTROL CABLE

REMOVE AND REPLACE

1. Disconnect defroster air valve control cable from heater control panel.

2. Disconnect defroster valve control cable at lever on heater core and outlet air duct assembly.

3. Remove defroster valve control cable.

4. Replace by reversing the above procedure positioning cable housing to extend $\frac{3}{16}'' \pm \frac{1}{16}''$ beyond the housing clamp at the control panel (Fig. 2-23).

5. Adjust defroster valve control cable.

BLOWER MOTOR

REMOVE AND REPLACE

1. Hoist front end.

2. Remove right front wheel assembly.

3. Remove right front headlamp assembly.

4. Disconnect right front fender skirt assembly, move skirt toward rear of car and downward.

5. Disconnect wires at blower motor (Fig. 2-24).

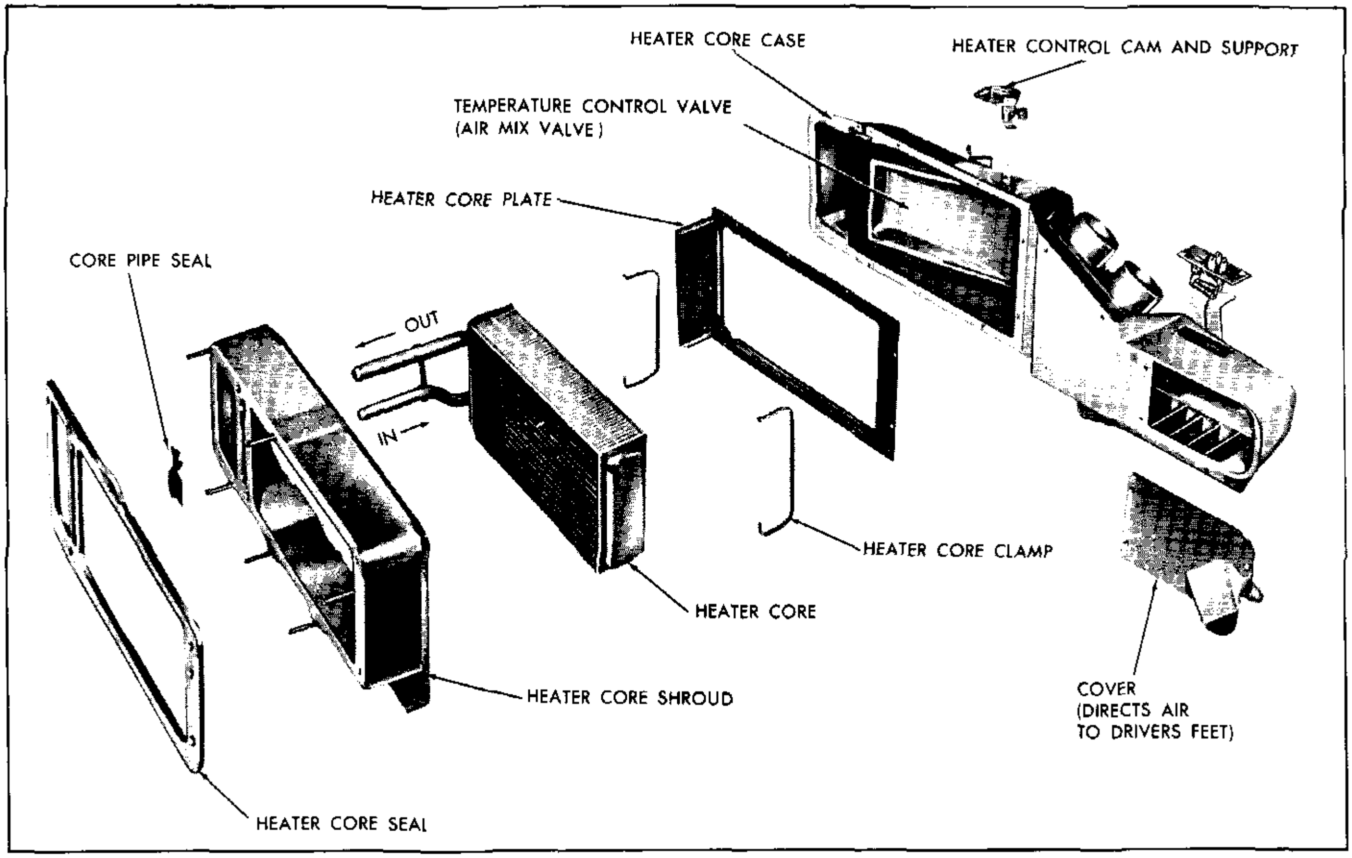


Fig. 2-25 Direct-Aire Heater Core and Case Assembly (Heater Only) Exploded View

6. Remove blower motor assembly.

7. Replace by reversing the above procedure.

AIR INLET DUCT ASSEMBLY

REMOVE AND REPLACE TO SERVICE ASSEMBLY

1. Drain radiator.

2. Disconnect air valve cable at top of duct.

3. Disconnect heater inlet and outlet water hoses at heater.

4. Remove six nuts securing air inlet duct assembly and remove assembly and duct to housing sleeve.

5. Replace by reversing the above procedure.

HEATER CORE

REMOVE AND REPLACE

1. Drain radiator.

2. Disconnect air valve cable at top of heater air inlet duct.

3. Disconnect heater inlet and outlet water hoses at heater.

4. Remove six nuts securing air inlet duct assembly and remove assembly and duct to housing sleeve.

5. Remove glove box.

6. Disconnect temperature control cable at top of heater core and air outlet duct.

7. Disconnect "DE-ICE" cable from defroster air valve.

8. Disconnect air outlet hoses to defroster outlet assemblies.

9. Remove wire connector from resistor assembly at top left side of the heater air outlet duct assembly by prying connector up with flat blade screwdriver.

10. Remove spring retainers on heater core studs at engine side of dash shroud.

11. Remove the heater core and case assembly.

12. Remove the heater core assembly noting position and location of seals (Fig. 2-26).

13. Replace by reversing the above procedure.

14. Adjust temperature, air and defroster control cables.

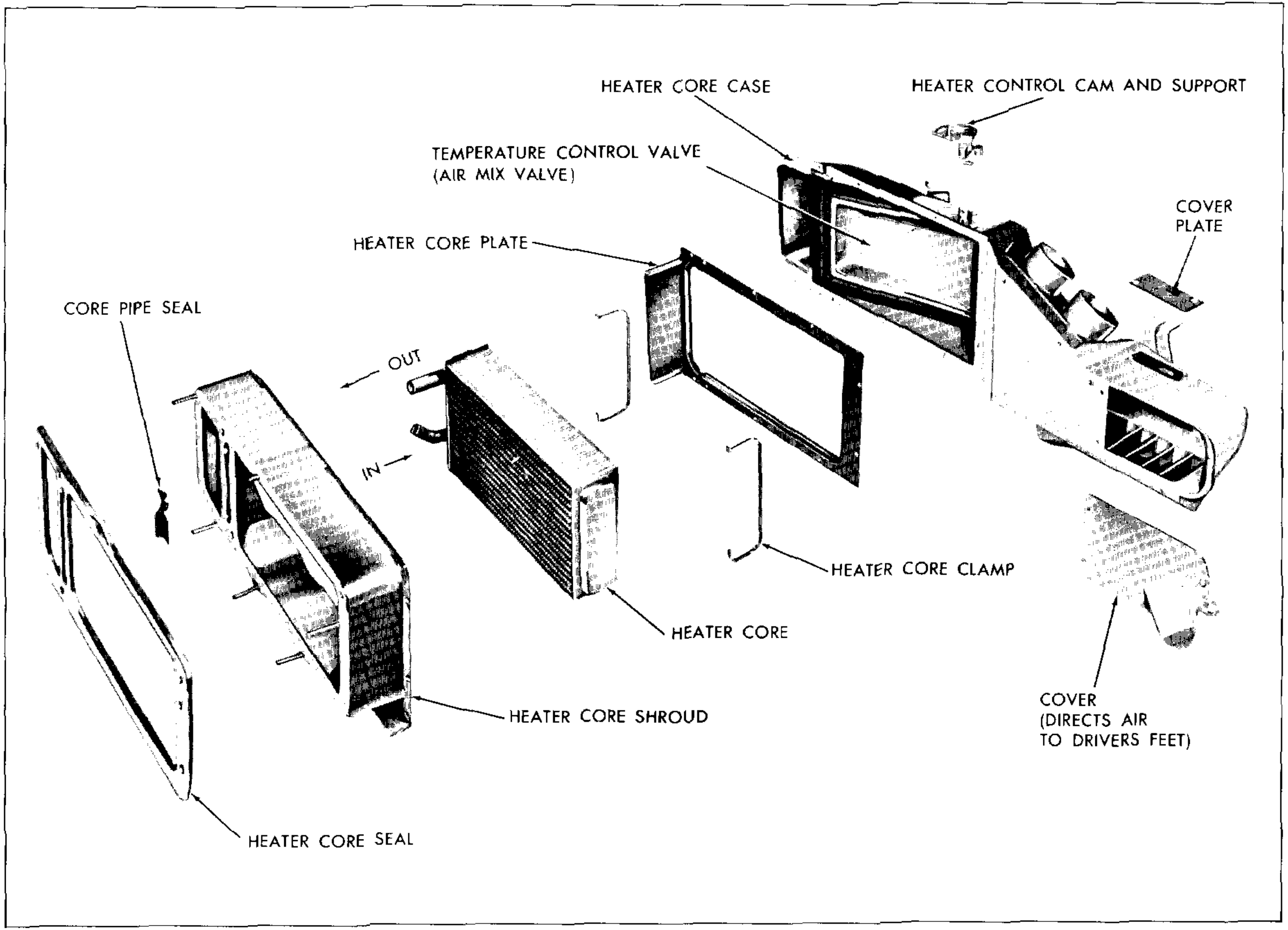


Fig. 2-26 Direct-Aire Heater Core and Case Assembly (With Circ-L-Aire Conditioning)—Exploded View

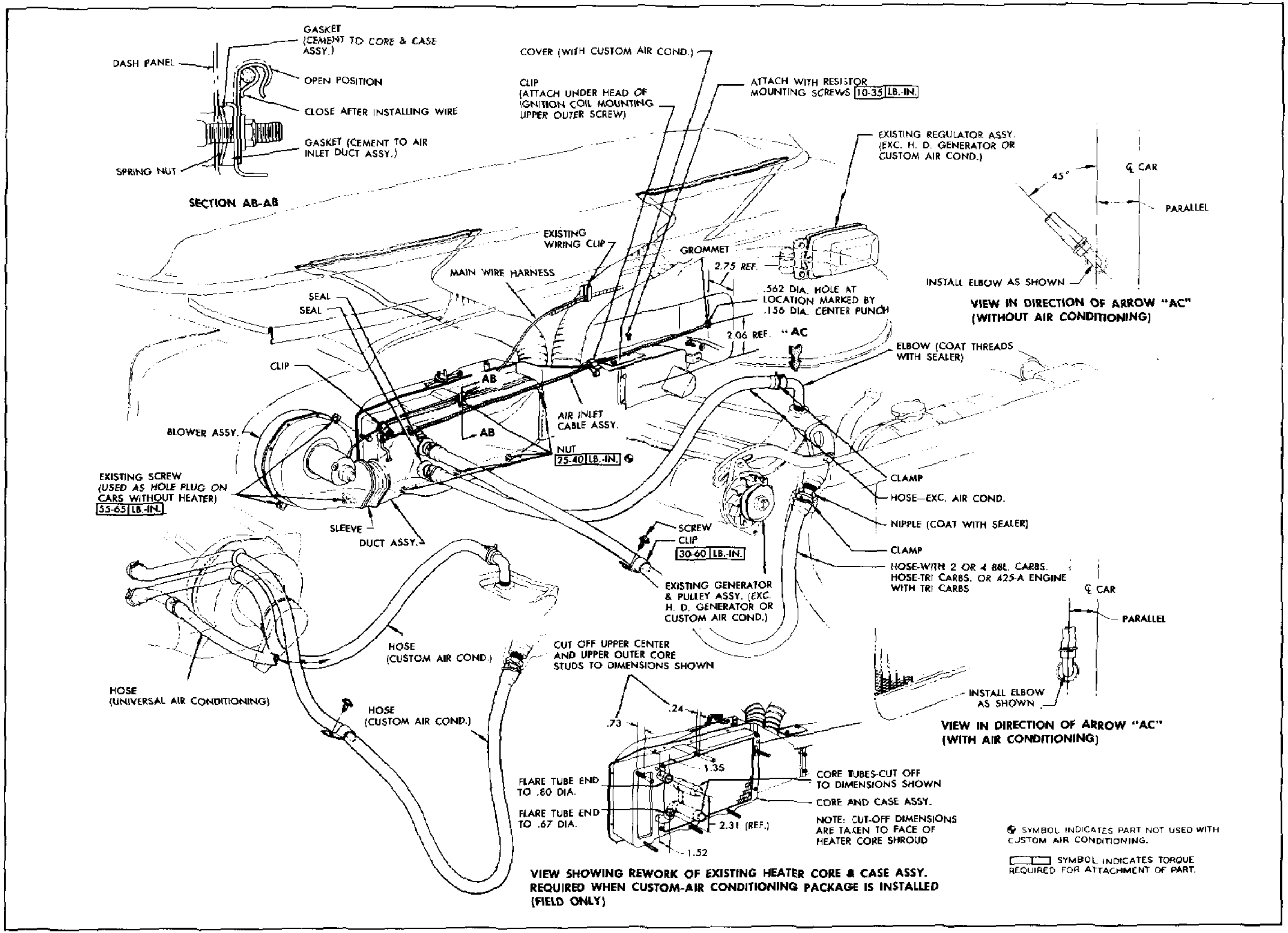


Fig. 2-27 Reference Illustration—Direct-Aire Heater Parts in Engine Compartment

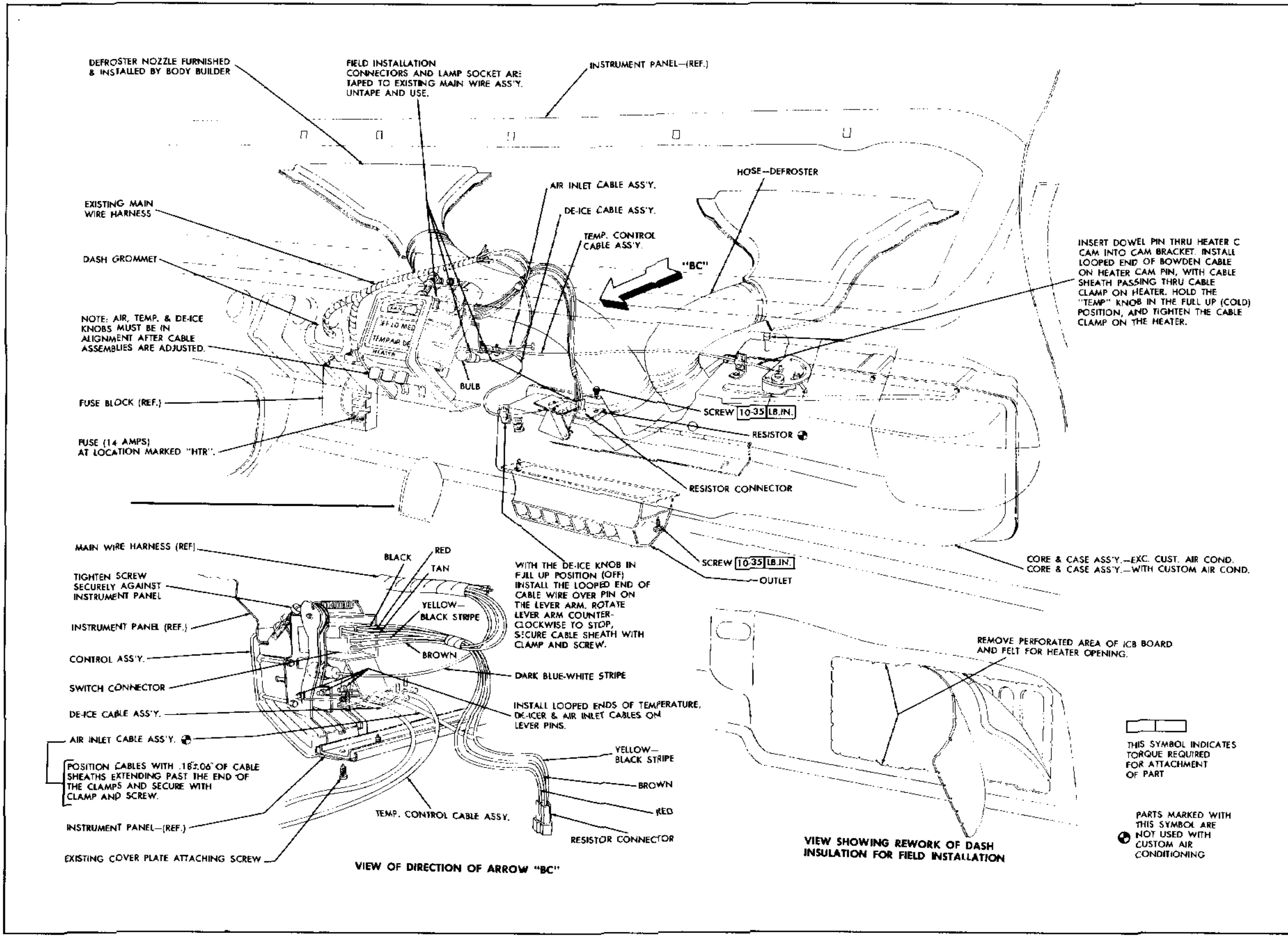


Fig. 2-28 Reference Illustration—Direct-Aire Heater Parts in Body Interior

TESTING AND DIAGNOSIS

CONTENTS OF THIS SECTION

TESTING

OPERATIONAL TEST

The purpose of performing a heater operational test is to prove the heater system is operating properly.

PRELIMINARY CHECKS

Engine Compartment

1. Check radiator for proper engine coolant level.

2. Inspect radiator core and heater hoses for leaks at the same time inspecting for kinked or collapsed heater hoses.

3. Inspect the air inlet duct to heater blower sleeve to see that it is not torn or damaged and that it is properly installed (to prevent any air leaks from engine compartment which may have objectionable fumes or odors).

Inside Car Body

1. Check to see that all levers operate smoothly and they are in alignment when all are in the full up position.

2. Start engine.

3. Place "FAN" control lever at full left position; blower should not operate.

4. Move "FAN" lever to the "LO", "MED", and "HI" positions; blower should operate, increasing speed in each position.

5. Move "AIR" lever down slowly until the full down position is reached; more and more air should flow through outlet as lever is depressed (with blower operating).

6. Move "DE-ICE" lever down slowly until the full down position is reached and at the same time sensing the amount of air flowing from the defroster outlets. More and more air should flow through these outlets as the lever is depressed.

Should the heater control levers operate satisfactorily during the above checks, it would appear that heater operation is normal. If during the checks irregularities are noted or complaints on heater operation could not be noted or determined, then refer to TROUBLE DIAGNOSIS for the complaint or cause and the remedy.

TROUBLE DIAGNOSIS

INSUFFICIENT HEATING

COMPLAINT OR CAUSE	REMEDY
Slow warming in car.	Incorrect operation of controls. Advise operator of proper operation of heater and cowl vent controls.
Objectionable engine or exhaust fumes in car.	Check for good seal between hood and cowl.
	Check for seal between vent grille and cowl.
	Check for damaged and/or improper installation of sleeve between air inlet duct and blower motor.
	Locate and seal any other air leaks.
	Check and adjust cowl vent control.
Cold drafts on floor.	Check operation and adjustment of cowl vent cables.
	Advise operator of proper operation of heater system.
	Door vents open or improperly adjusted.

INSUFFICIENT HEATING—Continued

COMPLAINT OR CAUSE	REMEDY
Insufficient heat to rear seat.	Advise owner to use blower to force air to rear seat area. Check for obstructions under front seat.
Low engine coolant level.	Check radiator and engine cooling system for leaks. Correct and fill to proper level. Run engine to clear any air lock.
Failure of engine cooling system to warm up.	Check radiator cap and engine thermostat and replace if required.
Kinked heater hoses.	Remove kink or replace hose.
Foreign material obstructing water flow in or through heater core.	Remove foreign material if possible, otherwise replace core.
Temperature control cable improperly adjusted.	Adjust cable.
Temperature air valve improperly adjusted.	Adjust valve.
Air valves do not open.	Check for proper installation of cables.

INADEQUATE REMOVAL OF FOG OR ICE

CAUSE	REMEDY
Air valve does not open.	Check for proper installation of cable.
Defroster valve does not open fully.	Adjust control cable.
Obstructions in defroster outlets at windshield.	Remove obstruction. On cars with instrument panel pads, look for and fix loose panel pad cover at defroster outlets.
Dinged defroster outlets.	Reshape outlet flange with pliers. The outlet should have a uniform opening, $\frac{5}{16}''$ wide.
Blower motor not connected.	Connect wire.
Inoperative blower motor.	Replace motor. Check heater fuse.
Inoperative blower motor switch.	Replace switch.

TOO WARM IN CAR

CAUSE	REMEDY
Temperature air valve improperly adjusted.	Adjust valve.
Incorrect operation of controls.	Advise operator of proper operation of heater system.

BLOWER INOPERATIVE

CAUSE	REMEDY
Blown fuse.	Replace fuse.
Inoperative motor.	Replace motor.

BLOWER INOPERATIVE—Continued

CAUSE	REMEDY
Open circuit.	Repair circuit between ignition switch, blower switch, blower speed resistor, and blower motor. See wiring diagrams.
Inoperative blower motor switch.	Adjust and/or replace faulty switch.

MISCELLANEOUS

CAUSE	REMEDY
Control levers not aligned due to incorrect adjustment.	Adjust control valve cables.
Blown fuses.	Shorts in electrical system; locate and correct short. Blower wheel rubbing on case. Failed blower motor.
Front floor mat wet under heater.	Windshield improperly sealed. Manual antenna improperly sealed. Heater core leaking. Repair if possible, otherwise replace. On Circ-L-Aire Conditioned cars check for proper seal to dash. Check also for leak at hose connection at heater core.
Heater "gurgle".	Check engine coolant level in radiator.

SPECIFICATIONS

Direct-Aire Heater Current and Voltages

Measurements are for in-car installation, all windows and doors closed, and at room temperature.

Control Position	Input Voltage at Junction Block	Blower Current	Motor Voltage	Impeller Speed
DE-ICE	14.5	9.3	13.5	2865
HI	14.5	8.9	11.0	2475
MED	14.5	6.35	8.35	2085
LO	14.5	5.1	6.2	1695
DE-ICE	13.5	8.7	12.55	2745
HI	13.5	7.4	10.2	2370
MED	13.5	5.95	7.7	1950
LO	13.5	4.75	5.65	1605
DE-ICE	12.2	7.95	11.35	2550
HI	12.2	6.8	9.2	2205
MED	12.2	5.5	7.0	1845
LO	12.2	4.4	5.0	1470

Cooling System Capacity

Engine Less Heater .... 18.5 qts.

Engine With Heater .... 19.5 qts.

Fuse

Heater Electrical System (on fuse block) .... 14 amp.

Heater Control Panel Lamp (on fuse block) .... 4 amp.

	Early Type	Late Type
Generator Model	1102204	1102263
Brush Spring Tension, Oz.	28	28
Cold Output	30 amps., 14 V. 2240 rpm	30 amps., 14 V. 2310 rpm
Field Current Draw	1.69-1.70 amps 12 V., 80°F.	1.48-1.62 amps 12 V., 80°F.

Regulator Model	1119263 (Includes 1119001 regulator with 1945172—45 amp. fuse assy.)	
Paint Code Identification (daub)	Red	
Cutout Relay:		
Air Gap, In.	.020	
Point Opening, In.	.020	
Closing Voltage, volts	*11.8-13.5*	
Voltage Regulator:		
Air Gap, In.	.075	
Normal Range (125°F) volts	13.8-14.8	
Current Regulator:	Standard	Hydra-Matic
Air Gap, In.	.075	.075
Allowable Limits (125°F), ampere	27-33	38-45

TEMPEST HEATER

CONTENTS OF THIS SECTION

DESCRIPTION AND OPERATING INSTRUCTIONS

GENERAL DESCRIPTION

Pontiac's Tempest Heating and Defroster System provides rapid warm-up sensation and even distribution of warmed air to all parts of the car. All air entering the system is taken through hood high cowl vents providing air with a minimum of dust, foreign material and undesirable fumes.

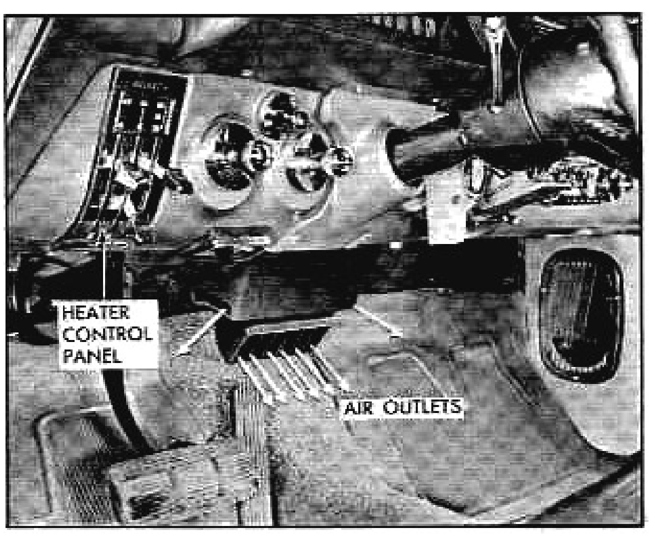


Fig. 3-1 Air Outlets and Controls

The use of outside air exclusively provides constant and rapidly changing air inside the car, eliminating a smoke-filled interior and keeps the occupants comfortable.

The driver has fingertip control of the temperature warmed air entering the car. When heated air is desired, the blower forces air taken from the hood high cowl air inlet duct through the heater core and then through an air distributing system to the air outlets.

The design of the heater and defroster system, its valves and controls permits a method of obtaining different amounts of forced air flow for ventilation.

AIR OUTLETS AND CONTROLS

AIR OUTLETS

Heated air enters the interior of the car and is distributed by a center outlet grille opening at the bottom of the heater duct, which disperses air over the front floor area and is so aimed that it also directs air to the rear passenger compartment.

Additional outlets are provided on the right and left sides of the heater outlet air duct for additional air distribution to the driver and front seat passenger floor area.

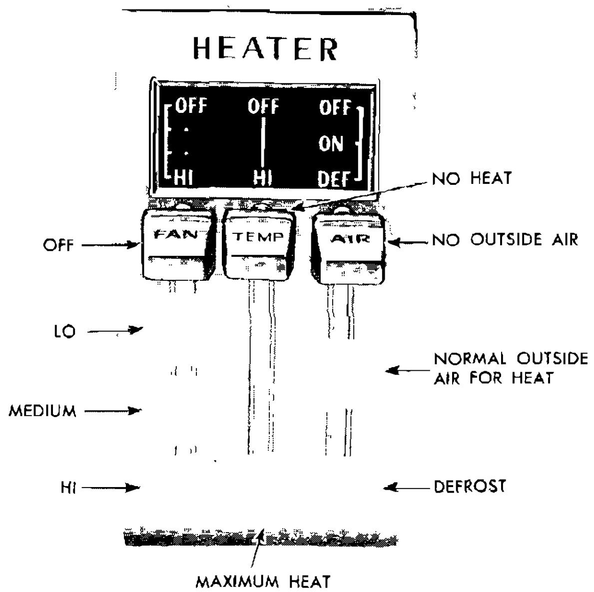


Fig. 3-2 Tempest Heater Control Panel

CONTROLS

The heater control panel is located to the left of the steering column on the lower section of the instrument panel. The panel has three levers sliding in a vertical plane which control air flow and fan speed; one each for "FAN", "TEMP", and "AIR". When all levers are in the full up position, all valves and control units are closed and the fan blower motor is off.

"FAN"

The fan control lever has four distinct positions—"OFF", "LO", "MED", and "HI"; "OFF" is in the full up position, "LO" and "MED" partially down, and "HI" in the full down position.

"TEMP"

When the temperature control lever is in the full up position no heated coolant enters the heater core to provide heat. As the lever is progressively moved downward, more and more heated engine coolant is permitted to flow through the heater core. In the full down position maximum heat is obtained.

Depress the temperature control to be in the full down position during engine warm up. After the inside of the car is at the desired level adjust the "TEMP" lever to maintain this desired temperature.

"AIR"

With the air lever in the full up position no air enters the car. As the lever is depressed more and more air is permitted through the heater air system until maximum outside air is admitted when lever is in the midway position where a detent will be felt.

This position permits partial air flow out of the defroster nozzles while providing the majority of air flow through the heater air system.

Moving the "AIR" lever further downward from the detent position permits more and more air to be directed to the windshield until in the full down position full defrost air is obtained, with only a limited amount of air coming out of the heater outlets.

OPERATING INSTRUCTIONS

To warm a car under various weather and driving conditions, use the following control settings after the green light indicating a "COLD" engine goes out:

FAST WARM-UP

(CAR WHICH HAS BEEN STANDING IN COLD)

CONTROL	SETTING
Fan control lever	full down for high speed
Temperature control lever	down, for maximum heating, then adjusted for occupant comfort
Air control lever	full down until windshield is "de-iced" or "de-fogged", then to midway position for maximum air flow and partial defrost
Car windows	front door vent and door window open slightly to assist in de-icing or de-fogging, then closed or positioned to provide comfort for all occupants

SLOW CITY DRIVING IN COLD WEATHER

CONTROL	SETTING
Fan control lever	full down for high speed

SLOW CITY DRIVING IN COLD WEATHER—Continued

CONTROL	SETTING
Temperature control lever	down, for maximum heating, then adjusted for comfort
Air control lever	at midway position for maximum air flow and partial defrost
Car windows . . .	closed

NORMAL COOL WEATHER HIGHWAY CRUISING

CONTROL	SETTING
Fan control lever	full down for high speed
Temperature control lever	position to obtain desired temperature
Air control lever . .	at midway position for maximum air flow and partial defrost
Car windows	closed, door vent(s) may be opened to suit occupant comfort

COLD WEATHER HIGHWAY CRUISING

CONTROL	SETTING
Fan control lever	full down for high speed
Temperature control lever .	down, for maximum heating, then adjusted for occupant comfort
Air control lever .	at midway position for maximum air flow and partial defrost
Car windows	closed

TIPS ON USE OF HEATER AND DEFROSTER SYSTEM

KEEPING COMFORTABLE IN EXTREMELY HUMID "MUGGY" WEATHER

When the relative humidity is extremely high causing discomfort on a day when the temperature is 55°F.-70°F., depress the air control lever to the midway position and move the temperature control lever down slightly. This will permit hot engine coolant to enter the heater core and provide minimum heating. Move the fan control lever to the low speed position.

KEEPING COMFORTABLE IN MILD WEATHER

When the weather is cool, but the sun is very bright, as in spring or fall or at high altitudes, use both the heater and the cowl ventilators at the same time, setting the temperature control, and fan speed for desired comfort.

CONTROLLING TEMPERATURE IN CAR

The most satisfactory method of controlling the temperature in the car is to:

1. Set air control lever down for maximum air flow (midway position).

2. Position temperature control lever down for maximum heating, then adjust to maintain the desired temperature in the car.

3. Set fan speed for your personal comfort.

USING THE HEATING SYSTEM FOR VENTILATION

The heating system is designed so that it can also be used for ventilation when it is not necessary to warm the air. Ventilation may be obtained by placing the air control lever in the midway position for maximum air flow and the temperature control lever in the extreme up position to prevent the flow of heated coolant from entering the heater core. Select the amount of air flow desired by positioning the fan control lever at the speed desired.

PRINCIPLES OF OPERATION

CONTENTS OF THIS SECTION

DESCRIPTION AND OPERATION OF INDIVIDUAL UNITS

TEMPERATURE CONTROL VALVE

DESCRIPTION

The temperature control valve has a water inlet connection (from the intake manifold) and a water outlet connection (to the heater core). The amount of water flowing through the water outlet opening is controlled by a poppet valve connected to an over-ride spring retainer at one end of a valve control lever which pivots about a stationary pivot point "D" (Fig. 3-4).

The lever spring retainer is held in position with a lever spring between the retainer and valve control lever. A valve adjusting screw contacts the motor unit piston (actuated by a capillary tube) and is at the opposite end of the valve control lever to balance the assembly. The distance from the adjusting screw

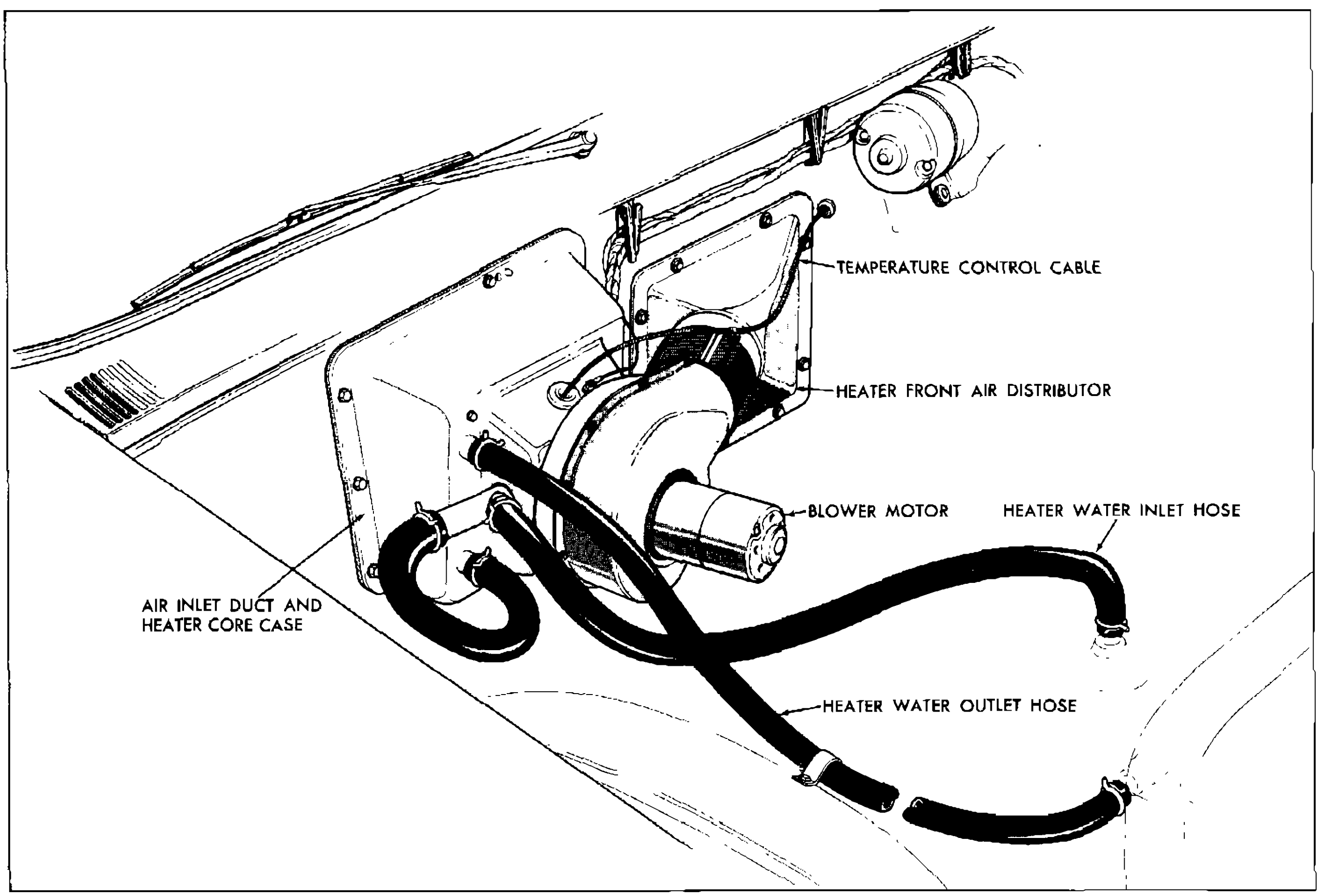


Fig. 3-3 Location of Units in the Tempest Heater System

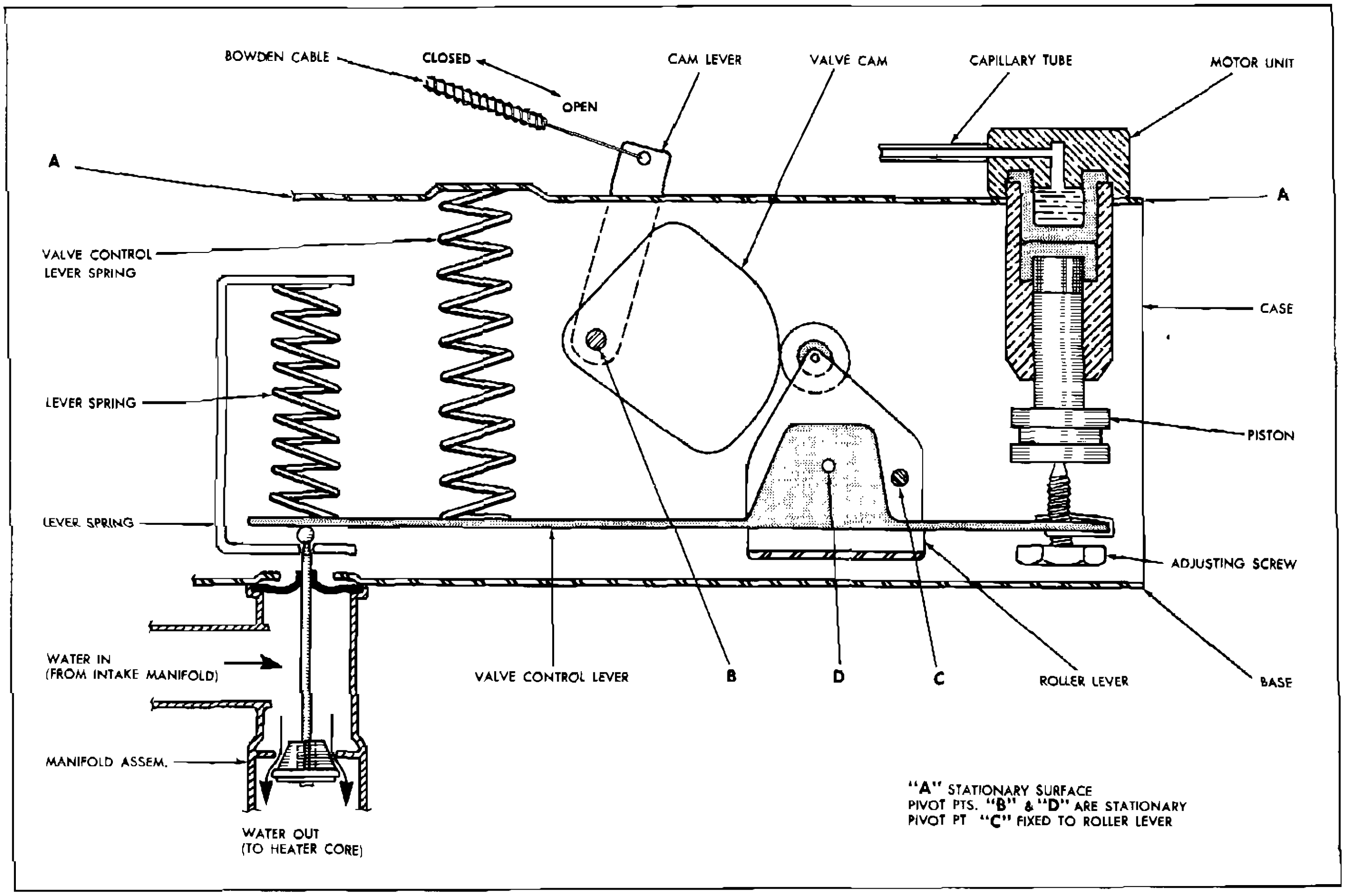


Fig. 3-4 Schematic Diagram of Temperature Control Valve

to pivot point "D" is one-half of the distance from "D" to the valve. A bowden cable from the control panel operates the valve cam.

While this valve is located at the inlet of the heater core (at lower right corner) the capillary tube is attached to the heater core air outlet side (Fig. 3-5).

FUNCTION

The purpose of the temperature control valve is to regulate the flow of engine coolant into the heater core and thereby maintain the desired heater outlet temperature.

This valve controls water flow into the heater core by a direct connection to the valve from the temperature control lever at the heater control panel.

A capillary tube filled with a solution of three parts of ethylene glycol to one part water provides the temperature regulation of the temperature control valve. This capillary tube is fastened to the air outlet side of the heater core so that it communicates the temperature of the heated air at that point to the motor unit in the valve. If the temperature of the air coming from the core falls appreciably below the valve setting, the valve automatically opens to increase the flow of hot water to the core. If the temperature increases, the valve will restrict the flow of hot water to the core.

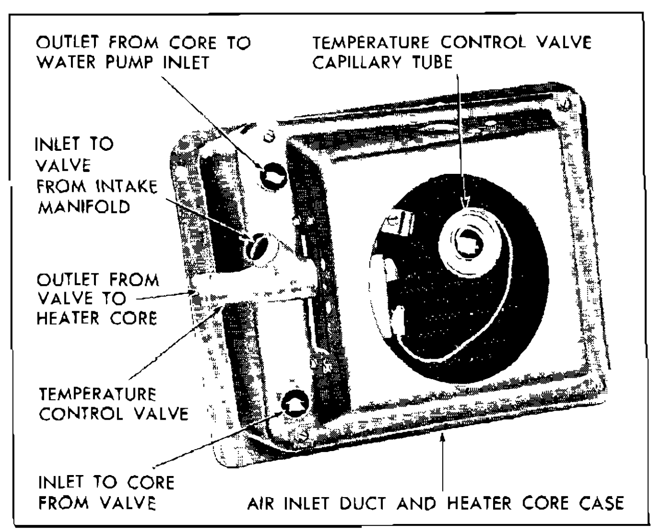


Fig. 3-5 Temperature Control Valve and Heater Core

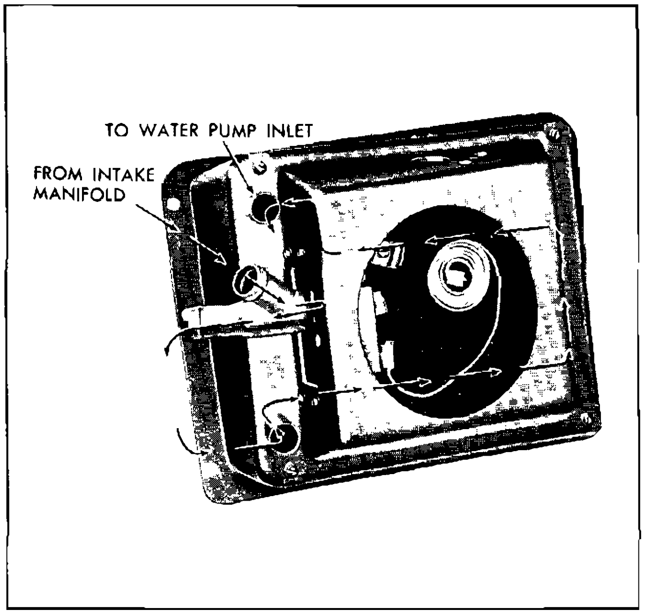


Fig. 3-6 Flow of Engine Coolant Through Valve and Core

It is the temperature of the air passing over the capillary tube that influences the amount of hot water that will enter and pass through the core. When the air is very warm. the heat transfer from the water to the air is small and a lesser quantity of hot water is required to warm the air and to achieve the desired temperature control. When the air passing over the heater core is cool, the heat transfer is great and a greater quantity of hot water is required to warm the air and to achieve the desired temperature control.

A mechanical adjustment located within the valve is provided to regulate the amount of water flow control through the valve. This is accomplished by an adjusting screw which, when turned, moves the valve control lever to increase or decrease the tension on the lever springs. By varying the tension on the lever spring, it is possible to regulate the point at which the tapered valve head begins to open or close, thereby regulating flow into the heater core. ***All valves are preset at the time of manufacture and should not be disturbed.***

OPERATION

When the heater temperature control valve control lever is in the up position the valve is manually positioned to close the valve outlet to the heater core, regardless of the temperature of the air that flows over the valve's capillary tube. With the valve in this condition no water flows into or through the heater core.

Moving the temperature control lever down slightly will manually unlock the valve permitting capillary control of the valve. Depressing the air control lever opens the inlet air valve to permit outside air to flow through the system. Moving the fan control lever to the low, medium or high speed position starts the blower to force outside air through the system.

When the heater core is cool, any air passing over the core surface will not be heated. This cool air will cause the solution in the capillary tube to drop in pressure, permitting maximum opening of the valve at that temperature.

As the engine warms the water (flowing through the heater core), any air forced over the core is warmed and the warm air in turn warms the capillary tube of the temperature control valve. Warming the capillary tube causes the solution to increase in pressure (expand) and force the piston in the motor unit in the temperature control valve to move downward against the adjusting screw and the lever. This action compresses the valve lever springs, and moves the valve to restrict water flow through the core.

HEATER CORE

The copper heater core is of tube and center construction and is designed to permit the engine water (coolant) to flow in a "U" path through the core (Fig. 3-6). This core construction permits a high volume of air to pass through the core as well as a rapid heat dissipation from the water to the core surfaces which provides for rapid transfer of heat to the air.

The heater is located on the right side center of the dash shroud in the engine compartment, with the air duct outlet in the center of the dash shroud inside the car body. Its location permits maximum heating of all air passing over the heater core. The air passing over the hot heater core is warmed and also cools the hot engine coolant which returns to the intake side of the water pump.

WATER FLOW

Water flow in the heater system is taken from the engine cooling system from a water passage in the engine intake manifold, via a hose to the heater temperature control valve located at the heater core inlet through the valve to a hose to the core, through the heater core, via a hose to the intake side of the water pump, and back to the engine cooling system (Fig. 3-7).

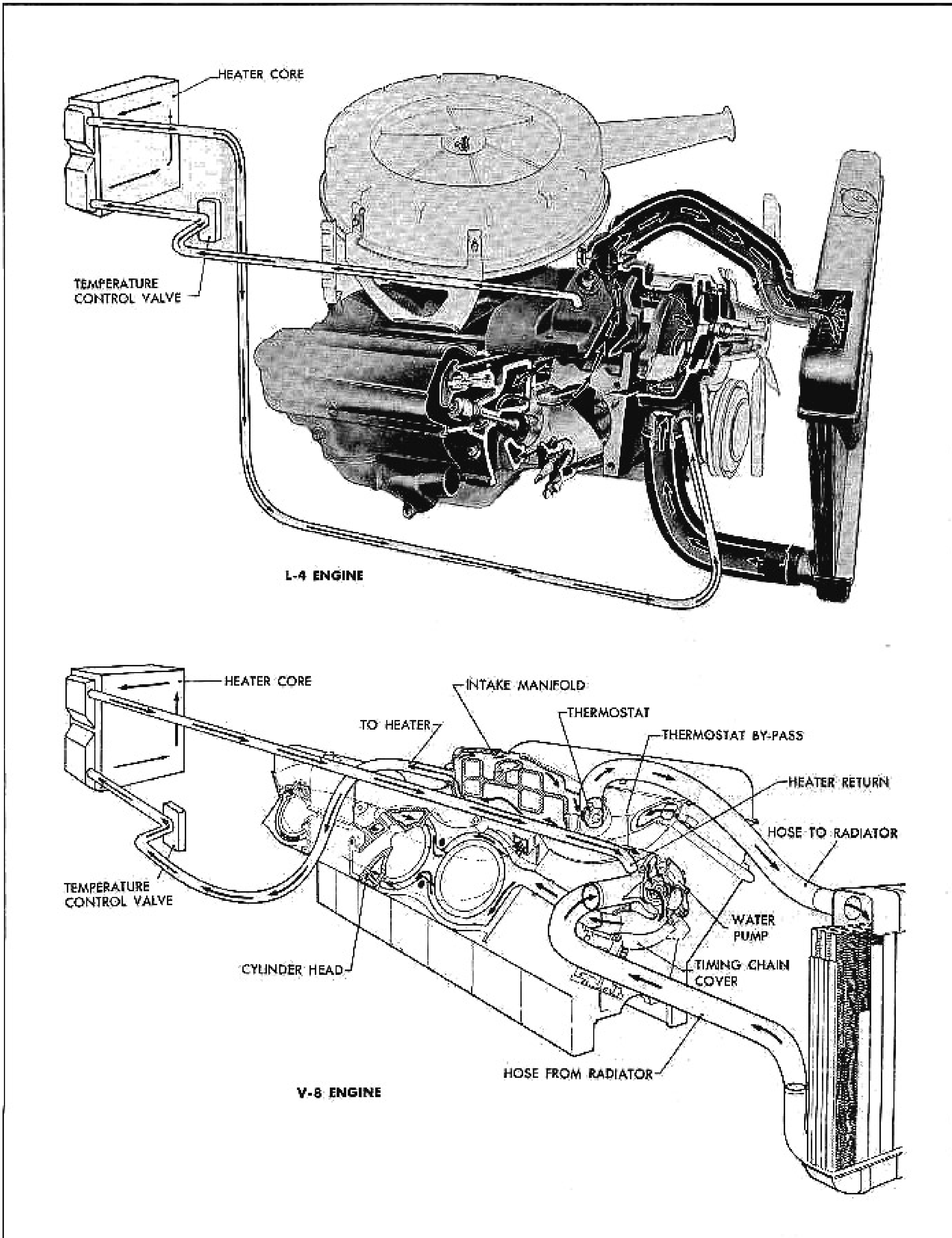


Fig. 3-7 Water Flow Through Tempest Heater System

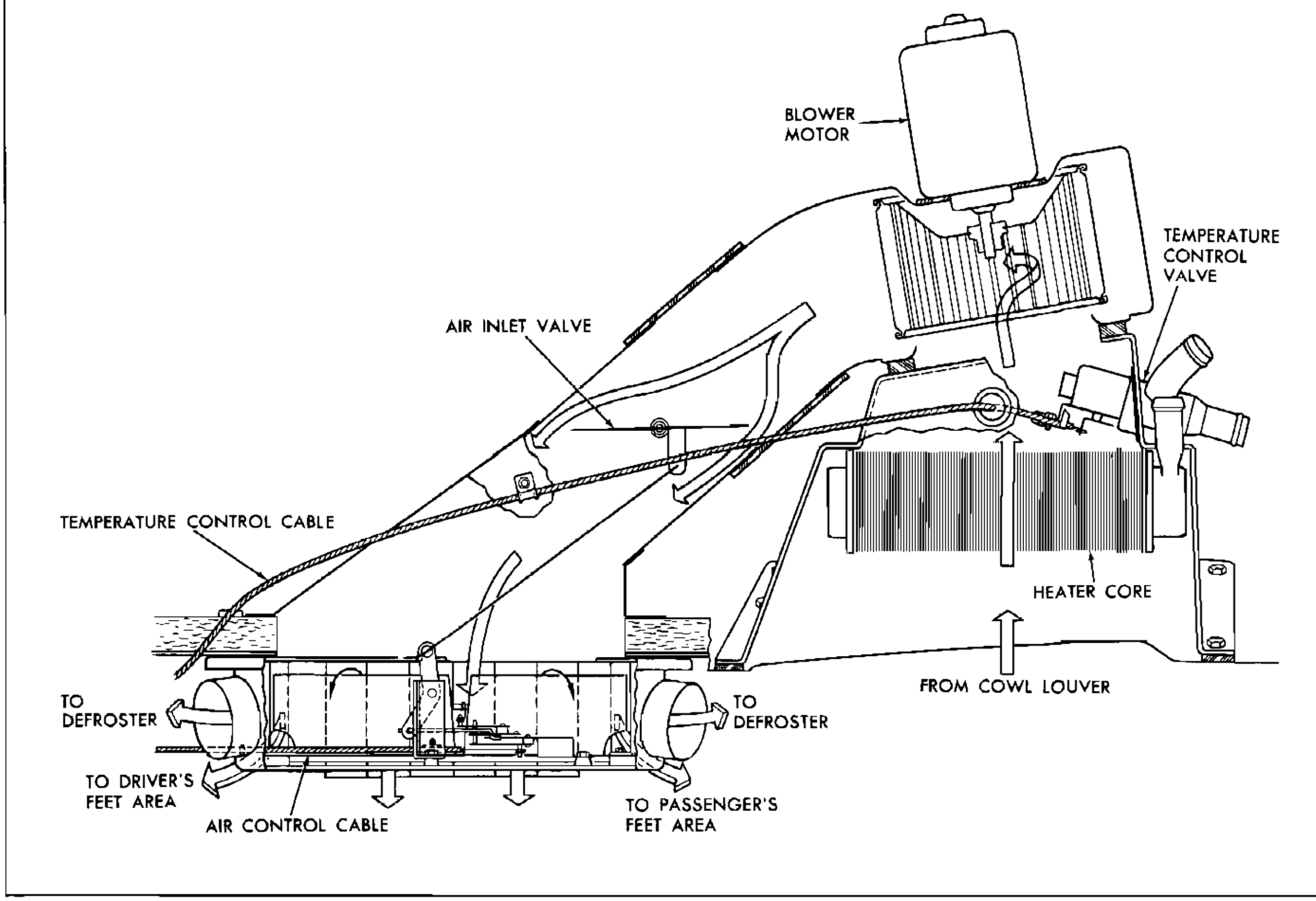


Fig. 3-8 Air Flow Through the Tempest Heater System

Water entering the core from the temperature control valve (at right) fills the lower half of the core and flows to the left where it enters a chamber connecting the lower half of the core with the upper half. Engine cooling system pressure (created by the water pump) forces the water into the upper half of the core and then back to the intake side of the water pump.

The amount of hot water flowing through the heater core is controlled in two ways; mechanically by the setting of the temperature control lever located on the dash and automatically by the temperature control valve. A thermostatic element (connected to a valve in the inlet opening) controls the air temperature as it leaves the heater core. If more heat is required, hot water supply to the core is automatically increased by the temperature control valve and conversely, if less heat is desired, the supply of hot water to the core is decreased.

AIR SYSTEM

Outside air enters through an intake grille mounted flush with the hood directly below the windshield. Air in this chamber is pulled by the blower and forced to the air inlet duct and heater core assembly positioned on the right side of the dash in the engine compartment. Air is directed through the dash shroud then enters the body through the heater rear air distributor duct (air outlet duct) (Fig. 3-8).

Heater air is distributed by a center outlet grilled opening in the heater air outlet duct which disperses air over the front floor area and is so aimed as to also direct air to the rear passenger compartment. Openings in the right and left side of the heater outlet air duct are for additional air distribution to the front seat area (Fig. 3-9).

Flexible hoses, extending from the heater air outlet duct are attached to two nozzles located along the base of the windshield for effective defrosting. A valve in the heater air outlet duct assembly (controlled at the control panel) may be positioned to direct varying amounts of air to the defrosters.

Air flow through Pontiac's Tempest heater system is controlled by levers that slide in a vertical plane in the heater control panel which is located to the left of the steering column. These levers control and operate the heater inlet air valve in the heater front air distributor (air inlet duct) assembly located on the engine side of the dash shroud), the temperature control valve (located adjacent to the heater core on the engine side of the dash shroud), the defroster valve in the heater air outlet duct assembly (located on the passenger side of the dash shroud) and the fan control switch for "OFF", "LO", "MED" and "HI" speed.

The amount of air flow through the heater air system can be varied with the "AIR" control valve lever in the heater control panel and also with the "FAN" lever.

With the "FAN" lever in the full up position the blower is off. Moving the lever to the first (1/3 down) position operates a blower switch with linkage to provide for "LO" blower speed.

With the "FAN" lever in the second (2/3 down) position the blower switch will provide "MED" blower speed.

With the "FAN" lever in the full down position, "HI" blower speed is obtained to provide for maximum air flow through the system (Fig. 3-10).

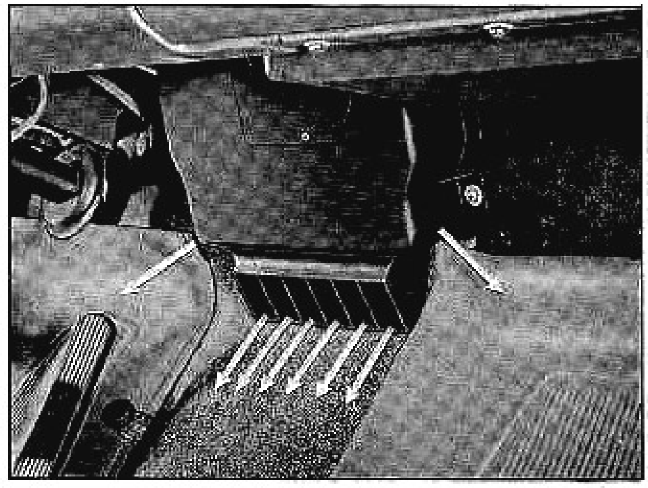


Fig. 3-9 Air Outlets to Floor Area

ELECTRICAL SYSTEM

The heater control panel lamp is fed from the instrument panel rheostat output circuit which is protected by a 2 amp. fuse in the upper right corner of the fuse block.

The blower circuit of the heater system receives its electrical supply from the heater terminal on the fuse block. Overload protection of the heater electrical systems is provided by a 14 amp. fuse located in the lower left corner of the fuse block.

When the ignition switch is turned to the start position, the accessory terminal of the ignition switch

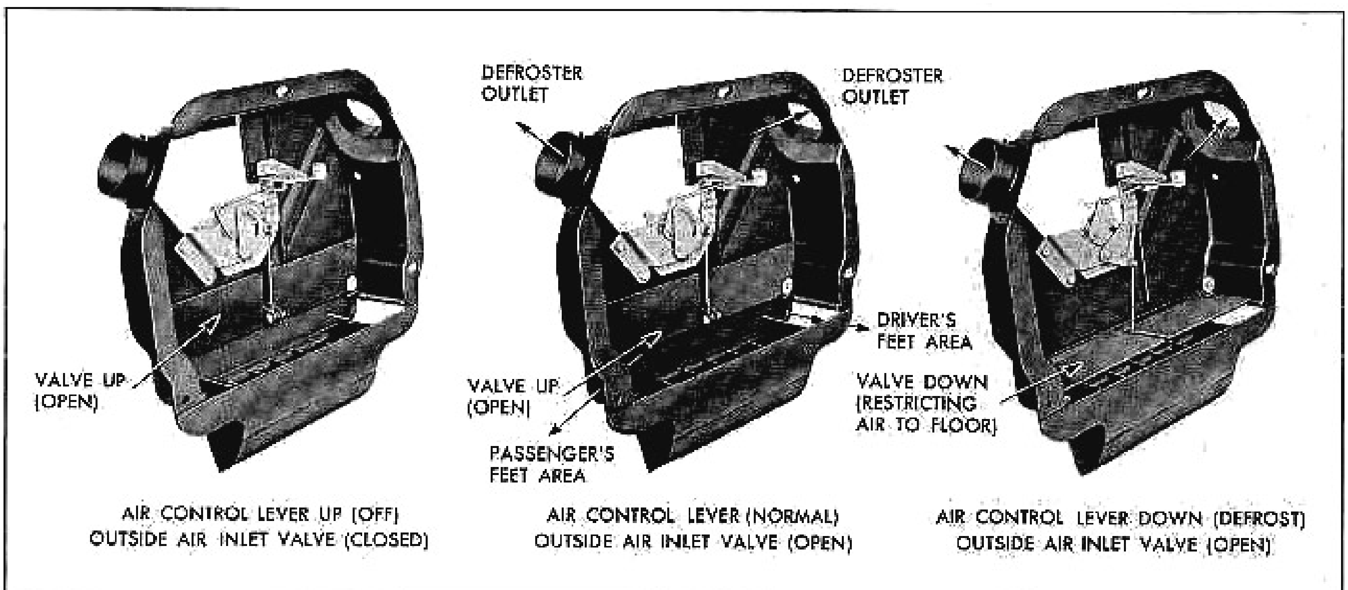


Fig. 3-10 Air Outlet Linkage Position for Air Control Positions

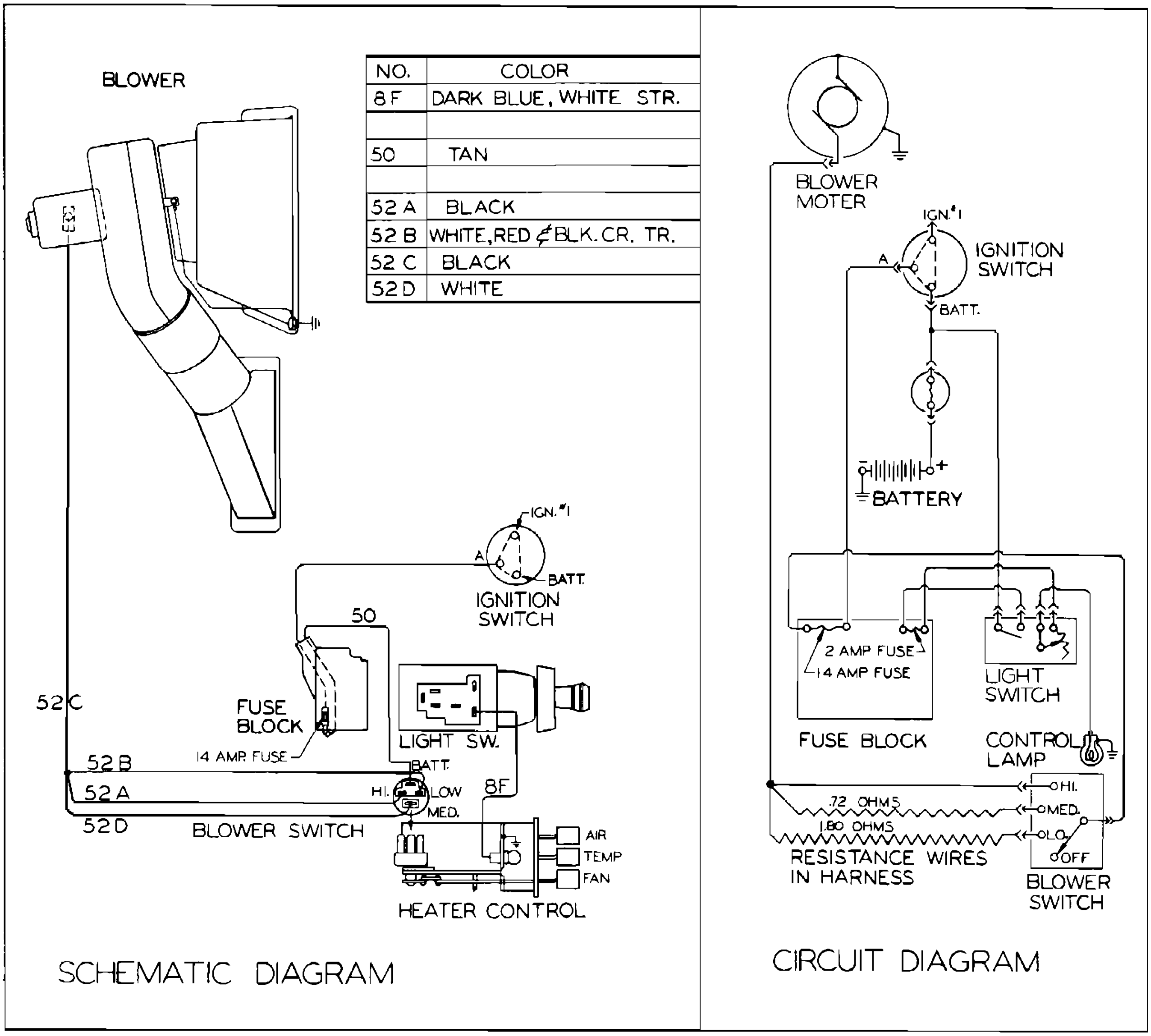


Fig. 3-11 Schematic and Circuit Diagrams of Tempest Heater Electrical System

is cut out. This prevents operation of the accessories connected through the ignition switch while starting the engine. Thus, the starting motor receives maximum battery current while cranking the engine because there is no current to the heater electrical system.

When the "FAN" control lever is in the full up position, no current flows through the blower switch.

The heater blower switch is a four position switch that provides for three blower speeds; low, medium and high. The blower is fed through a single connection at its input; a black colored wire.

CURRENT FLOW THROUGH HEATER FAN CONTROL POSITIONS

Four positions of the heater blower switch permit current flow to the blower as follows:

When the "FAN" control lever is in the "OFF" (full up) position, the blower switch is open and no current flows through the switch.

When the "FAN" control lever is in "LO" position, the circuit is closed to the blower. This allows current to flow from the "HTR" terminal of the fuse block through a tan colored wire to the blower

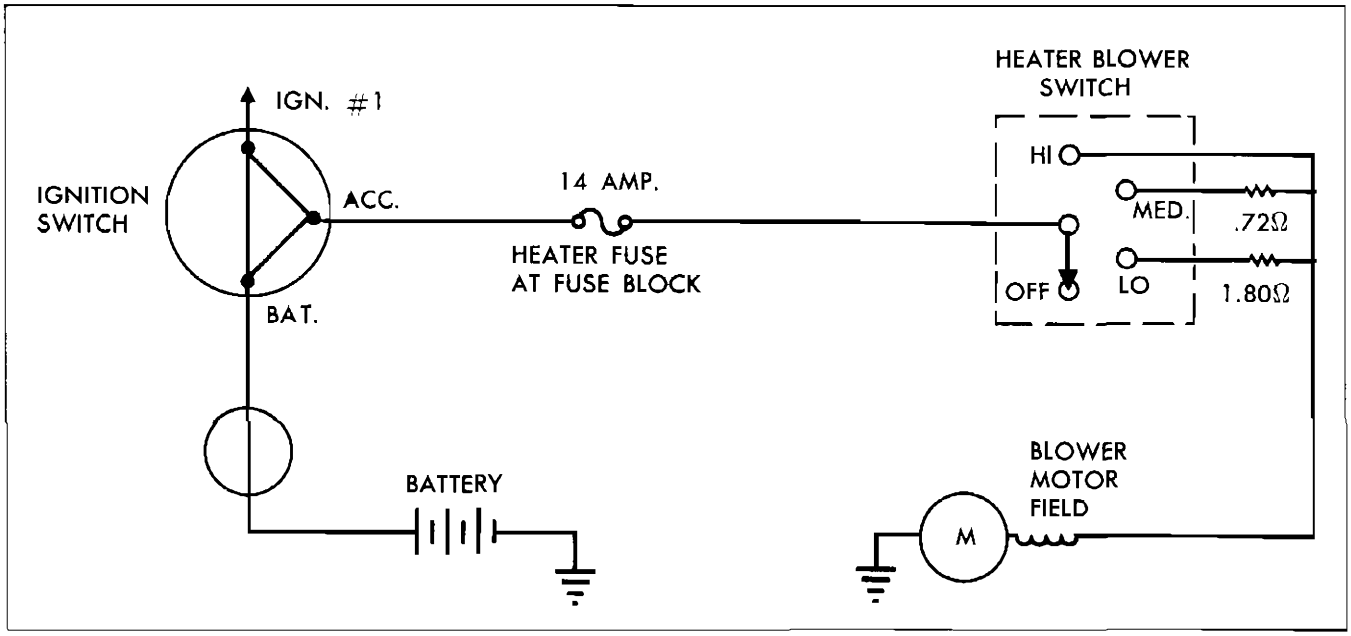


Fig. 3-12 Simplified Circuit Diagram of Tempest Heater Electrical System

switch, through the switch and a white, red and black center stripe resistance wire (having 1.80 ohms) and to the blower motor via a black colored wire (Fig. 3-11).

When the "FAN" control lever is on "MED" the current flows from the "HTR" terminal of the fuse block through a tan wire to the blower switch. The current then flows through the medium terminal of the blower switch and through a white resistance wire (having 0.72 ohms) and then through a black wire to blower motor (Fig. 3-11).

High blower speed is obtained when the "FAN" control lever is in the "HI" (full down) position. This position closes the circuit to the blower motor and allows current to flow from the "HTR" terminal of the fuse block through a tan colored wire to the blower switch. Current flows through the switch to white colored wire joined at a common connection with the low and medium speed resistance wires, then through a black colored wire to the blower motor for high speed (Figs. 3-11 and 3-12).

MINOR SERVICES AND REPAIRS

CONTENTS OF THIS SECTION

ADJUSTMENTS ON CAR

TEMPERATURE CONTROL VALVE CABLE ADJUSTMENT

NOTE: This adjustment should be checked when insufficiently heated or slightly warmed air leaves the heater outlets.

1. Remove the blower assembly from the heater core case.

2. Check to see that the temperature control valve cable housing extends no more than $\frac{1}{16}''$ beyond the cable housing clamp on the control panel assembly (Fig. 3-13).

3. Move temperature control valve lever (at the heater control panel) making sure lever moves up against its stop.

4. Loosen cable housing clamp screw at temperature control valve.

5. Slide cable housing and temperature control arm apart (temperature control arm will move down) to remove cable slack and secure cable housing clamp.

6. Check operation of cable.

7. Replace heater blower assembly.

NOTE: After adjustment, the "TEMP" lever knob must be in alignment with the "AIR" and "FAN" lever knobs, with all in the full up position.

AIR CONTROL CABLE ADJUSTMENT

This procedure adjusts a link which connects the air inlet valve (in the heater front air distributor on the engine side of the dash shroud) and the valve bracket assembly (in the heater rear air distributor or air outlet duct on the body interior side of the dash shroud).

EARLY TYPE HEATER REAR AIR DISTRIBUTOR (AIR OUTLET DUCT) (ADJUST IN "OFF" POSITION)

1. Remove inspection hole cover on heater rear air distributor (air outlet duct Fig. 3-14). Identify early type duct by absence of two dowel pin holes—from air selector cam and from cam bracket. Note that a few ducts have one dowel pin hole. These are classed as early type ducts.

2. Check to see that the air cable housing does not extend any farther than $\frac{1}{16}''$ beyond the cable housing clamp on the control panel.

3. Loosen the bowden cable clamp in the heater air outlet duct. Access is through inspection hole.

4. Rotate the air selector cam in the heater air outlet duct full clockwise. Adjust air inlet valve link so air inlet valve is in the full closed position.

NOTE: A tool made as shown in Fig. 3-15 will facilitate adjustment of the link.

5. With "AIR" control in the "OFF" (full up) position and the air selector cam full clockwise, slide

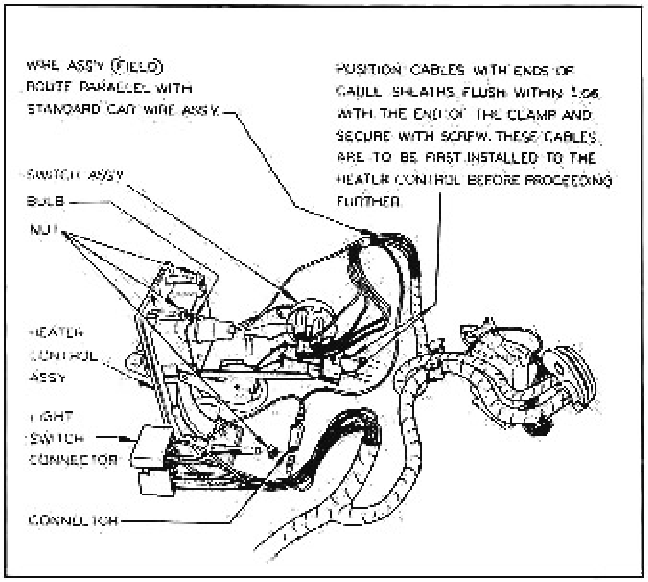


Fig. 3-13 Control Cable Connections at Control Panel

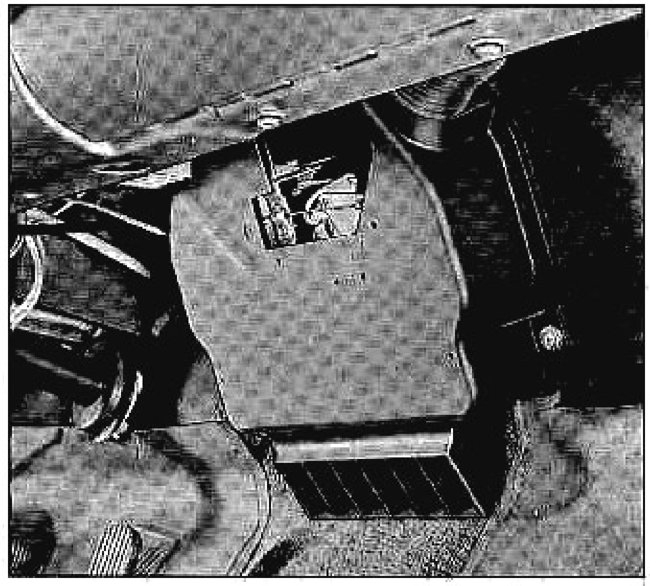


Fig. 3-14 Inspection Hole in Air Outlet Duct

bowden cable housing to its neutral position in the bowden cable clamp in the heater outlet duct and secure bowden cable clamp.

6. Move air control lever to "HEAT" (detent) position and check position of air inlet valve. Valve should be open. If not, re-adjust control cable.

7. Move air control lever to "DE-ICE" (full down) position and check position of air inlet valve. Valve should still be open.

8. Replace inspection hole cover.

LATE TYPE HEATER REAR AIR DISTRIBUTOR (AIR OUTLET DUCT) (ADJUST IN "HEAT" POSITION)

1. Remove inspection hole cover on the heater rear air distributor (air outlet duct). Identify late type duct by presence of two dowel pin holes—one in air selector cam and one in the cam bracket.

2. Check to see that the air cable housing does not extend any farther than 1/16" beyond the cable housing clamp on the control panel.

3. Loosen the bowden cable clamp in the heater air outlet duct. Access is through inspection hole.

4. With the "AIR" control in the "HEAT" (detent) position, install a 3/16" dowel pin (approximately 1" long) through the holes in the air selector cam and the cam bracket.

5. Adjust air inlet valve link so air inlet valve is in full open position.

NOTE: A tool made as shown in Fig. 3-15 will facilitate adjustment of the link.

6. With the "AIR" control lever in "HEAT" (detent) position, and the 3/16" dowel pin installed, slide bowden cable housing to its neutral position in the bowden cable clamp in the heater outlet duct and secure the bowden cable housing clamp.

7. Remove dowel pin.

8. Move "AIR" control lever to "OFF" (full up) position and check adjustment of air inlet valve. Valve should be closed. If not, re-adjust so air inlet valve closes when air control lever is in "OFF" (up) position.

9. Replace inspection hole cover.

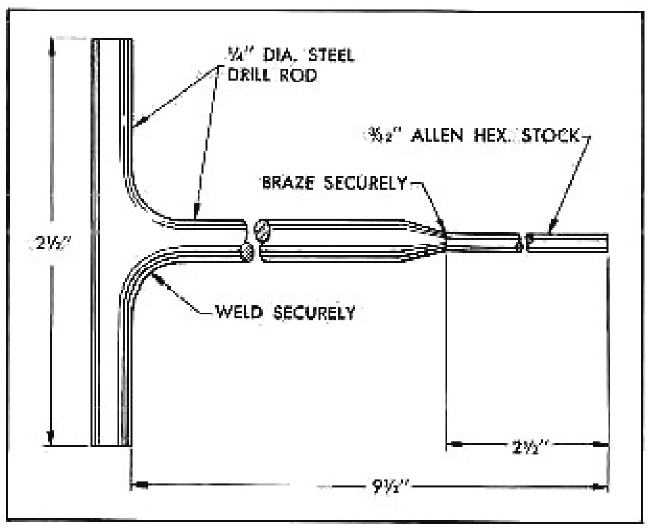


Fig. 3-15 Air Inlet Valve Link Adjusting Tool

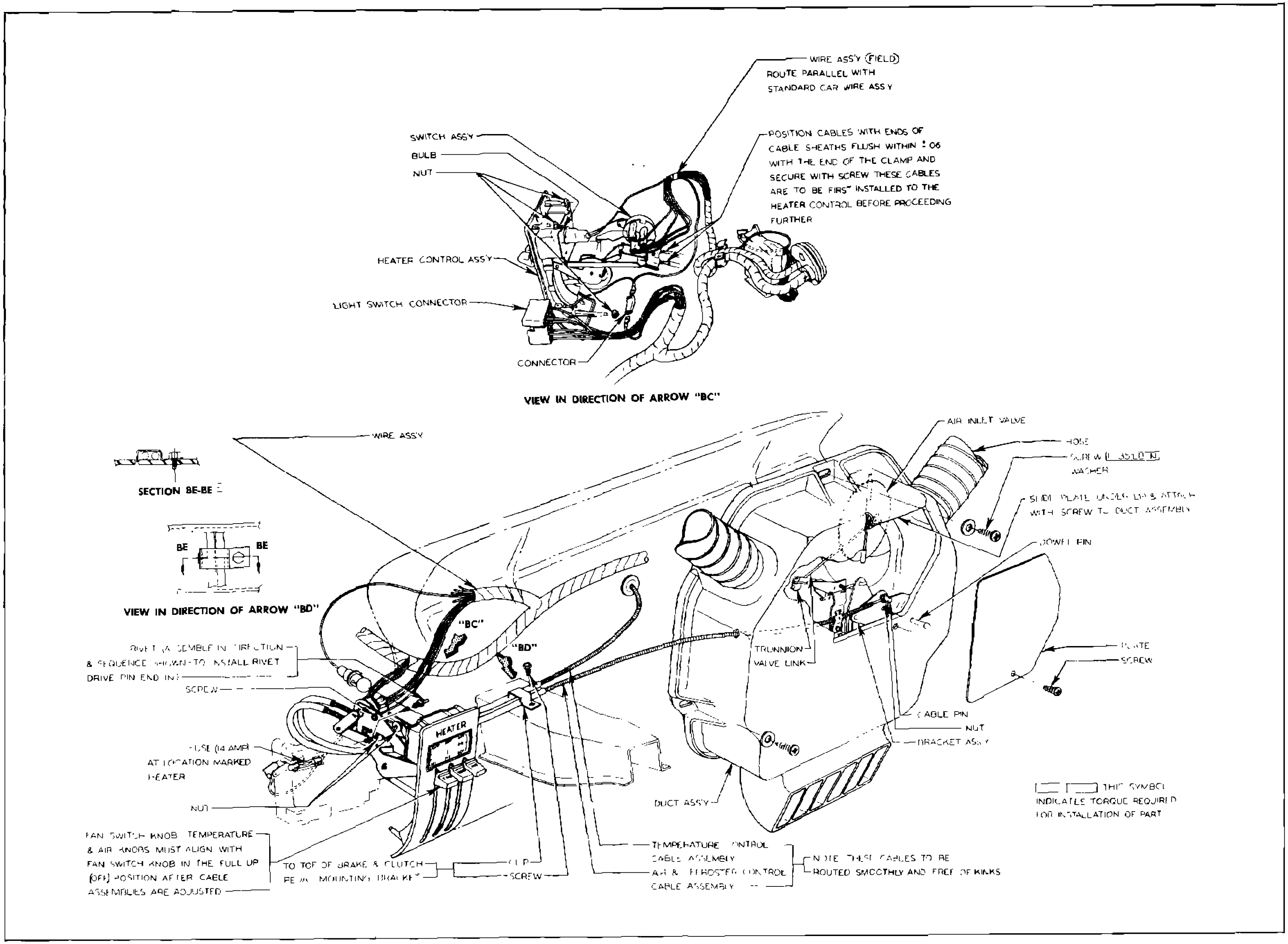


Fig. 3-16 Reference Illustration—Body Interior Details

TEMPERATURE CONTROL BOWDEN CABLE

REMOVE AND REPLACE

1. Remove blower motor.

2. Disconnect temperature control bowden cable at valve and pull cable from heater core and case assembly.

3. Disconnect temperature control cable clamp from heater front air distributor (on engine side of dash shroud).

4. Disconnect temperature control bowden cable from heater control assembly.

5. Attach a piece of wire or stout cord about four feet long to valve end of cable and pull bowden cable into passenger compartment.

6. Replace by reversing the above procedure, making sure insulated end of cable is toward control panel. (Insulation protects wires from chafing on cable housing.) Do not replace blower motor.

7. Adjust temperature control bowden cable.

8. Replace blower motor.

AIR CONTROL BOWDEN CABLE

REMOVE AND REPLACE

1. Disconnect air control bowden cable at heater control assembly.

2. Remove inspection hole cover from heater rear air distributor (inside passenger compartment).

3. Disconnect bowden cable from air selector cam assembly.

4. Remove air control bowden cable.

5. Replace by reversing the above procedure.

6. Adjust air control bowden cable.

HEATER CONTROL PANEL ASSEMBLY

REMOVE AND REPLACE

1. Disconnect battery.

2. Disconnect headlamp switch assembly from instrument panel.

3. Remove one stamped nut at bottom and two at top from back side of heater control assembly.

4. Move control assembly out from instrument panel and disconnect "TEMP" and "AIR" control bowden cables from heater control assembly.

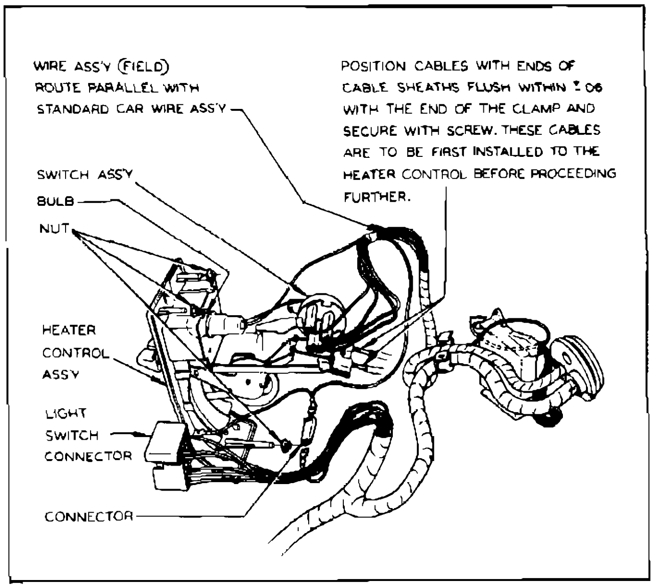


Fig. 3-17 Connections at Tempest Control Panel

5. Disconnect wires and remove control assembly.

6. Replace by reversing the above procedure (Fig. 3-17).

7. Adjust "AIR" control bowden cable.

8. Adjust "TEMP" control bowden cable.

9. Connect battery.

HEATER FAN (BLOWER) SWITCH ASSEMBLY

REMOVE AND REPLACE

1. Disconnect battery.

2. Disconnect headlamp switch assembly from instrument panel.

3. Remove heater control assembly.

4. Remove heater blower switch from control assembly (Figs. 3-18 and 3-19).

NOTE: Remove plastic "hinge" by removing round pin from center of hinge, then remove hinge.

5. Replace blower switch, making sure control lever engages in all four positions without hitting top or bottom of lever slot, and the lever does not contact depressions in left side of slot.

6. Replace control assembly.

7. Connect headlamp switch assembly.

8. Adjust "AIR" control bowden cable.

9. Adjust "TEMP" control bowden cable.

10. Connect battery.

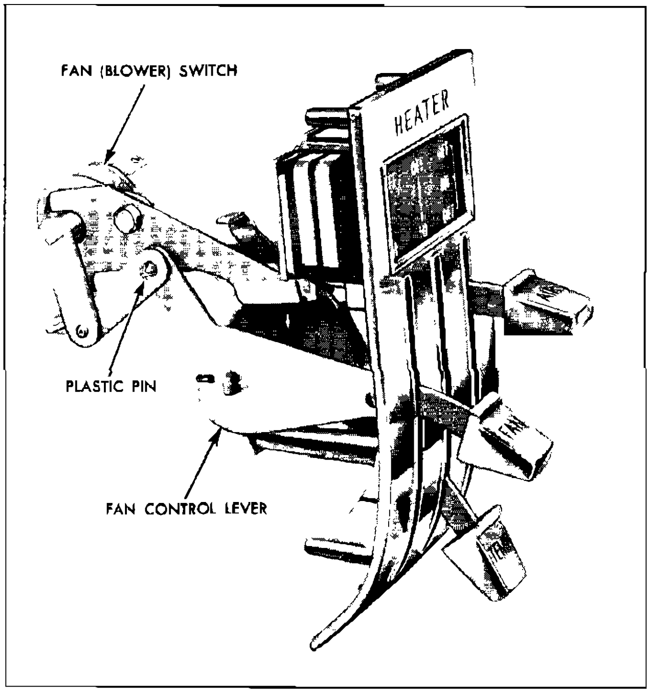


Fig. 3-18 Tempest Control Panel Fan (Blower) Linkage

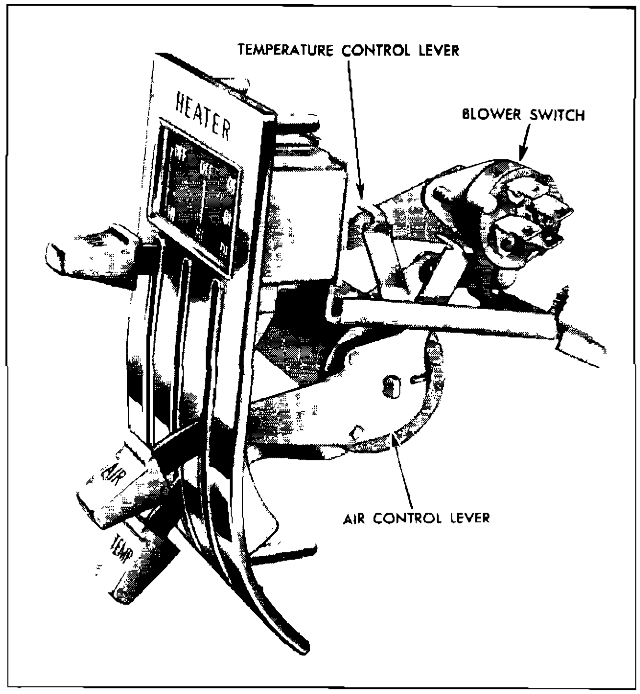


Fig 3-19 Tempest Control Panel Control Cable Linkage

HEATER FRONT AIR DISTRIBUTOR DUCT ASSEMBLY

REMOVE AND REPLACE

1. Move "AIR" control to full down position.

2. Remove inspection hole cover from the heater air outlet duct.

3. Loosen Allen set screw on air inlet valve link and disconnect link.

'4. Remove temperature control bowden cable clip from front air distributor duct.

5. Remove screws securing front air distributor duct to dash shroud and remove duct.

6. Replace by reversing the above procedure, making sure the heater blower to front air distributor duct sleeve (rubber) is properly installed to eliminate any air leaks.

7. Adjust air inlet valve link.

HEATER REAR AIR DISTRIBUTOR DUCT ASSEMBLY

(AIR INLET DUCT)

REMOVE AND REPLACE

1. Move "AIR" control to full down position.

2. Remove inspection hole cover.

3. Loosen Allen set screw on air inlet valve link and disconnect link.

4. Disconnect and remove air control bowden cable from duct.

5. Disconnect defroster hoses.

6. Remove three screws retaining heater air outlet duct to dash shroud (one at each side and one at top) and remove duct.

7. Replace by reversing the above procedure.

8. Before replacing the inspection hole cover, adjust air inlet valve link so valve is closed when the air selector cam is in the full clockwise position.

9. Adjust "AIR" control bowden cable.

10. Replace inspection hole cover.

HEATER BLOWER MOTOR

REMOVE AND REPLACE

1. Disconnect hot wire to blower motor at motor.

2. Remove three blower motor housing to inlet air duct screws and remove blower motor assembly.

3. Replace by reversing the above procedure, making sure blower motor ground wire is attached at top screw.

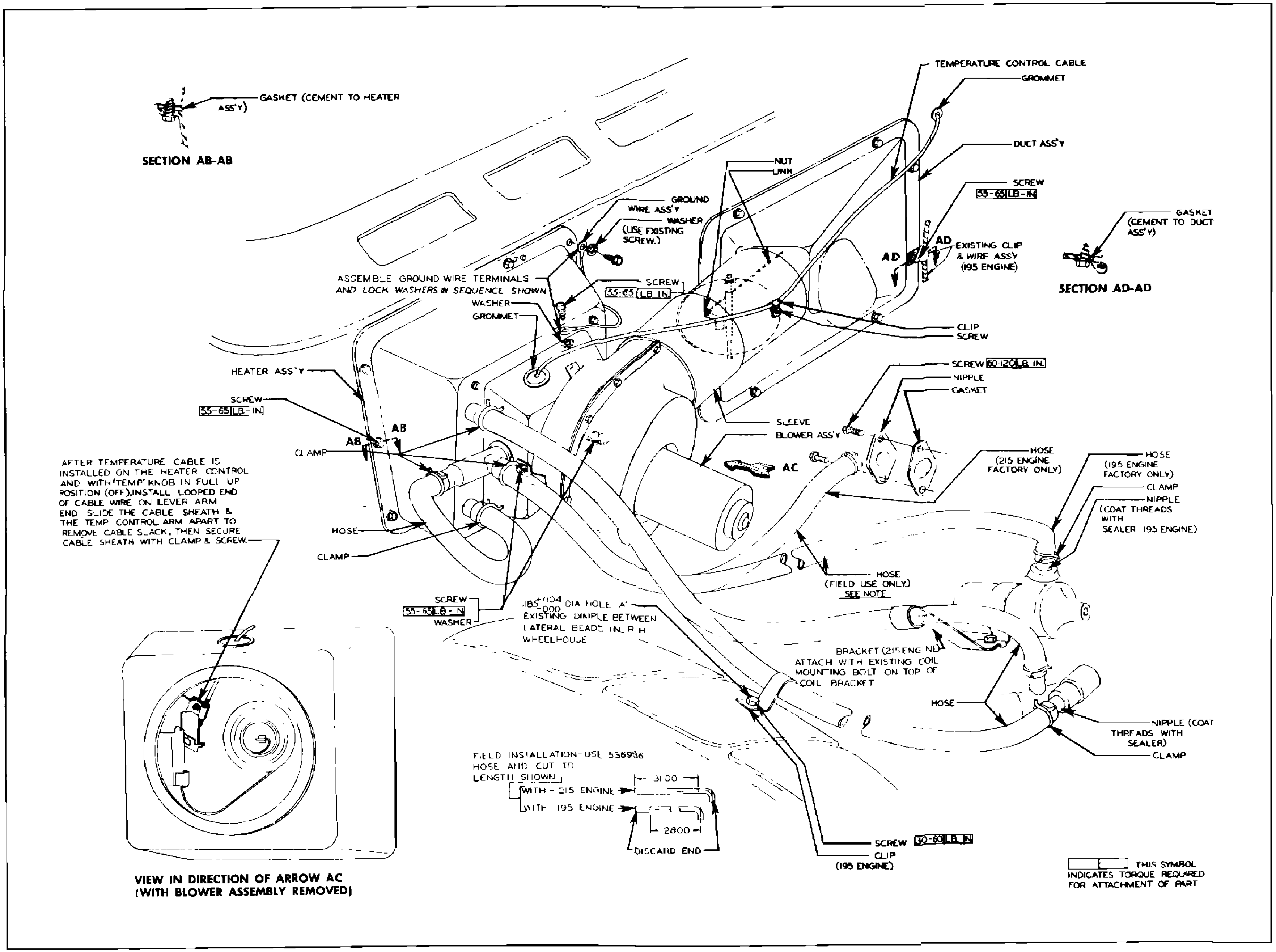


Fig. 3-20 Reference Illustration—Engine Compartment Details

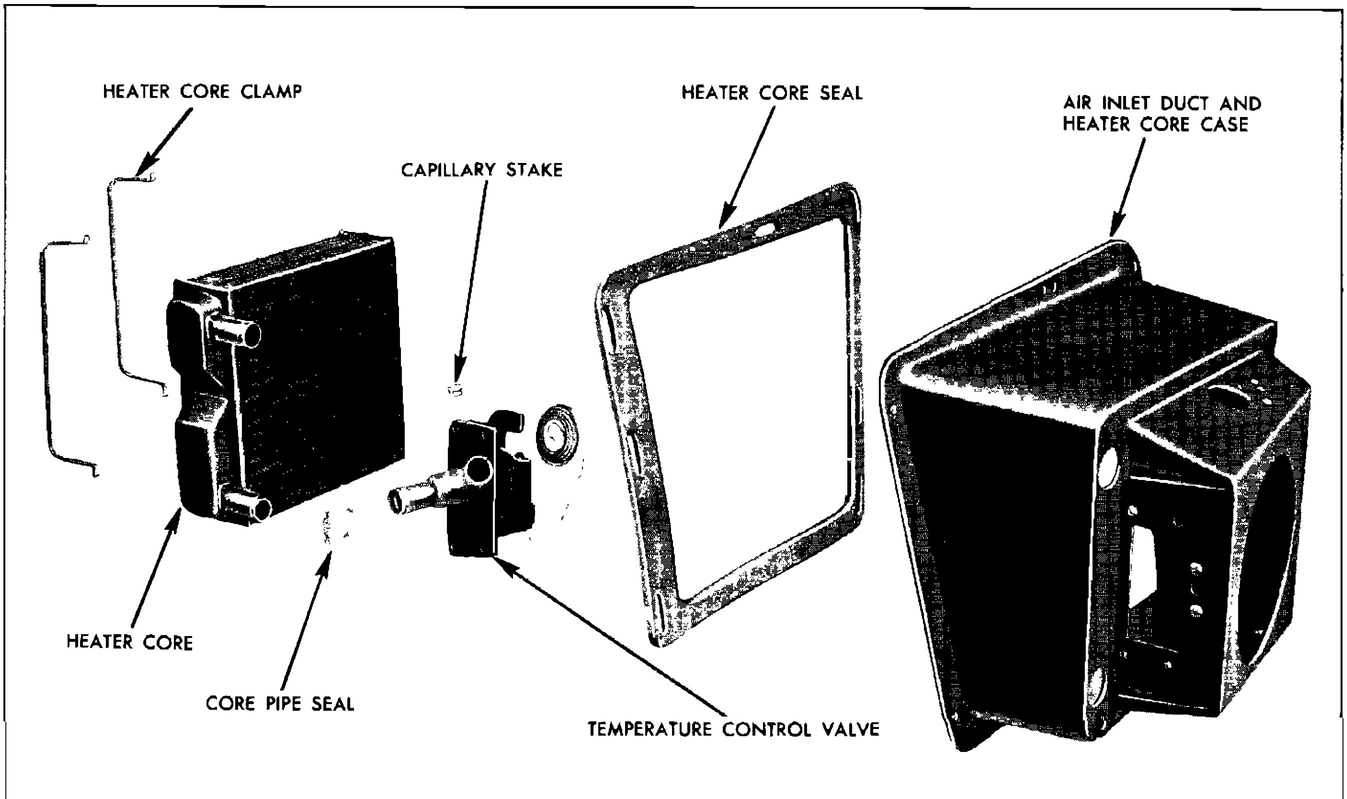


Fig. 3-21 Tempest Heater Air Inlet and Core Case Assembly—Exploded View

4. Note that the blower impeller (and for the Pontiac Circ-L-Aire Air Conditioner) is of opposite rotation from the Pontiac heater. The proper Tempest impeller (and Circ-L-Aire Air Conditioner) is identified by a gold colored inlet ring. Use of the wrong impeller will cause excessive blower noise and reduced air flow.

HEATER CORE AND/OR HEATER TEMPERATURE CONTROL VALVE

REMOVE AND REPLACE

1. Drain radiator.

2. Remove heater blower motor.

3. Disconnect water inlet hose (intake manifold to temperature control valve) at temperature control valve (Fig. 3-20).

4. Disconnect temperature control valve to heater core hose at valve.

5. Disconnect temperature control bowden cable at valve.

6. Disconnect heater water outlet hose (top hose) at core.

7. Disconnect heater water inlet hose (bottom hose) at core.

8. Remove heater core and inlet air duct assembly.

9. Remove four screws (two on each side) of the front of the duct.

10. Remove four screws retaining valve to duct (insert screwdriver just below heater core outlet hose and just above heater core inlet hose).

11. Disconnect temperature control valve capillary tube from core and remove core and valve.

12. Replace by reversing the above procedure (Fig. 3-21).

13. Adjust temperature control bowden cable.

14. Fill radiator.

TESTING AND DIAGNOSIS

CONTENTS OF THIS SECTION

TESTING

OPERATIONAL TEST

The purpose of performing a heater operational test is to prove the heater system is operating properly.

PRELIMINARY CHECKS

Engine Compartment

1. Check radiator for proper engine coolant level.

2. Inspect radiator core and heater hoses for leaks, at the same time inspecting for kinked or collapsed heater hoses.

3. Inspect the blower to heater front air distributor sleeve to see that it is not torn or damaged and that it is properly installed (to prevent any air leaks from engine compartment, which may have objectionable fumes or odors).

Inside Car Body

1. Check to see that all control levers operate smoothly, and they are in alignment when all are in the full up position.

2. Start engine.

3. Place "FAN" control lever in "OFF" position; blower should not operate.

4. Move "FAN" lever to the "LO" and "MED" position; blower should operate. Continue by moving lever to the "HI" position; blower should operate at a speed faster than at the "LO" and "MED" position.

5. Move "AIR" lever down slowly until the mid-way down position is reached; more and more air should flow through outlet as lever is depressed.

6. Move "AIR" lever down slowly until the full down position is reached, at the same time sensing the amount of air flowing from the defroster outlets. More and more air should flow through these outlets as the lever is depressed.

Should the heater control levers operate satisfactorily during the above checks, it would appear that heater controls operation is normal. If during the checks irregularities are noted or complaints on heater operation could not be noted or determined, then refer to TROUBLE DIAGNOSIS for the complaint or cause and the remedy.

TROUBLE DIAGNOSIS

INSUFFICIENT HEATING

COMPLAINT OR CAUSE	REMEDY
Slow warming in car.	Incorrect operation of controls. Advise operator of proper operation of heater controls.
Objectionable engine or exhaust fumes in car.	Check for good seal between hood and cowl.
	Check for good seal between vent grille and cowl.
	Check for damaged and/or improper installation of sleeve between air inlet duct and heater core and case, and heater front air distributor duct.
	Locate and seal any other air leaks.

INSUFFICIENT HEATING—Continued

COMPLAINT OR CAUSE	REMEDY
Cold drafts on floor.	Check operation and adjustment of cowl vent cables. Advise operator of proper operation of heater system.
Insufficient heat to rear seat.	Check for obstructions under front seat. Blower must operate.
Low engine coolant level.	Check radiator and fill to proper level, open water control valve wide, run engine to clear air lock.
Failure of engine cooling system to warm up.	Check radiator cap and engine thermostat and replace if required.
Kinked heater hoses.	Remove kink or replace hose.
Foreign material obstructing water flow in heater core.	Remove foreign material if possible, otherwise replace core.
Temperature control valve cable improperly adjusted.	Adjust cable.
Inoperative temperature control valve.	Replace valve.
Air valves do not open.	Check for proper installation and/or adjustment of cables.

INADEQUATE REMOVAL OF FOG OR ICE

CAUSE	REMEDY
Air valve does not open.	Check for proper installation and/or adjustment of cable.
Defroster valve does not open fully.	Adjust air control cable.
Obstructions in defroster outlets at windshield.	Remove obstruction. On cars with instrument panel pads, look for and fix loose panel pad cover at defroster outlets.
Dinged defroster outlets.	Reshape outlet flange with pliers. The outlet should have a uniform opening, $5/16''$ wide.
Blower motor not connected.	Connect wire.
Inoperative blower motor.	Check heater fuse. Replace motor.
Inoperative blower motor switch.	Replace switch.

TOO WARM IN CAR

CAUSE	REMEDY
Inoperative temperature control valve.	Replace valve.
Incorrect operation of controls.	Advise operator of proper operation of heater system

BLOWER INOPERATIVE

CAUSE	REMEDY
Blown fuse.	Replace fuse.
Inoperative motor.	Replace motor.
Open circuit.	Repair circuit between ignition switch, blower switch, and blower motor.
Inoperative blower motor switch.	Replace faulty switch.

MISCELLANEOUS

CAUSE	REMEDY
Control levers not aligned due to incorrect adjustment.	Adjust control cables.
Blown fuses.	Shorts in electrical system. Locate and correct short. Blower wheel rubbing on case. Failed blower motor.
Heater "gurgle".	Check engine coolant level in radiator.

SPECIFICATIONS

Blower Switch Positions (Blower Current Drain)

Measurements are for an in-car installation with all windows and doors closed. Measured at room temperature.

VOLTAGE AT REGULATOR	CONTROL POSITION	SWITCH POSITION	BLOWER MOTOR		
			AMPERES	VOLTS	IMPELLER RPM
12.2	DE-ICE	High	6.3	11.4	1947
13.5	DE-ICE	High	6.9	12.5	2088
14.5	DE-ICE	High	7.4	13.6	2226
12.2	NORMAL	High	6.6	11.4	1896
13.5	NORMAL	High	7.1	12.6	2046
14.5	NORMAL	High	7.7	13.5	2166
12.2	NORMAL	Medium	4.9	8.3	1512
13.5	NORMAL	Medium	5.4	9.3	1638
14.5	NORMAL	Medium	5.8	10.0	1725
12.2	NORMAL	Low	3.7	5.6	1140
13.5	NORMAL	Low	4.0	6.3	1236
14.5	NORMAL	Low	4.3	6.8	1311

Cooling System Capacity (Engine with Heater) . . . . 12.6 qts.

Fuse

Heater Electrical System (on fuse block) . . . . 14 amp.

Heater Control Panel Lamp (on fuse block) . . . . 2 amp.

VENTILATING

CONTENTS OF THIS SECTION

GENERAL DESCRIPTION

Comfortable, draft free ventilation inside the car may be obtained by opening the front door vent windows and/or the ventilator valves in the side shroud.

The air intake for the ventilation system is located at the horizontal portion of the cowl forward of the windshield reveal molding and flush with the hood. Outside air enters the louvered intake then flows into an enclosed chamber which extends on each side of the cowl. Outside air in the chamber travels to inlets in the side cowl trim pads. Air can also be directed through heater and/or defroster outlets without being heated, provided the temperature controls are at the off position.

Control knobs mounted on the instrument panel provide individual control of the air flow through the inlets into the front passenger compartment (Figs. 4-1 and 4-2).

Contour of the air chamber is such that water in the air is deflected away from the inlet ducts, which extend into the chamber and also through the inlets in the cowl trim pads. A large volume of water, such as would be present when the car is being washed, is prevented from entering the inlet ducts by gutters on the ducts in each side of the chamber.

All cars except those equipped with Circ-L-Aire conditioning are equipped with side shroud ventilators at both sides. On Circ-L-Aire equipped cars only the left side shroud ventilator is installed, and on Tempest with A/C, where special parts are used.

ADUSTMENTS ON CAR

FRONT DOOR VENT WINDOWS

Refer to the 1961 Body Shop Manual for all services and repairs for the front door vent windows.

MINOR SERVICES AND REPAIRS

SHROUD TOP VENTILATOR GRILLE—REMOVE AND REPLACE

1. Place protective coverings over hood and fenders.
2. Remove windshield wiper arm, spanner nut,

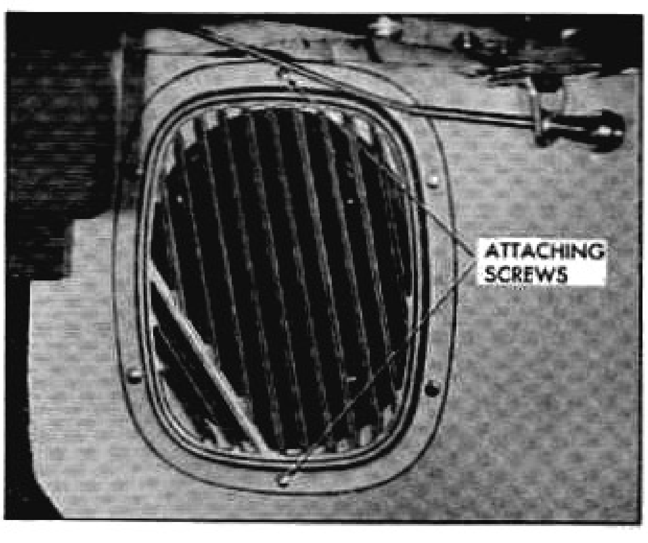


Fig. 4-1 Pontiac—Right Vent and Vent Control

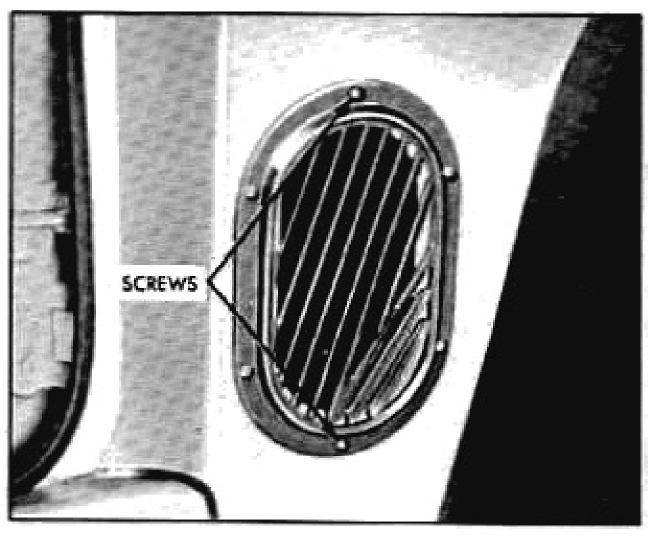


Fig. 4-2 Tempest—Right Vent

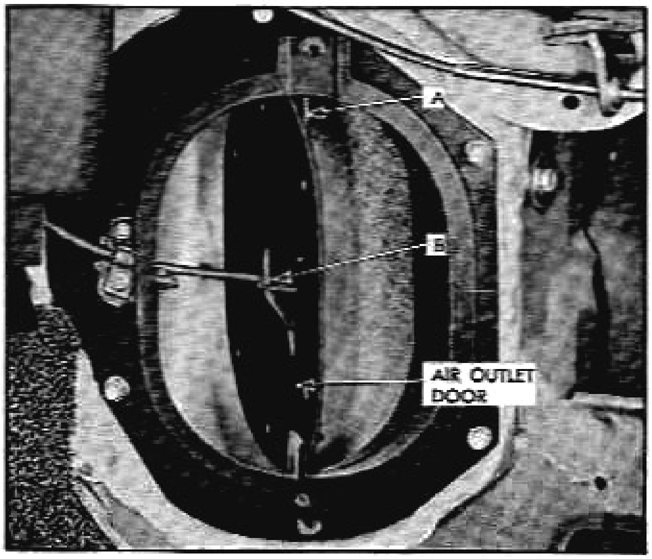


Fig. 4-3 Pontiac—Air Outlet Door

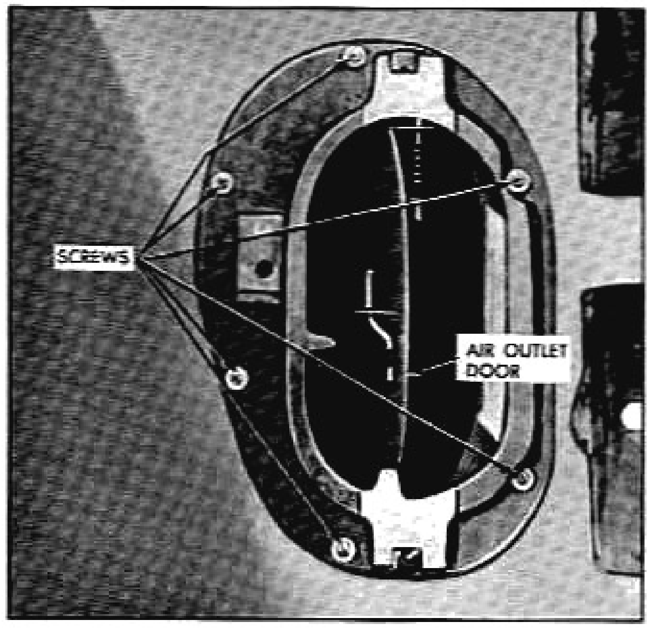


Fig. 4-4 Tempest—Air Outlet Door

washer and escutcheon from each wiper transmission. Use tool No. J-6592-01 to remove transmission nut.

3. Raise hood and remove screws securing front edge of grille to shroud.

4. Carefully raise front edge of grille and slide grille forward (toward front of car) to disengage retaining tabs along rear edge of grille positioned between lower reveal moldings and molding attaching clips and remove grille.

NOTE: Exercise care so that grille does not contact hood.

5. On Tempest models apply medium-bodied sealer around grille retaining slots in shroud panel and around screw attaching holes.

6. Insert retaining tabs along rear edge of grille in slots in shroud panel and reverse removal procedure. Make certain windshield washer nozzle is in proper position.

NOTE: Check to see that grille does not contact hood after installation.

SHROUD SIDE FOUNDATION—REMOVE AND REPLACE

1. Remove screw at upper and lower end of air inlet grille (Figs. 4-1 and 4-2) and bend down tabs securing foundation to floor pan.

2. Slide foundation forward to disengage rear edge from retainer and remove from body and remove foundation.

3. To install, reverse above procedure. Only the lower attaching screw is used on the left foundation.

SHROUD SIDE DUCT VENT CONTROL CABLE—REMOVE AND REPLACE

1. Remove side foundation trim panel (kick pad). (Two screws secure this panel at top and bottom of vent grille.)

2. Loosen control cable clamp.

3. Holding the air outlet door in the closed position, slide cable housing toward rear of car so there is approximately ¼" between the cable knob and the mounting bracket and tighten cable housing clamp.

4. Replace side foundation trim panel.

SHROUD SIDE DUCT PANEL AIR OUTLET DOOR—REMOVE AND REPLACE

1. Remove shroud side foundation panel.

2. Remove end of control cable from pin indicated in Figs. 4-3 and 4-4.

3. Pry hinge pin downward and remove door.

4. To install, reverse above procedure.

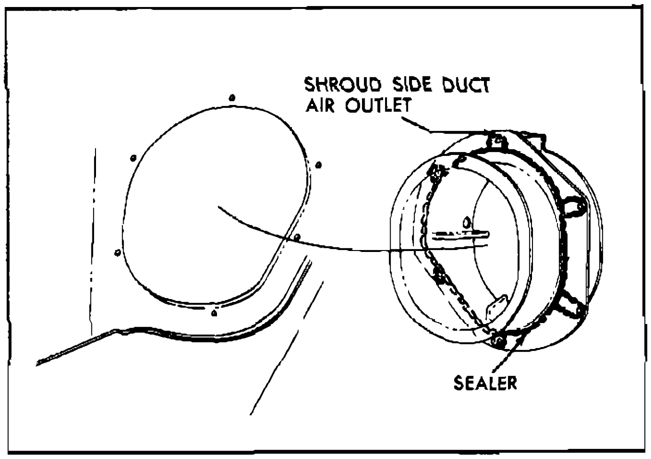


Fig. 4-5 Pontiac—Side Duct Air Outlet Sealing

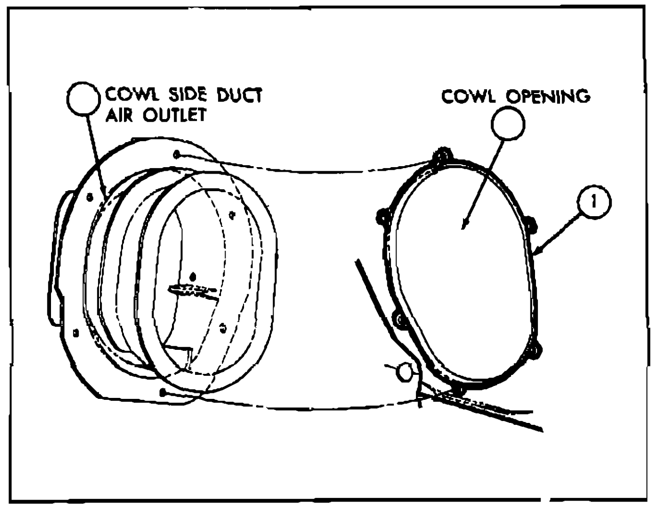


Fig. 4-6 Tempest—Side Duct Air Outlet Sealing

SHROUD SIDE DUCT PANEL AIR OUTLET—REMOVE AND REPLACE

1. Remove shroud side foundation panel.

2. Remove screws securing outlet door housing to shroud panel as shown in Figs. 4-3 and 4-4 and remove housing.

NOTE: Outlet is only present on left side of bodies equipped with Circ-L-Aire conditioning.

3. Apply a bead of medium-bodied sealer to areas indicated in Figs. 4-5 and 4-6 and install reversing the above procedure.

BASIC AIR CONDITIONING INFORMATION

CONTENTS OF THIS SECTION

FUNDAMENTAL PRINCIPLES OF REFRIGERATION

Pontiac's air conditioning system cools the air by means of a refrigeration system which is basically the same as that used in a home refrigerator.

The principle of operation of the refrigeration system is based on a few simple laws of physics which are stated informally as follows:

1. *Temperature is a measurement of the intensity* of heat.

2. Heat is a form of energy. When heat is added to a substance, it usually is noticed by an increase in temperature. For example, in order to raise the temperature of water from 35°F. to 100°F., it is necessary to add a certain amount of heat.

3. When an object cools, it does not absorb cold, but rather it loses heat to a colder object or substance nearby. When a bottle containing warm liquid is placed on a cake of ice, the ice melts and the bottle and its contents become cool. Heat from the bottle and its contents is lost to the ice.

4. When a liquid boils, turning to vapor, it absorbs a great amount of heat. For instance, water boiling on a stove is absorbing a great amount of heat from the burner as it is changing to the vapor commonly called steam. Boiling is a rapid form of evaporation.

When a liquid boils, it absorbs heat without changing temperature. For example, when heat is added to water at sea level, as when heating on a stove, the temperature of the water will rise until it reaches 212°F. If the water remains on the hot stove, it will boil, but the temperature will remain at 212°F. The heat being absorbed by the water is changing it to steam rather than raising the temperature.

Refrigerant-12, the refrigerant used in Pontiac's air conditioning system, boils at 21.7°F. below zero. Thus, if it were exposed to the air at normal room temperature, it would absorb heat from the surrounding air and boil, immediately changing to a vapor.

5. When heat is removed from this water vapor, it will condense back into a liquid. For example, the steam caused by boiling water on a stove will condense into water on the underside of the cover. This is due to the cover not being as hot as the steam. The cover, therefore, takes heat from the steam, causing it to condense back to water. This same action occurs when warm air contacts any cooler substance. Heat from the air is lost to the cool substance and usually any moisture in the air condenses on the cooler substance.

6. The temperature at which substances will boil or condense is affected by pressure. If the pressure is increased, the liquid will not boil until a higher temperature is reached. Thus we can prevent the refrigerant from boiling if it is kept under high pressure. If this high pressure is suddenly released, the refrigerant will immediately boil. A similar condition has been demonstrated in modern automobiles with pressure cooling systems.

Many persons have had the experience of removing the radiator cap from a car in which the water is overheated but not boiling; the pressure is released and the solution boils over with considerable violence.

When the pressure of a vapor is increased, the temperature at which it will condense is also raised. Steam condenses at 212°F. if heat is removed from it, but it can be made to condense at a higher temperature by increasing the pressure.

7. Compressing a vapor increases its temperature. For example, when pumping air into a tire with a

hand pump, the pump will become warm due to the heating of the air as it is compressed.

8. When a liquid is heated until it is converted to a gas, then this gas is heated additionally without changing pressure, this gas is said to be superheated. For instance, in the evaporator Refrigerant-12 absorbs heat and boils at a constant temperature and pressure until it has been completely vaporized, it continues to absorb heat from the warm air passing over the evaporator without any increase in pressure. Since this heat is no longer being used to convert the refrigerant from a liquid to a gas, it will now cause the temperature of the refrigerant to rise. The refrigerant is then superheated.

OPERATION OF A SIMPLIFIED REFRIGERATION SYSTEM

Any refrigeration system takes advantage of the principles described above. A very simple refrigeration system would have five basic parts. They are the compressor, condenser, receiver, expansion valve and evaporator. The refrigeration cycle of this simple system (Fig. 5-1) is as follows:

Refrigerant gas under low pressure is drawn into the compressor, where it is compressed to a high pressure and high temperature. (The process of compressing heats the gas.) The hot refrigerant gas is then pumped into the condenser where it cools by giving off heat to the metal of the condenser, then to the air passing over the condenser surfaces.

As the refrigerant gas cools, while passing through the condenser, it condenses into a liquid under high pressure. From the condenser, the high pressure refrigerant liquid passes into the receiver. The receiver acts as a reservoir to furnish a solid column of refrigerant liquid to the expansion valve at all times. Liquid refrigerant under high pressure passes from the receiver to the expansion valve located at the inlet of the evaporator.

The expansion valve meters refrigerant into the evaporator where a low pressure is maintained by the suction of the compressor. As the refrigerant enters this low pressure area, it will immediately begin to boil and its temperature will drop to that corresponding with the low pressure. For instance, if the pressure inside the evaporator is 30 psi, the temperature of the refrigerant will drop to 32°F. (Fig. 5-2) and it will begin to boil by absorbing heat from the surrounding areas. As the liquid refrigerant passes through the evaporator, it will continue to boil at 32°F. until all the liquid has changed to gas (vaporized). The flow of refrigerant is regulated by the expansion valve so that the refrigerant will remain in the evaporator long enough to completely vaporize.

From the evaporator the cool refrigerant gas is drawn back to the compressor to repeat the cycle.

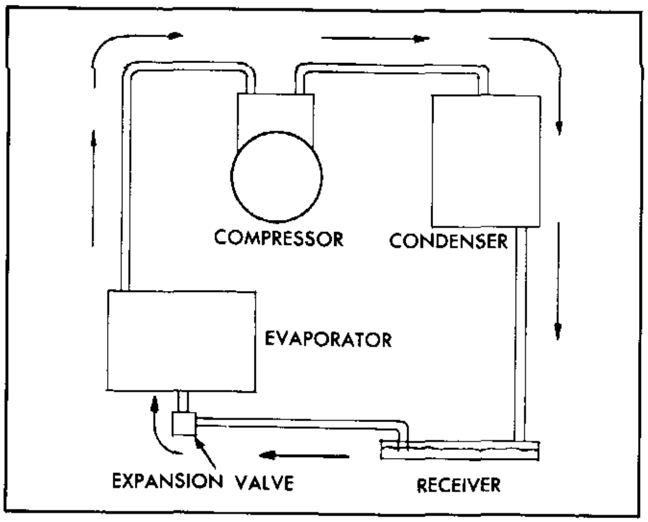


Fig. 5-1 Schematic of Simplified Refrigeration Cycle

REFRIGERANT-12
PRESSURE-TEMPERATURE RELATIONSHIP

The table below indicates the pressure of Refrigerant-12 at various temperatures. For instance, a drum of Refrigerant at a temperature of 80°F. will have a pressure of 84.1 psi. If it is heated to 125°F. the pressure will increase to 167.5 psi. It also can be used conversely to determine the temperature at which Refrigerant-12 boils under various pressures. For example, at a pressure of 30.1 psi, Refrigerant boils at 32°F.

TEMP. (°F.)	PRESSURE (PSIG)	TEMP. (°F.)	PRESSURE (PSIG)
-21.7	0 (atmospheric pressure)	55	52.0
		60	57.7
-20	2.4	65	63.7
-10	4.5	70	70.1
- 5	6.8	75	76.9
0	9.2	80	84.1
5	11.8	85	91.7
10	14.7	90	99.6
15	17.7	95	108.1
20	21.1	100	116.9
25	24.6	105	126.2
30	28.5	110	136.0
32	30.1	115	146.5
35	32.6	120	157.1
40	37.0	125	167.5
45	41.7	130	179.0
50	46.7	140	204.5

Fig. 5-2 Pressure - Temperature Relationship of Refrigerant-12

GENERAL INFORMATION ON REFRIGERATION SERVICE

REFRIGERANT-12 (DICHLORODIFLUOROMETHANE)

Refrigerant-12 is a transparent and colorless refrigerant in both the gaseous and the liquid state. It has a boiling point of 21.7°F. below zero at atmospheric pressure; therefore, at all normal temperatures and pressures it will be a vapor. The vapor is heavier than air and resembles chloroform in odor. Refrigerant-12 is non-flammable, non-corrosive and non-toxic or irritating when *not* in contact with a live flame or fire.

PROCUREMENT

Refrigerant-12 is shipped and stored in metal drums. It is serviced in 25 lb. drums and one pound (15 oz. net weight) cans. Consult your parts department for details about procuring refrigerant.

It will be impossible to draw all the refrigerant out of the drum. The use of warm water when charging the system will assure the extraction of a maximum amount of refrigerant from the drum. Be sure to follow the instructions under CHARGING THE SYSTEM.

PRECAUTIONS IN HANDLING REFRIGERANT-12

1. Do not leave drum of Refrigerant-12 uncapped.
2. Do not carry drum in passenger compartment of car.
3. Do not subject drum to high temperature.
4. Do not weld or steam clean on or near system.
5. Do not fill drum completely.
6. Do not discharge vapor into area where flame is exposed.
7. Do not expose eyes to liquid.

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

If it is ever necessary to transport or carry a drum of refrigerant in a car, keep it in the luggage compartment. If the drum is exposed to the radiant heat from the sun, the resultant increase in pressure may cause the safety plug to release or the drum to burst.

For the same reason, the refrigerant drum should never be subjected to excessive temperature when charging a system. The refrigerant drum should be heated for charging purposes by placing in 125°F. water. Never heat above 125°F. or use blowtorch, radiator or stove to heat the drum.

Welding or steam cleaning of or near any of the refrigerant lines or components of the air conditioning system could build up dangerous and damaging pressures in the system.

If you ever have the occasion to fill a small drum from a large one, never fill the drum completely. Space should always be allowed above the liquid for expansion. If the drum were completely full and the temperature was increased, tremendous hydraulic force could be developed.

Discharging large quantities of Refrigerant-12 into a room can usually be done safely as the vapor would produce no ill effects. However, this should not be done if the area contains a flame-producing device such as a gas heater or running engines. While Refrigerant-12 normally is non-poisonous, heavy concentrations of it in contact with a live flame will produce a poisonous gas. The same gas will attack all bright metal surfaces.

One of the most important cautions concerns the eyes. Any liquid Refrigerant-12 which may accidentally escape is approximately 21°F. *below* zero. If liquid refrigerant should touch the eyes, serious damage could result. Always wear goggles to protect the eyes when opening refrigerant connections.

If Refrigerant-12 liquid should strike the eye, *call a doctor immediately.*

a. DO NOT RUB THE EYE. Splash the affected area with quantities of cold water to gradually get the temperature above the freezing point.

b. The use of an antiseptic oil is helpful in providing a protective film over the eye ball to reduce the possibility of infection.

c. As soon as possible, obtain treatment from a doctor or an eye specialist.

Should liquid refrigerant come in contact with the skin, the injury should be treated the same as though the skin has been frostbitten or frozen.

PRECAUTIONS IN HANDLING HOSES, TUBES AND FITTINGS

When replacing hoses, tubes or disconnecting and connecting fittings, there are several important points which should be kept in mind.

NOTE: New tubes in parts department stock have been dehydrated and sealed. They should not be opened until immediately before they are to be installed. If a delay is encountered the tubes should be capped again until they are ready to be used.

1. The tubes should be free of kinks, since kinks will cause restrictions in the flow of refrigerant and create system noise. The refrigeration capacity of the entire system can be greatly reduced by a single kink in any tube.

2. Use proper wrenches when loosening or tightening connections. This assures the proper tightening of each fitting without damaging the seal.

The special wrenches for flared fittings are similar to box end wrenches, but have an opening so that they will fit over the tubes. It is extremely important to use these wrenches on the tube fittings in order to prevent distortion of the fittings.

When loosening or tightening tube fittings, always use two wrenches. Use an open end wrench to hold the seat stationary so that the original seal will not be broken, causing a leak.

3. "O" rings and fittings must be in perfect condition. The slightest burr or foreign material may cause a leak.

4. "O" rings and fittings should be coated with refrigeration oil before they are assembled. This is extremely important in allowing the connection to be tightened evenly to the proper torque. Fittings which are not coated with refrigeration oil are almost sure to leak. Refrigeration oil is as moisture free as it can be made and therefore the container should always be capped when not in use.

5. When disconnecting any fitting or removing any plug in the refrigeration system, proceed very cautiously, regardless of gauge readings. Open very slowly, keeping face and hands away so that no injury can occur if there happens to be liquid refrigerant in the line. If pressure is noticed when fitting is loosened, allow it to bleed off very slowly.

CAUTION: Always wear safety goggles when opening refrigerant lines.

6. When any connection is opened it should immediately be capped to prevent the entrance of air and moisture. When tubes are laid aside while other work is being performed the utmost care should be taken to keep them absolutely clean.

MAINTAINING CHEMICAL STABILITY IN THE REFRIGERATION SYSTEM

The efficient operation of the air conditioning refrigeration system is dependent on the pressure-temperature relationship of pure Refrigerant-12. As long as the system contains pure Refrigerant-12 (plus a certain amount of compressor oil which mixes with the Refrigerant) it is considered to be chemically stable.

When foreign materials, such as dirt, air, or moisture are allowed to get into the system they will change the pressure-temperature relationship of the refrigerant. Thus, the system will no longer operate at the proper pressures and temperatures and the efficiency will decrease.

The following general practices should be observed to insure chemical stability in the system:

1. Whenever it becomes necessary to disconnect a refrigerant connection, wipe away any dirt or oil at and near the connection to eliminate the possibility of dirt entering the system. Both sides of the connection should be immediately capped or plugged to prevent the entrance of dirt, foreign material and moisture. It must be remembered that all air contains moisture. Air that enters any part of the system will carry moisture with it and the exposed surfaces will collect the moisture quickly.

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

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

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

5. Any time the system has been opened and it has been sealed again, the system must be properly evacuated.

GAUGE SET

The gauge set shown in Fig. 5-3 is one of the most valuable of the air conditioning tools. It is used when charging, evacuating and for diagnosing trouble in the system.

The gauge at the left is known as the low pressure gauge. The face is graduated into pounds of pressure from 0 to 60 (with a cushion to 200) in 2 pound graduations, and, in the opposite direction, in inches of vacuum from 0 to 30 inches. This is the gauge that should always be used in checking pressure on the low pressure side of the system.

The gauge at the right in Fig. 5-3 is graduated from 0 to 600 pounds pressure in 10 pound graduations. This is the high pressure gauge which is used for checking pressure on the high pressure side of the system.

The connection on the left (Fig. 5-3) is for attaching the low pressure gauge line; the one on the right, the high pressure gauge line.

The center connector is common to both and is for evacuating or adding refrigerant to the system. When this connection is not required, it should be capped.

The hand shut-off valves do not have anything to do with opening or closing off pressure to the gauges. They merely close each opening to the center connector and to each other. During most diagnosing and service operations, the valves must be closed. The occasions for opening both at the same time would be when evacuating and charging the system.

When the gauges are connected to the compressor gauge fittings with the refrigeration system charged, the gauge lines should always be purged. Purging is done by "cracking" each valve on the gauge set to allow the pressure of the refrigerant in the refrigeration system to force the air to escape through the center gauge line. Failure to purge lines may result in air or other contaminants entering refrigeration system.

LEAK DETECTORS

LEAK DETECTOR J-6084

Leak detector J-6084 is a gas operated torch type leak detector using a replaceable cylinder. It can also be used as a blowtorch by replacing the leak detector burner unit with Utility Torch Unit J-6085.

ASSEMBLING UNIT

1. Remove dust cap from cylinder.

2. Close valve knob on detector unit.

3. Thread detector unit onto top of fuel cylinder. Tighten finger tight.

NOTE: Do not use tool or wrench to tighten.

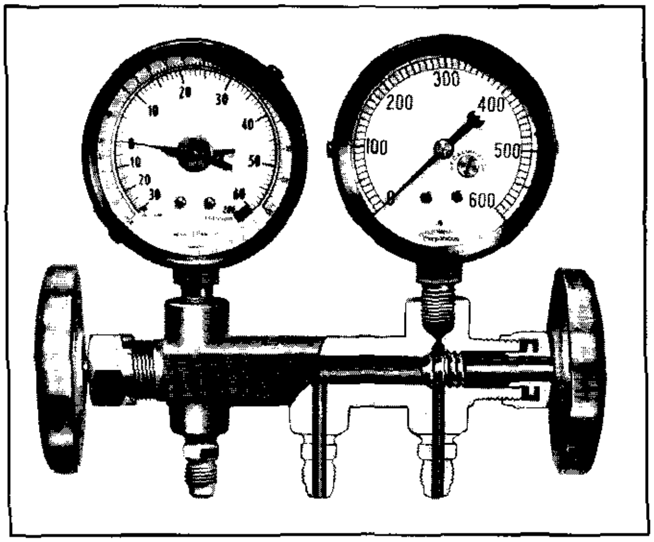


Fig. 5-3 J-5725-01 Gauge Set

4. Attach search hose assembly to detector unit (Fig. 5-4).

LIGHTING DETECTOR J-6084

1. Open control valve until slight hiss of gas is heard, then light gas at opening in chimney.

CAUTION: Do not use lighted detector in any place where combustible or explosive gases, dusts or vapors may be present.

2. Adjust the flame until the desired volume is obtained. A pale blue flame approximately 3/8" above the reaction plate is best for detecting leaks.

NOTE: The reaction plate will be heated to a cherry red.

CORRECTION FOR YELLOW FLAME

If the flame is yellow, insufficient air is being inspirated or the reaction plate is dirty. Insufficient air may be caused by:

1. Obstructed or partially collapsed suction tube.

2. Dirt or foreign substance in burner tube.

3. Dirty or partially clogged orifice.

Blowing air through the suction tube and back through the detector will usually clear dirt or foreign matter. If a yellow flame is caused by dirty reaction plate, allow the flame to burn for several minutes. This will usually burn the plate clean. If an oxide film appears on the reaction plate from continued use, it will reduce the sensitivity of the detector. This may be remedied by removing the plate and scraping the surface gently with a knife.

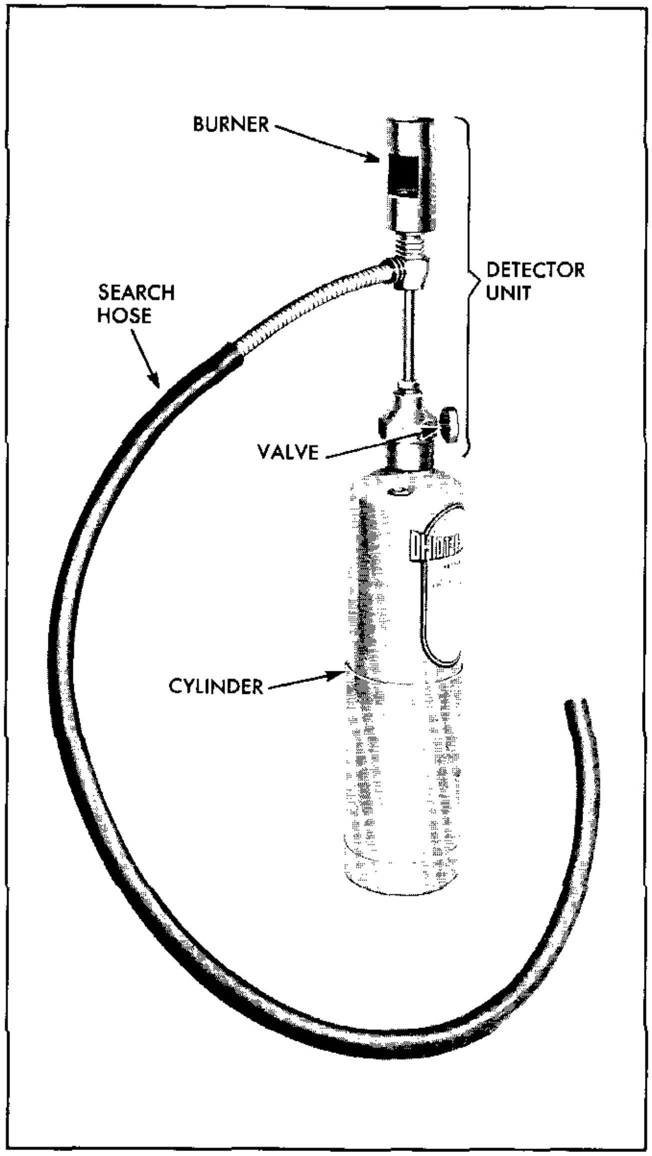


Fig. 5-4 J-6084 Leak Detector

TO CLEAN ORIFICE

1. Never attempt to clean orifice by passing anything through the hole.

2. Unscrew burner assembly from burner tube by applying wrench to hexagon part located immediately below search hose connection. Turn to left. This will expose orifice block which is inserted into the end of the tube.

3. Remove orifice block from tube.

4. Reverse orifice block and replace against burner tube; screw burner head onto burner tube (hand tight), then open valve quickly, admitting several short blasts.

5. To reassemble: unscrew burner head, insert orifice block into burner tube, and screw burner head onto burner tube with a wrench to form a gas-tight joint.

Replacement parts can be obtained from Kent-Moore.

CHECKING FOR REFRIGERANT LEAKS

After the leak detector flame is adjusted check for refrigerant leaks in an area having a minimum amount of air flow in the following manner:

Explore for leaks by moving end of hose or sampling tube around all connections and points where a leak may be. Check around bottom of connections, since Refrigerant-12 is heavier than air and will, therefore, be more apparent at bottom of fitting.

The color of the flame will turn to a yellow-green when a small leak is detected. Large leaks will be indicated by a change in color to brilliant blue or purple. When the suction hose is moved away from the leak the flame will clear to an almost colorless pale-blue again.

CAUTION: Do not breathe the fumes and black smoke that are produced if the leak is a big one. They are poisonous! Any time an open flame is used near a car there is a certain amount of danger. Although the torch flame is small and well protected, it is recommended that a fire extinguisher be close at hand for any emergency that might arise.

LIQUID LEAK DETECTORS

There are a number of fittings and places throughout the air conditioning unit where a liquid leak detector solution may be used to pin-point leaks.

By merely applying solution to the area with the swab that is attached to the bottle cap, bubbles will form within seconds if there is a leak.

For confined areas, such as sections of the evaporator and condenser, the torch type detector is the only practical kind which should be used for determining leaks.

VACUUM PUMP

A vacuum pump J-5428 (Fig. 5-5) should be used to evacuate air and moisture from the air conditioning system. All pumps are shipped fully charged with 8 ozs. oil; however, the following precautions should be observed relative to the maintenance and operation of this pump.

MAINTENANCE

***CAUTION:* Do not use this pump as an air compressor.**

1. Keep all openings capped when not in use to avoid moisture being drawn into the system.

2. Oil should be changed after every 250 hours of normal operation.

To change oil, simply unscrew hex nut located on back side of pump, tilt backward and drain out oil (Fig. 5-6). Recharge with 8 ounces of vacuum pump oil Frigidaire 150 or equivalent (Fig. 5-7). If you desire to flush out the pump, use this same type clean oil. Do not use a solvent.

NOTE: Improper lubrication will shorten the life of the pump.

3. If this pump is subjected to extreme or prolonged cold, allow it to remain indoors until oil has reached approximate room temperature. Failure to warm oil will result in a blown fuse.

4. A five ampere time delay cartridge fuse has been installed in the common line to protect the windings of the compressor. The fuse will blow if an excessive load is placed on the pump. In the event the fuse is blown, replace with a five ampere time delay fuse—*do not use a substitute fuse* as it will result in damage to the starting windings.

5. If the pump is being utilized to evacuate a burnt-out system, a filter must be connected to the intake fitting to prevent any sludge from contaminating the working parts, which will result in malfunction of the pump.

6. Before using pump, remove dust cap on discharge outlet of pump.

SERVICE STATION

The J-8393 Deluxe Portable Air Conditioner Service Station supplies all evacuating and charging equipment assembled into a compact portable unit (Fig. 5-8).

J-8393 consists of a wheeled cart, a vacuum pump, pressure gauges, *control valves, and most important,* a calibrated charging cylinder capable of storing and accurately metering up to five pounds of liquid refrigerant. All necessary hoses are included and the cart is fitted with brackets for a 25 or 50 pound refrigerant cylinder, oil injector, and leak detector.

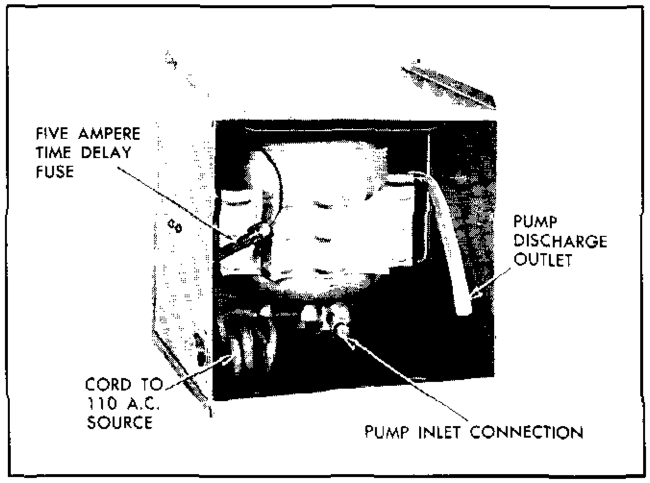


Fig. 5-5 J-5428 Vacuum Pump

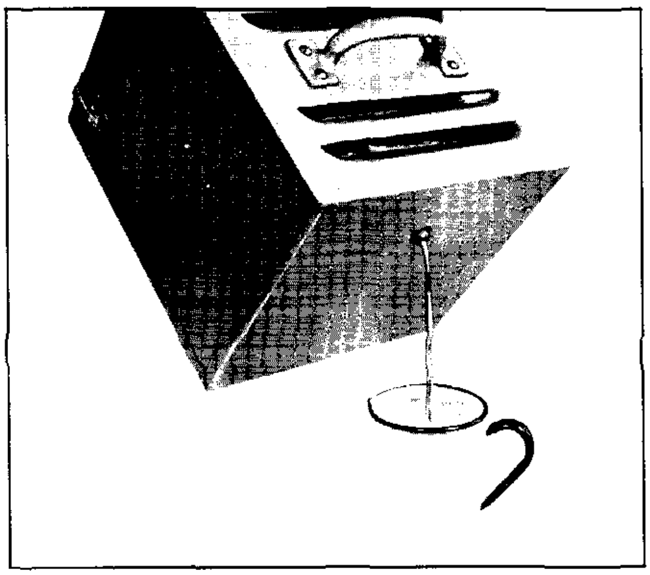


Fig. 5-6 Draining Oil from Vacuum Pump

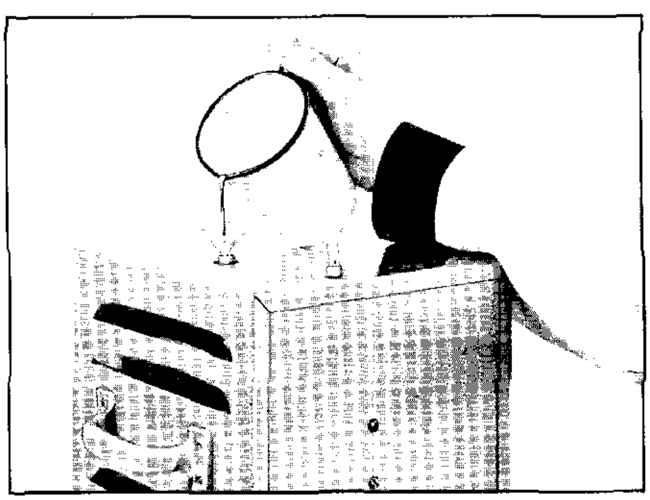


Fig. 5-7 Adding Oil To Pump

Since refrigerant is metered into the system, by volume, the correct amount will always be added to the system. This, plus the fact that the unit remains "plumbed" at all times, thereby eliminating loss of refrigerant that would be caused by purging of lines and hooking-up components, combines to enable the serviceman to economically utilize all refrigerant purchased.

The simplified lay-out of evacuating and charging equipment is designed to allow any mechanic to do a first-rate job of servicing an air conditioner. The "Station" virtually makes air conditioner servicing simply a matter of connecting two hoses and manipulating clearly labeled valves.

Dealerships that desire all features of the Deluxe Portable Air Conditioner Service Station (J-8393) may obtain same, yet avoid duplication of air conditioning tools now in their possession, simply by selecting "Station" components from those listed below:

J-8418–PORTABLE SERVICE STATION. Without vacuum pump or manifold and gauge set, otherwise same as "Deluxe" unit J-8393. Includes provisions for easy installation of the A-5428 Vacuum Pump and J-5725-01 Gauge Set.

J-8420 – CHARGING CYLINDER AND TEST PANEL (Complete), consists of J-8413 Charging Cylinder and test panel with all gauges, hoses and valves. It also includes universal upper and lower mountings for bench, wall, or portable equipment.

J-8413 – CHARGING CYLINDER AND TEST PANEL (Less J-5725-01 Manifold and Gauge Set).

J-8413 – CHARGING CYLINDER ASSEMBLY. This assembly also includes cylinder adapter fitting, inlet and bleeder valves as well as a 12" length of inlet hose.

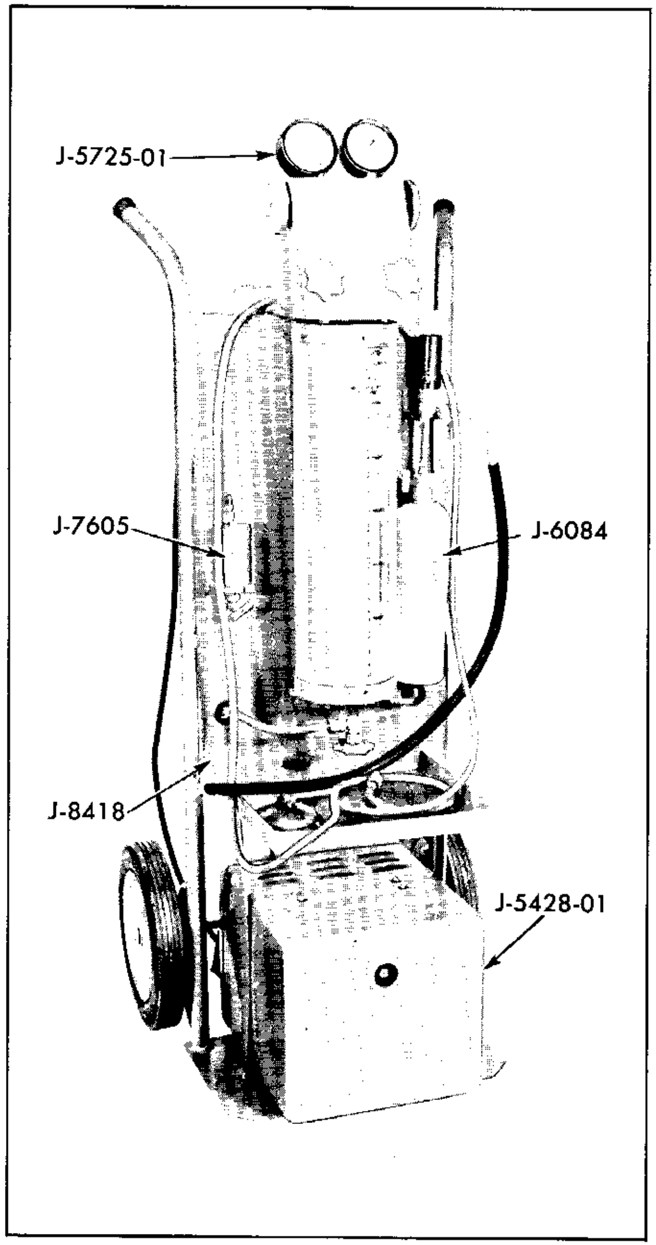
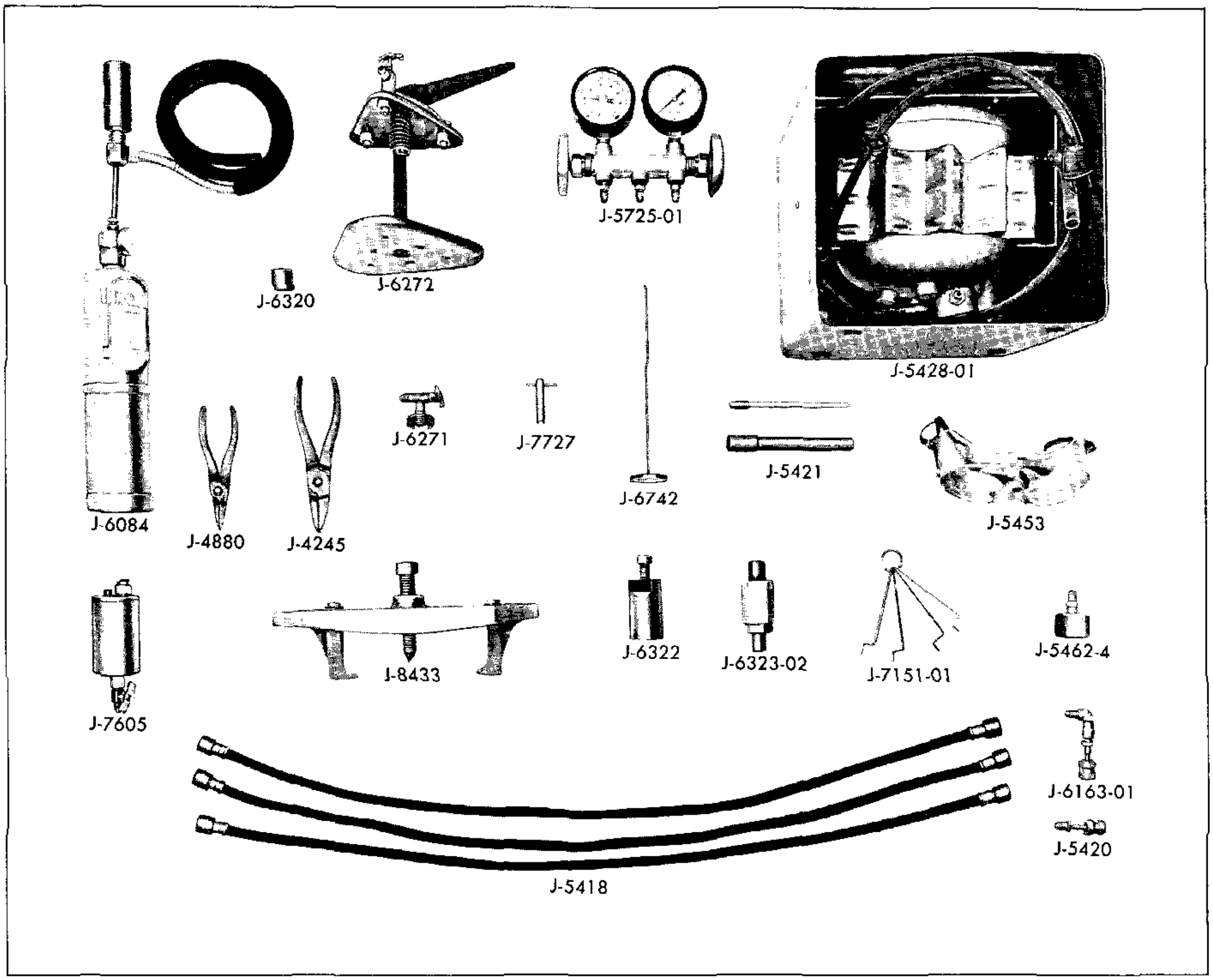


Fig. 5-8 Complete Service Station



J-4245	Snap Ring Pliers (No. 23 Internal, 1$\frac{1}{16}$"-1 $\frac{3}{4}$")
J-4880	Snap Ring Pliers (No. 22 External, $\frac{1}{4}$"-$\frac{7}{8}$")
J-5418	Gauge Charging Lines (3 ft. long)
J-5420	Gauge Adapter
J-5421	Pocket Thermometer (0°F. to 220°F.)—Glass
J-5428-01	Vacuum Pump
J-5453	Safety Goggles
J-5462-4	Refrigerant Drum Reducer
J-5725-01	Gauge Set (Includes Gauges and Manifold)
J-6084	Leak Detector Kit (Refrigerant-12)
J-6163-01	Gauge Adapter (90°)
J-6271	Fitz-All Valve (for one "1 lb. can" of Refrigerant-12)
J-6272	No. 3 Multi-Opener (for three "1 lb. cans" of Refrigerant-12)
J-6320	Compressor Shaft Seal Protector
J-6322 or J-6322-01	Compressor Clutch Plate Puller—Use J-7849 Adapter only with J-6322 Puller
J-6323 or J-6323-02 or J-8446	Compressor Clutch Plate and Pulley Installer. Use J-6323-5 with J-6323
J-6742	Thermometer (0°F. to 180°F.)—Shock Resistant
J-7151-01	Compressor Clutch Non-Magnetic Feeler Gauge (.025"-.035"-.045")
J-7605	Compressor Oil Injector (2 oz. volume)
J-7727	Temperature Regulation Valve Adjuster—Late Type Design (J-6389 Early Type Design)
J-8433	Compressor Pulley Remover

Fig. 5-9 Special Tools Required to Service Air Conditioning Installations

CIRC-L-AIRE CONDITIONER

CONTENTS OF THIS SECTION

DESCRIPTION AND OPERATING INSTRUCTIONS

GENERAL DESCRIPTION

Pontiac's Circ-L-Aire Conditioner is combined with the heater to provide a year-round air conditioning system. This permits the air blower to be used for both air conditioning and/or heater operation. All outside air entering the system is taken through hood high cowl vents, providing air free of dust, foreign material, and undesirable fumes.

Pontiac's Circ-L-Aire Conditioning system may be operated to provide conditioned air taken from the outside or air taken from the inside of the car and recirculated. The use of outside air exclusively provides constant and rapidly changing air inside the car, eliminating a stuffy, smoke-filled interior and keeps the occupants fresh and comfortable. The use of air taken from the inside of the car and recircu-

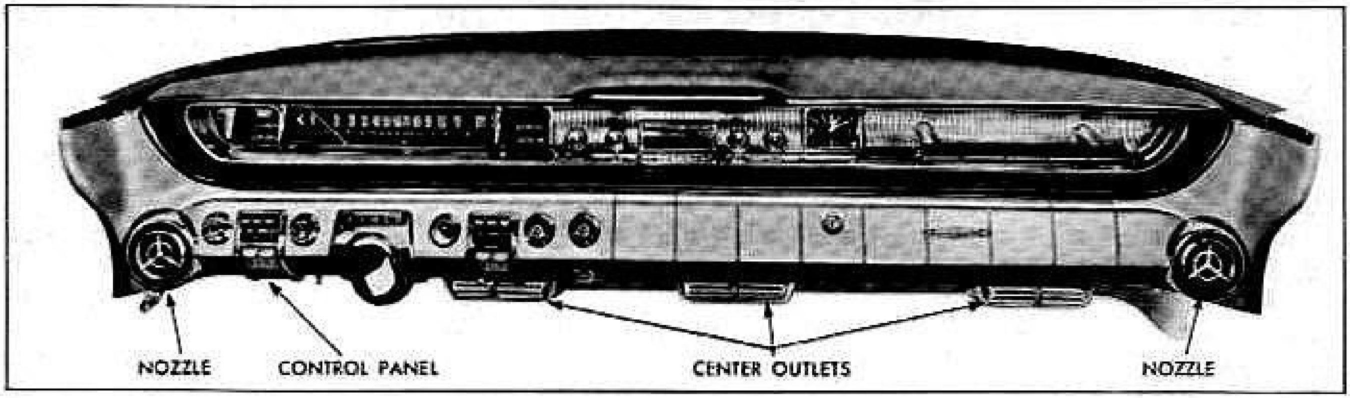


Fig. 6-1 Air Outlets and Controls

lated permits cooled inside air inside the car to be drawn through the cooling coils when outside air is unwanted or when greater cooling is desired.

The driver has fingertip control of the temperature of conditioned air entering the car. When air conditioning is desired, the blower forces air taken from the hood high cowl air inlet housing through the evaporator core (cooling coils), and is directed through an air distributing system to the air outlets. When heated air is desired, the blower forces air taken from the hood high cowl air inlet housing through the heater core to the heater air outlets.

During mild or rainy weather both the air conditioning system and heater system may be operated together to provide the degree of comfort desired.

The design of the air conditioning air system, its valves and controls, permits a method of obtaining many different amounts of forced air flow for ventilation. Innumerable degrees of comfort may be easily obtained by drawing air from outside or inside the car with the refrigeration system operating.

AIR OUTLETS AND CONTROLS

AIR OUTLETS

Refrigerated air enters the interior of the car through five outlets in the instrument panel (Fig. 6-1), and through a number of holes in the bottom and left end of the air outlet duct which directs cooled air to the passenger's and driver's legs.

An air outlet located at each end of the instrument panel can be individually controlled to provide a comfortable air flow in any direction desired by the occupants.

The center outlets (three), affixed to the lower part of the instrument panel, contain a vaned rotary valve which can be adjusted to change vertical direction of air flow.

CONTROL PANEL PUSH BUTTONS

The control panel is located to the left of the steering column on the lower section of the instrument panel (Fig. 6-1). Three push buttons across the top of the panel control air flow through the system; "OFF", "OUTSIDE" and "INSIDE" (Fig. 6-2).

This push button selector panel directs vacuum to diaphragms which, by mechanical linkage, cause air control valves to function in the following manner (all heater controls must be in "OFF" position for maximum air conditioning performance):

1. "OFF" button pushed in ("OUTSIDE" and "INSIDE" buttons in out position): No air flow, no cooling.

2. "OUTSIDE" button pushed in ("OFF" and "INSIDE" buttons in out position): Blower on and outside air is admitted into the car through air conditioning outlets located at each end and the center of the instrument panel.

3. "INSIDE" button pushed in ("OFF" and "OUTSIDE" buttons in out position): Blower on and air inside the car is recirculated to re-enter the interior of the car through air conditioning outlets.

NOTE: When the recirculation air valve is opened, it swings to cover all but 15% of the outside air inlet opening. This small amount of outside air is mixed with recirculated air at all times to prevent infiltration of hot outside air through small openings in the car body, and aids in eliminating a stuffy, smoke-filled interior, thereby keeping the occupants fresh and comfortable.

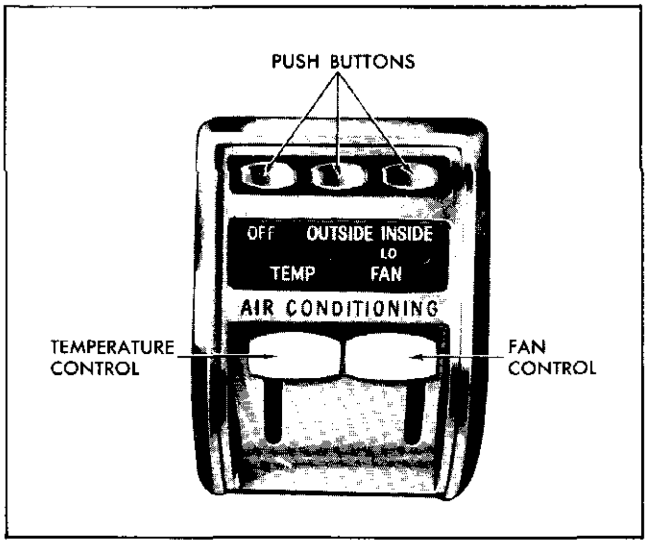


Fig. 6-2 Circ-L-Aire Conditioner Control Panel

BLOWER CONTROL

The blower control lever is located in the lower left part of the control panel. A vertically sliding lever controls four blower speeds to regulate the amount of forced air movement.

When the blower control lever is in the up position, the letters "LO" appear in the "FAN" window and the blower operates at low speed. When the blower control lever is in the down position, the letters "HI" appear in the "FAN" window and the blower operates at high speed. Between the extreme up and down positions, "2" and "3" appear in the window and the blower operates at two medium speeds.

The blower always operates in one of the four speed positions whenever the air conditioner control panel push buttons labeled "OUTSIDE" or "INSIDE" are pushed in.

TEMPERATURE CONTROL

The temperature control lever is located in the lower right part of the control panel.

A vertically sliding lever activates the air conditioning compressor and also tailors inside temperature. In the extreme up position the compressor does not operate because the compressor clutch switch is open. This feature permits forced air for ventilation without cooling the air. As the temperature control lever is depressed slightly the compressor clutch switch closes to energize the compressor clutch coil to engage the clutch.

A dial opening in the panel above the lever shows progressively increasing bands of blue color to indicate increased cooling. Maximum cooling is obtained when the lever is in the full down position.

OPERATING INSTRUCTIONS

To cool a car under various weather and driving conditions, use the following control settings:

FAST COOL DOWN

(CAR WHICH HAS BEEN STANDING IN HOT SUN)

CONTROL	SETTING
Push button	"OUTSIDE" pushed in for two or three minutes, then "INSIDE"
Blower control lever	down, for high speed
Temperature control lever	down, for maximum cooling
Nozzles	position as desired
Center air nozzles	position as desired
Car windows	wide open for two or three minutes to expel hot air, then closed

SLOW CITY DRIVING

CONTROL	SETTING
Push button	"INSIDE" pushed in
Blower control lever	down, for high speed
Temperature control lever	down, for maximum cooling
Nozzles	position as desired
Center air nozzles	position as desired
Car windows	closed

NOTE: Under extreme heat conditions, additional cooling may be obtained if the car is operated with transmission control lever in drive right range.

NORMAL WARM WEATHER HIGHWAY CRUISING

CONTROL	SETTING
Push button	"OUTSIDE" pushed in
Blower control lever	up, for low speed, or in "2" or "3" speed position

NORMAL WARM WEATHER HIGHWAY CRUISING—Continued

CONTROL	SETTING
Temperature control lever	position to obtain desired temperature at nozzles
Nozzles	to direct air stream along roof for indirect cooling
Center air nozzles	position as desired
Car windows	closed

HOT WEATHER HIGHWAY CRUISING

CONTROL	SETTING
Push button	"OUTSIDE" pushed in or "INSIDE" pushed in if air inside car is to be recirculated
Blower control lever	down, for high speed
Temperature control lever	down for maximum cooling
Nozzles	position as desired
Center air nozzles	position as desired
Car windows	closed

TIPS ON USE OF AIR CONDITIONING SYSTEM

KEEPING COMFORTABLE IN EXTREMELY HUMID "MUGGY" WEATHER

When the relative humidity is extremely high causing discomfort on a day when the temperature is 75°F.-80°F. depress the "INSIDE" button and move the temperature control lever down slightly. This will operate the refrigeration system and provide minimum cooling. Move the blower control lever to the up position (low speed) to recirculate inside air, thereby rapidly dehumidifying the air inside the car.

KEEPING COMFORTABLE IN MILD WEATHER

When the weather is cool, but the sun is very bright as in spring or fall or at high altitudes, use both the heater and the air conditioner at the same time, setting the temperature controls, blower speed and nozzle positions for desired comfort.

CONTROLLING TEMPERATURE IN CAR

The most satisfactory method of controlling the temperature in the car is to:

1. Set blower speed for your personal comfort;
2. Position temperature control lever as necessary to maintain the desired temperature in the car;
3. Depress "OUTSIDE" or "INSIDE" push button for desired source of air for cooling inside of car;
4. Use sun visors to reduce direct sun rays on front seat passengers.

NOTE: E-Z-Eye glass is a great aid in keeping cool since it reduces glare and aids in protecting passengers from much of the direct rays of the sun.

USING THE AIR CONDITIONING SYSTEM FOR VENTILATION

The air conditioning system is designed so that it can also be used for ventilation when it is not necessary to cool the air by refrigeration. Ventilation may be obtained by placing the temperature control lever in the extreme up position, depressing the "OUTSIDE" or "INSIDE" push button, and selecting the amount of air flow desired by positioning the blower control lever to "LO", "2", "3", or "HI" speed.

DIFFERENCES IN THE AIR CONDITIONED CAR

Pontiac models equipped with Circ-L-Aire Conditioning have been specially engineered to accommodate the extra weight, power requirements, and electrical loads of the air conditioning system.

Following is a listing of the major differences that will be found in these models. Before attempting to order these or related parts for an air conditioned equipped car, consult the latest parts information for correct part numbers.

Air Vents (at kick pads)

Only at left side on cars equipped with Circ-L-Aire conditioning.

Battery

Heavy duty to improve hot starting on factory installed cars.

Compressor Drive Belt

15/32" belt connecting compressor pulley and harmonic balancer only.

Cooling System Capacity

All Models—18.5 qts. less heater, 19.5 qts. with heater.

Engine Fuel System

Incorporates a vapor separator. The gasoline vapor separator cover has two outlets: one to the carburetor, the other outlet has a small restriction in the filter assembly cover which permits fuel vapor to return to the bottom of the fuel tank via the fuel tank gauge unit. (A ¼" dia. steel tube connects the filter cover and the tank gauge unit.)

An anti fuel surge air dome is located at fuel pump inlet.

A fuel filter is located just above fuel pump in fuel line to carburetor.

Engine Oil Level Indicator

Permits greater accessibility to engine oil dip stick.

Fan Assembly

Six-bladed fan to give more air flow for greater cooling capacity.

Fan Clutch

Regulate fan speed, so that fan runs slowly except when hot weather requires increased fan speed for good engine cooling.

Fan Shroud

To direct air flow for greater cooling capacity at idle.

Front Springs

Heavier springs to accommodate extra weight (approximately 80 lbs. at each spring).

Generator Assembly

Heavy duty 45 ampere generator to accommodate higher electrical loads.

Generator Regulator Assembly

Heavy duty 45 ampere.

Generator Mounting

Special brackets to realign generator so it is driven by fan and water pump drive belt.

Harmonic Balancer

Changed to accommodate the compressor drive belt, and has heavy duty weight and springs.

Ignition Switch

Incorporates a ground terminal in the switch to short out the air conditioning system when starting the car.

Radiator Assembly

Increased heat constant of core for better cooling.

Radiator Cap

Fifteen pound pressure cap.

Regular Fuel Engine

The heavy duty starter and battery are included on factory installed Circ-L-Aire Conditioners with regular fuel engine.

Shroud Side Ventilator

Only on left side.

Starter

Heavy duty to improve hot starting on factory installations only.

Tires

8:50-14 tires on all sedans and coupes.

E-Z Eye Glass and Cars Painted with Light Colors

Desirable as these reflect some of sun's rays and some added cooling can be obtained.

DESCRIPTION AND OPERATION OF INDIVIDUAL UNITS

CONTENTS OF THIS SECTION

DESCRIPTION AND OPERATION OF INDIVIDUAL UNITS

Fig. 6-3 illustrates the location of units of the Circ-L-Aire Conditioning System as combined with the Circ-L-Aire Heating System. Each of the units in the air conditioning system is described on the following pages.

COMPRESSOR

The compressor is a five-cylinder, horizontal, reciprocating type compressor. The five cylinders are mounted axially around the compressor shaft. Pistons are actuated by rods connected to a socket plate which is caused to wobble or wave by a special cam type ball bearing on the shaft. See Fig. 6-4.

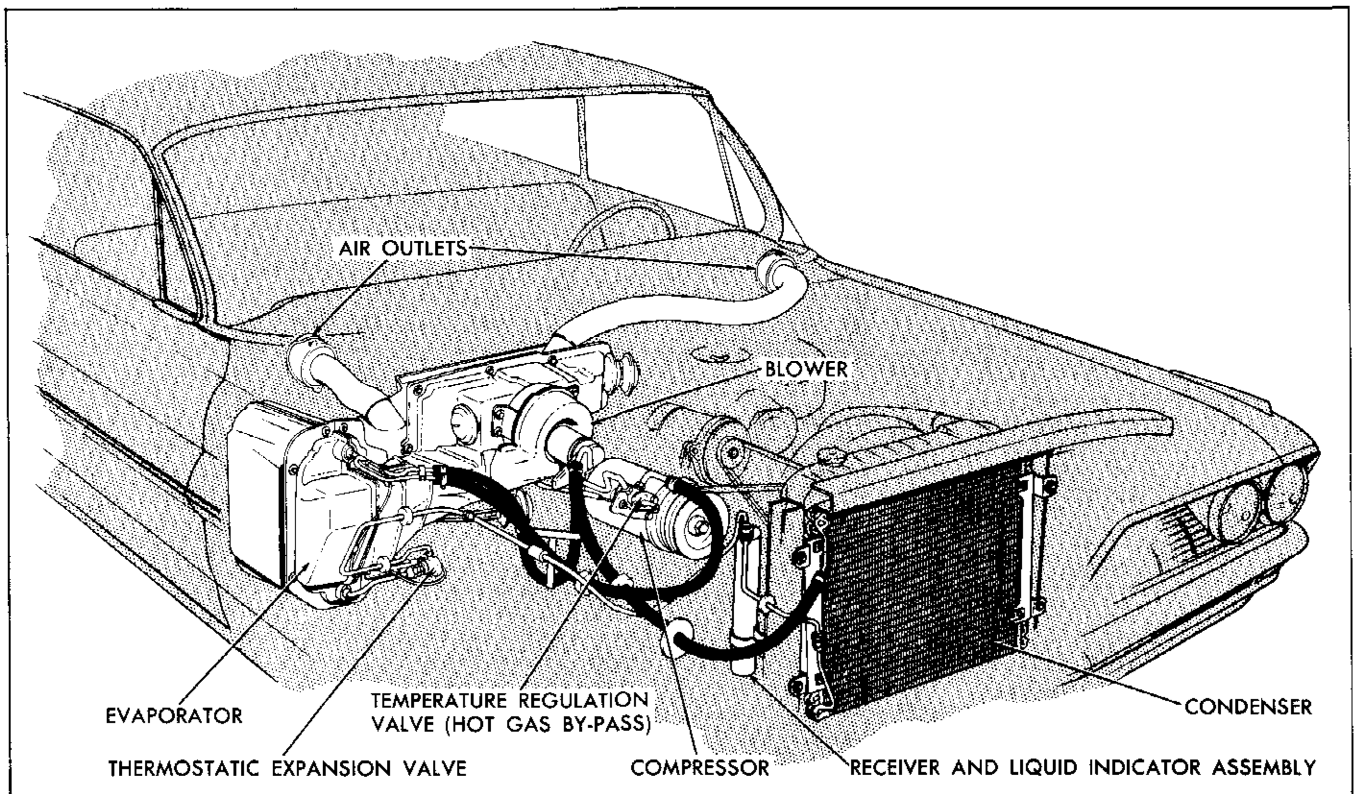


Fig. 6-3 Location of Units in the Circ-L-Aire Conditioner System

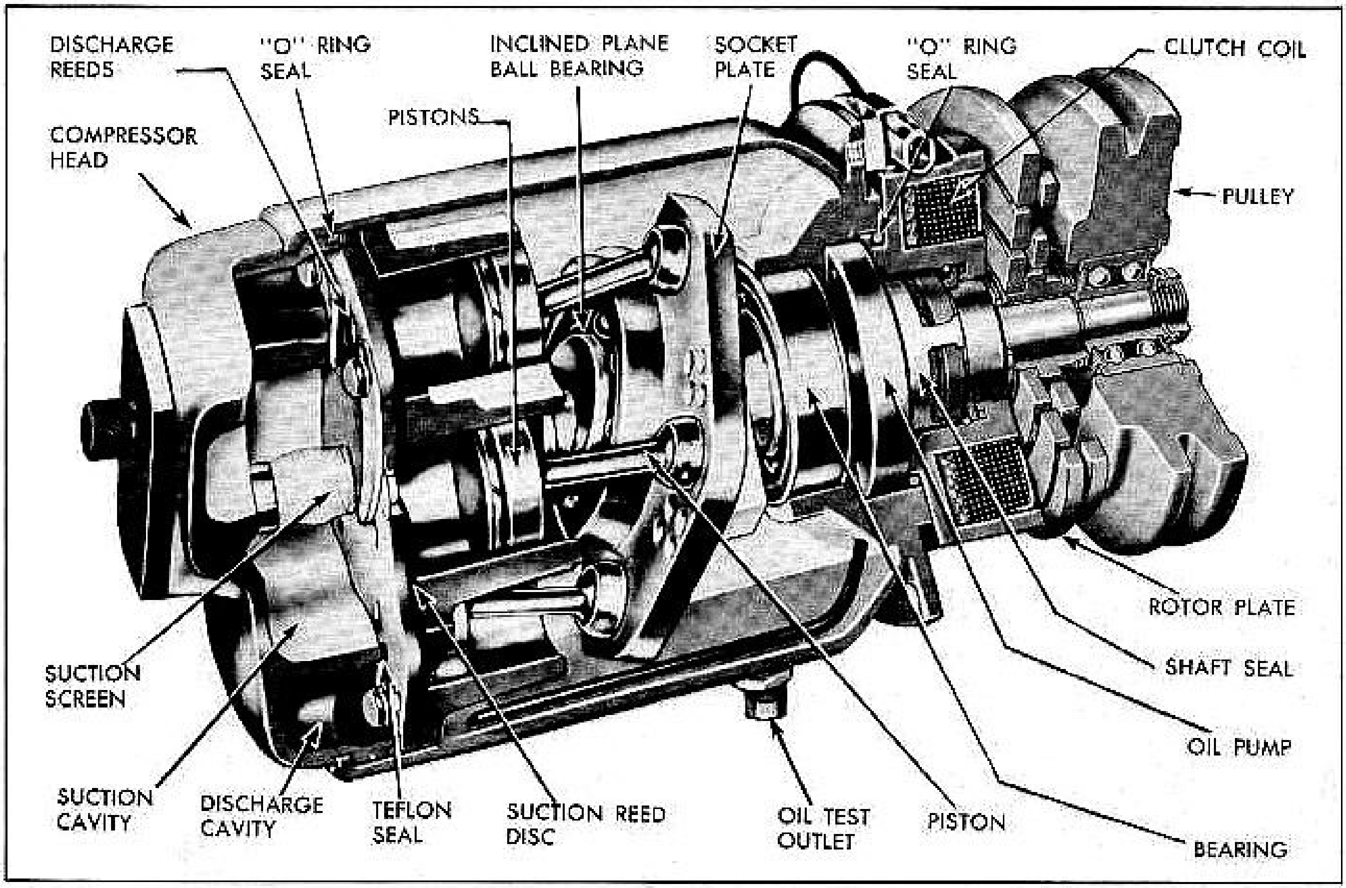


Fig. 6-4 Cross Section of Compressor

Reed type suction and discharge valves are mounten in a valve plate between the cylinder assembly and the head.

The cylinder head contains two cavities, one in the center which indexes with the suction reeds, and one around the outside which indexes with the discharge reeds. These cavities are sealed from each other with a teflon seal molded onto the cylinder head. The discharge cavity is sealed from the outside of the compressor by an "O" ring seal which rests in a groove in the cylinder head and compresses against the compressor body.

An oil pump body mounted at the front of the compressor (ahead of the front ball bearing) picks up oil from the bottom of the compressor and pumps it to the seal and to the internal parts of the compressor.

The compressor is fitted with a high pressure relief valve (Fig. 6-5). If the discharge pressure ever exceeds approximately 440 psi, the relief valve opens automatically to relieve the pressure and closes again when the pressure reduces. Opening of the relief valve will be accompanied by a loud popping noise and perhaps the ejection of some oil with the refrigerant. Any condition that causes this valve to open should be corrected immediately.

An oil test outlet is located on the under side of the compressor shell. The proper method of checking oil level is outlined under CHECKING COMPRESSOR OIL LEVEL AND ADDING OIL.

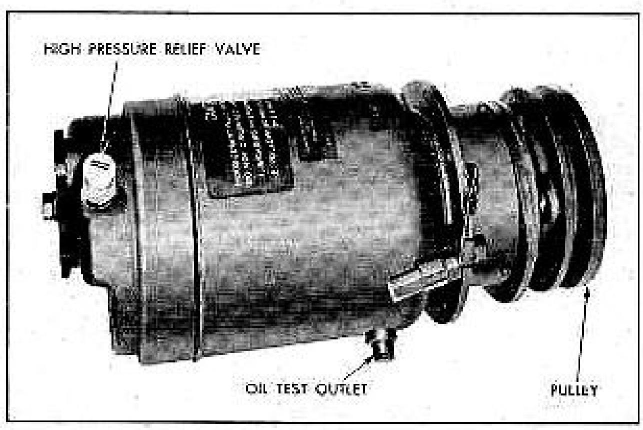
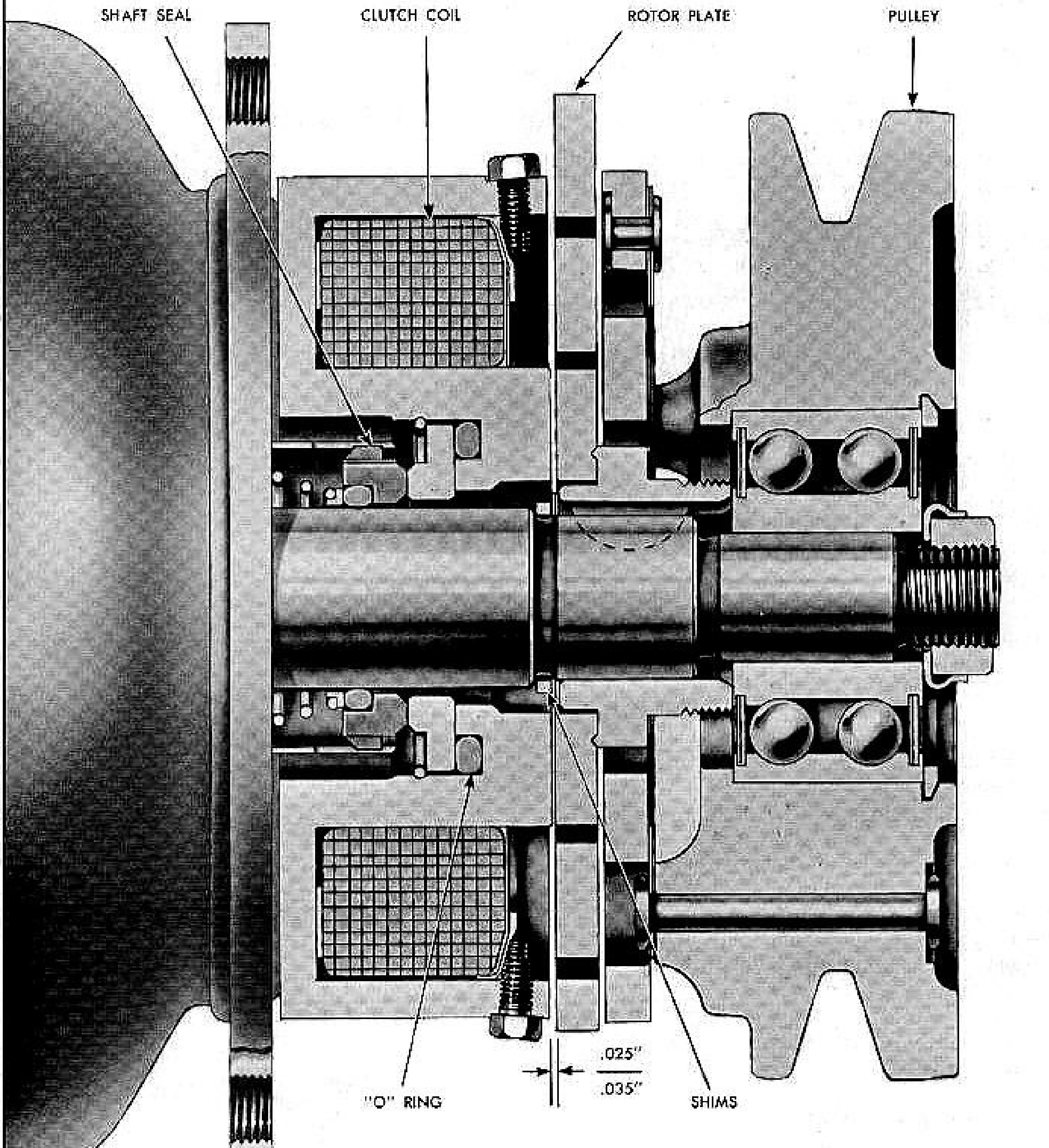


Fig. 6-5 Compressor Assembly



SHIMS: USE AS REQUIRED TO OBTAIN .025"-.035" AIR GAP BETWEEN ROTOR PLATE AND COIL HOUSING WHEN COIL IS ENERGIZED AND CLUTCH IS IN THE ENGAGED POSITION.

Fig. 6-6 Cross Section of Compressor Clutch

The compressor serial number is located on a plate on top of the compressor. This number should be included in all Product Information Reports, claims or correspondence concerning the compressor. The compressor part number is also shown on the serial number plate and bears the reference of "Model 6550082".

CLUTCH AND PULLEY ASSEMBLY

The pulley assembly contains an electrically controlled magnetic clutch, permitting the compressor to operate only when refrigerated air is desired.

When the temperature control lever is in the extreme up position or when the "OFF" button is pushed in, the circuit to the compressor clutch is open and the clutch is released. The compressor shaft does not turn, although the pulley is still being turned by the compressor belt.

CONSTRUCTION

The principal parts of the clutch (Fig. 6-6) are the pulley assembly (to which is attached the clutch armature plate) which turns on a ball bearing on the compressor shaft, the rotor plate (which is keyed to the compressor shaft), and the clutch coil, which controls the clutch.

OPERATION

With the "OUTSIDE" or "INSIDE" push button pushed in and the temperature control lever is moved down slightly from the extreme up position, demand for cooling is met as this condition closes the electrical circuit to the clutch. Current flowing through the coil creates a magnetic force which draws the armature plate (on the pulley assembly) rearwardly toward the coil. As the armature plate moves away from the pulley, it contacts the rotor plate face (which is keyed to the compressor shaft to the pulley).

In this condition, the plates and pulley are locked together as a unit. Since the armature is riveted to the pulley and the rotor plate is pressed on and keyed to the compressor shaft, the compressor shaft will then turn with the pulley. The design of the clutch and coil is such that maximum magnetic holding force is obtained to magnetically lock the armature and rotor plate together.

When the temperature lever is moved to the up position or when the "OFF" push button is depressed the electric circuit to the compressor clutch is opened and the magnetic pull on the clutch no longer exists. The armature plate to pulley actuating springs will then pull the armature plate toward the pulley and the clutch plates lose contact with each other. With the clutch released, the pulley rotates freely on its bearing. In this condition, the compressor shaft does not rotate. It may be noted on some cars that if the clutch is turned on and then off, when the engine is not running, the armature plate may remain in contact with the rotor plate, due to residual magnetism. This will cause no trouble, as the clutch plates will separate as soon as the engine is started.

COMPRESSOR SHAFT SEAL

A replaceable seal is used at the front of the compressor to seal the air conditioning system from atmosphere when the compressor is operating or at rest, regardless of pressures in the compressor.

The components of the seal (Fig. 6-7) are the retaining ring, the small "O" ring, the compressor shaft seal, the cast iron seal seat and the large "O" ring. The seal indexes with the seal drive pin to turn with the compressor shaft. A spring in the shaft seal assembly holds the seal against the seal seat which is held stationary in the coil housing. The small "O" ring seals between the shaft and the seal, and the large "O" ring seals the area between the seal seat and the coil housing.

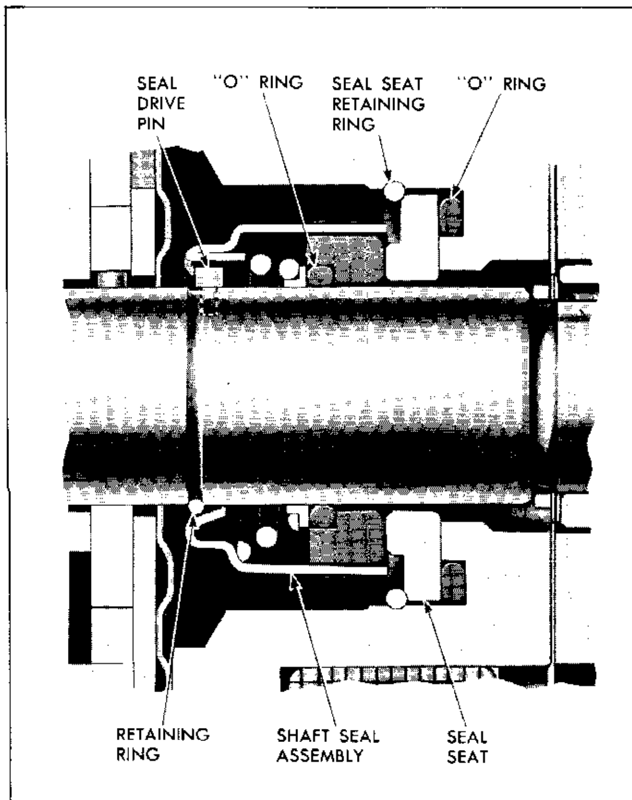


Fig. 6-7 Cross Section of Compressor at Shaft Seal Area

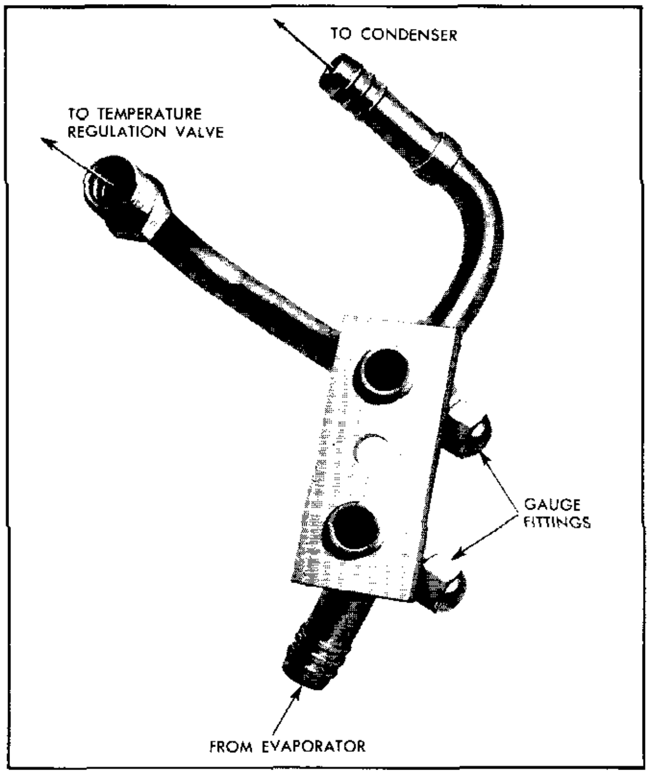


Fig. 6-8 Compressor Fittings Assembly

COMPRESSOR FITTINGS ASSEMBLY

The compressor fittings assembly (Fig. 6-8) contains an open passage into the compressor from the evaporator (low pressure) and an open passage from the compressor to the condenser and temperature regulation valve (high pressure).

A gauge fitting containing a Schrader valve is in the suction (Fig. 6-9) and discharge (Fig. 6-10) passages to permit pressure gauge readings at any time. These valves are also the means of servicing the refrigeration system whenever it is necessary to depressurize, evacuate or charge the system.

CONDENSER

The condenser is similar to the ordinary car radiator but is designed to withstand much higher pressures. It is made up of tubes which carry the refrigerant and cooling fins which provide rapid transfer of heat. The condenser is made completely of aluminum.

The condenser is located in front of the engine cooling system radiator so that it receives a high volume of air from the movement of the car and from the engine fan. Air passing over the condenser cools the hot high pressure refrigerant gas, causing it to condense into high pressure liquid refrigerant.

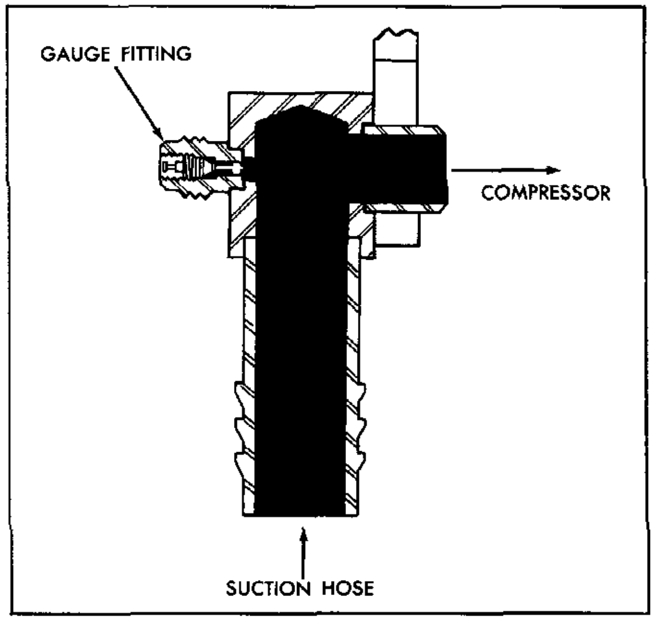


Fig. 6-9 Schematic of Suction Portion of Fittings Assembly

RECEIVER AND LIQUID INDICATOR ASSEMBLY

The receiver and liquid indicator assembly is mounted vertically along the right rear side of the radiator support.

The purpose of the receiver part of this assembly is to insure a solid column of liquid refrigerant to the thermostatic expansion valve at all times, provided the system is properly charged.

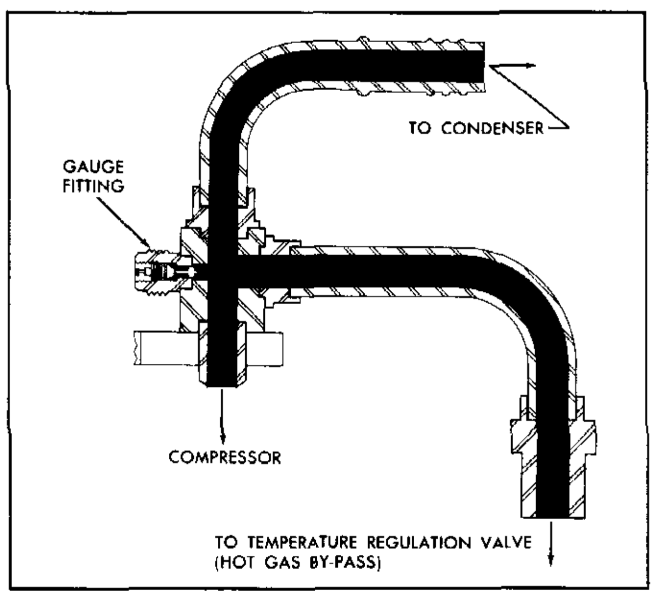


Fig. 6-10 Schematic of Discharge Portion of Fittings Assembly

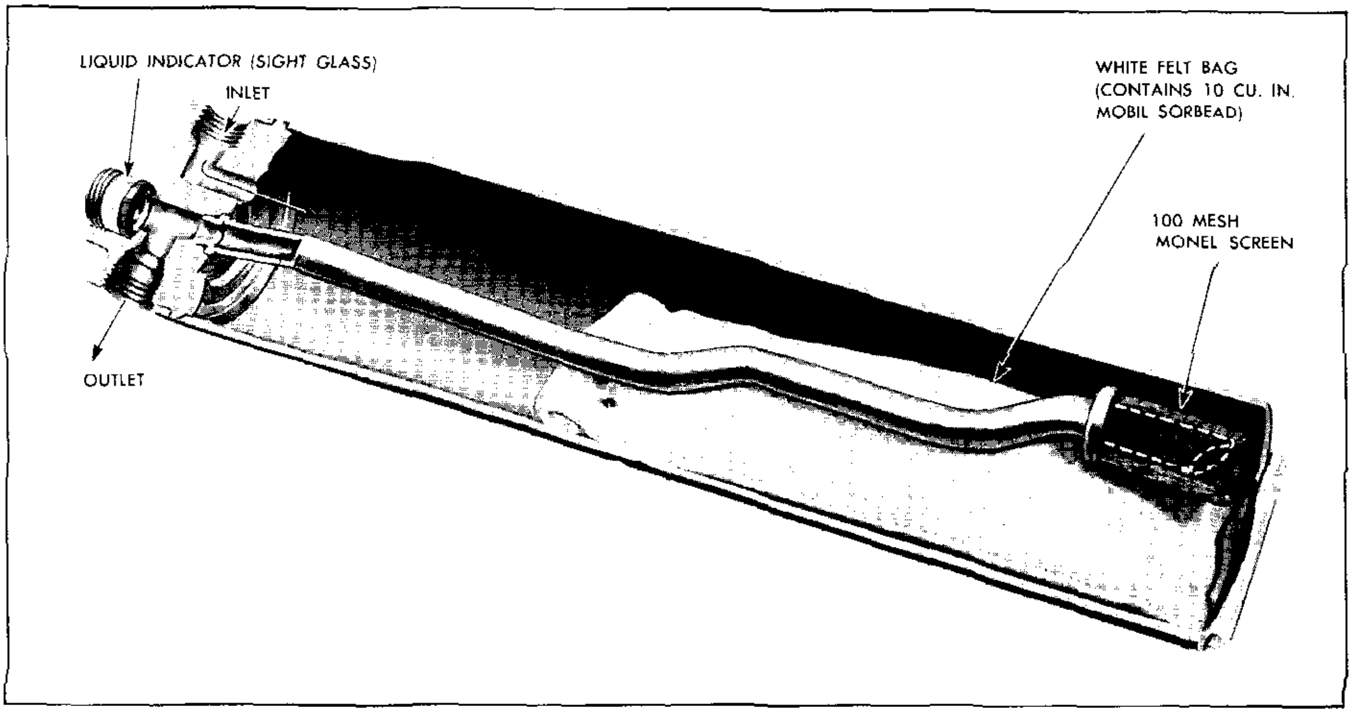


Fig. 6-11 Inside View of Receiver and Liquid Indicator Assembly

The liquid indicator (many times referred to as a sight glass) serves no purpose in the refrigeration system except as an aid to diagnosis. It is possible to look into the interior of the indicator chamber through a glass window. The appearance of bubbles or foam beneath the sight glass (liquid indicator) above 70°F. ambient indicates air or a shortage of refrigerant in the system. Foam may be noted in the *sight glass below 70°F. with a system free of air and* properly charged. Details of these conditions are in the TROUBLE DIAGNOSIS Section.

Liquid refrigerant from the condenser enters the receiver to flow into the upper portion of the receiver which contains dessicant confined in a white felt bag that is not attached to anything but merely rests on the baffle in the lower portion of the receiver. As the refrigerant flows through an opening in the lower portion of the receiver, it is also filtered through a 100 mesh screen attached to a baffle at the bottom of the receiver. (See Fig. 6-11.)

The desiccant in this assembly is to absorb any moisture that might be present in the system after assembly. The screens trap any foreign material which may enter the system during assembly. (See Fig. 6-11.) These features of the assembly prevent obstruction to the valves or damage to the compressor.

NOTE: Markings on top of the receiver show the proper inlet and outlet fitting connections.

THERMOSTATIC EXPANSION VALVE

DESCRIPTION

The thermostatic expansion valve (Fig. 6-12) consists of a capillary bulb and tube which is connected to an operating diaphragm which is sealed within the valve itself. The valve contains three operating pins *(spaced approximately 120° apart), needle valve* stationary seat, needle valve, needle valve carriage, adjusting spring and screw, an inlet which has a fine

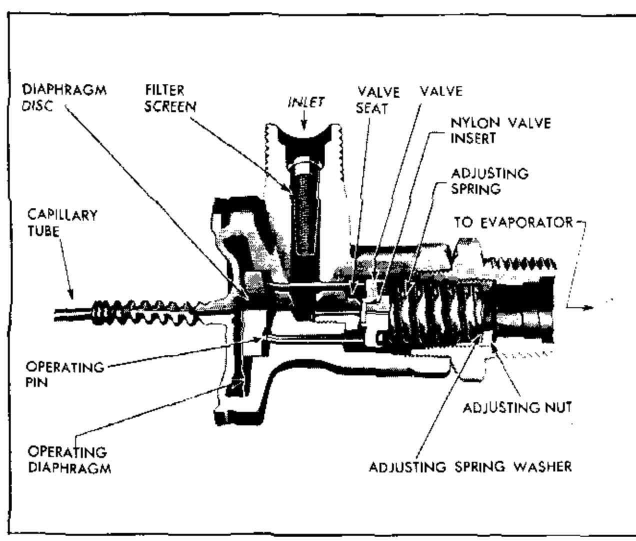


Fig. 6-12 Cross Section of Thermostatic Expansion Valve

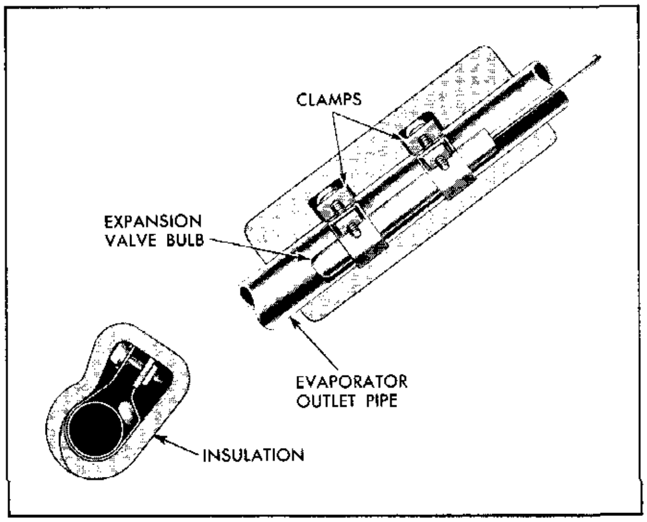


Fig. 6-13 Thermostatic Expansion Valve Bulb at Evaporator Outlet Pipe

mesh screen, and an outlet connection (which attaches to the evaporator). The fine mesh screen at the inlet of the valve provides protection to the valve by preventing dirt and other foreign material from entering the valve.

While this valve is located at the inlet of the evaporator (at the bottom of the evaporator), the thermo bulb is attached to the evaporator outlet pipe (Fig. 6-13) and is insulated from temperature other than that of the evaporator outlet pipe.

FUNCTION

The purpose of the thermostatic expansion valve is to regulate the flow of liquid refrigerant into the evaporator automatically in accordance to the requirements of the evaporator.

This valve is the dividing point in the system between high pressure liquid refrigerant supplied from the receiver and relatively low pressure liquid and gaseous refrigerant, in the evaporator. It is so designed that the temperature of the refrigerant at the evaporator outlet must be 4°F. higher than the temperature of the refrigerant at the inlet before more refrigerant is allowed to enter the evaporator. This increase in temperature of the gaseous refrigerant above the temperature at which the refrigerant vaporized is known as superheat.

A capillary tube filled with carbon dioxide provides the temperature regulation of the expansion valve. This capillary tube is fastened to the low pressure refrigerant pipe coming out of the evaporator so that it communicates the temperature of the refrigerant at this point to the expansion valve. If the temperature differential between the inlet and outlet decreases below 4°F., the expansion valve will automatically reduce the amount of refrigerant entering the evaporator, thus reducing the amount of cooling. If the temperature differential increases, the expansion valve will automatically allow more refrigerant to enter the evaporator, thus increasing the cooling.

It is the temperature of the air passing over the evaporator core that determines the amount of refrigerant that will enter and pass through the evaporator. When the air is very warm, the heat transfer from the air to the refrigerant is great and a greater quantity of refrigerant is required to cool the air and to achieve the proper superheat on the refrigerant gas leaving the evaporator. When the air passing over the evaporator is cool, the heat transfer is small and a lesser quantity of refrigerant is required to cool the air and to achieve the proper superheat on the refrigerant gas leaving the evaporator.

A mechanical adjusting nut located within the valve is provided to regulate the amount of refrigerant flow through the valve; when turned, moves the spring seat to increase or decrease the tension on the needle valve carriage spring. By varying the tension on this spring, it is possible to regulate the point at which the needle valve begins to open or close, thereby regulating refrigerant flow into the evaporator. As this adjustment feature is inside the valve, no external adjustment is possible. All valves are preset at the time of manufacture.

Since the evaporator outlet pressure is proportionate to the amount of heat (superheat) picked up by the refrigerant gas in passing through the evaporator, it can be seen that adjusting spring tension which works against capillary pressure controls the volume of refrigerant entering the evaporator as signaled by the temperature of the evaporator outlet pipe.

OPERATION

When the air conditioning system has not been operating, all pressures within the thermostatic expansion valve assembly will have equalized at the ambient (surrounding air) temperature, thus the pressure above and below the operating diaphragm and at the inlet and outlet side of the valve will be equal (Fig. 6-12). (Pressure under the diaphragm is evaporator pressure. It reaches this area by means of clearance around the operating pins which connects the area under the diaphragm with the evaporator pressure area.) While pressures in the expansion valve are almost equal, the addition of the valve adjusting spring pressure behind the needle will hold the needle valve over to close the needle valve orifice.

When the air conditioning system first begins to operate, the compressor will immediately begin to draw refrigerant from the evaporator, lowering the pressure in the evaporator and in the area under the operating diaphragm. As the pressure in this area decreases, the pressure above the diaphragm exerted by the carbon dioxide in the capillary tube will overcome spring pressure and push the diaphragm against the operating pins, which in turn will force the needle valve off its seat.

Refrigerant will then pass through the expansion valve into the evaporator where it will boil at a temperature corresponding to the pressure in the evaporator. This will begin cooling the air passing over the evaporator, and, also it will begin to cool the evaporator outlet pipe.

As the evaporator outlet pipe cools, the pressure of the carbon dioxide in the capillary tube (contacting this outlet pipe) decreases, exerting less force on the operating diaphragm.

The valve adjusting spring is calibrated so that the pressure of the refrigerant in the evaporator, plus the spring force, will equal the force above the operating diaphragm when the temperature of the refrigerant in the evaporator outlet is 4°F. above the temperature of the refrigerant entering the evaporator. In other words, the refrigerant should remain in the evaporator long enough to completely vaporize and then warm (superheat) 4°F.

If the temperature differential begins to go below 4°F. (outlet pipe becoming too cold) carbon dioxide pressure in the capillary tube and area above the diaphragm decreases, allowing the valve adjusting spring to move the needle valve towards its seat closing off the flow of refrigerant past the needle valve.

If the temperature differential begins to go above 4°F. (outlet pipe too warm), the pressure in the capillary tube and area above the operating diaphragm will increase, pushing this diaphragm against the operating pins to open the needle valve further, admitting more refrigerant to the evaporator.

EVAPORATOR

DESIGN

The evaporator core consists of a series of plates which when joined together form the refrigerant tubes and the top and bottom tanks. Between the tubes

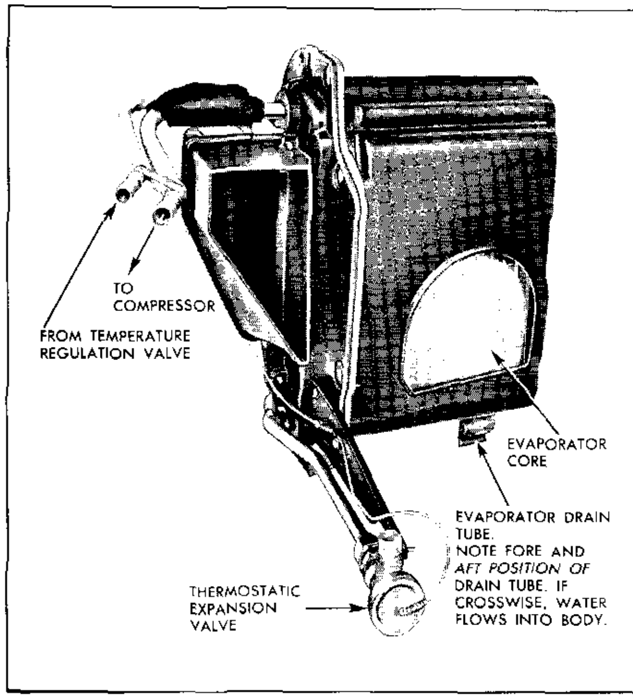


Fig. 6-14 Evaporator Assembly (With Thermostatic Expansion Valve)

corrugated strips of aluminum serve as air fins. This type of construction is called a channel plate type core. The nature of this design is such that the refrigerant travels a relatively short distance with little or no pressure drop resulting between the inlet and the outlet. Therefore, the inlet pressures and outlet pressures are about equal and exactly controlled to maintain the refrigerant boiling point at a temperature which cools the air passing over the evaporator to a temperature at or just above the freezing point of water.

The evaporator core with this design permits a very efficient distribution of refrigerant at the moment refrigerant enters the core. As far as operating pressures are concerned, they will vary considerably due to ambient temperature and load requirement variations. The setting of the temperature control lever which in turn sets the temperature regulation valve (hot gas by-pass valve), located just over the compressor, will determine the amount of cooling the refrigeration system will deliver.

As the compressor operates at all times whenever refrigerated air is desired, it is the proper pre-set adjustment of the thermostatic expansion valve and the setting of the temperature regulation valve that governs the amount of refrigerant flow through the evaporator and amount of cooling which results.

DESCRIPTION

The evaporator assembly consists of an evaporator core and housing. The evaporator core assembly is aluminum-brazed and allodized and is approximately 10$\frac{3}{16}$" wide, 10½" high, and 3⅝" thick. The core contains 16 aluminum channeled (embossed) plate type tubes (in parallel) with cooling fins between the plates on the outside.

An aluminum pipe (which connects to the by-pass line) is welded to the outlet pipe to the compressor suction hose between the suction hose fitting and the evaporator core.

The evaporator housing is constructed of a reinforced plastic material for strength. A self-opening rubber nozzle serves as a water drain and is located at the bottom of the housing.

FUNCTION

The evaporator is actually the device which cools and dehumidifies the air before it enters the car. High pressure liquid refrigerant flows through the valve orifice in the thermostatic expansion valve into the low pressure area of the evaporator. This regulated flow of refrigerant boils immediately. Heat from the core surface is lost to the boiling and vaporizing refrigerant, which is cooler than the core, thereby cooling the core. The heat in the air passing over the evaporator loses its heat to the cooler surface of the core, thereby cooling the air. As the process of heat loss from the air to the evaporator core surface is taking place, any moisture (humidity) in the air condenses on the outside surface of the evaporator core and is drained off as water.

Since Refrigerant-12 will boil at 21.7°F. below zero at atmospheric pressure and water freezes at 32°F., it becomes obvious that the temperature in the evaporator must be controlled so that the water collecting on the core surface will not freeze in the fins of the core and block off the air passages. In order to control the temperature, it is necessary to control pressure inside the evaporator and this is by the amount of liquid refrigerant entering the core.

To obtain maximum cooling, the refrigerant must remain in the core long enough to completely vaporize and then superheat a minimum of 4°F. If too much or too little refrigerant is present in the core, then maximum cooling efficiency is lost. A thermostatic expansion valve in conjunction with the temperature regulation valve is used to provide this necessary refrigerant volume control.

TEMPERATURE REGULATION VALVE (HOT GAS BY-PASS VALVE)

DESCRIPTION

The temperature regulation valve (hot gas by-pass valve) is manually controlled (by the temperature control lever at the control panel) and is located above the compressor in a refrigerant line between the compressor discharge valve and the evaporator outlet pipe (near the evaporator top tank).

A cam lever at the end of the valve contacts a spring (in a mounting bracket assembly) in such a manner as to increase or decrease pressure on a pilot diaphragm which is opposed by evaporator pressure.

The main valve body contains an inlet connection from the compressor discharge valve, an outlet connection to a point between the evaporator top tank outlet pipe (suction side) and the thermostatic expansion valve capillary tube bulb, a main valve stem assembly (attached to the main diaphragm), and a pilot valve (held closed with spring tension).

The cover and a main diaphragm spring (which is the opposing force to the main diaphragm and valve stem assembly) completes the temperature regulation valve assembly.

A manually operated temperature regulation valve control cable is the connecting medium between the air conditioning temperature control lever and the temperature regulation valve cam.

FUNCTION

The function of the temperature regulation valve is to maintain a given temperature inside the car as selected by the temperature control lever and also to limit the evaporator to a minimum pressure to prevent any moisture condensing on the evaporator core from freezing.

This valve automatically controls cooling and prevents evaporator freeze-up by allowing high pressure hot gas to by-pass the condenser and evaporator (and the connecting parts) and to enter the suction side of the system at a point where the low pressure gas has just left the evaporator.

OPERATION

When the temperature control lever is just below the full up position the temperature regulation valve is manually positioned at its "warmest" setting (the temperature regulation valve cam lever is towards the rear of the car) thereby providing minimum cool-

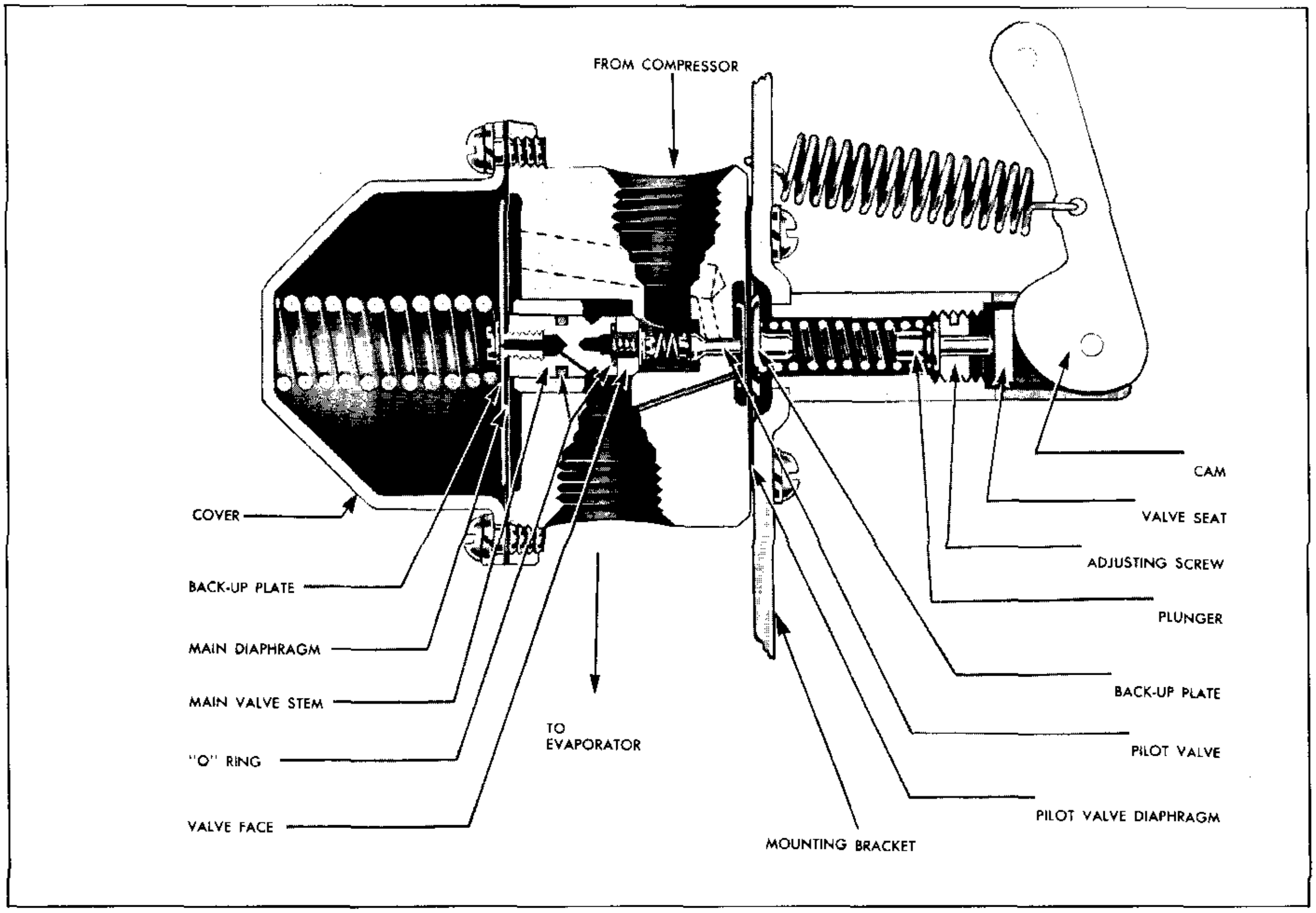


Fig. 6-15 Cross Section of the Temperature Regulation Valve

ing. Progressive movement of the temperature control lever down progressively moves the temperature regulation valve cam lever towards the front of the car. Its "coldest" position (cam lever fully forward) is reached when the temperature control lever is at the extreme down position. At this setting the temperature regulation valve is so set that the air leaving the evaporator is as cold as possible. Any further attempt to reduce air temperature, as might result from adjusting the temperature regulation valve below its minimum setting, will only result in a momentary gain in cooling and will be followed by evaporator core icing and a resultant loss of cooling.

Hot high pressure refrigerant 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 of the refrigerant gas in 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. 6-15.) Suction pressure refrigerant gas is also transmitted to the inside of the cover through a calibrated 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.

Whenever suction pressure remains at or above the minimum desired evaporator pressure, 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. (The valve stem assembly will be forced off its seat if discharged pressure exceeds 450 psi but the compressor relief valve would open at 440 psi so this condition would probably not happen.)

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 refrigerant gas flows through this opening into the drilled passage through the main valve body and to the main diaphragm to oppose main diaphragm spring tension and suction pressure in the cover. High pressure refrigerant gas will move the diaphragm against main spring tension to compress the spring and thus move the main valve stem assembly face off its seat to permit the high pressure hot refrigant gas to flow through the valve.

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

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

The flow of high pressure refrigerant gas through the temperature regulation valve is dependent upon evaporator pressure and pilot valve spring pressure. When evaporator pressure is greater than the opposing pilot valve spring pressure against the pilot valve diaphragm the pilot valve will be closed. When evaporator pressure is less than the opposing pilot valve spring pressure against the pilot valve diaphragm, the pilot valve will move off its seat to permit high pressure gas to flow to the main diaphragm to move the main valve stem off its seat and high pressure refrigerant gas will flow through the temperature regulation valve.

REFRIGERATION CIRCUIT IN PONTIAC'S CIRC-L-AIRE CONDITIONING SYSTEM

Cool Refrigerant-12 gas is drawn into the compressor from the evaporator and pumped from the compressor to the condenser and temperature regulation valve under high pressure (Fig. 6-16). This high pressure gas being pumped to the condenser and temperature regulation valve will also have a high temperature as a result of being subjected to compression. As it passes through the condenser, the high pressure high temperature gas rejects its heat to the outside air, as the air passes over the metal surfaces of the condenser. This cooling of the gas causes it to condense into liquid refrigerant. The liquid refrigerant, still under high pressure, then passes from the bottom of the condenser into the receiver and liquid indicator assembly, of which the receiver portion of this assembly acts as a reservoir.

Liquid refrigerant from the receiver and liquid indicator assembly flows to the thermostatic expansion valve.

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

Refrigerant passing through the evaporator is returned to the compressor where the refrigeration cycle is repeated.

When the pressure in the evaporator becomes low enough to cause any moisture condensing on the evaporator surface to freeze, the temperature regulation valve opens. As this valve opens, hot high pressure refrigerant gas enters the system between the evaporator core outlet and the thermostatic expansion valve bulb. This increases the suction pressure and warms the evaporator outlet pipe and the bulb which in turn signals the thermostatic expansion valve to open further allowing more refrigerant to enter the evaporator. As suction pressure builds up to a value where the moisture depositing on the evaporator core will not freeze, the hot gas by-pass valve closes.

AIR SYSTEM

Air flow through the Circ-L-Aire conditioning system is controlled by push buttons located in the air conditioning control panel. These buttons operate a

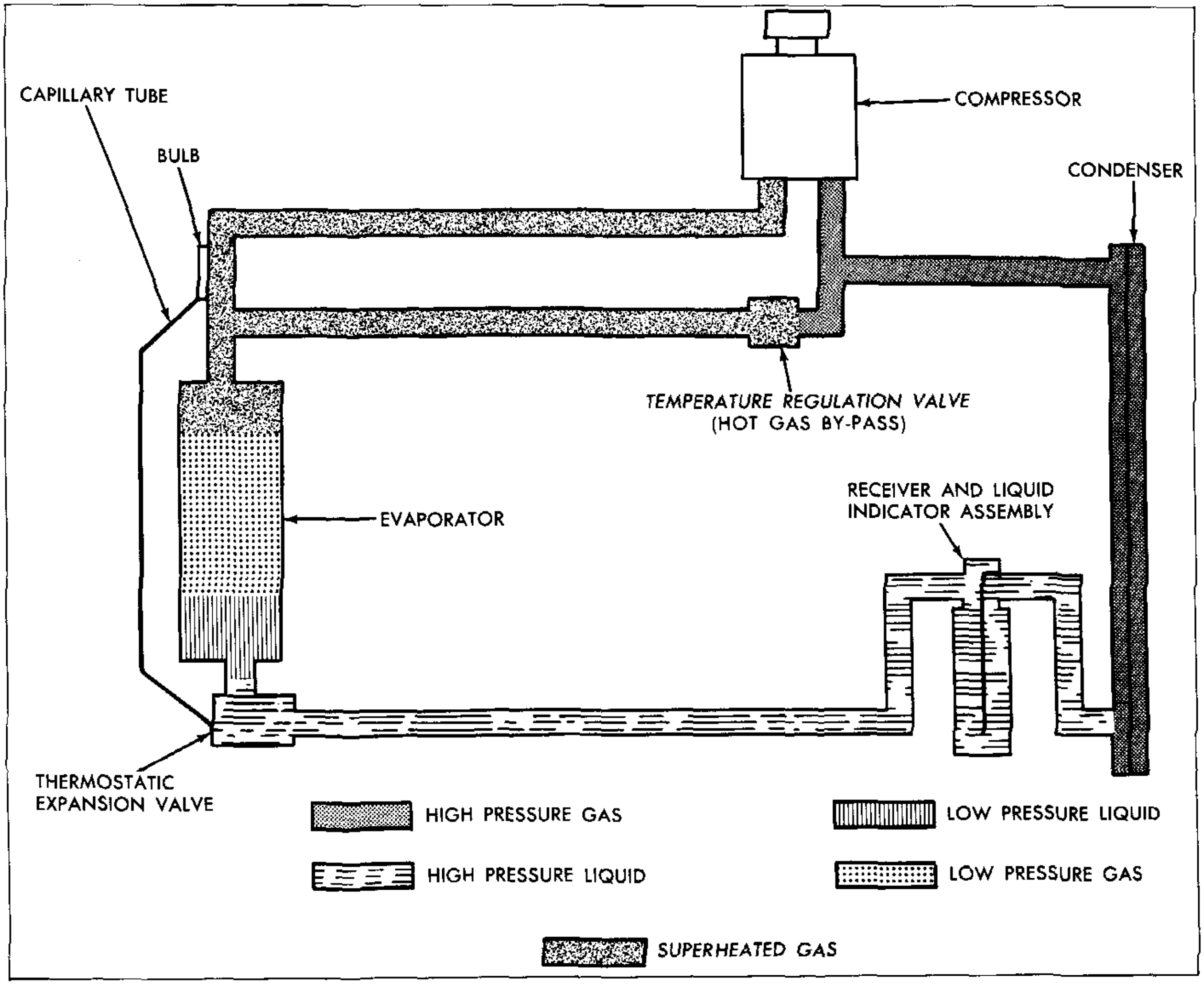


Fig. 6-16 Refrigeration Circuit in the Circ-L-Aire Conditioner System

vacuum switch which appropriately applies vacuum to five vacuum operated diaphragms to control the position of the three air valves which direct air flow through the air conditioning system.

All air for ventilation or refrigerated air enters the interior of the car through five outlets on the instrument panel and also through a series of holes in the bottom of the air outlet duct assembly. (These holes direct cooled air to the left and right side of the front floor to cool the passengers' feet.) Nozzles located at each end of the instrument panel can be individually controlled to provide a comfortable air flow in any direction desired by the passengers.

The ball type nozzle may be rotated to direct air in any direction. It is retained in a bezel and is mounted between felt "bearings" for ease of turning. A nozzle retainer keeps the felts and nozzle tight against the bezel. See Fig. 6-17. The bezel is held tight against the instrument panel by screws (from behind the instrument panel) which secure the entire assembly from the back side of the instrument panel.

Attached to the lower center part of the instrument panel are three center outlets having vaned valves which can be rotated to change the vertical direction of air flow. A concealed opening in the left side of the center outlet directs a stream of cooled air to the driver's feet.

The design of the air conditioning air system, its valves and controls, permits a method of obtaining many different amounts of forced air flow for ventilation or refrigeration and can draw its source of air from either outside or inside the car.

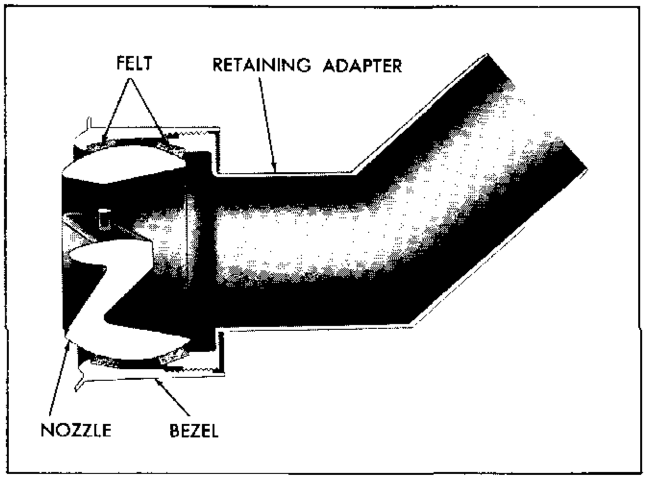


Fig. 6-17 Cross Section of Bezel and Nozzle Assembly (Left Shown)

VACUUM SYSTEM

Air flow through the Circ-L-Aire conditioning system is controlled by push buttons located in the air conditioning control panel. These buttons operate a vacuum switch which appropriately applies vacuum to diaphragms that operate the air conditioning inlet air valves in the top of the blower and inlet air duct and the outlet (selector) air valve located in the lower right portion of the blower and inlet air duct assembly. The inlet air valves control air source from outside the car or inside the car (for recirculation) depending upon the position of the vacuum switch as positioned by the "OUTSIDE" or "INSIDE" push button.

Air flow through the heating system is controlled similarly. In this case, however, vacuum operates the inlet air (outside) valve to open the valve to outside air and also the inside air valve to close it to prevent recirculation of inside air (located in the top of the blower and inlet air duct).

Vacuum input to both the air conditioning and heater vacuum switch is through a "T" connection in the vacuum line to the distributor vacuum advance on all cars except those equipped with triple two barrel carburetors. On cars with triple two barrel carburetors, vacuum input to both the air conditioning and heater vacuum switch is through a tee connection fed from the carburetor vacuum source for accessories. This vacuum is applied to the No. 1 post of the air conditioner and heater vacuum switches in both input arrangements.

These vacuum switches are connected to each other through the common vacuum source and also with a vacuum hose connecting the No. 3 vacuum post on the Circ-L-Aire heater control panel vacuum switch to the No. 5 vacuum post on the air conditioning control panel vacuum switch.

Inlet and outlet (selector) air valve action is controlled by directing vacuum to one or more of five diaphragms on the blower and air duct assembly

Control Setting		Air Valve—Positions			Usages	
Air Cond. Push Button	Heater Push Button	Defroster	Outside-Inside Combination	Selector		
Off	Off	Heat	Full Recirculation	To Heater	Air Cond. and Heater off	
Off	Normal	Heat	Outside	To Heater	Heat	Heater only
Off	De-ice	Defrost	Outside	To Heater	Defrost	
Outside	Off	Heat	Outside	To Evaporator	Outside Air Cooling	Air Cond. only
Inside	Off	Heat	Recirculation	To Evaporator	Maximum Cooling	
Outside	Normal	Heat	Outside	To Both	Upper Level—Cool Lower Level—Heat	Bright sun on cool days. Humid mornings and warm evenings
Inside	Normal	Heat	Recirculation	To Both	Upper Level—Max. Cool Lower Level—Heat	Rainstorms
Outside	De-ice	Defrost	Outside	To Both	Not Recommended	
Inside	De-ice	Defrost	Recirculation	To Both	Not Recommended	

Fig. 6-18 Summary of Circ-L-Aire Conditioner and Circ-L-Aire Heater Valve Positions Under Various Control Settings

Control Setting			Air Valve—Positions			Usages	
Air Cond. Push Button	Direct-Aire Heater Air Knob	Direct-Aire Heater De-Ice Knob	Defroster	Outside-Inside Combination	Selector		
Off	Off	—	—	Full Recirculation	To Heater	Air Cond. and Heater off	Note: Operation of Heater blower fan at this setting not recommended
Off	On	Off	Heat	Outside	To Heater	Heat	Heater Only
Off	On	On	Defrost	Outside	To Heater	Defrost	
Outside	Off	—	—	Outside	To Evaporator	Outside Air Cooling	Air Cond. only
Inside	Off	—	—	Recirculation	To Evaporator	Maximum Cooling	
Outside	On	Off	Heat	Outside	To Both	Upper Level—Cool Lower Level—Heat	Bright sun on cool days. Humid mornings and warm evenings
Inside	On	Off	Heat	Recirculation	To Both	Upper Level—Max. Cool Lower Level—Heat	Rainstorms
Outside	On	On	Defrost	Outside	To Both	Not Recommended	
Inside	On	On	Defrost	Recirculation	To Both	Not Recommended	

Fig. 6-19 Summary of Circ-L-Aire Conditioner and Direct-Aire Heater Valve *Positions Under Various Control Settings*

and one diaphragm on the Circ-L-Aire heater core and case assembly.

Valve action under various push button positions with air conditioning and the Circ-L-Aire heater is as follows:

PUSH BUTTON: AC—OFF, CIRC-L-AIRE HEATER—OFF See Fig. 6-21

VACUUM

With the engine running, vacuum is at the No. 1 post of each of the heater and air conditioning vacuum switch. No vacuum passes through the heater switch. Vacuum does pass from the No. 1 post of the air conditioning vacuum switch through the No. 2 post of the same switch where it is directed to the return travel portion of the selector air valve holding this valve in such a position to prevent the entrance of air flow to the air conditioning evaporator.

Since atmospheric pressure is on both sides of all other diaphragms, spring tension holds the inside and outside air valve in a closed position to prevent air flow through the air conditioning and heater systems.

ELECTRICAL

In the off position, the electrical circuit is open and no current flows to the electrical units (compressor and blower).

PUSH BUTTONS: AC—OUTSIDE, CIRC-L-AIRE HEATER—OFF (See Fig. 6-22)

VACUUM

When the "OUTSIDE" button is pushed in, the rotor part of the air conditioning vacuum switch moves to direct vacuum to the No. 1 post through the switch to the No. 3 and No. 4 post of the same switch.

Vacuum from the No. 4 post is directed to the full travel portion of the inside air diaphragm which moves the inside air valve to allow outside air to enter the air inlet duct. At its full travel position, the valve is now located to prevent air inside the car from entering the air inlet duct. Vacuum is also di-

Control Setting	Air Valve—Positions		Usages
Air Cond. Push Button	Outside-Inside Combination	Selector	
Off	Off (Full Recirculation)	Off	Air Cond. off
Outside	Outside	To Evaporator	Outside air cooling
Inside	Recirculation	To Evaporator	Maximum cooling

Fig. 6-20 Summary of Circ-L-Aire Conditioner Only *Valve Positions Under Various Control Settings*

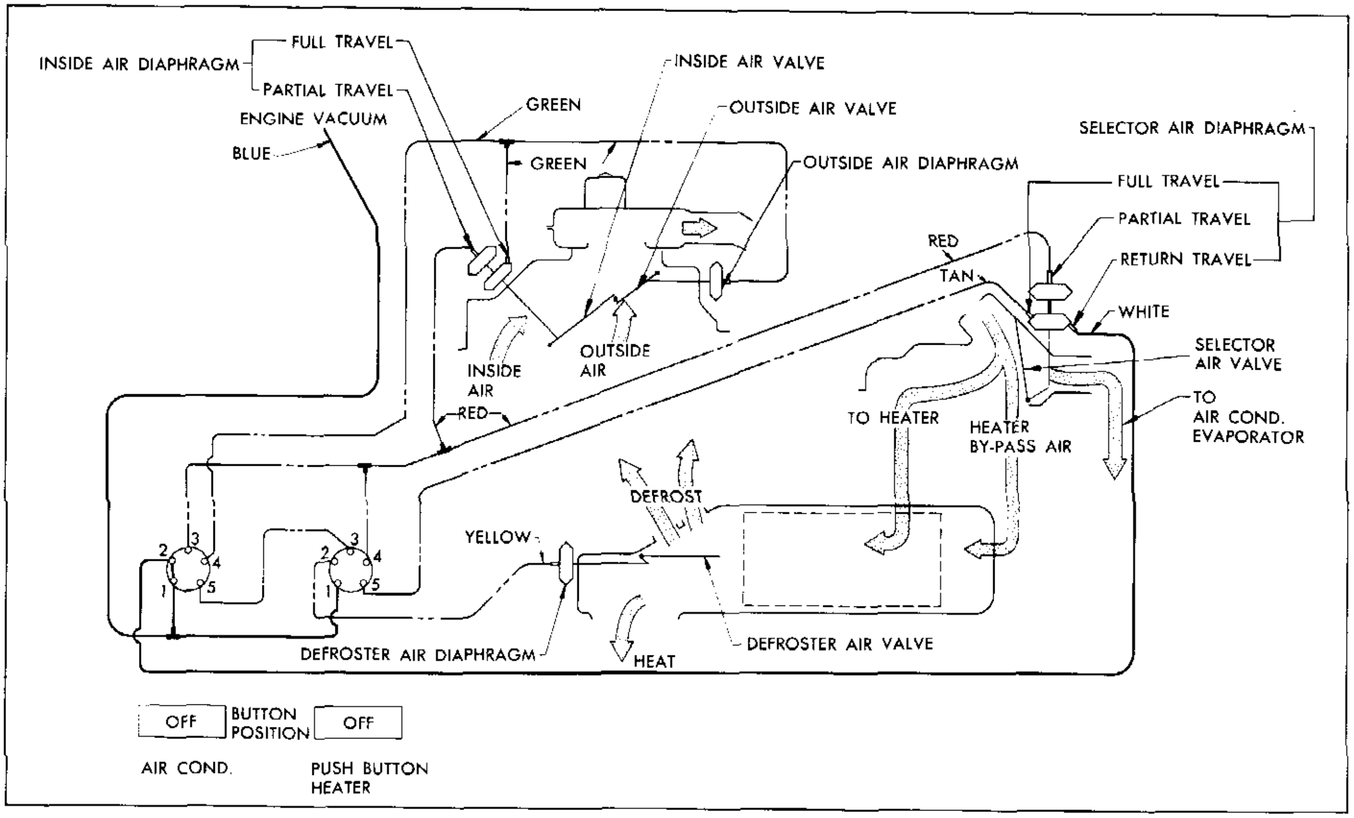


Fig. 6-21 Push Buttons: AC-OFF, Heater-OFF, No Air Flow. (Vacuum in Dark Black Lines)

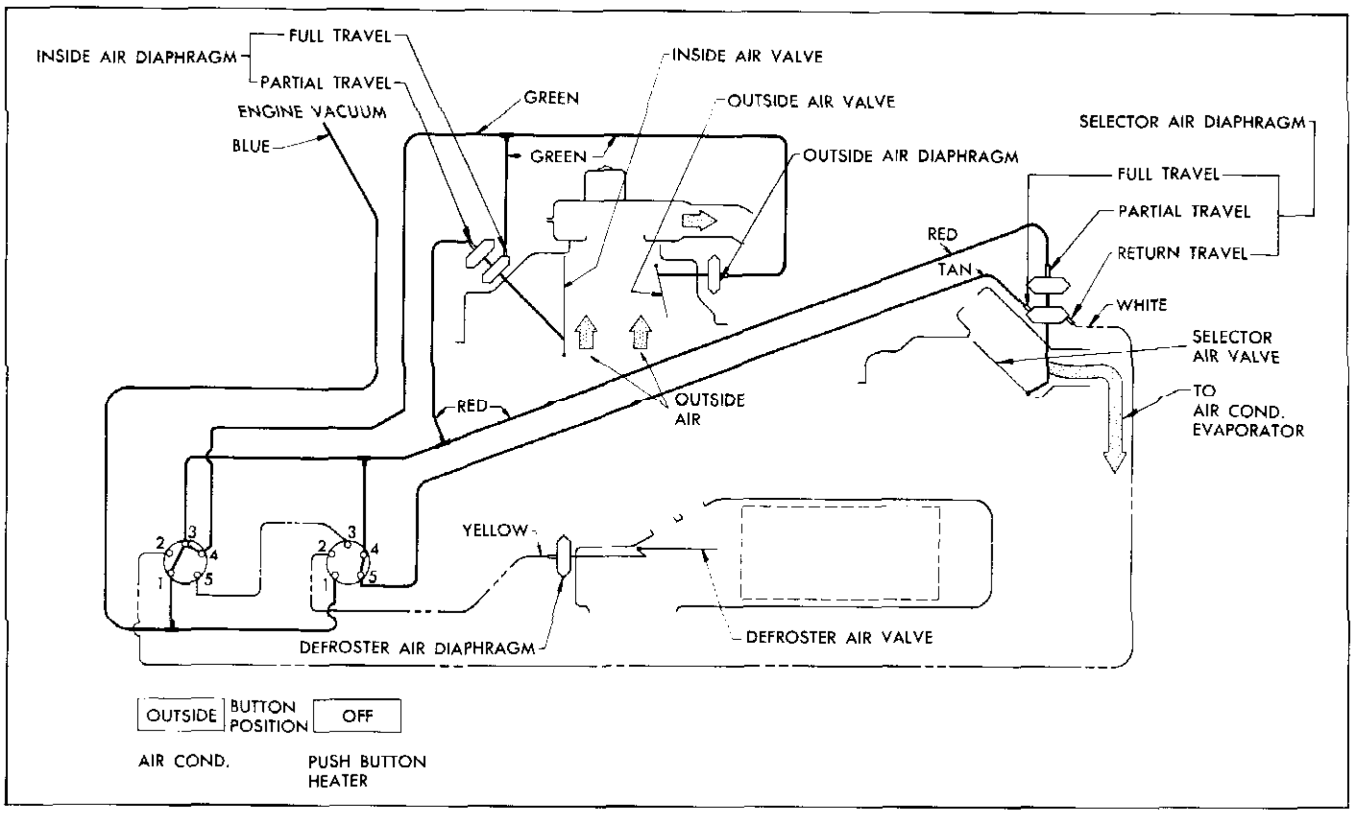


Fig. 6-22 Push Buttons: AC-OUTSIDE, Heater-OFF.
Air Flow through AC System—All Outside Air To Nozzels, Center Outlets and Foot Cooling. (Vacuum in Dark Black Lines)

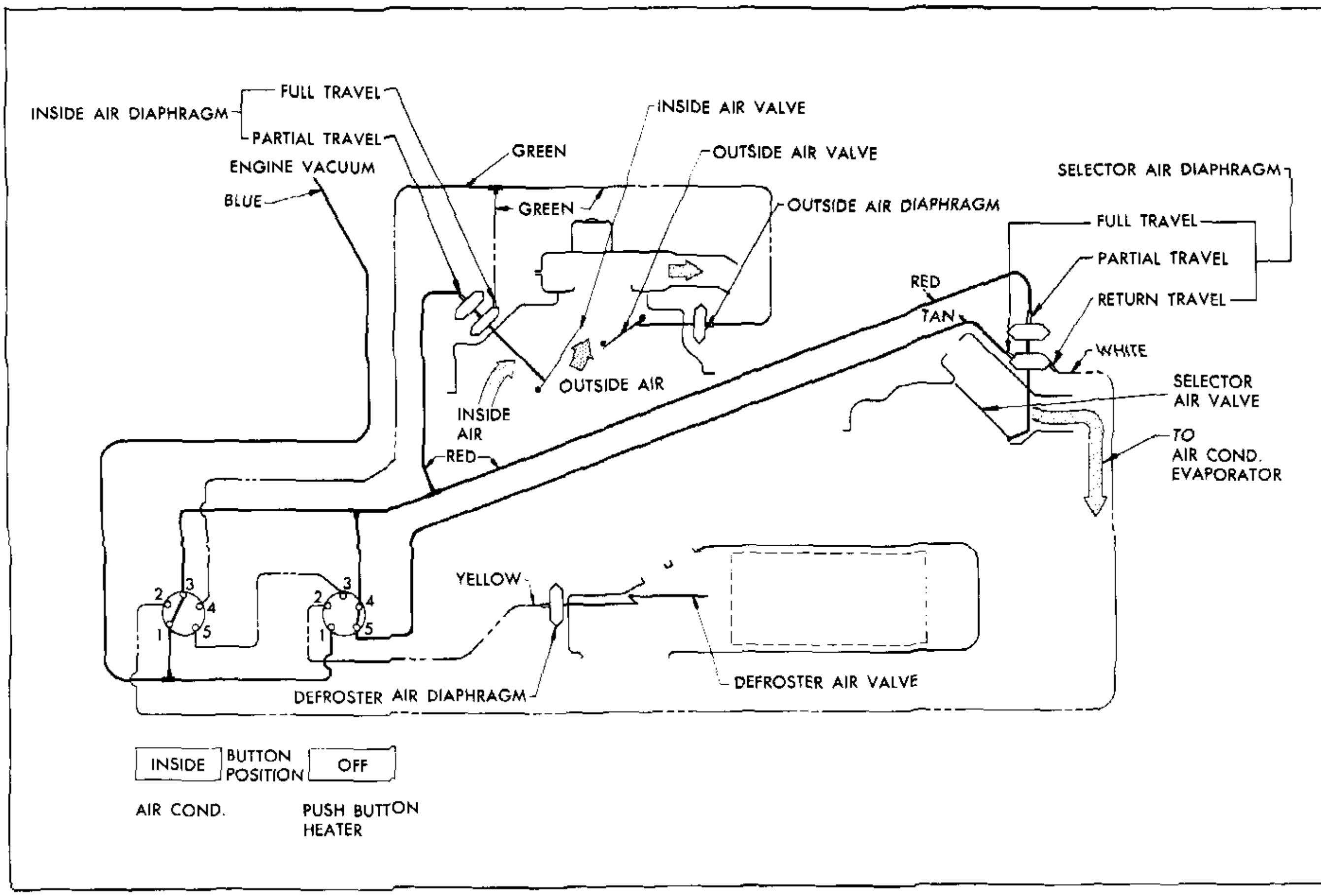


Fig. 6-23 Push Buttons: AC-INSIDE, Heater-OFF.
Air Flow through AC System—Majority of Air Recirculated to Nozzles, Center Outlets and Foot Cooling.
(Vacuum in Dark Black Lines)

rected to the outside air diaphragm to open the valve permitting outside air to enter the air inlet duct assembly.

Vacuum from the No. 3 post is directed to a "T" connector where it is applied to the partial travel portion of the inside air diaphragm and to the partial travel portion of the selector air diaphragm. Vacuum from this "T" is also applied to the No. 4 post on the heater vacuum switch. From the No. 4 post, on the heater vacuum switch, vacuum is directed through this switch to the No. 5 post and to the full travel portion of the selector air valve moving the valve to open the passage to the evaporator and close the passage to the heater system permitting all air to be directed to the evaporator, to the nozzles and to the air outlets on the instrument panel.

With vacuum on one side of these diaphragms and atmospheric pressure on the other, atmospheric pressure is sufficient to overcome the spring tension holding the valve closed, and force them to swing open.

ELECTRICAL

When the "OUTSIDE" button is pushed, the electrical circuit is closed to energize the master control relay which closes the electrical circuit to the blower and compressor clutch switches. With the blower circuit closed, the blower operates to pull air through the louvers on the top of the cowl to the inlet air assembly. The blower then forces air through the evaporator and air conditioning air outlets on the instrument panel (hoses are attached to each bezel and the air outlet duct assembly).

PUSH BUTTONS: AC—INSIDE, CIRC-L-AIRE HEATER—OFF (See Fig. 6-23)

VACUUM

Pushing the "INSIDE" button moves the rotor part of the air conditioning vacuum switch to direct vacuum from the No. 1 post through the switch to the No. 3 post of the same switch.

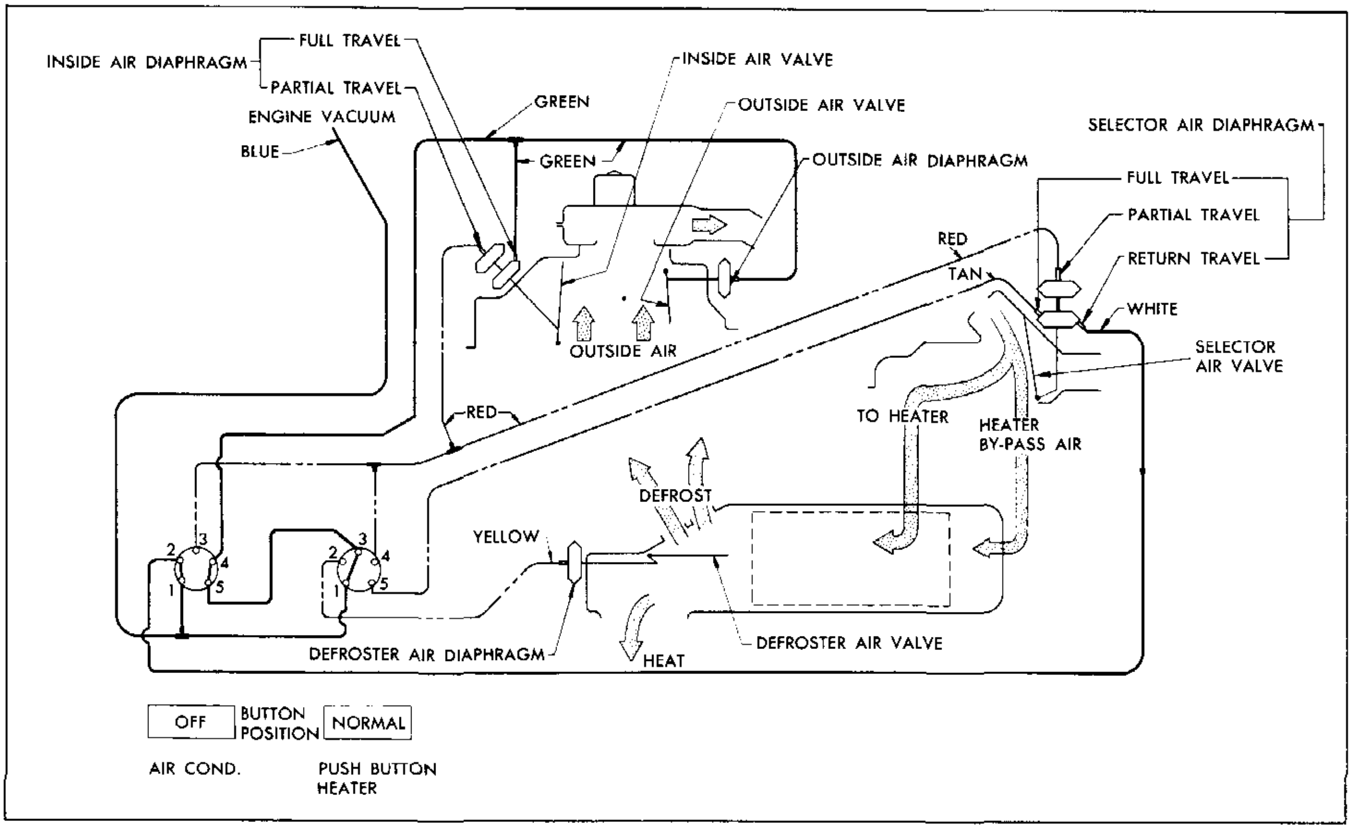


Fig. 6-24 Push Buttons: AC-OFF, Heater-NORMAL.
Air Flow Through Heater System—All Outside Air to Heater Ducts and Defroster. (Vacuum in Dark Black Lines)

Vacuum from the No. 3 post is directed to a "T" connector where it is applied to the partial travel portion of the inside air diaphragm to move the inside air valve a slight amount. Since air from the inside of the car may enter the inlet air duct unrestricted, and the slight movement of the inside valve permits some outside air to enter the air inlet duct assembly, outside air mixes with inside air in the air inlet duct.

Vacuum is also directed to the partial travel portion of the selector air valve diaphragm. Vacuum from this "T" is also directed to the No. 4 post on the heater vacuum switch. From the No. 4 post on the heater vacuum switch, vacuum is directed through the switch to the No. 5 post and to the full travel portion of the air selector air diaphragm to open the selector valve moving the valve to open the passage to the evaporator and close the passage to the heater system, permitting all air to be directed to the evaporator, to the nozzles and to the air outlets on the instrument panel.

With vacuum on one side of these diaphragms and atmospheric pressure on the other, atmospheric pressure is sufficient to overcome spring tension holding valves closed, causing them to swing open.

ELECTRICAL

When the "INSIDE" button is pushed in, the electrical circuit is closed to energize the master relay and close the electrical circuit to the blower and compressor clutch switches. With the blower circuit closed, the blower operates to pull air from inside the car through the air recirculation opening to the air inlet housing. Some outside air (approximately 15%) is permitted to mix with this inside air to "pressurize" the inside of the car and thus prevent infiltration of hot outside air through small openings in the car body. The blower then forces this mixed air through the evaporator and on to the air conditioning outlets on the instrument panel.

PUSH BUTTONS: AC—OFF, CIRC-L-AIRE HEATER—NORMAL (See Fig. 6-24)

VACUUM

Depressing the "NORMAL" button on the Circ-L-Aire heater control panel moves the rotor part of the heater vacuum switch to direct vacuum from the No. 1 post through the switch to the No. 3 post of the same switch to the No. 5 post on the air conditioning vacuum switch through this switch to the No. 4 post and to a "T" connector which directs vacuum to the full travel portion of the inside air diaphragm. At its full travel position, the valve is now located to prevent air inside the car from entering the air inlet duct. Vacuum is also directed to the outside air diaphragm to open the valve, permitting outside air to enter the air inlet duct assembly.

Vacuum passes from the No. 1 post of the air conditioning vacuum switch through the switch to the No. 2 post where it is directed to the return travel portion of the selector air valve holding the valve in such a position to prevent entrance of air flow to the air conditioning evaporator, permitting all air to be directed to the heater system and out the heater and defroster outlets.

With vacuum on one side of the inside and outside air diaphragms and atmospheric pressure on the other, atmospheric pressure is sufficient to overcome the spring tension holding the valve closed, and forces them to swing open. With vacuum on one side of the return travel portion of the selector air valve and atmospheric pressure on the other, atmospheric pressure assists valve spring pressure to assure positive sealing of the air inlet opening to the air conditioning system.

ELECTRICAL

When the "NORMAL" button on the Circ-L-Aire heater control panel is pushed, the heater master switch closes to close the electrical circuit to the heater blower switch. The blower will not operate unless the blower control lever is in the "LO", "MED" or "HI" position. If in one of these blower speed positions, air will be pulled through the louvers on the top of the cowl into the blower and inlet air assembly. The blower then forces this air through the heater core and out the heater outlets. Some air will be directed through the defroster nozzles due to the design of the heater core case assembly.

Air will not enter the passage to the evaporator since no vacuum is directed to the return travel portion of the selector air valve diaphragm which keeps the selector air valve closed.

***PUSH BUTTONS: AC—OFF, CIRC-L-AIRE* HEATER—DE-ICE (See Fig. 6-25)**

VACUUM

Depressing the "DE-ICE" button on the Circ-L-Aire heater control panel moves the rotor part of the heater vacuum switch to direct vacuum from the No. 1 post through the switch to the No. 2 and No. 3 posts of the same switch. Vacuum from the No. 2 post is directed to the defroster air valve diaphragm. Vacuum from the No. 3 post is directed to the No. 5 post on the air conditioning vacuum switch through this switch to the No. 4 post and to a "T" connector which directs vacuum to the full travel portion of the inside air diaphragm. At its full travel position, the valve is now located to prevent air inside the car from entering the air inlet duct. Vacuum is also directed to the outside air diaphragm to open the valve, permitting outside air to enter the air inlet duct assembly.

Vacuum passes from the No. 1 post of the air conditioning vacuum switch through the switch to the No. 2 post where it is directed to the return travel portion of the selector air valve holding the valve in such a position to prevent entrance of air flow to the air conditioning evaporator, permitting all air to be directed to the heater system and out the heater and defroster outlets.

Atmospheric pressure on one side of the defroster air valve diaphragm is sufficient to overcome spring tension holding the defroster air valve up (in the heater core and case assembly) (closed) to cause the valve to swing open (down) permitting maximum flow of heater system air to be directed to the defroster outlets. Some air will also be emitted from the heater outlet nozzle.

With vacuum on one side of the inside and outside air diaphragms and atmospheric pressure on the other, atmospheric pressure is sufficient to overcome the spring tension holding the valve closed, and forces them to swing open. With vacuum on one side of the return travel portion of the selector air valve and atmospheric pressure on the other, atmospheric pressure assists valve spring pressure to assure positive sealing of the air inlet opening to the air conditioning system.

ELECTRICAL

Pushing the "DE-ICE" button causes the Circ-L-Aire heater master switch and defroster switch to close the electrical circuit to the heater blower switch and to the blower motor (which by-passes the blower switch) regardless of the position of the blower control lever.

Air will be pulled through the louvers on the top of the cowl into the blower and air inlet assembly. The blower then forces the air through the heater core and case assembly and out the defroster nozzles. (The defroster air valve being in the down position acts as

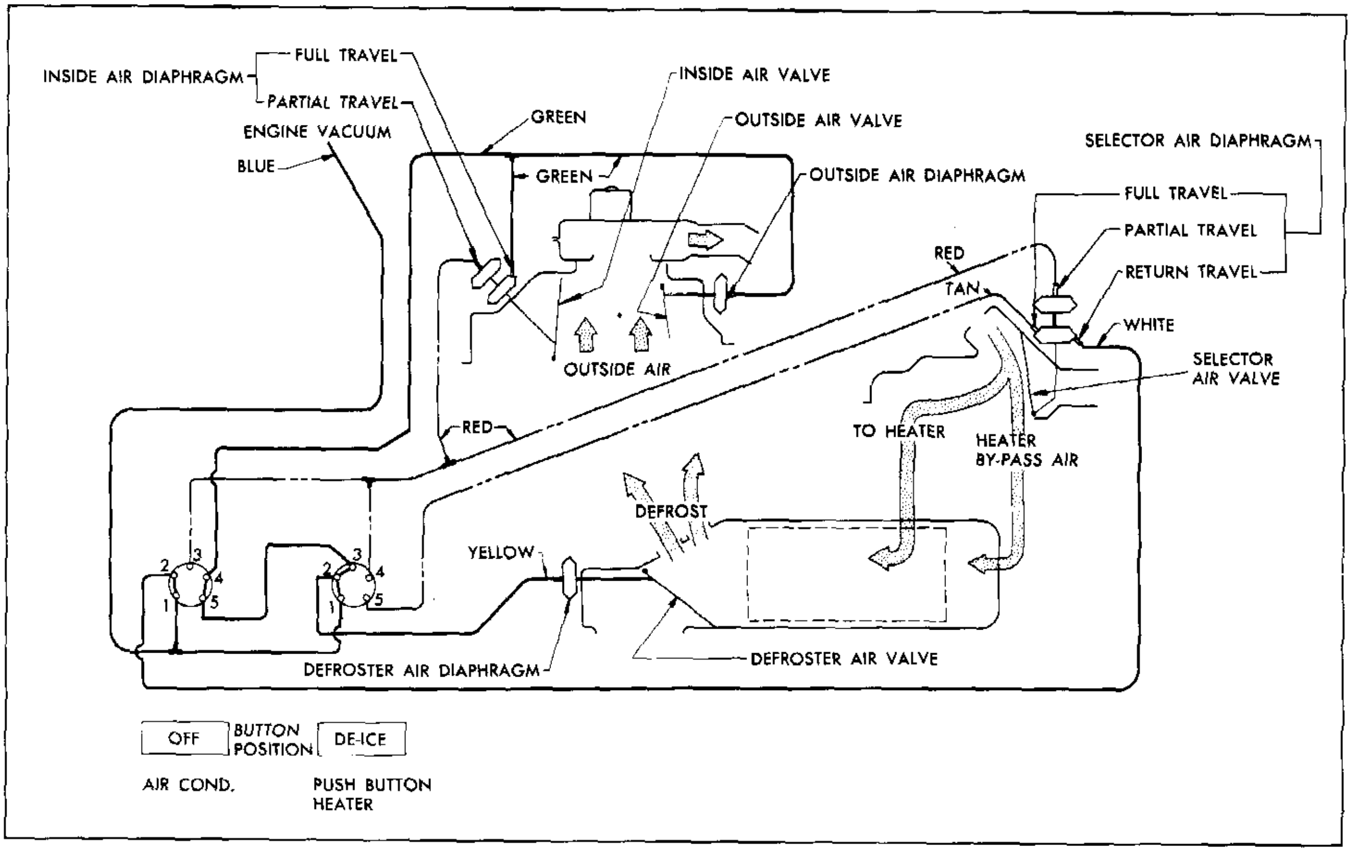


Fig. 6-25 Push Buttons: AC-OFF, Heater-DE-ICE.
Air Flow Through Heater System—All Outside Air to Defroster and Heater Ducts. (Vacuum in Dark Black Lines)

a ramp to direct the air to the defroster outlets.) Some air will be directed through the heater outlets since the defroster air valve does not completely block the heater air duct.

Air will not enter the passage to the evaporator since vacuum is directed to the return portion of the selector air valve diaphragm which keeps the selector air valve closed.

PUSH BUTTONS: AC—OUTSIDE, CIRC-L-AIRE HEATER—NORMAL (See Fig. 6-26)

VACUUM—AC SYSTEM

When the "OUTSIDE" button is pushed in on the air conditioning control panel, the rotor part of the air conditioning vacuum switch moves to direct vacuum to the No. 1 post through the switch to the No. 3 and No. 4 post of the same switch.

Vacuum from the No. 4 post is directed to the full travel portion of the inside air diaphragm which moves the inside air valve to allow outside air to enter the air inlet duct. At its full travel position, the valve is now located to prevent air inside the car from entering the air inlet duct. Vacuum is also directed to the outside air diaphragm to open the valve, permitting outside air to enter the air inlet duct assembly.

Vacuum from the No. 3 post is directed to a "T" connector where it is applied to the partial travel portion of the inside air diaphragm and to the partial travel portion of the selector air diaphragm. The selector air valve moves to permit air to enter the evaporator and air conditioning outlets and also the heater core and heater outlets. Vacuum from this "T" is also applied to the No. 4 post on the heater vacuum switch where it ends.

With vacuum on one side of these diaphragms and atmospheric pressure on the other, atmospheric pressure is sufficient to overcome the spring tension holding the valves closed, and force them to swing open.

VACUUM—HEATER SYSTEM

Depressing the "NORMAL" button on the Circ-L-Aire heater control panel moves the rotor part of the heater vacuum switch to direct vacuum from the No. 1 post through the switch to the No. 3 post of the same switch to the No. 5 post on the air conditioning vacuum switch where it ends.

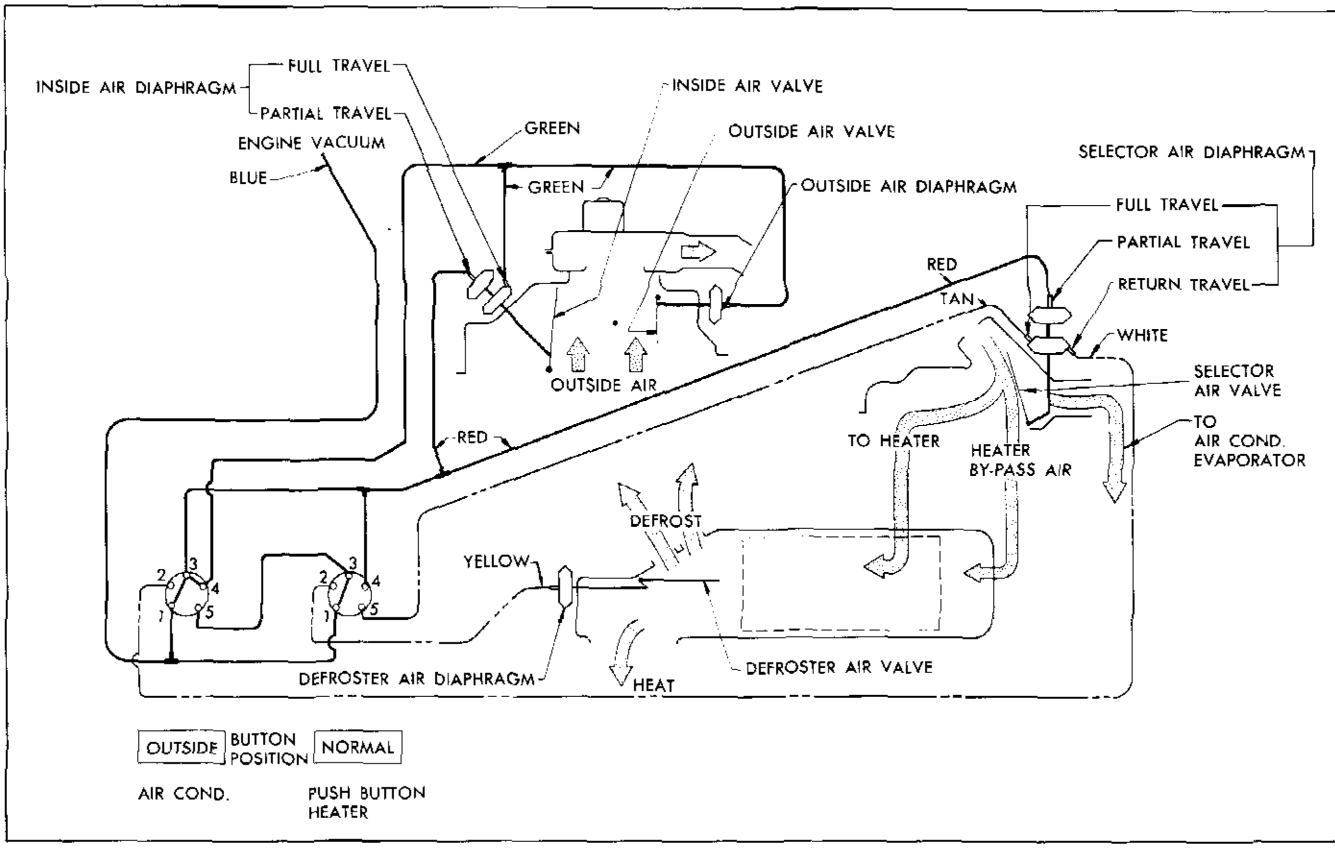


Fig. 6-26 Push Buttons: AC-OUTSIDE, Heater-NORMAL.
Air Flow Through AC and Heater Systems—All Outside Air Equally Divided Between AC and Heater Outlets.
(Vacuum in Dark Black Lines)

ELECTRICAL–AC SYSTEM

When the "OUTSIDE" button on the air conditioning control panel is pushed in, the electrical circuit is closed to energize the master control relay which closes the electrical circuit to the blower and compressor clutch switches.

ELECTRICAL–HEATER SYSTEM

Depressing the "NORMAL" button on the heater control panel closes the heater master switch to close the electrical circuit to the heater blower switch.

The speed of the blower will depend on the position of the blower control lever on the air conditioning and heater control panels; the fastest blower speed will depend upon the least resistance in the electrical circuit to the blower motor.

With the blower circuit closed, the blower operates to pull air through the louvers on the top of the cowl to the blower and inlet air assembly. The blower then forces air through the evaporator and the heater core and case assembly. Air from the evaporator emits from the air conditioning outlets on the instrument panel. Most of the air from the heater core and case assembly is directed to the heater outlets with a slight amount out of the defroster nozzles.

PUSH BUTTONS: AC—INSIDE, CIRC-L-AIRE HEATER—NORMAL (See Fig. 6-27)

VACUUM–AC SYSTEM

Pushing the "INSIDE" button moves the rotor part of the air conditioning vacuum switch to direct vacuum from the No. 1 post through the switch to the No. 3 post of the same switch.

Vacuum from the No. 3 post is directed to a "T" connector where it is applied to the partial travel portion of the inside air diaphragm to move the inside air valve a slight amount. Since air from the inside of the car may enter the inlet air duct unrestricted, and the slight movement of the inside valve permits some outside air to enter the air inlet duct assembly, outside air mixes with inside air in the air inlet duct. Vacuum is also directed to the partial travel portion

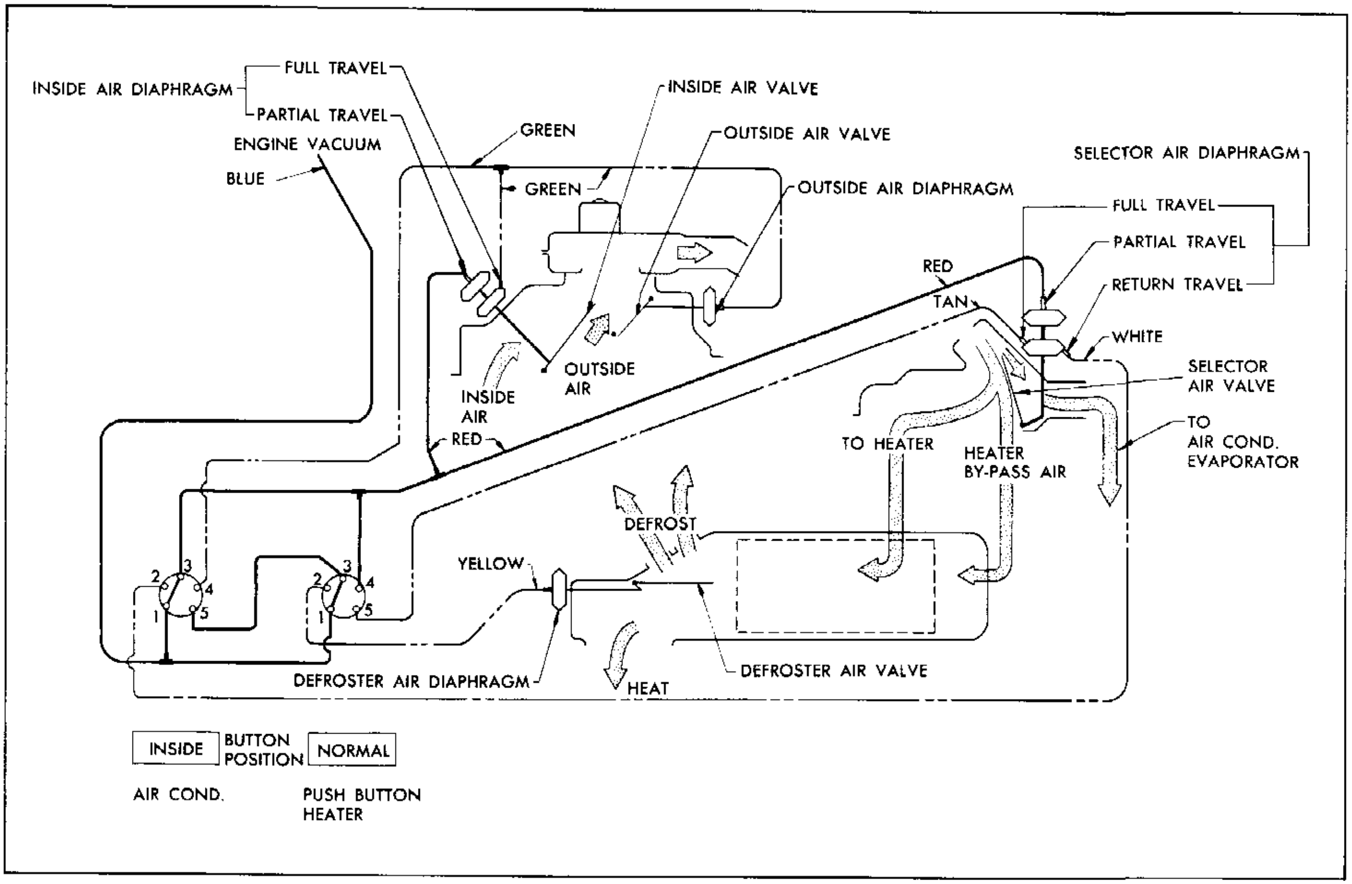


Fig. 6-27 Push Buttons: AC-INSIDE, Heater-NORMAL
Air Flow Through AC and Heater Systems—Majority of Air Recirculated and Equally Divided Between AC and Heater Outlets. (Vacuum in Dark Black Lines)

of the selector air valve diaphragm. The selector air valve moves to permit air to enter evaporator and air conditioning outlets and also heater core and heater outlets. Vacuum from this "T" is also applied to the No. 4 post on heater vacuum switch where it ends.

With vacuum on one side of these diaphragms and atmospheric pressure on the other, atmospheric pressure is sufficient to overcome the spring tension holding the valves closed, and force them to swing open.

VACUUM—HEATER SYSTEM

Depressing the "NORMAL" button on the Circ-L-Aire heater control panel moves the rotor part of the heater vacuum switch to direct vacuum from the No. 1 post through the switch to the No. 3 post of the same switch to the No. 5 post on the air conditioning vacuum switch where it ends.

ELECTRICAL

When the "INSIDE" button is pushed in on the air conditioning control panel the electrical circuit is closed to energize the master control relay and the electrical circuit to the blower and compressor clutch switches.

Depressing the "NORMAL" button on the heater control panel closes the heater master switch to close the electrical circuit to the heater blower switch.

The speed of the blower will depend on the position of the blower control lever on the air conditioning and heater control panels; the fastest blower speed will depend upon the least resistance in the electrical circuit to the blower motor.

With the blower motor circuit closed, the blower operates to pull air from inside the car plus a little from the outside of the car (entering through the louvers at the top of the cowl). The blower then forces the air through the evaporator and the heater core and case assembly. Air from the evaporator emits from the air conditioning outlets on the instrument panel. Most of the air from the heater core and case assembly is directed to the heater outlets with a slight amount out of the defroster nozzles.

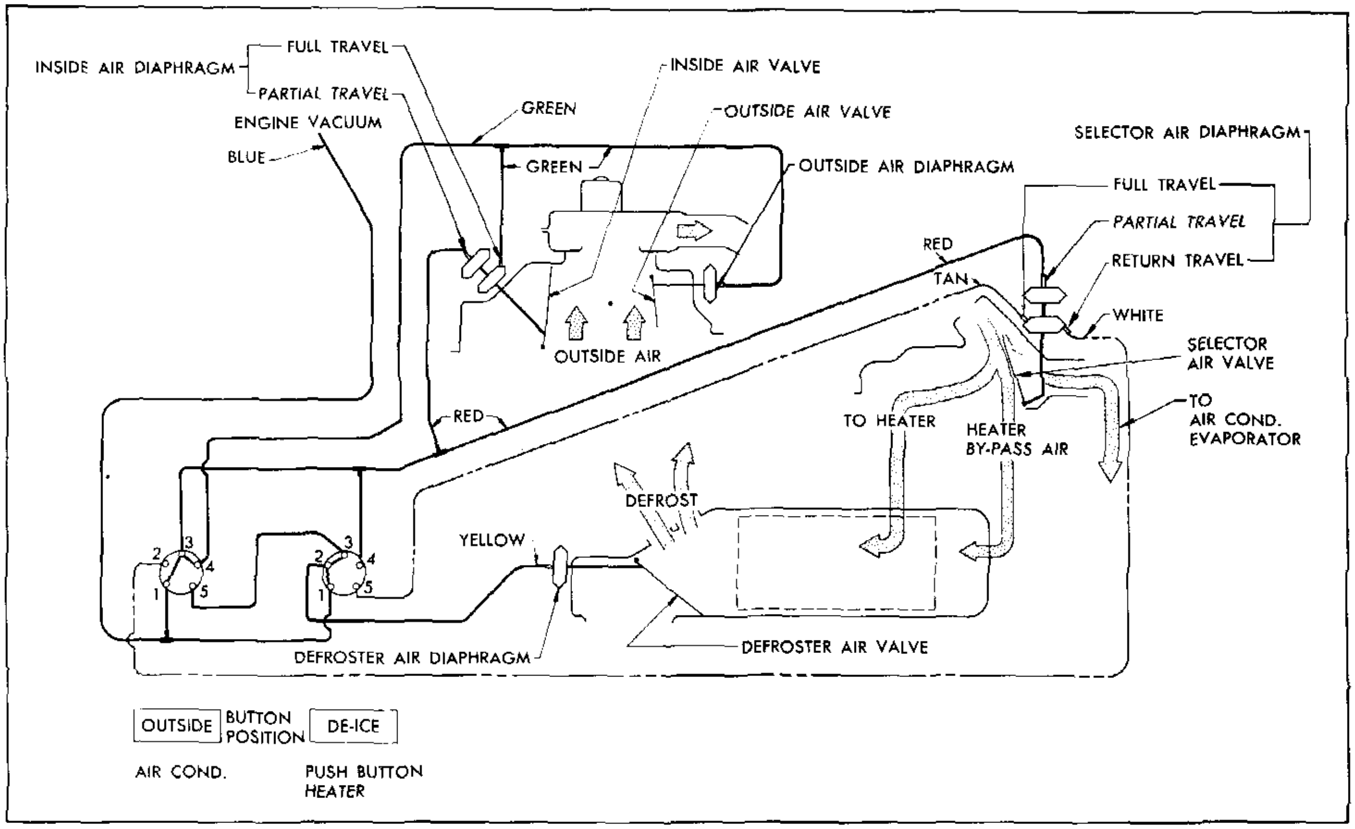


Fig. 6-28 Push Buttons: AC-OUTSIDE, Heater-DE-ICE.
Air Flow Through AC and Heater Systems—All Outside Air Equally Divided Between AC and Defroster and Heater Outlets.
(Vacuum in Dark Black Lines)

PUSH BUTTONS: AC—OUTSIDE, CIRC-L-AIRE HEATER—DE-ICE (See Fig. 6-28)

VACUUM—AC SYSTEM

When the "OUTSIDE" button is pushed in, the rotor part of the air conditioning vacuum switch moves to direct vacuum to the No. 1 post through the switch to the No. 3 and No. 4 post of the same switch.

Vacuum from the No. 4 post is directed to the full travel portion of the inside air diaphragm which moves the inside air valve to allow outside air to enter the air inlet duct. At its full travel position, the valve is now located to prevent air inside the car from entering the air inlet duct. Vacuum is also directed to the outside air diaphragm to open the valve, permitting outside air to enter the air inlet duct assembly.

Vacuum from the No. 3 post is directed to a "T" connector where it is applied to the partial travel portion of the inside air diaphragm and to the partial travel portion of the selector air diaphragm. The selector valve moves to permit air to enter the evaporator and air conditioning outlets and also the heater core and heater outlets. Vacuum from this "T" is also applied to the No. 4 post on the heater vacuum switch where it ends.

With vacuum on one side of these diaphragms and atmospheric pressure on the other, atmospheric pressure is sufficient to overcome the spring tension holding the valves closed, and force them to swing open.

VACUUM—HEATER SYSTEM

Depressing the "DE-ICE" button on the Circ-L-Aire heater control panel moves the rotor part of the heater vacuum switch to direct vacuum from the No. 1 post through the switch to the No. 2 and No. 3 posts of the same switch. Vacuum from the No. 2 post is directed to the defroster air valve diaphragm. Vacuum from the No. 3 post is directed to the No. 5 post on the air conditioning vacuum switch where it ends.

Atmospheric pressure on one side of the defroster air valve diaphragm is sufficient to overcome spring tension holding the defroster air valve (in the heater core and case assembly) up (closed), to cause the valve to swing open (down) permitting maximum flow of heater system air to be directed to the defroster outlets. Some air will also be emitted from the heater outlet nozzle.

ELECTRICAL

When the "OUTSIDE" button on the air conditioning control panel is pushed in, the electrical circuit is closed to energize the master control relay which closes the electrical circuit to the blower and compressor clutch switches.

Pushing the "DE-ICE" button causes the heater master switch and defroster switch to close the electrical circuit to the heater blower switch and to the blower motor (which by-passes the blower switch) regardless of the position of the blower control lever.

The speed of the blower motor will depend on the position of the air conditioning blower control lever; the fastest blower speed will depend upon the least resistance in the electrical circuit to the blower motor.

With the blower motor circuit closed the blower operates to pull air through the louvers on the top of the cowl into the blower and inlet air assembly. The blower then forces air through the evaporator and the heater core and case assembly. Air from the evaporator emits from the air conditioning outlets on the instrument panel. Most of the air from the heater core and case assembly is directed to the defroster nozzles with a slight amount out the heater air outlets.

PUSH BUTTONS: AC—INSIDE, CIRC-L-AIRE HEATER—DE-ICE (See Fig. 6-29)

VACUUM—AC SYSTEM

Pushing the "INSIDE" button moves the rotor part of the air conditioning vacuum switch to direct vacuum from the No. 1 post through the switch to No. 3 post of the same switch.

Vacuum from the No. 3 post is directed to a "T" connection where it is applied to the partial travel portion of the inside air diaphragm to move the inside air valve a slight amount. Since air from the inside of the car may enter the inlet air duct unrestricted, and the slight movement of the inside valve permits some outside air to enter the air inlet duct assembly, outside air mixes with inside air in the air inlet duct.

Vacuum is also directed to the partial travel portion of the selector air valve diaphragm. The selector valve moves to permit air to enter the evaporator and air conditioning outlets and also the heater core and heater outlets. Vacuum from this "T" is also applied to the No. 4 post on the heater vacuum switch where it ends.

With vacuum on one side of these diaphragms and atmospheric pressure on the other, atmospheric pressure is sufficient to overcome the spring tension holding the valve closed, and force them to swing open.

VACUUM—HEATER SYSTEM

Depressing the "DE-ICE" button on the Circ-L-Aire heater control panel moves the rotor part of the heater vacuum switch to direct vacuum from the No. 1 post through the switch to the No. 2 and No. 3 posts of the same switch. Vacuum from the No. 2 post is directed to the defroster air valve diaphragm. Vacuum from the No. 3 post is directed to the No. 5 post on the air conditioning vacuum switch where it ends.

Atmospheric pressure on one side of the defroster air valve diaphragm is sufficient to overcome spring tension holding the defroster air valve (in the heater core and case assembly) up (closed) to cause the valve to swing open (down) permitting maximum flow of heater system air to be directed to the defroster outlets. Some air will also be emitted from the heater outlet nozzle.

ELECTRICAL

When the "INSIDE" button is pushed in on the air conditioning control panel, the electrical circuit is closed to energize the master control relay and also the electrical circuit to the blower and compressor clutch switches.

Pushing the "DE-ICE" button causes the heater master switch and defroster switch to close the electrical circuit to the heater blower switch to close an electrical circuit directly to the blower motor (which by-passes the blower switch) regardless of the position of the blower control lever.

The speed of the blower motor will depend on the position of the air conditioning blower control lever; the fastest blower speed will depend upon the least resistance in the electrical circuit to the blower motor.

With the blower motor circuit closed, the blower operates to pull air from inside the car plus a little from outside of the car (entering through louvers at the top of the cowl). The blower then forces the air through the evaporator and heater core and case assembly. Air from the evaporator emits from the air

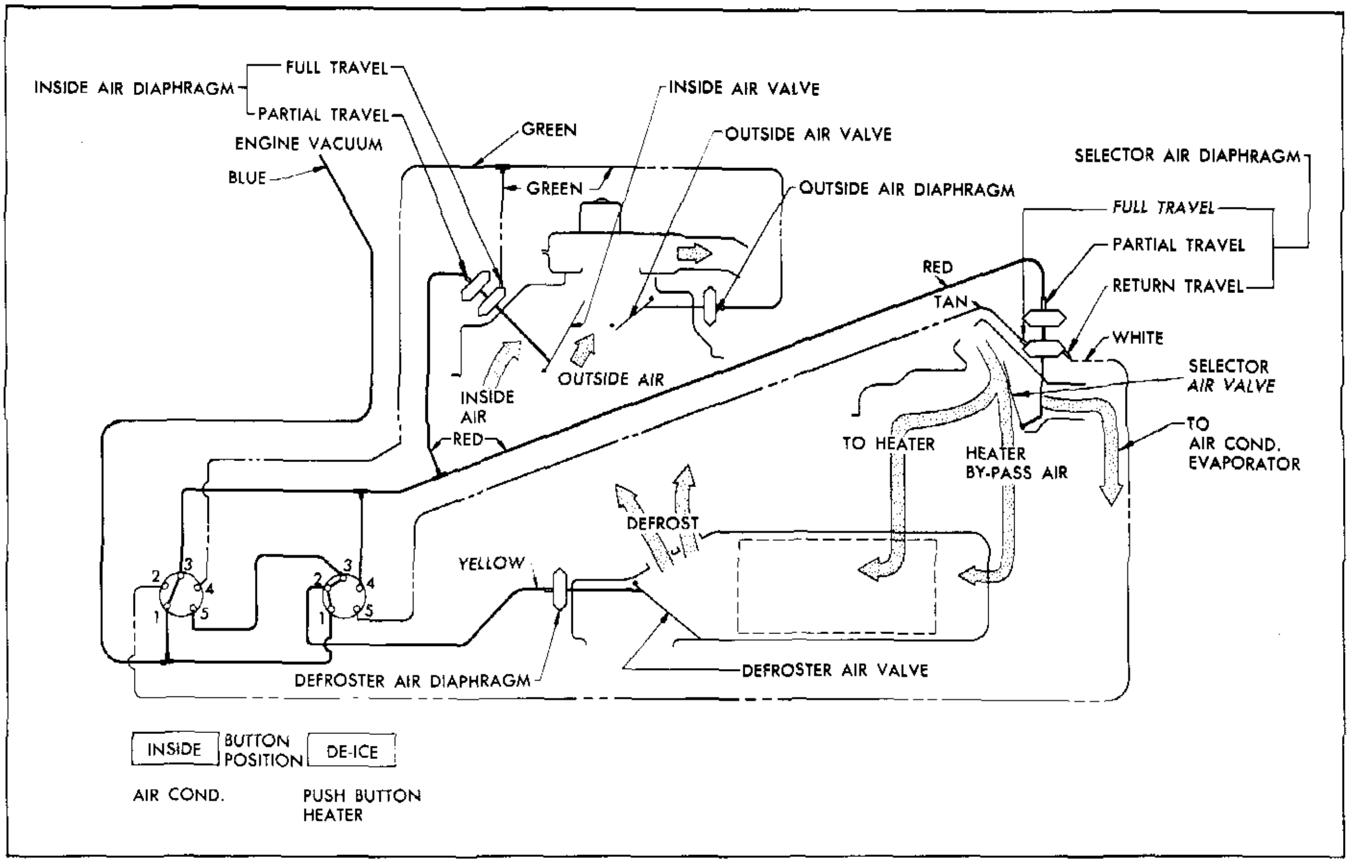


Fig. 6-29 Push Buttons: AC-INSIDE, Heater-DE-ICE.
Air Flow Through AC and Heater Systems—Majority of Air Recirculated and Equally Divided Between AC and Defroster and Heater Outlets. (Vacuum in Dark Black Lines)

conditioning outlets on the instrument panel. Most of the air from the heater core and case assembly is directed to the defroster nozzles with a slight amount out the heater outlets.

CIRC-L-AIRE CONDITIONING WITH DIRECT-AIRE HEATER (See Fig. 6-31)

A vacuum switch assembly is attached to the Direct-Aire heater control assembly (Fig. 6-30) and is operated by the "AIR" lever on the heater control. This vacuum switch construction is the same as the one used on the Circ-L-Aire heater control panel.

All air conditioning valve and vacuum operation will be the same as when used with the Circ-L-Aire heater since it is used in conjunction with the vacuum switch on the direct-aire heater control panel.

Since the defroster air valve is manually operated, the No. 2 post on the Direct-Aire heater vacuum switch (which would operate the defroster air valve diaphragm on the Circ-L-Aire heater) is plugged.

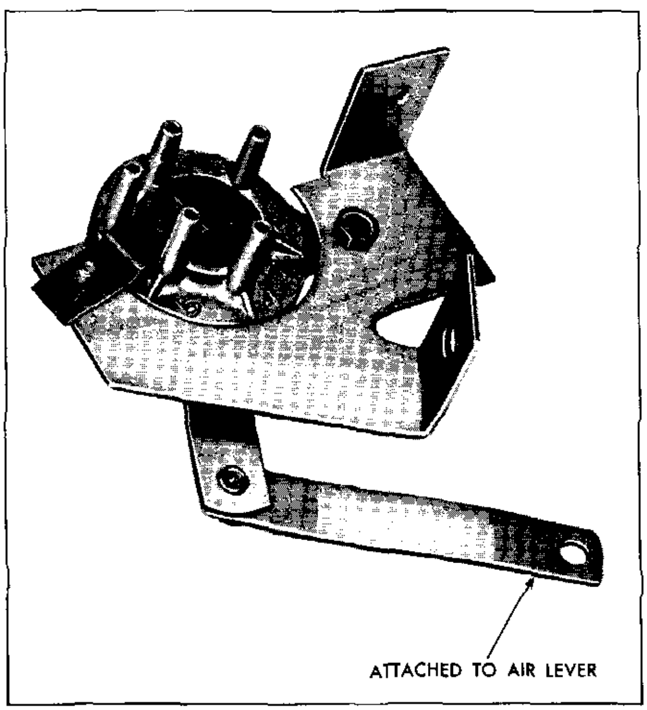


Fig. 6-30 Vacuum Switch on Direct-Aire Heater Control Panel

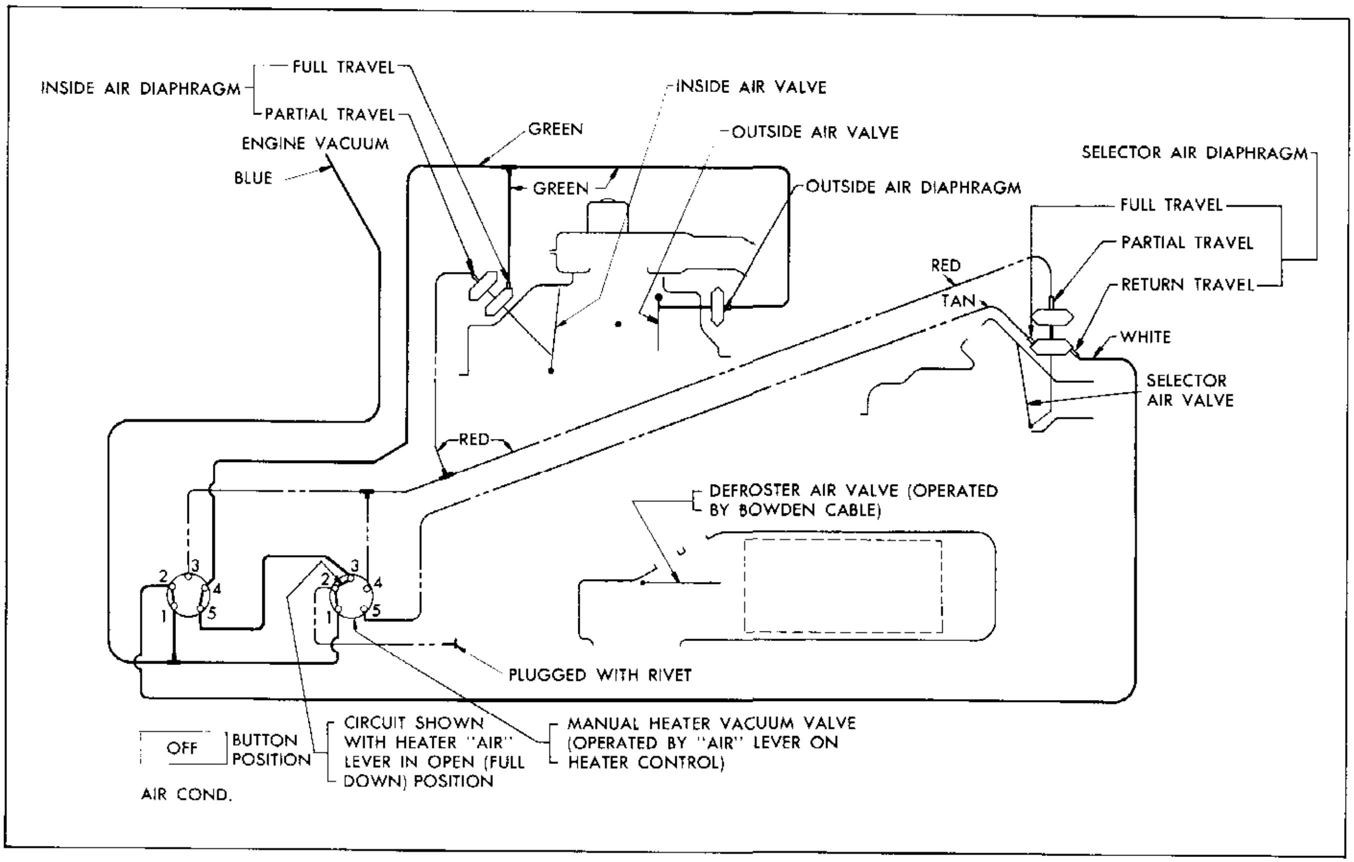


Fig. 6-31 Schematic Showing Vacuum System for Circ-L-Aire Conditioner and Direct-Aire Heater

CIRC-L-AIRE CONDITIONING ONLY

(See Fig. 6-32)

Operation of valves and vacuum circuits on cars equipped with Circ-L-Aire conditioning only, will be similar to those explained for PUSH BUTTONS: AC – OUTSIDE, CIRC-L-AIRE HEATER – OFF and PUSH BUTTONS: AC – INSIDE, CIRC-L-AIRE HEATER–OFF.

Since no heater is used the No. 5 post on the air conditioning vacuum switch is plugged. (This post would connect with the No. 3 post on a heater control vacuum switch.)

ELECTRICAL SYSTEM

The air conditioning and heater control lamps are connected with each other by a grey wire which is fed from the instrument panel rheostat output circuit on the fuse block. The blower circuit of the Circ-L-Aire system receives its electrical supply through a master control relay mounted on the upper part of the dash shroud just left of the windshield wiper motor. Overload protection of the air conditioning electrical system is provided by a 30 ampere fuse in a fuse holder line in front of the fuse block coming out of the wiring harness at the left and connecting the "AIR COND" terminal in the fuse block.

There are six terminals on the back of the ignition switch, used on all models without Circ-L-Aire Conditioning, and seven terminals on cars with Circ-L-Aire Conditioning (Fig. 6-33).

The terminal marked "BAT" is connected to the battery through the ammeter and supplies the power to the switch. The accessory terminal supplies power to the accessories when the switch is in the "ACC" or running positions. The "SOL" terminal supplies power to the solenoid to activate the starter in the start position. The terminal marked "GR" (ground) completes the test circuit for the temperature "HOT" indicator bulb when the switch is turned to the start position. These circuits are all open when the ignition switch is in the "OFF" or "START" positions.

When the ignition switch is turned to the start position, the accessory terminal of the ignition switch is cut out. At the same time, the "ground" terminal in the ignition switch is opened de-energizing the air conditioning electrical system to prevent operation

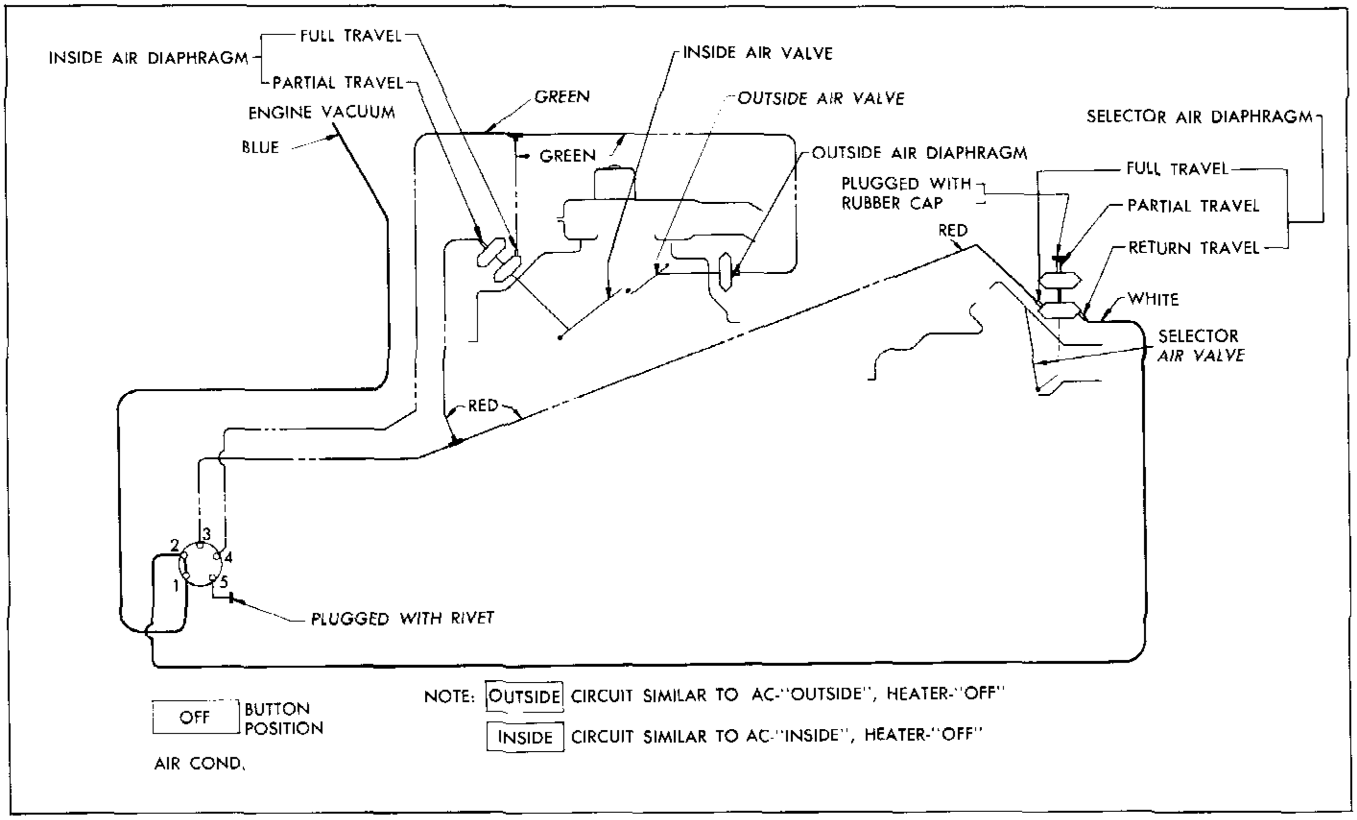


Fig. 6-32 Schematic Showing Vacuum System For Circ-L-Aire Conditioning Only

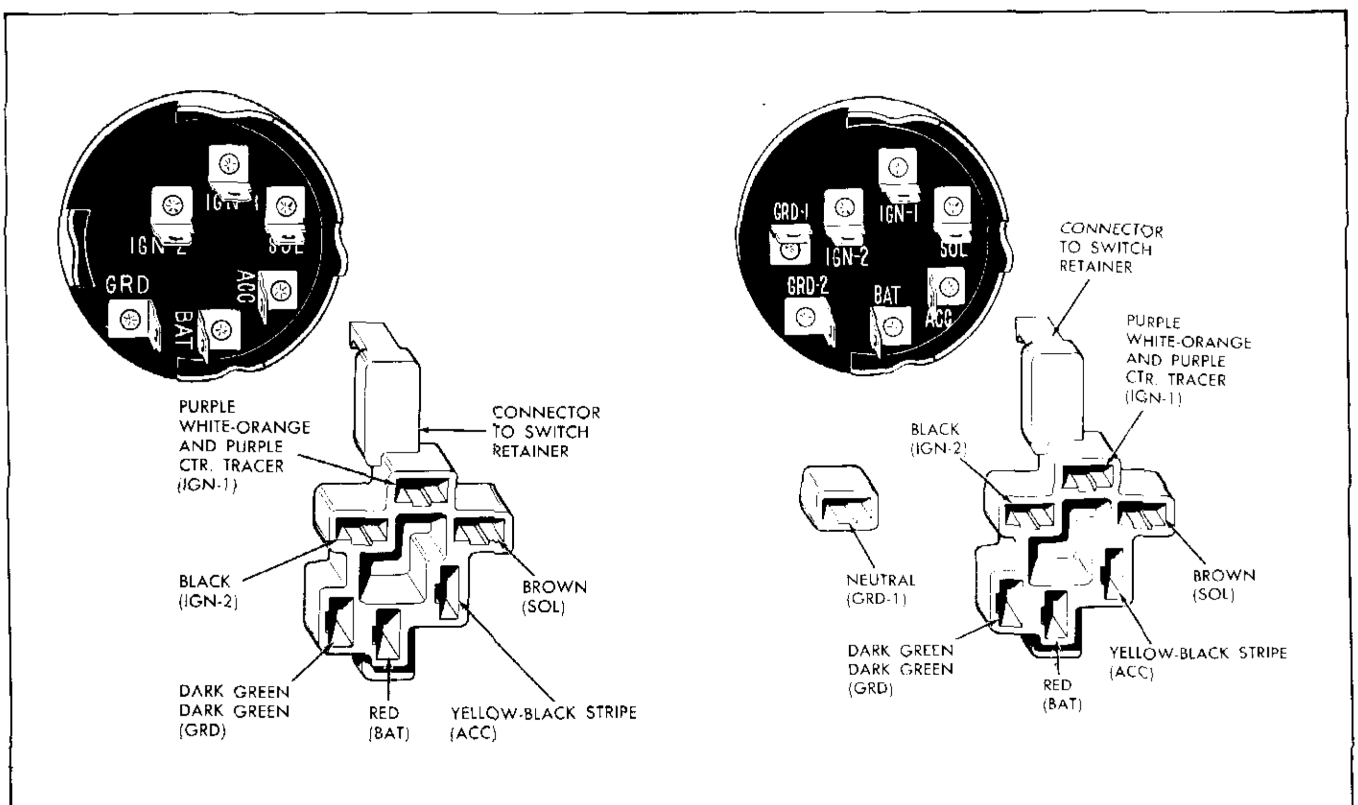


Fig. 6-33 Comparison of Back Side of Ignition and Starter Switch Assemblies

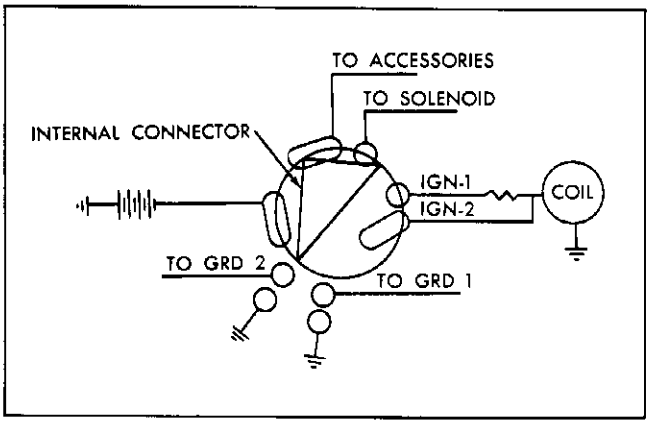


Fig. 6-34 AC Ignition Switch—Circuit Diagram "OFF" Position: No Current Flow—Switch Open

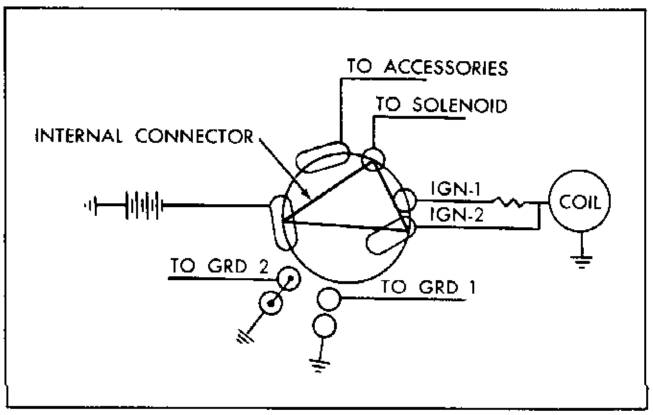


Fig. 6-35 All with Circ-L-Aire AC—Circuit Diagram "Start" Position—Contactors are shown in "IGN-2" (start) position. Current flows from the battery to and through the switch to the starter solenoid to operate engine electrical systems. No current flow through accessories circuit or Circ-L-Aire Conditioning circuit.

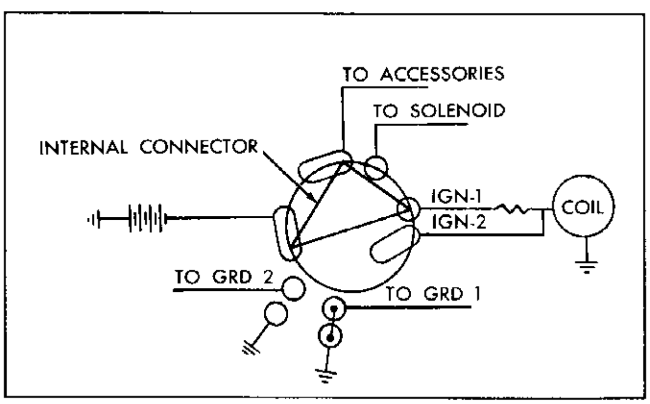


Fig. 6-36 All with Circ-L-Aire AC—Circuit Diagram "Run" Position—Contactors are shown in "IGN-1" (run) position. Current flow is from the battery to and through the switch to operate all engine electrical requirements as well as all accessories circuits.

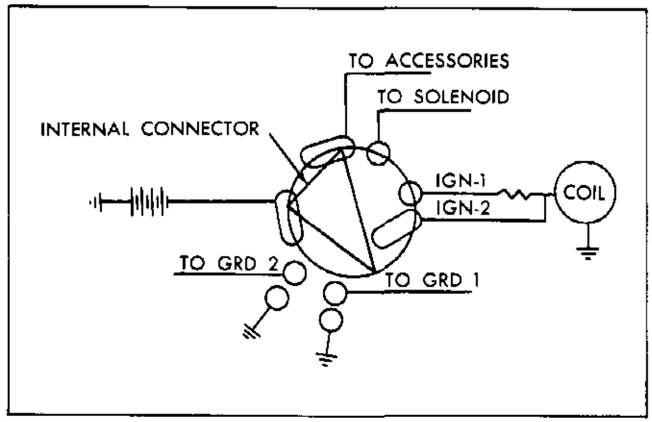


Fig. 6-37 All with Circ-L-Aire AC—Circuit Diagram "ACC." Position—Contactors are shown in "ACC" position. Current flow is from the battery to and through the switch to operate all accessories circuits except Circ-L-Aire Conditioning system. (The "GRD-1" connection inside the switch is open to prevent operation of the Circ-L-Aire Conditioning system.)

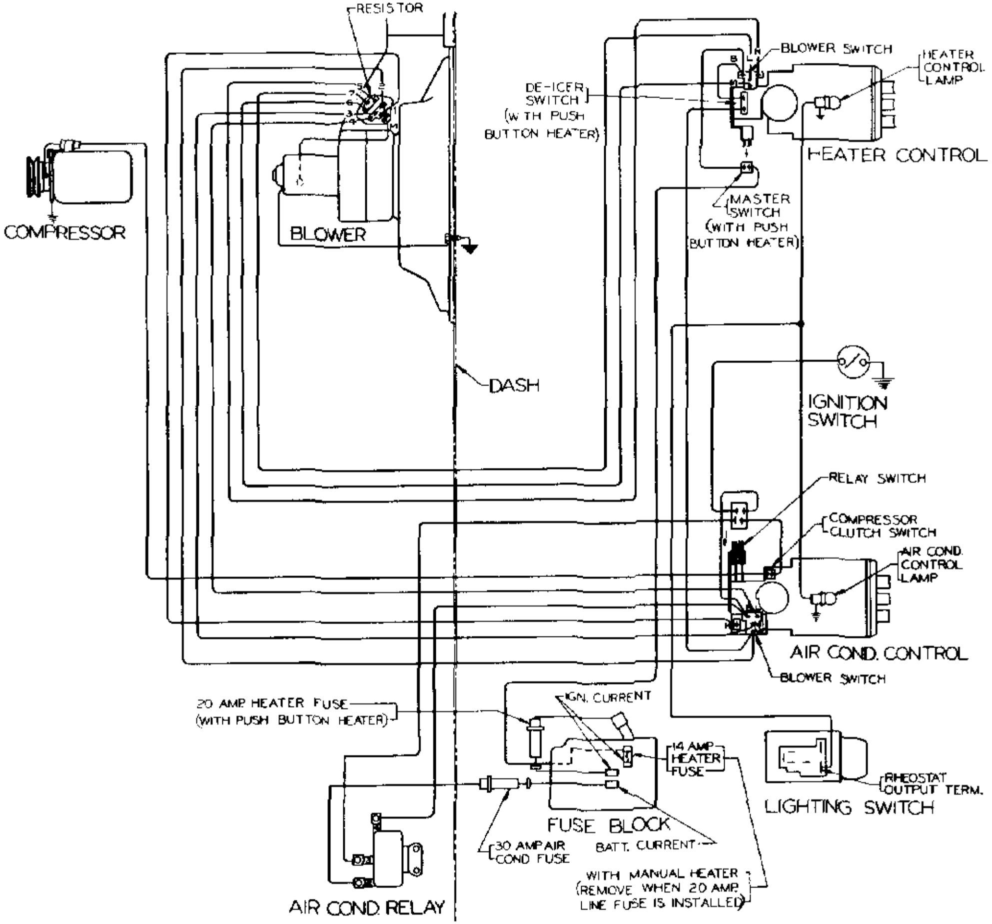
of the accessories and air conditioner while starting the engine. Thus, the starting motor does not have to turn the compressor while cranking the engine. See Figs. 6-34 through 6-37.

When the "OFF" push button is depressed, the relay control and ignition relay switch is opened and no current reaches the master control relay. The relay control switch is activated when either the "OUTSIDE" or "INSIDE" push button is depressed to energize the master control relay and the compressor clutch control switch. Current does not flow to the compressor clutch coil until the temperature control lever is moved down slightly from the full up position which closes the compressor clutch control switch. This feature allows the use of forced uncooled air for ventilation.

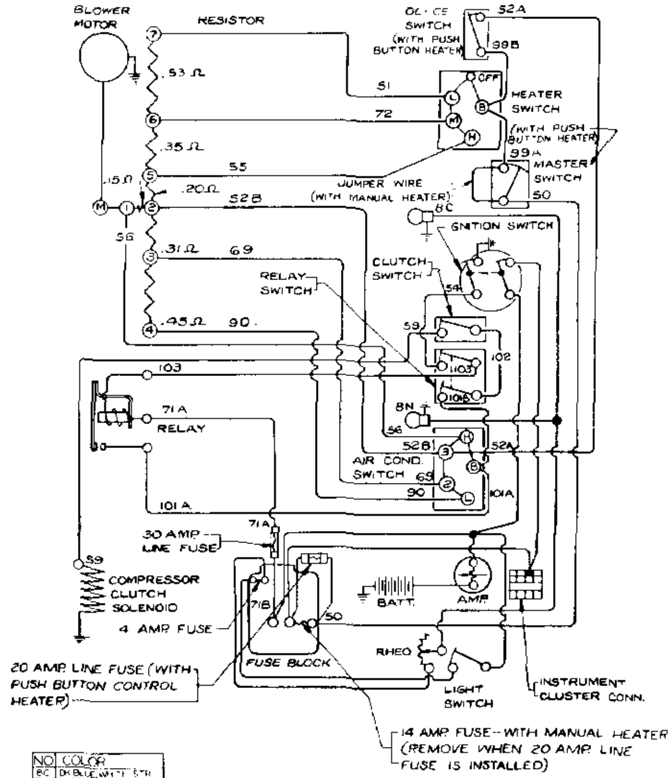
NOTE: The same blower is used to provide forced air for air conditioning and/or heater operation.

Wires for the heater blower switch and the air conditioning blower switch are contained in the same wire harness and are connected in parallel. This arrangement allows the use of the heater blower switch when the air conditioning control "OFF" button is pushed in, since the heater blower switch will then receive its current through a 20 ampere fuse at the "HTR" terminal on the fuse block. See Figs. 6-38 and 6-39.

The air conditioning blower switch provides for four blower speeds: "LO", "2", "3", and "HI." The heater blower switch is also a four position switch with positions of "OFF," "LO", "MED" and "HI".



SCHEMATIC DIAGRAM



NO	COLOR
8C	DK BLUE, WHITE STR
8N	GRAY
50	TAN
51	WHITE
52A	BLACK
52B	RED, WHITE STRIPE
54	WHITE
55	RED
56	BLACK
59	BLACK
69	YELLOW
71A	RED
71B	RED
72	BROWN
90	BROWN, WHITE STR
99A	TAN, WHITE STRIPE
99B	TAN, WHITE STRIPE
101A	LIGHT BLUE
101B	RED
102	YELLOW
103	GRAY

CIRCUIT DIAGRAM

Fig. 6-38 Schematic and Circuit Diagrams of Circ-L-Aire Conditioner Electrical System

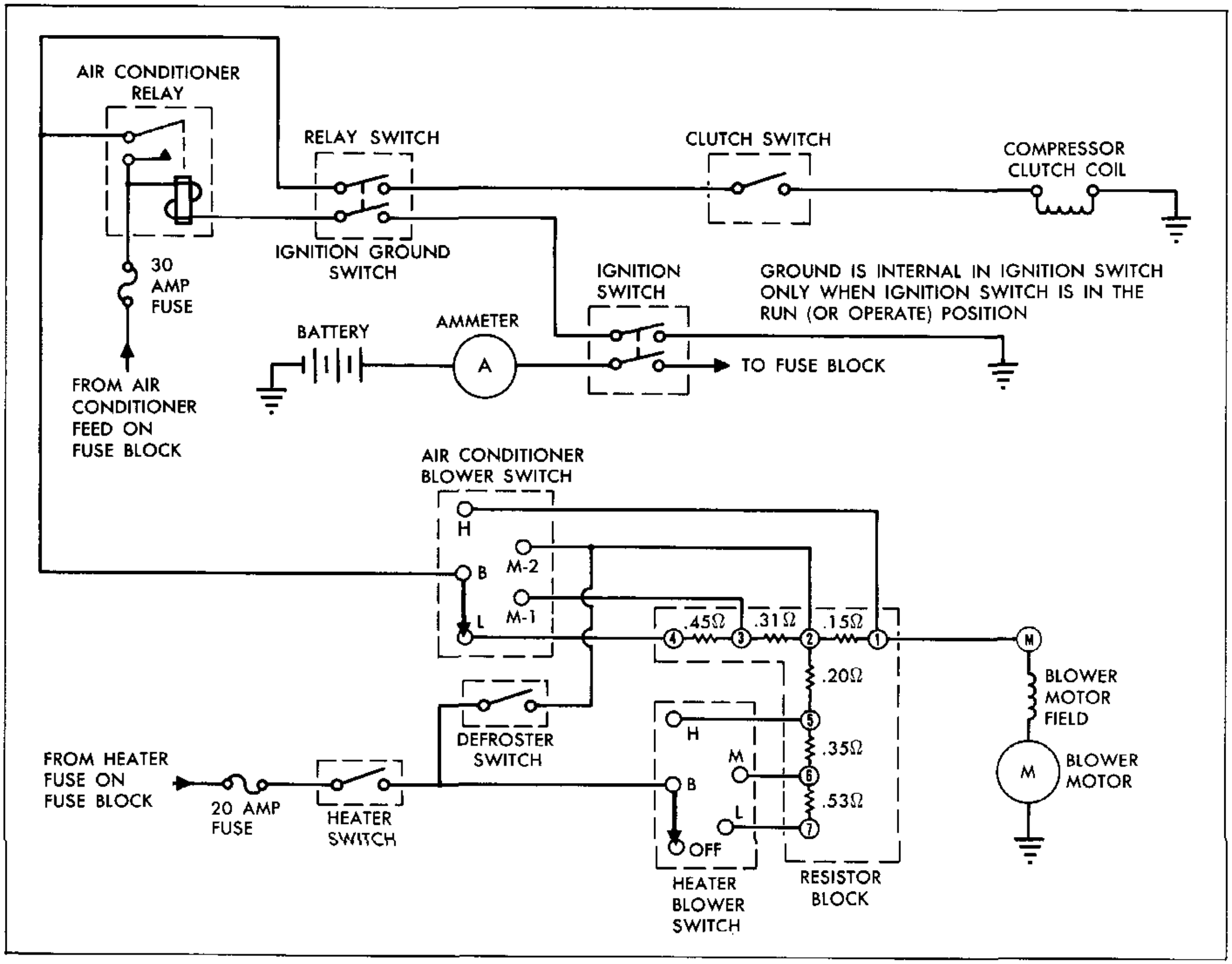


Fig. 6-39 Simplified Circuit Diagram of The Circ-L-Aire Conditioner Electrical System

The blower is fed through a single connection at its input; a black colored lead. Variable voltages to give the various blower speeds is accomplished by using resistances of different values. When the air conditioning blower control is in the "HI" position full system voltage is impressed on the black lead.

CURRENT FLOW AT AIR CONDITIONING CONTROL POSITIONS (HEATER OFF)

The blower is always on when the air conditioner is operating in order to prevent the possibility of evaporator freeze-up when car is driven very slowly or if car is stopped for any length of time with the engine running.

Four positions of the air conditioning blower control provide current to the blower as follows:

"LO" CURRENT

"LO" speed current flows from the master control relay to the air conditioning blower switch via a light blue wire at the input terminal, through the switch to the "LO" terminal and to the resistor assembly via a brown wire with a white stripe. Current continues through three resistors, (.45 ohm, .31 ohm, and .15 ohm) and to the blower motor via a black wire.

"2" CURRENT

"2" speed current flows from the master control relay to the air conditioning blower switch via a light blue wire, through the "2" terminal of the switch and through a yellow colored wire to the resistor assembly where it flows through two resistors (.31 ohm and .15 ohm) and then to the blower motor via a black colored wire.

"3" CURRENT

"3" speed current flows from the master control relay to the air conditioning blower switch via a light blue wire, through the "3" terminal of the switch and through a red wire with white stripe to the resistor assembly where it flows through one resistor (.15 ohm) and then to the blower motor via a black colored wire. A black colored wire connects the No. 3 terminal of this switch to the Circ-L-Aire heater "DE-ICE" switch.

"HI" CURRENT

"HI" speed current flows from the master control relay via a light blue wire to the air conditioning blower switch, through theb lower switch high terminal through a black wire to the resistor assembly and to the blower motor through a black colored wire. While the current flows through the resistor assembly, there is no resistance in the circuit through the resistor.

TEMPERATURE CONTROL LEVER

When the temperature control lever is moved down slightly from its full up position, the compressor clutch control switch closes, permitting current to flow via a black wire to the compressor clutch coil to energize the coil. Current will continue to flow through the clutch coil until the temperature control lever is placed in the full up position or the "OFF" button is depressed.

CURRENT FLOW AT HEATER CONTROL POSITIONS (AC OFF)

"OFF" PUSH BUTTON DEPRESSED ON CIRC-L-AIRE HEATER OR DIRECT-AIRE HEATER SWITCH OFF

In the "OFF" position, the heater master switch is open and prevents the flow of current.

"NORMAL" PUSH BUTTON DEPRESSED (ON CIRC-L-AIRE HEATER)

With the "NORMAL" push button depressed, the master switch is closed, permitting current to flow to the heater blower control switch, which in turn permits current flow to the blower as follows:

"FAN" CONTROL LEVER IN "OFF" POSITION

"OFF" position places the heater blower switch to prevent the flow of current through the switch.

"FAN" CONTROL LEVER IN "LO" SPEED POSITION

The "FAN" control lever at "LO" provides for low speed current to flow from the fuse block (HTR terminal) to the heater master switch via a tan colored wire. Current flows through the switch, via a tan colored wire with a white stripe to the heater blower switch, through this switch to the resistor assembly via a white colored wire, through four resistor coils in the resistor assembly (totaling 1.23 ohms) to the blower motor via a black wire.

A black colored wire serves as a "jumper" around the master switch on cars with Direct-Aire heater.

"FAN" CONTROL LEVER IN "MED" SPEED POSITION

The "FAN" control lever at "MED" provides for low speed current to flow from the fuse block (HTR terminal) to the heater master switch via a tan colored wire. Current flows through the switch, via a tan colored wire with white stripe to the heater blower switch, through this switch to the resistor assembly via a brown colored wire, through three resistor coils in the resistor assembly (totaling 0.70 ohms) to the blower motor via a black wire.

A black colored wire serves as a "jumper" around the master switch on cars with Direct-Aire heater.

"FAN" CONTROL LEVER IN "HI" SPEED POSITION

The "FAN" control lever at "HI" provides for "HI" speed current to flow from the fuse block (HTR terminal) to the heater switch via a tan colored wire.

Current flows through the switch via a tan colored wire with a white stripe to the heater blower switch, through this switch to the resistor assembly via a red colored wire, through two resistor coils in the resistor assembly (totaling 0.35 ohms) to the blower motor via a black colored wire.

A black colored wire serves as a "jumper" around the master switch on cars with Direct-Aire heater.

"DE-ICE" PUSH BUTTON DEPRESSED (CIRC-L-AIRE HEATER ONLY)

When the "DE-ICE" button is pushed in the heater master switch closes to supply current to the defroster switch.

Current flows from the fuse block (HTR terminal) to the heater master switch via a tan colored wire. Current flows through this switch through a tan

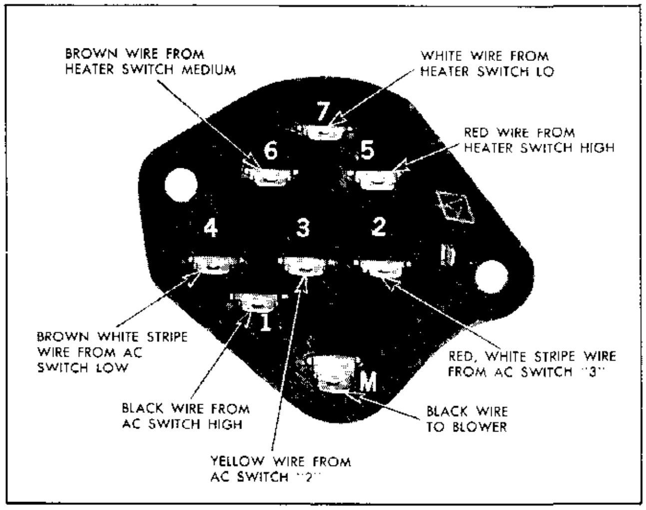


Fig. 6-40 Identification of Terminals on Resistor Assembly

colored wire having a white stripe to the current input side of the heater blower switch and then to the defroster switch through a tan colored wire having a white stripe, through the defroster switch to the air conditioning blower motor switch "3" terminal (a double connector) via a black colored wire, to the resistor assembly via a red colored wire having a white stripe, through one coil of the resistor assembly (having a value of 0.15 ohms) and to the blower motor via a black colored wire.

The "DE-ICE" current flow has less resistance than either the heater blower "LO", "MED" or "HI" speed positions. The blower will operate at "DE-

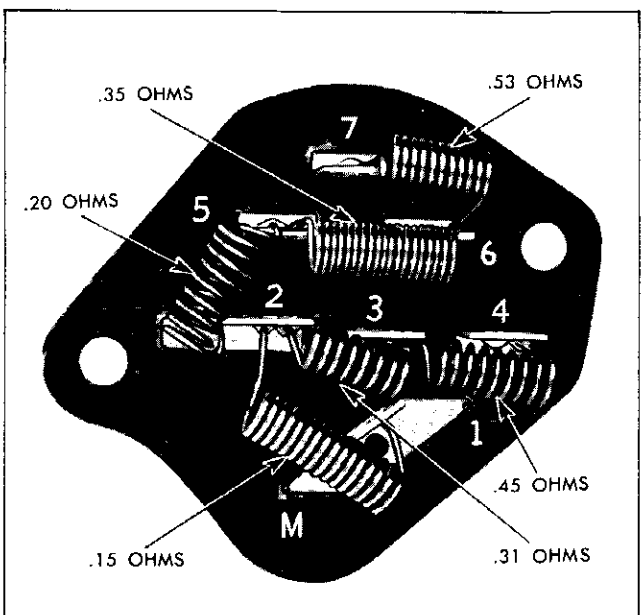


Fig. 6-41 Resistance Values of Resistor Assembly Coils

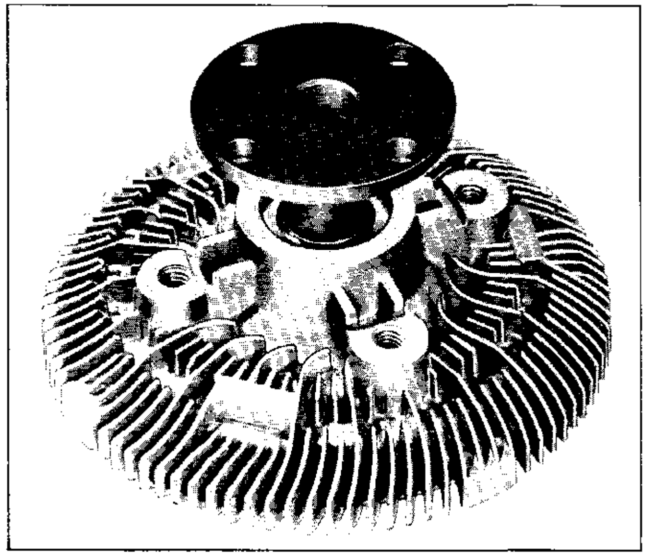


Fig. 6-42 Fan Fluid Clutch Assembly

ICE" speed regardless of the position of the heater blower control lever, providing the "DE-ICE" button is depressed.

THERMOSTATIC CONTROLLED ENGINE FAN FLUID CLUTCH

A thermostatically controlled engine fan fluid clutch is used on Circ-L-Aire conditioned equipped cars and operates only when additional air flow is required to reduce radiator coolant temperatures.

This clutch is of simple functional design and is made of light weight metal filled with silicone oil and is hermetically sealed. The finned (rear) housing contains a hub assembly (secured to the housing bearing) which attaches to the engine water pump (Fig. 6-42). Four bosses with tapped holes (in the rear face) provide for attachment of the engine fan. The front surface of the housing has six deep circular grooves which index with six matching bosses on the rear face of a floating clutch. A separator plate and front cover (with thermostatic coil control) complete the clutch assembly.

During periods of operation when radiator discharge air temperature is low (below approximately 150°F), the fan clutch limits the fan speed to 800-1400 r.p.m. In this position, the clutch is disengaged since a small oil pump driven by the separator plate forces the silicone oil into the reservoir between the separator plate and the front cover assembly. In this position also, the passage from this cavity to the clutch area is closed by the coil spring leaf valve.

As operating conditions produce a high radiator discharge air temperature (above approximately 150°F), the temperature sensitive bi-metal coil tightens to move the leaf valve (attached to the coil) which opens a port in the separator plate allowing flow of silicone oil into the clutch chamber to engage clutch providing a maximum fan speed of approximately 2200 r.p.m.

The clutch coil is calibrated so that at road load with an ambient temperature of approximately 90°F, the clutch is just at a point of shift between high and low fan speed.

No attempt should be made to disturb the calibration of the engine fan clutch assembly as each assembly is individually calibrated at the time of manufacture.

INSPECTION AND PERIODIC SERVICE

CONTENTS OF THIS SECTION

NEW CAR PRE-DELIVERY INSPECTION

1. Check compressor belt tension to 100-105 lbs. indicated on the Borroughs Belt Tension Gauge.

2. Check all hose and air duct connections for tightness.

3. Operate system and check for correct operation in all control positions.

NOTE: This step and step 5 can be done in conjunction with the pre-delivery road test.

4. Check for refrigerant leaks (Fig. 6-43) and observe the refrigerant passing through the liquid indicator with system operating to see if there is any evidence of bubbles (above 70°F. ambient).

NOTE: This check can be made immediately after the pre-delivery road test provided the system was operated during the road test.

a. If a refrigerant leak is detected, correct leak. If necessary to replace parts, evacuate and charge system after new parts are installed.

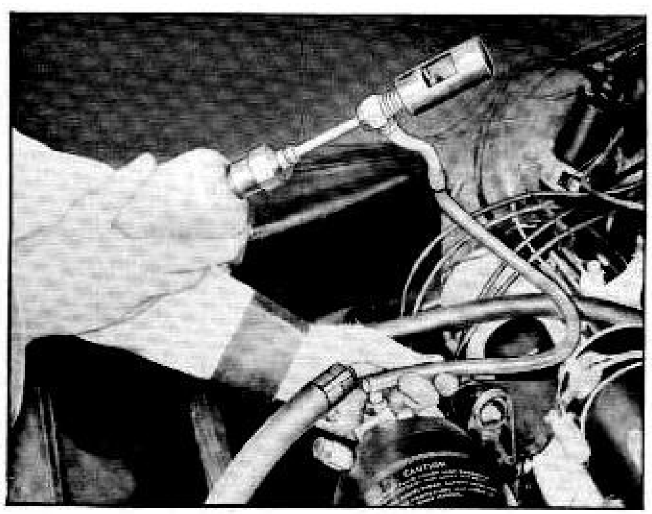


Fig. 6-43 Checking for Leaks

b. If a refrigerant leak is detected and the leak can be corrected without changing parts, bleed system slowly through discharge fitting valve until bubbles appear in the liquid indicator with the temperature control lever at the full cold position. Depress "OUTSIDE" or "INSIDE" button. Place blower on "HI" and temperature control lever down to full cold. Add one pound of Refrigerant-12. See ADDING REFRIGERANT-12.

c. If bubbles are visible in the liquid indicator (above 70°F. ambient) and no leaks are evident, it indicates partial or complete plug in a line or a lack of refrigerant in the system. Correct condition. Add refrigerant until the liquid indicator clears, then add another one pound of refrigerant.

5. Check ambient air temperature and air temperature at outlets on instrument panel in accordance with the operational test procedure. Temperature should correspond to those in the SYSTEM PRESSURES AND TEMPERATURE chart.

6. Check and adjust engine idle—540-560 RPM with air conditioning off. (Hydra-Matic transmission in Drive range, Synchro-Mesh transmission in Neutral.)

2000 MILE INSPECTION

1. Inspect all connections for presence of oil on any of the refrigerant system parts which could indicate a refrigerant leak. If oil is evident, check for leaks and repair as necessary.

a. If a refrigerant leak is detected, correct leak. If necessary to replace parts, evacuate and charge system after new parts are installed.

b. If a refrigerant leak is detected and leak can be corrected without changing parts, bleed system slowly through discharge fitting valve until bubbles appear in liquid indicator. Add one pound of refrigerant. See ADDING REFRIGERANT-12.

c. If bubbles are visible in the liquid indicator (above 70°F. ambient) with the temperature control lever at the full cold position and no leaks are evident, it indicates partial or complete plug in a line or a lack of refrigerant in the system. Correct condition. Depress "OUTSIDE" or "INSIDE" button. Place blower on "HI" and temperature control lever down for full cold. Add refrigerant until the liquid indicator clears, then add another one pound of refrigerant.

2. Check compressor belt tension. If below 70 lbs. adjust to 100-105 lbs. indicated on the Borroughs Belt Tension Gauge.

3. Check hose and air duct connections for tightness.

4. Operate system for five minutes at 1500 RPM with temperature control lever at full down and blower control lever down for high speed. Liquid indicator should be clear (above 70°F. ambient).

If bubbles are visible when temperature control lever is at the full cold position it indicates a lack of refrigerant in the system. Correct as necessary and charge system as explained in step one above.

NOTE: This check can be made immediately after the regular road test which is part of the 2000 Mile Inspection, provided the system is operated during the road test.

PERIODIC SERVICE

EVERY 2000 MILES

1. Inspect condenser and radiator cores to be sure they are not plugged with leaves or other foreign materials. Be sure to check between the condenser and radiator cores as well as the outer surfaces.

2. Check to ensure that the evaporator drain is open.

TWICE A YEAR OR EVERY 10,000 MILES

Twice a year or every 10,000 miles make a complete maintenance schedule test of the system.

1. Clean out front of condenser to remove all obstruction, such as leaves, bugs, dirt, etc. Be sure that the space between the condenser and radiator is also free of this material.

2. Check to insure that the evaporator drain is open.

3. Check and adjust the temperature regulator valve cable.

4. Check compressor for sufficient oil.

5. Inspect compressor drive belt. Check and adjust belt tension.

6. Check to see that the air distributor hoses are connected.

7. Check electrical circuit for proper operation of relays, compressor clutch and blower control switches.

8. Adjust engine idle to 540-560 RPM, with air conditioning "OFF" (Hydra-Matic transmission in Drive range, Synchro-Mesh transmission in Neutral).

9. Check all vacuum connections to diaphragm operating valves.

10. Perform operation test.

ADJUSTMENTS ON CAR

COMPRESSOR BELT

NOTE: Check compressor belt tension, adjust if looseness is indicated by slipping or tension is below 70 lbs. on Borroughs Belt Tension Gauge. Adjust as follows:

1. Loosen compressor two front and rear mounting plate adjusting slot bolts, compressor two front and rear pivot bolts and compressor rear bracket adjusting strap bolt.

2. Swing air conditioning compressor outward to obtain a belt tension of 100-105 lbs. using the Borroughs Belt Tension Gauge.

3. Tighten compressor rear mounting plate adjusting slot bolt, and two front adjusting bolts. Tighten pivot bolts.

TEMPERATURE REGULATION VALVE CONTROL CABLE ADJUSTMENT

The purpose of this adjustment is to insure that the air conditioner refrigeration system will give maximum cooling performance when required.

1. Disconnect the Bowden cable loop from the temperature regulation valve cam lever, and disconnect spring.

2. Pull the Bowden cable loop as far forward (toward front of car) as possible.

3. Move the temperature regulation valve cam lever forward (toward front of car) and return slowly until the lever just contacts the nylon plunger. Hold in this position.

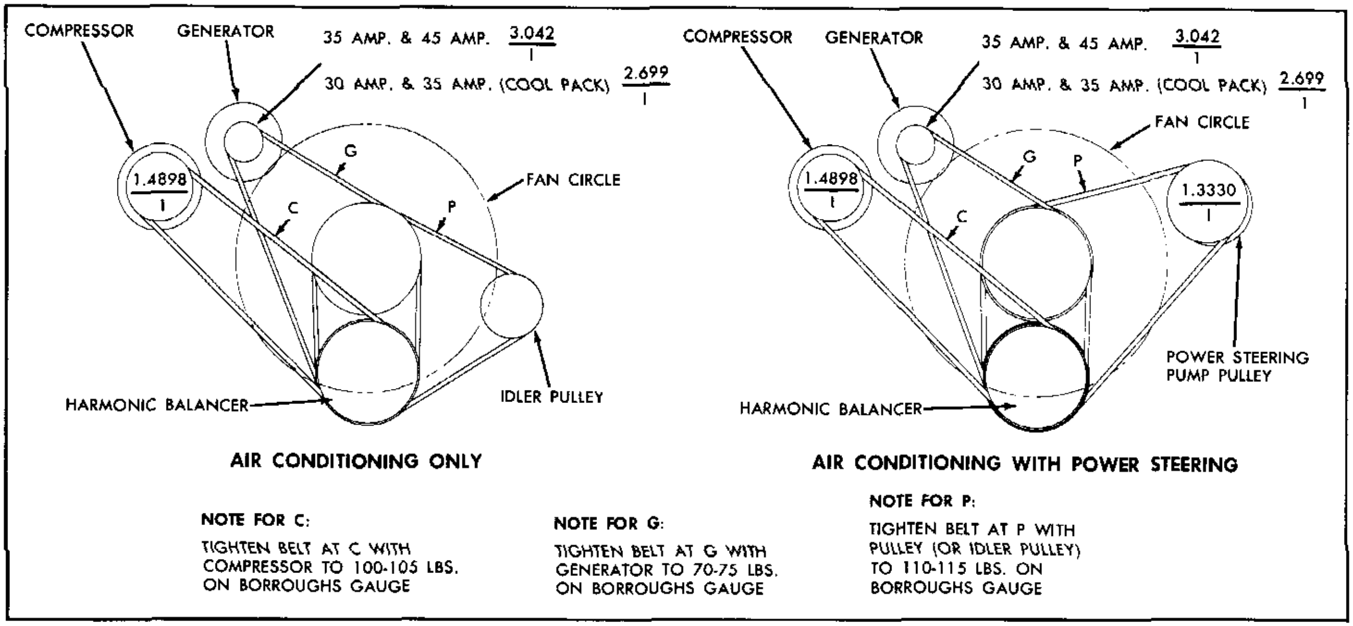


Fig. 6-44 Engine Drive Belt Combinations

4. If cable loop does not extend ⅛" ahead of the temperature regulation valve cam lever pin, adjust the Bowden cable adjusting nuts at the temperature regulation valve and position Bowden cable housing as required.

5. Tighten Bowden cable housing adjustment nuts.

6. Install Bowden cable loop on temperature regulation valve cam lever pin and connect spring.

TEMPERATURE REGULATION VALVE ADJUSTMENT

The purpose of this adjustment is to provide evaporator core freeze protection with maximum cooling efficiency.

NOTE: It is essential that the temperature regulation valve control cable be properly adjusted prior to conducting this check.

1. Check calibration of suction gauge and connect low pressure side of the manifold gauge set J-5725 or J-5725-01 using J-5420 Schrader valve adapter to the Schrader valve located in the suction side of the compressor fitting (valve) assembly.

2. Connect the high pressure side of the gauge set using J-6163 Schrader valve adapter (90°) to the Schrader valve located in the discharge side of the compressor fitting (gauge) assembly.

3. Push temperature control lever full down for maximum cooling. In this position the valve lever cam should just contact the nylon plunger. (See TEMPERATURE REGULATION VALVE CONTROL CABLE ADJUSTMENT.)

4. Depress "INSIDE" button and position blower on "HI".

5. Close car doors and windows.

6. Start engine and slowly increase speed to run at 2900 RPM. Operate for at least 3 minutes.

7. After three minutes, observe low pressure gauge and adjust temperature regulation valve only if reading (on suction gauge) is not to the specification for the ambient temperature.

NOTE: If adjustment of temperature regulation valve is necessary, proceed as follows:

a. Remove temperature regulation valve lever and nylon plunger, and insert adjusting tool J-6389 into the front end of the valve.

b. Obtain proper pressure reading on the suction gauge by turning adjusting tool clockwise to increase pressure or counterclockwise to decrease pressure.

NOTE: It is important that changes be made in small increments, with time allowed for the pressure to stabilize.

c. Install and adjust temperature valve control cable at temperature regulation valve so that valve lever cam just contacts nylon plunger in maximum cold position. (See TEMPERATURE REGULATION VALVE CONTROL CABLE ADJUSTMENT.)

CLUTCH CONTROL SWITCH ADJUSTMENT

The purpose of this adjustment is to insure an open circuit to the compressor clutch coil when the temperature control lever is in the full up position.

This switch may be adjusted without removing the air conditioning control assembly.

Adjust clutch control switch to insure an open circuit to the compressor clutch coil when the temperature control lever is in the full up position. The switch should close electrical circuit to compressor coil when the temperature control lever is moved downward 1/4" from the full up position.

MINOR SERVICES AND REPAIRS—MECHANICAL

CONTENTS OF THIS SECTION

The following services and repairs concern parts of the air conditioning system which can be serviced without opening the refrigeration system. Before attempting any repairs which require opening refrigerant connections, see MINOR SERVICES AND REPAIRS—REFRIGERATION.

TEMPERATURE REGULATION VALVE CONTROL CABLE

REMOVE AND REPLACE

1. Disconnect temperature regulation valve control cable at temperature regulation valve and detach cable from clamp at blower housing.

2. Disconnect cable at air conditioning control panel assembly.

3. Attach a stout piece of cord or wire (approximately 6 feet long) to the control panel end of the cable and remove cable leaving end of cord on engine side of dash.

4. Detach cable from cord (or wire) and attach new cable to cord. Before installation, inspect the new cable to be sure that it is free of kinks, and that the cable "eyes" are centered with the cable.

5. Pull cable through dash and attach to control panel so cable housing extends through the cable clamp and ¼" beyond (Fig. 6-45).

6. Attach control cable to temperature regulation valve, and secure clamps.

7. Adjust temperature regulation valve control cable.

BLOWER SWITCH

REMOVE AND REPLACE

The blower switch may be replaced without removing the air conditioning control panel assembly.

1. Disconnect wire connector at blower switch.

2. Remove blower switch lever plastic rivet. Push the plastic center pin out of the plastic rivet and then the rivet can be pushed out of the switch lever.

3. Remove blower switch and switch lever arm as an assembly by removing the two switch attaching screws (Fig. 6-46).

4. Attach the new blower switch to the control assembly with the two screws finger tight.

5. Replace plastic hinge rivet by inserting the rivet and then the plastic center pin.

6. With the blower control lever in the full up position in the control panel, move switch body to engage the "LO" detent and tighten blower switch mounting screws.

CLUTCH CONTROL SWITCH

REMOVE AND REPLACE

The clutch control switch may be replaced without removing the air conditioning control panel assembly.

1. Disconnect wires at clutch control switch.

2. Remove clutch control switch by removing two switch attaching screws (¼") (Fig. 6-47).

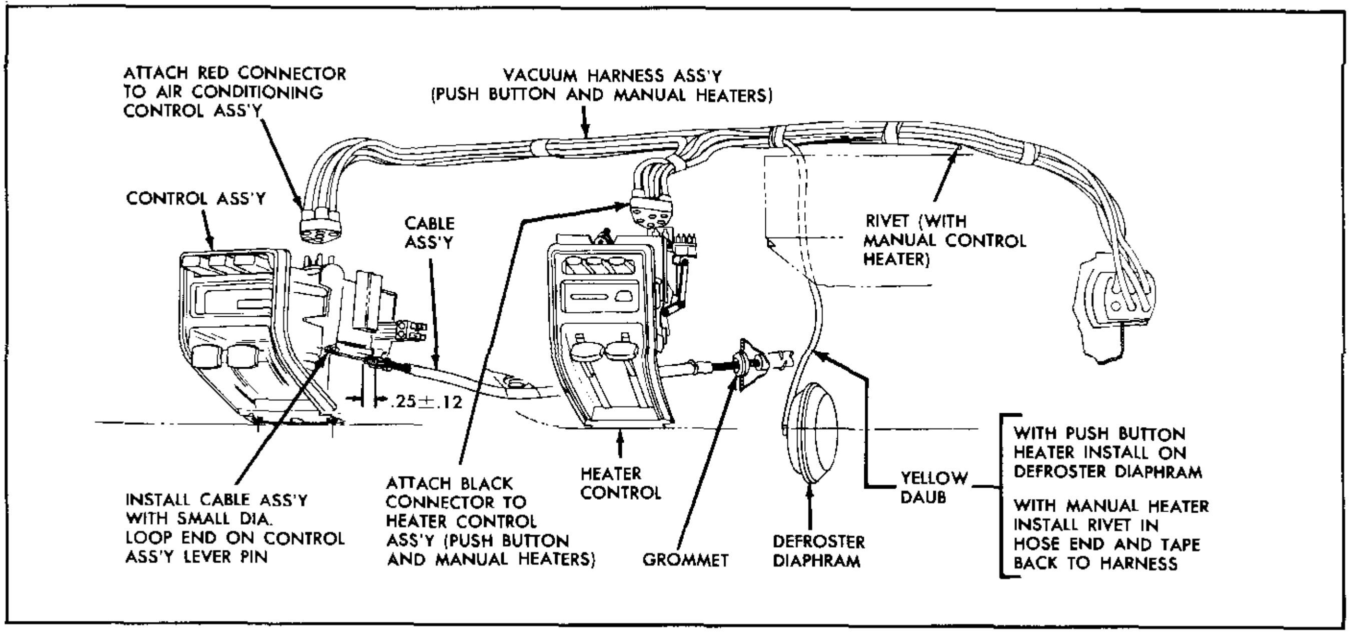


Fig. 6-45 Installation of Cables at Control Panel

3. Replace switch and attach wires.

NOTE: The sliding switch release bar should be in front of (towards engine) the switch release lever (plastic end).

4. Adjust the clutch control switch to insure an open circuit to the compressor clutch coil when the temperature control lever is in the full up position. The switch should close the electrical circuit to the compressor coil when the temperature control lever is moved downward ¼" from the full up position.

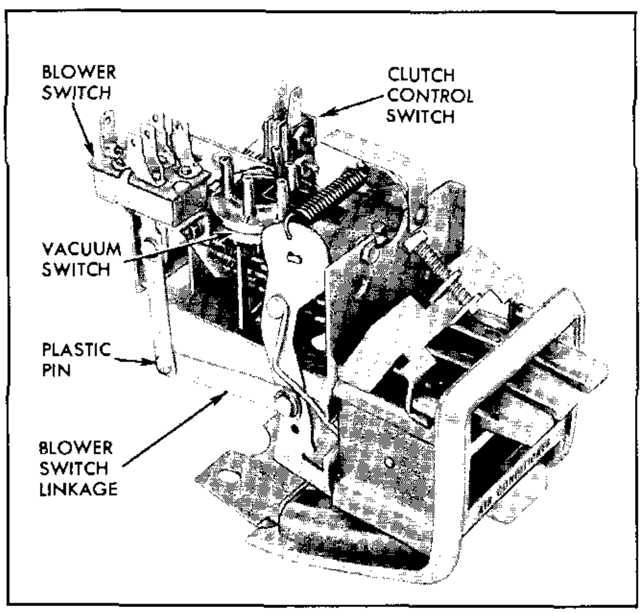


Fig. 6-46 Control Panel Blower Switch and Linkage

RELAY CONTROL SWITCH

REMOVE AND REPLACE

The relay control switch may be removed without removing the air conditioning control panel assembly.

1. Disconnect wire connector at switch.

2. Remove relay control switch (Fig. 6-47).

3. Replace relay control switch so plastic portion of switch makes good contact with the "OFF" sliding bar when either the "OUTSIDE" or "INSIDE" button is depressed. Plastic ends of switch should *not*

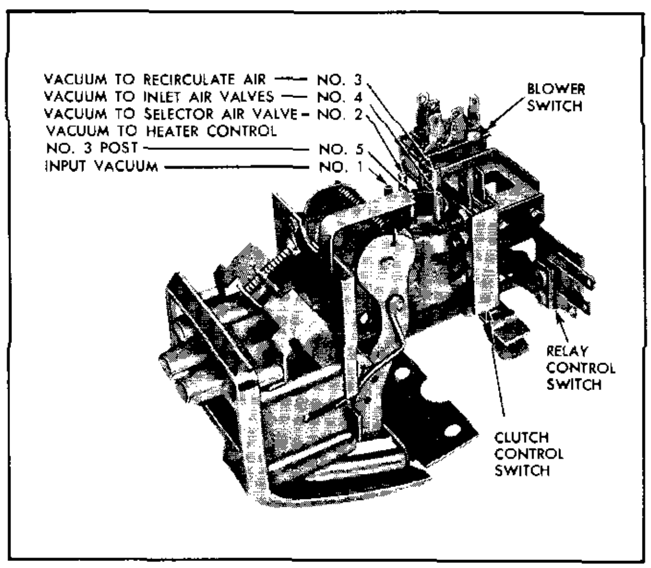


Fig. 6-47 Location of Clutch and Relay Control Switches

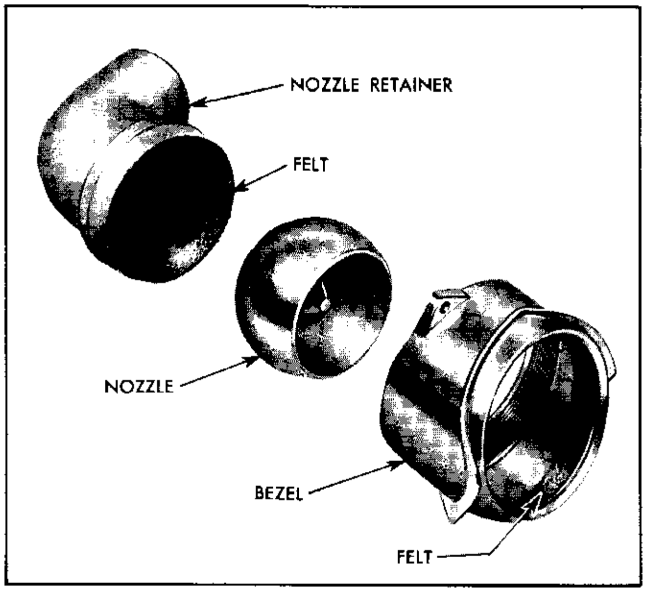


Fig. 6-48 Bezel and Nozzle Assembly—Exploded View

contact front portion of control assembly but rather extend through "window" in the front (towards engine) of the control assembly.

AIR CONDITIONING CONTROL PANEL ASSEMBLY

REMOVE AND REPLACE TO SERVICE ASSEMBLY

1. Disconnect battery.

2. Remove two control panel to instrument panel lower attaching screws.

3. Disconnect wire connectors from control assembly.

4. Disconnect temperature valve control cable.

5. Loosen control panel to instrument panel upper screw (from back side of instrument panel).

6. Pull control panel out of instrument panel far enough to disconnect vacuum hoses, temperature regulation valve control cable and wires.

7. Disconnect vacuum hose connector and remove control assembly.

8. Service assembly as necessary, free up sliding levers, etc.

9. Replace by reversing the above procedure.

10. Adjust temperature regulation valve control cable.

11. Connect battery.

VACUUM SWITCH

REMOVE AND REPLACE

1. Remove control panel assembly.

2. Remove vacuum switch.

3. Replace by reversing the above procedure, using new vacuum switch and switch felt retainer (in service switch package).

4. Adjust temperature regulation valve control cable.

BEZEL AND NOZZLE ASSEMBLY

REMOVE AND REPLACE

The bezel and nozzle assembly consists of a bezel, nozzle front bearing felt, nozzle, nozzle rear bearing felt and a nozzle retainer (Fig. 6-48). This assembly fits to the instrument panel from the passenger side and is retained by two screws; one at the bottom and one at the top (from the back side of the instrument panel).

RIGHT OR LEFT SIDE

1. Disconnect air distributor to right nozzle hose.

2. Remove bezel to instrument panel lower screw.

3. Loosen nozzle adapter to instrument panel screw (at top of bezel) from back side of instrument panel.

NOTE: Turn adapter at left nozzle to gain access to the upper screw.

4. Remove bezel and nozzle assembly from instrument panel by rolling bottom of bezel out.

5. Replace by reversing the above procedure.

BEZEL AND NOZZLE ASSEMBLY—OVERHAUL

1. Remove bezel and nozzle assembly.

2. Unscrew nozzle retainer from bezel.

3. Replace by reversing the above procedure.

BLOWER ASSEMBLY

REMOVE AND REPLACE TO SERVICE

1. Disconnect wires from resistor on blower motor housing (Fig. 6-49).

2. Disconnect blower motor ground wire at dash shroud.

3. Remove blower impeller housing to air inlet duct screws and remove blower assembly.

4. Replace by reversing the above procedure.

5. Note that the blower impeller (and for the Tempest heater) is of opposite rotation from the Pontiac heater. The proper air conditioning impeller

(and Tempest heater) is identified by a gold colored inlet ring. Use of the wrong impeller will cause excessive blower noise and reduced air flow.

BLOWER AND AIR INLET DUCT ASSEMBLY

REMOVE AND REPLACE

1. Drain radiator.

2. Remove air cleaner.

3. Disconnect coil bracket at dash shroud and move out of way.

4. Remove blower assembly.

5. Disconnect wires from resistor block and vacuum hoses at diaphragms. (Remove hose and wire clips at top of air duct assembly.)

6. Remove right headlamp assembly.

7. Remove wheel and tire assembly.

8. Remove fender skirt.

9. Remove screws from adapter between air duct assembly and evaporator.

10. Remove screws and nuts holding air duct assembly to dash.

11. Rotate inboard side of air duct assembly towards right fender as necessary to clear heater pipes and then move the assembly towards engine to disengage from the adapter between air duct assembly and the evaporator.

12. Disconnect heater hoses and remove air inlet duct assembly.

13. Replace by reversing the above procedure, making sure all parts are properly sealed and vacuum hoses are properly connected. Be sure that heater hoses are connected to the heater core at the proper angle so they are not kinked inside the air inlet duct attached to the dash.

NOTE: Connect the vacuum hoses to the control diaphragms as shown in Fig. 6-50.

OUTSIDE AIR DIAPHRAGM

REMOVE AND REPLACE

1. Disconnect wire connectors from resistor and remove blower assembly.

2. Disconnect vacuum hoses and remove air inlet duct assembly.

3. Remove outside air diaphragm assembly.

4. Check air valve to be sure it is properly adjusted and that valve moves fully open.

Fig. 6-49 Location of Circ-L-Aire Conditioner Resistor Assembly

5. Replace by reversing the above procedure, making sure all vacuum hoses are properly connected (Fig. 6-50) and that wire connectors to resistor are installed.

INSIDE AIR DIAPHRAGM ASSEMBLY

REMOVE AND REPLACE

1. Disconnect wire connectors from resistor and remove blower assembly.

2. Unhook diaphragm assembly.

3. Remove two stamped nuts from inside air inlet duct assembly and remove diaphragm assembly.

4. Replace diaphragm assembly. It may be necessary to hold diaphragm lever against the diaphragm next to the air duct assembly to hook onto the lever arm.

5. Check operation diaphragms. When the diaphragm closest to the duct is operated, the air door should go wide open. When the other diaphragm is operated, the air door should move only 1/8" from its closed position.

6. Replace blower motor assembly.

7. Attach vacuum hoses to diaphragms (Fig. 6-50) and wires to resistor.

SELECTOR AIR DIAPHRAGMS

REMOVE AND REPLACE

1. Disconnect wire connectors at resistor assembly and remove blower motor assembly.

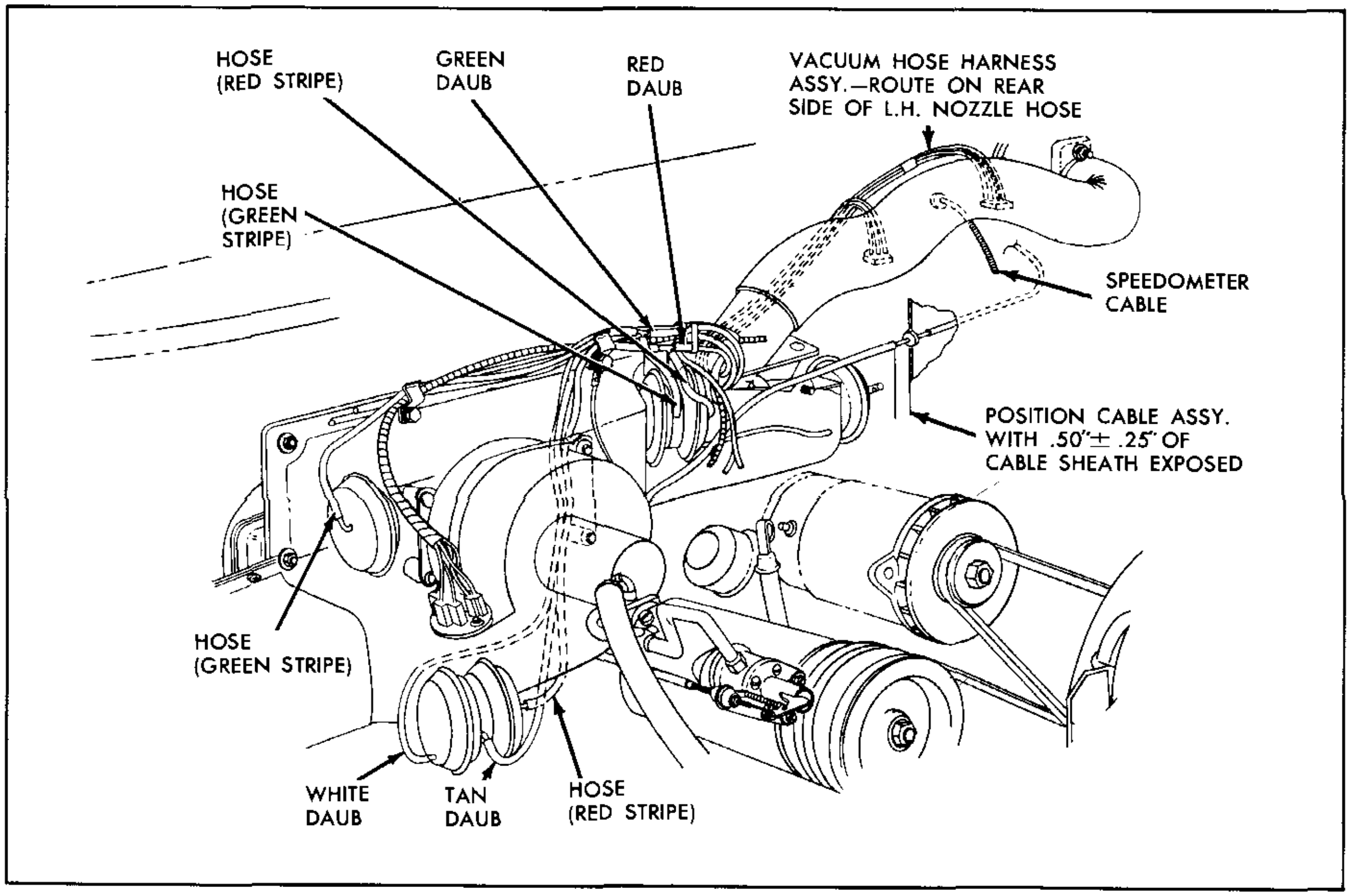


Fig. 6-50 Vacuum Hose Connections at Control Diaphragms

2. Disconnect vacuum hoses from diaphragms and remove two stamped nuts retaining diaphragms to duct.

3. Replace by reversing above procedure, making sure vacuum hoses are properly connected (Fig. 6-51).

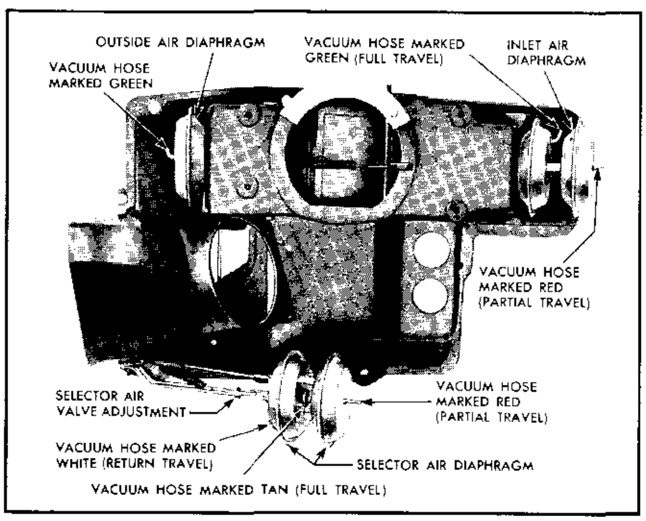


Fig. 6-51 Identification of Diaphragms and Vacuum Hose Connections

4. Check operation of diaphragms by operating controls and observing that the selector valve seals tightly at both ends of its travel.

REMOVE COMPRESSOR AND TEMPERATURE REGULATION VALVE ASSEMBLY TO SERVICE ENGINE

1. Disconnect compressor clutch coil hot wire at compressor.

2. Remove compressor drive belt.

3. Disconnect compressor rear brace to cylinder head brace bolt.

4. Remove compressor front plate to front bracket lower bolts.

5. Remove compressor rear plate to rear bracket lower bolts.

6. Pad fender and fender skirt and place compressor near top of fender skirt, securing compressor to

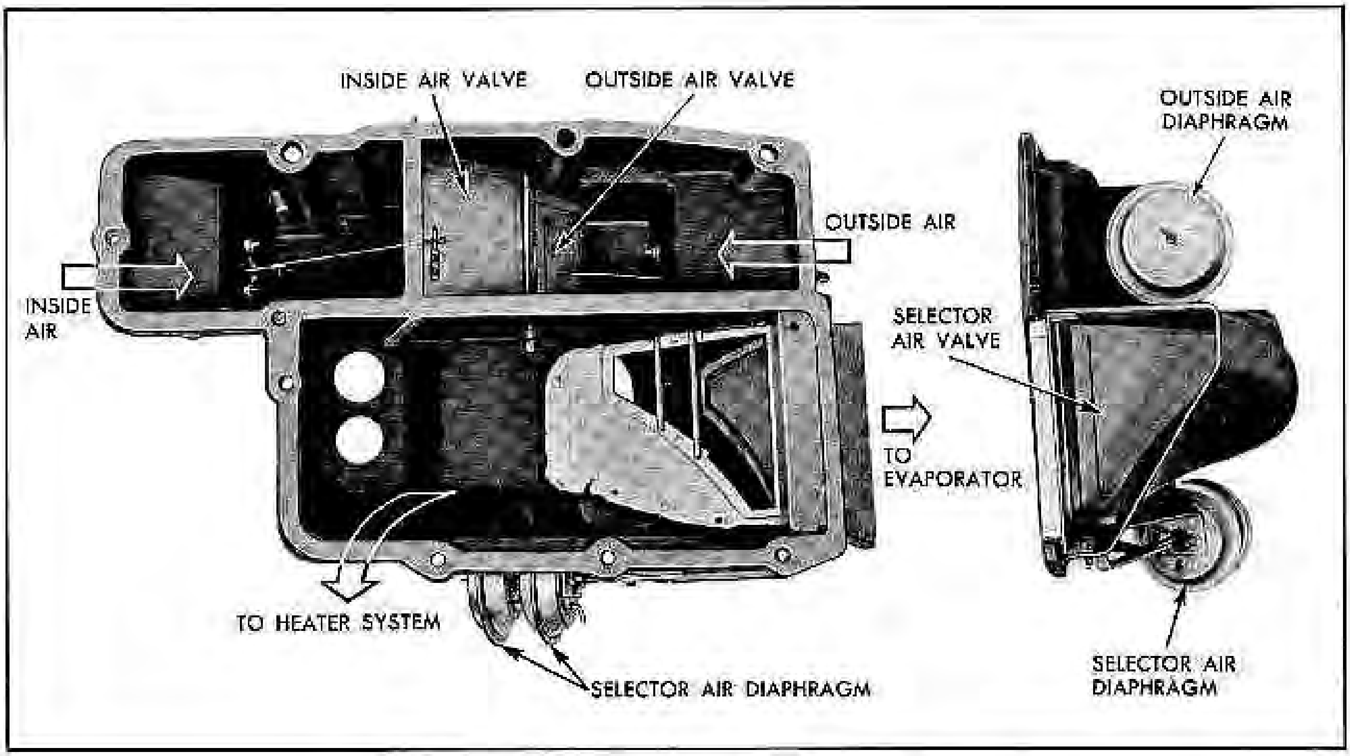


Fig. 6-52 Blower and Air Inlet Duct Assembly—Air Flow

right fender brace (with wire, rope or similar means).

CAUTION: DO NOT KINK ANY HOSES OR PLACE EXCESSIVE TENSION ON THE HOSE connecting temperature regulation valve to evaporator.

7. Replace by reversing the above procedure.

8. Tighten compressor belt to give 100-105 lbs. indicated on the Borroughs Belt Tension Gauge.

MINOR SERVICES AND REPAIRS—REFRIGERATION

CONTENTS OF THIS SECTION

PRECAUTIONARY SERVICE MEASURES

Before any service is attempted which requires the opening of refrigeration pipes or units, the person doing the work should be thoroughly familiar with GENERAL INFORMATION ON REFRIGERATION SERVICE. Also, he should follow very carefully the instructions given on the following pages for the unit being serviced.

The major reasons behind these measures are for safety and to prevent dirt and moisture from getting into the system. Dirt contaminant is apt to cause leaky valves or wear in the compressor, and moisture will freeze into ice at the expansion valve and freeze the valve stem.

The presence of moisture can also cause the formation of hydrochloric or hydrofluoric acids in the system.

PRE-ASSEMBLY

1. All sub-assemblies are shipped, sealed and dehydrated. They are to remain sealed until just prior to making connections.

2. All sub-assemblies should be at room temperature before uncapping. (This prevents condensation of moisture from the air that enters into the system.)

3. If for any reason the caps are removed, but the connections are not made, then the tubes and other parts should not remain unsealed for more than 15 minutes. Reseal connections if period is to be longer. This applies particularly to partially built-up systems that will be left overnight.

4. Compressors are shipped with 13 oz. of Frigidaire 1000 Viscosity oil and charged with a mixture of Refrigerant-12 and dry nitrogen at atmospheric pressure.

ASSEMBLY

1. All precautions should be taken to prevent damage to fittings or connections. Even minute damage to a connection could cause it to leak.

2. Any fittings getting grease or dirt on them should be wiped clean with a cloth dampened with alcohol. Do not use chlorinated solvents such as trichloroethylene for a cleaning agent, as they are contaminants. If dirt, grease or moisture gets inside the pipes and cannot be removed, the pipe is to be replaced.

3. Sealing caps should be removed from sub-assemblies just prior to making connections for final assembly.

4. Use a small amount of clean refrigeration oil (525 or 1000 viscosity) on all tube and hose joints,

and dip the "O" ring gasket in this oil before assembling the joint, as this oil will help in making a leak-proof joint.

When tightening joints, use another wrench to hold the stationary part of the connection, so that a solid feel can be attained, which will indicate proper assembly.

When tightening a flexible hose connection, use a second stationary wrench on the hex on the hose to prevent hose kinking, as kinked hoses are apt to transmit noise and vibration.

CAUTION: Tighten evaporator to compressor hose connections as shown in Fig. 6-53. Insufficient torque when tightening can result in loose joints and excessive torque when tightening can result in deformed joint parts, either condition can result in refrigerant leakage.

5. Do not connect the receiver and liquid indicator assembly until all other sealed sub-assemblies have been connected. This is necessary to insure optimum dehydration and maximum moisture protection of the refrigeration system.

CAUTION—LIQUID INDICATOR

Under normal conditions, the liquid indicator will show clear with about 3.75 pounds of refrigerant in the system. However, the air conditioner will not produce its best performance until 5.0 pounds of refrigerant are in the system. Do not overcharge with refrigerant, as this will result in extremely high head pressures and the compressor safety valve will "blow off".

DEPRESSURIZING THE SYSTEM

Any time the system is to be opened, it must first be depressurized. Depressurize the system as follows:

1. Remove caps from suction and discharge valve gauge fittings on compressor.

2. With both valves on the manifold gauge set J-5725-01 closed (clockwise), attach manifold to compressor using J-5420 Schrader valve adapter at the suction gauge fitting and J-6163 Schrader valve adapter at the discharge gauge fitting.

3. Crack open the high pressure valve on manifold gauge set to allow slow escape of refrigerant from the system through the manifold gauge set and out the center fitting and hose. (Place end of hose in clean container.) If oil drips from the hose into the container, refrigerant is escaping too rapidly.

Metal Tube Outside Diameter	Thread and Fitting Side	Steel Tubing Torque Lb.-Ft.	Aluminum or Copper Tubing Torque Lb.-Ft.	Nominal Torque Wrench Span
1/4	7/16	10-15	5-7	5/8
3/8	5/8	30-35	11-13	3/4
1/2	3/4	30-35	11-13	7/8
5/8	7/8	30-35	18-21	1 1/16
3/4	1 1/16	30-35	23-28	1 1/4

Fig. 6-53 Pipe and Hose Connection Torque Chart

If a connection is made with steel to aluminum or copper, use torques for aluminum. In other words, use the lower torque specification.

Use steel torques *only* when *both* ends of connection are steel.

4. When hissing ceases (indicating all refrigerant has escaped) close high pressure valve on manifold gauge set by turning valve clockwise.

EVACUATING THE SYSTEM

When the refrigeration system is depressurized and opened for service, some air will enter the lines regardless of how quickly the openings are capped. In order to remove this air and as much as possible of the moisture it contains, the complete system must be "evacuated". Evacuating is merely the process of removing all air from the system, thereby creating a vacuum in the system.

CAUTION: Under no circumstances should alcohol be used in the system in an attempt to remove moisture, regardless of the successful use of alcohol in other refrigeration systems.

PREPARATIONS FOR EVACUATING COMPLETE SYSTEM

Due to the arrangement of the compressor fittings assembly, the system may be evacuated through the manifold gauge set, using the following procedure to catch any oil which may be lost:

1. Check the low pressure gauge for proper calibration, with the gauge disconnected from the refrigeration system. Be sure that the pointer on the gauge indicates to the center of "O". Tap the gauge a few times lightly to be sure pointer is not sticking. If necessary, calibrate as follows:

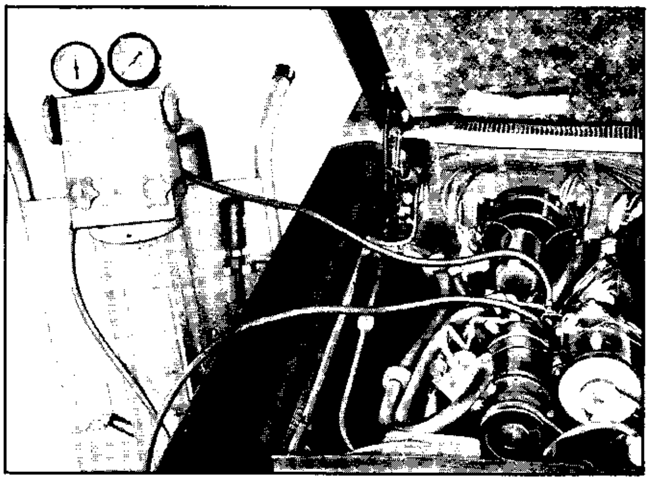


Fig. 6-54 Evacuating the Refrigeration System with J-8393

a. Remove the cover from the gauge.

b. Holding gauge pointer adjusting screw firmly with one hand, carefully force pointer in the proper direction in the proper amount to position the pointer through the center of the "O" position. Tap gauge a few times to be sure pointer on gauge is not sticking. Replace gauge cover.

2. If gauge set is not already connected to the compressor, connect gauge set to compressor as follows (Fig. 6-55):

a. Close hand shut-off valves on gauge set by turning clockwise.

b. Remove caps from gauge fittings on compressor suction and discharge fittings.

c. Attach Schrader valve adapter J-5420 to end of hose from low pressure gauge and connect this adapter fitted hose to the suction gauge fitting.

d. Attach Schrader valve adapter J-6163 to end of hose from high pressure gauge and connect this adapter fitted hose to the discharge gauge fitting.

3. Attach a flexible gauge hose to the center fitting of the gauge set and attach the other end of this hose to the vacuum pump J-5428 or J-5428-01 (Fig. 6-55).

4. The system can now be evacuated as follows:

EVACUATING COMPLETE SYSTEM

1. Turn hand shut-off valve on low pressure gauge of gauge set to the full clockwise position.

2. Slowly turn valve on high pressure gauge counterclockwise from the full clockwise position letting any pressure build up escape completely. Close high pressure valve.

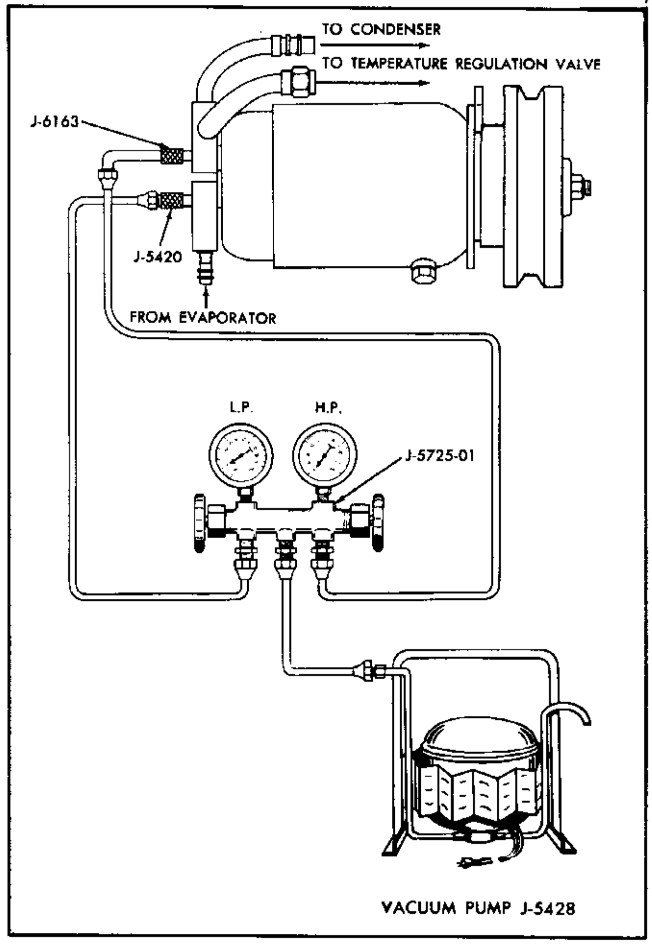


Fig. 6-55 Schematic Showing Connections and Tools for Evacuating the Refrigeration System

3. Check oil level in vacuum pump and add Frigidaire 150 viscosity oil or eqivalent, if necessary, to bring to proper level. Make sure dust cap on discharge side of vacuum pump has been removed.

4. Start the vacuum pump and slowly open the low and high pressure sides of the manifold gauge set to avoid forcing oil out of the refrigeration system and the pump. Pressure is now being reduced on both sides of the refrigeration system.

NOTE: If oil is blown from the vacuum pump, it should be refilled to the proper level with Frigidaire 150 viscosity oil or equivalent under GENERAL INFORMATION ON REFRIGERATION SERVICE.

5. Observe low pressure gauge and operate vacuum pump until gauge shows 26-28" vacuum. Continue to run pump for ten additional minutes.

NOTE: In all evacuating procedures the specification of 26-28 inches of vacuum is used. This evacuation can only be attained at or near sea level. For each 1000 feet above sea level where this operation is being performed, the specification should be lowered by one inch of mercury vacuum. For example: at 5000 feet elevation only 21 to 23 inches of vacuum can normally be obtained.

If vacuum cannot be pulled to the minimum specification for the respective altitude, it indicates a leak in the system, gauge connections or a defective vacuum pump. In this case, it will be necessary to check for leaks as outlined below, after a small amount of Refrigerant-12 has been added to the low side of the system.

a. Turn the hand shut-off valves at the low and high pressure gauge of the gauge set to the full clockwise position with the vacuum pump operating, then stop pump.

b. Connect flexible line from center fitting of the gauge set to refrigerant drum (drum should be at room temperature).

NOTE: It may be necessary to use reducer J-5462-4 with washer J-5462-3 and fitting J-5462-9 to attach flexible hose to refrigerant drum.

c. Open shut-off valve on drum and loosen flexible line fitting at center fitting at gauge set so that refrigerant will purge all air from line. Tighten flexible fitting when certain all air has been purged from line.

d. Open suction valve on gauge set. This will allow refrigerant to pass from the drum into the system. When pressure stops rising, close suction valve on gauge set and valve at refrigerant drum (as refrigerant drum is at room temperature, only a small refrigerant charge will enter the system).

e. Using leak detector J-6084, check all fittings in the system, compressor shaft seal and on the gauge set for evidence of leakage. When general area of leak has been found with the test torch, a liquid leak detector may be helpful in locating the exact point of leakage. After leak has been corrected, evacuate the system again.

6. Turn the hand shut-off valves at the low and high pressure gauge of the gauge set to the full clockwise position with the vacuum pump operating, then stop pump. Carefully check low pressure gauge to see that vacuum remains constant. If vacuum reduces, it indicates a leak in the system or gauge connections. See "NOTE" in step 5 above for method of locating leak.

CHARGING THE SYSTEM

The system should be charged only after being evacuated as outlined in EVACUATING THE SYSTEM.

REFRIGERANT DRUM METHOD

1. Connect center flexible line of gauge set to refrigerant drum.

NOTE: It may be necessary to use reducer J-5462-4 with washer J-5462-3 and fitting J-5462-9 to attach flexible line to refrigerant drum.

2. Place refrigerant drum in a pail of water which has been heated to a maximum of 125°F.

CAUTION: Do not allow temperature of water to exceed 125°F. High temperature will cause excessive pressure and possible softening of the fusible safety plugs in the refrigerant drum. It may not be necessary to use hot water if a large drum is used (over approximately 100 lbs.).

3. Place refrigerant drum (in pail of water) on scales (bathroom or commercial, preferably commercial), Fig. 6-56.

CAUTION: Do not turn refrigerant drum upside down as this would allow liquid refrigerant to enter compressor which may cause damage.

4. If line at center gauge fitting has not been purged of air, loosen line at center fitting on gauge set and "crack" valve on refrigerant drum to blow air from line. Retighten line at center fitting and record exact weight of refrigerant tank in water on the scales.

5. Open valve on refrigerant drum and both valves on gauge set to allow refrigerant to flow into the system. Continue charging until the scales show that 5.0 pounds of refrigerant have been transferred from refrigerant drum to the system.

NOTE: If full charge cannot be attained, close both valves on gauge set, start engine, and position temperature control lever to full down position. Open low pressure valve on gauge set slowly and leave open until full charge of 5.0 pounds of Refrigerant-12 is taken in.

CAUTION: Observe high pressure gauge while charging with compressor running. Shut off engine if pressure exceeds 350 psi. A large fan placed in front of the car will help reduce excessively high head pressure.

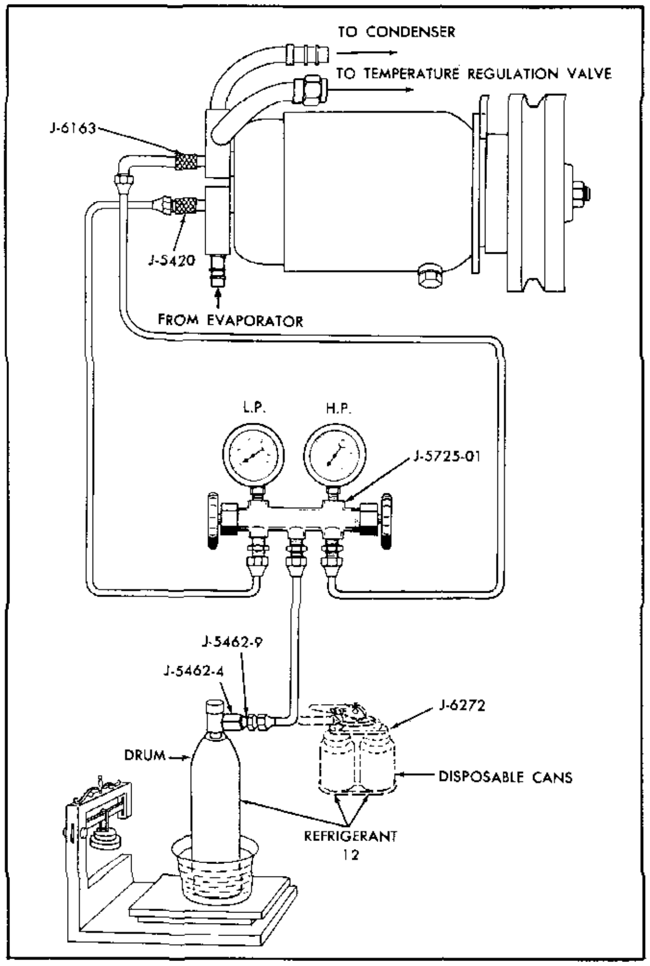


Fig. 6-56 Schematic Showing Connections and Tools for Charging the Refrigeration System

6. *Close both* valves on gauge set (high pressure valve will already be closed if charging was completed by running compressor) and close valve on refrigerant drum.

NOTE: If the engine was used to complete the Refrigerant-12 charge into the system, close valve on refrigerant drum to permit compressor to draw any refrigerant left in the line from the drum to the center fitting of the gauge set, then close the low pressure valve on the gauge set.

7. Operate engine at 1500 RPM with temperature control lever at full down position and blower control down for high speed. After ten minutes of operation, observe appearance of refrigerant in liquid indicator. If bubbles *are observed, open low* pressure gauge valve and valve on refrigerant drum to allow more refrigerant to enter system. Close valve when liquid indicator clears up.

NOTE: If air inlet temperature is below 70°F. when this check is made, bubbles may appear even though the proper amount of refrigerant is in the system. Air inlet temperature must be 70°F. or above to make an accurate check. In no case should the system be charged with more than 5.0 lbs. of refrigerant.

8. When refrigerant has been installed, continue to operate system and test for proper operation as outlined under OPERATIONAL TEST.

9. When satisfied that air conditioning system is operating properly, stop engine, remove gauge set and replace protective caps on compressor fittings.

NOTE: A considerable amount of refrigerant will collect in the high pressure line, since some of this refrigerant will have condensed into liquid refrigerant. Wrap the high pressure gauge fitting at the compressor with a shop cloth before disconnecting the Schrader valve from the gauge fitting, to prevent damage or injury to personnel.

10. Using leak detector J-6084, check complete system for leaks, as explained under LEAK DETECTORS.

REFRIGERANT-12 DISPOSABLE CAN METHOD

After having depressurized, repaired (if necessary), and evacuated the refrigeration system, the system may be charged as follows when using Refrigerant-12 disposable cans:

1. Obtain five "one" pound cans of Refrigerant-12. (Actually the net weight of refrigerant is 15 ozs. per can.)

2. Mount three cans in J-6272 No. 3 Multi-opener or attach J-6271 Fitz-All Valve (single can opener valve) on one can.

CAUTION: MAKE SURE OUTLET VALVE ON OPENER IS CLOSED (CLOCKWISE) BEFORE INSTALLING OPENER.

a. If the J-6272 No. 3 Multi-opener is used, raise locking lever, position three cans of refrigerant and froce the locking lever down to secure cans and at the same time puncture the top of the can to make it ready for charging.

b. If the J-6271 Fitz-All Valve is used, back off the valve from the can top retainer, slip the valve on to the can and turn the valve into the retainer until tight. *DO NOT* open outlet valve during this operation as turning the valve into the retainer punctures the top of the can to make it ready for charging.

3. Connect center flexible line of gauge set to the fitting on a can opener valve.

NOTE: If line at center gauge fitting has not been purged of air, loosen line at center fitting on gauge set and "crack" valve at can opener (for a second or two) to force air from the line. Retighten line at center fitting.

4. Open valve on No. 3 Multi-opener (or on single can) and also low pressure and high pressure valves on manifold gauge set. Leave can valve open until all refrigerant has entered the refrigeration system. Close valve on can.

a. If the system is charged using single cans and the J-6271 valve, disconnect valve from can, leaving valve closed to flexible line to the center fitting of the manifold gauge set. Install valve on a new and full disposable can of Refrigerant-12, and repeat until five "one pound" cans of refrigerant have been used to charge the system. The system requires 5.0 pounds of refrigerant to have a proper charge. Since the "can" only contains 15 ozs. of refrigerant, five cans will charge the system with five ozs. less than the maximum refrigerant charge of 5.0 pounds.

b. If the system is charged using the 3 can Multi-opener, J-6272, close the valve of the opener after all cans are empty. Release the locking lever and discard the three empty cans. If this tool will be used to complete the charge with two additional cans to bring the required refrigerant charge to 5.0 pounds, then leave one of the cans just emptied in position, locate the two full cans and lock the lever into place. (This empty can balances the assembly and prevents the loss of refrigerant out the open "series" passage.)

NOTE: Align the pierced hole in the empty can with the punch in the cover of the tool.

*If the J-6271 Fitz-All Valve for single cans is avail*able, complete charging as explained in 4.a. above.

5. Close valves on manifold gauge set.

6. Operate engine at 1500 RPM with temperature control lever at full down position and blower control down for high speed.

NOTE: If air inlet temperature is below 70°F. when this check is made, bubbles may appear even though the proper amount of refrigerant is in the system. Air inlet temperature must be 70°F. or above to make an accurate check. In no case should the system be charged with more than 5.0 lbs. of refrigerant.

7. When refrigerant has been installed, continue to operate system and test for proper operation as outlined under OPERATIONAL TEST.

8. When satisfied that air conditioning system is operating properly, stop engine, remove gauge set and replace protective caps on compressor fittings.

NOTE: A considerable amount of refrigerant will collect in the high pressure line, since some of this refrigerant will have condensed into liquid refrigerant. Wrap the high pressure fitting at the compressor with a shop cloth before disconnecting the Schrader valve from the gauge fitting to prevent damage or injury to personnel.

9. Using leak detector J-6084, check complete system for leaks as explained under LEAK DETECTORS.

SERVICE STATION METHOD

The J-8393 deluxe portable air conditioner service station supplies all evacuating and charging equipment assembled into a compact portable unit. Detailed description and instructions for use of the portable service station are presented below.

J-8393 consists of a wheeled cart, mounting: a vacuum pump, pressure gauges, control valves, and most important, a calibrated charging cylinder capable of storing and accurately metering up to five pounds of liquid refrigerant. All necessary hoses are *included and the cart is fitted with* brackets *for a* 25 or 50 pound refrigerant cylinder, oil injector, and leak detector.

Since refrigerant is metered into the system by volume, the correct amount will always be added to the system. This, plus the fact that the unit remains "plumbed" at all times, thereby eliminating loss of refrigerant that would be caused by purging of lines and hooking-up components, combines to *enable the* serviceman to economically utilize all refrigerant.

The simplified layout of evacuating and charging equipment is designed to allow any mechanic to do a first-rate job of servicing an air conditioner. The "station" virtually reduces air conditioner servicing simply to a matter of connecting two hoses and manipulating clearly labelled valves.

Dealerships that desire all features of the deluxe portable air conditioner service station (J-8393) may obtain same, yet avoid duplication of air conditioning tools now in their possession, simply by selecting "station" components from those listed below:

J-8418—PORTABLE SERVICE STATION. Without vacuum pump or manifold and gauge set, otherwise same as "Deluxe" unit J-8393. Includes provisions for easy installation of your J-5428 Vacuum Pump and J-5725-01 Gauge Set.

J-8420 – CHARGING CYLINDER AND TEST PANEL (Complete). Consists of J-8413 charging cylinder and test panel with all gauges, hoses and valves. It also includes universal upper and lower mountings for bench, wall, or portable equipment.

CHARGING THE SYSTEM, USING J-8393

1. With charging station installed as previously described, remove low pressure gauge line at compressor.

2. Crack open high (No. 2) and low (No. 1) pressure control valves on station, and allow refrigerant gas to purge from system. Purge slow enough so that oil does not escape from system along with refrigerant.

3. When refrigerant flow nearly stops, connect low pressure gauge line to compressor.

4. Turn on vacuum pump and open vacuum control valve (No. 3).

5. With system purged as above, run pump until 26-28 inches of vacuum is obtained. Continue to run pump for 15 minutes after the system reaches 26-28 inches vacuum.

NOTE: In all evacuating procedures, the specification of 26-28 inches of mercury vacuum is used. These figures are only attainable at or near sea level. For each 1000 feet above sea level where this operation is being performed, the specifications should be lowered by 1 inch. Example: at 5000 ft. elevation, only 21 to 23 inches vacuum can normally be obtained.

6. If 26-28 inches vacuum (corrected to sea level) cannot be obtained, close vacuum control valve (No. 3) and shut off vacuum pump. Open refrigerant control valve (No. 4) and allow some refrigerant to enter system. Locate and repair all leaks.

7. After evacuating for 15 minutes, add ½ pound of refrigerant to system as described in step 7 above. Purge this ½ pound and re-evacuate for 5 minutes. This second evacuation is to be certain that as much contamination is removed from the system as possible.

8. Only after evacuating as above, system is ready for charging. Note reading on sight glass of charging cylinder. If it does not contain a sufficient amount for a full charge, fill to the proper level.

9. Close low-pressure valve on charging station. Fully open station refrigerant control valve (No. 4) and allow all liquid refrigerant to enter system. When full charge of refrigerant has entered system (5.0 lbs.), turn off refrigerant control valve (No. 4) and close both hand shut-off valves.

10. If full charge of refrigerant will not enter system in step 3 above, close high pressure control and refrigerant control valves. Start engine and run at slow idle with compressor operating. Crack refrigerant control valve (No. 4) and low pressure control on station. Watch low side gauge and keep gauge below 50 psi by regulating refrigerant control valve. Closing valve will lower pressure. This is to prevent liquid refrigerant from reaching the compressor while the compressor is operating. When required charge has entered system, close refrigerant control valve and close low pressure control.

11. System is now charged and should be performance tested before removing gauges.

ADDING REFRIGERANT-12

The following procedure shuold be used in adding small amounts of refrigerant that may have been lost by leaks, or while opening system for servicing the compressor. Before adding refrigerant to replace that lost by leaks, check compressor oil level and add oil if necessary. See ADDING OIL.

1. Remove caps from compressor suction and discharge fitting gauge fittings. Attach gauge set to gauge fittings, making sure Schrader adapter J-5420 is between low pressure gauge hose and suction gauge fitting, and J-6163 is between high pressure gauge hose and discharge gauge fitting.

2. Start engine, move air conditioning temperature control lever to full down position, blower lever down for high speed. Operate for five minutes at 1500 RPM to stabilize system.

3. Observe the refrigerant through the glass cover of the liquid indicator with the system operating, to see if there are any bubbles evident.

a. If no bubbles are evident, then bleed system slowly through the discharge valve until bubbles appear in the liquid indicator. Add one pound of refrigerant as explained under CHARGING THE SYSTEM.

b. If bubbles are visible in the liquid indicator with the temperature control lever at the full cold position and the blower at "HI" speed, it indicates partial or complete plug in a line, or a shortage of refrigerant, or both. Correct condition. Add refrigerant as explained below until the sight glass clears, then add another one pound of refrigerant.

4. Attach flexible hose from center fitting of gauge set loosely to refrigerant drum or on disposable can valves. Open high and low pressure valves on the gauge set slightly to purge pressure gauge lines of air. Tighten fitting of refrigerant drum or can, when satisfied that all air has been removed from gauge lines. Close (clockwise) both hand shut-off valves of gauge set.

5. Partially charge system.

a. Refrigerant-12 Drum Method.

(1) Place pail containing hot water that does not have a temperature exceeding 125°F. on scales, place refrigerant drum in pail containing water, note weight, and only open low pressure valve on gauge set.

(2) Start engine, move temperature control lever to full down position, and place blower lever down for high speed. Operate engine for five minutes at 1500 RPM to stabilize system.

(3) With compressor operating, slowly open valve on refrigerant drum and allow refrigerant to flow into system (through manifold gauge set) until liquid indicator clears up and immediately shut off valve at gauge set or on refrigerant drum. Check weight of refrigerant drum and pail of water. Then slowly open valve on gauge set (or refrigerant drum) and add one more pound of refrigerant. Note total amount of refrigerant added.

b. Refrigerant-12 Disposable Can Method (15 oz. per can).

(1) Make sure the outlet valve on the J-6271 Fitz-All Valve is fully clockwise and attach the J-6271 to a "one pound" can of refrigerant as follows: back off the valve from the top of the retainer, slip the valve onto the can and turn the valve into the retainer until tight. DO NOT accidently open outlet valve during this operation as turning the valve into the retainer punctures the top of the can to make it ready for charging.

(2) Connect center flexible line of gauge set to the fitting to the valve (Fig. 6-57).

(3) Start engine, move temperature control lever to full down position and place blower lever down for high speed. Operate engine for five minutes at 1500 RPM to stabilize system.

(4) With compressor operating slowly, open valve on refrigerant can and allow refrigerant to flow into system (through manifold gauge set) until liquid indicator clears up and immediately shut off valve at gauge set and on refrigerant can. Check weight of can and valve assembly and record.

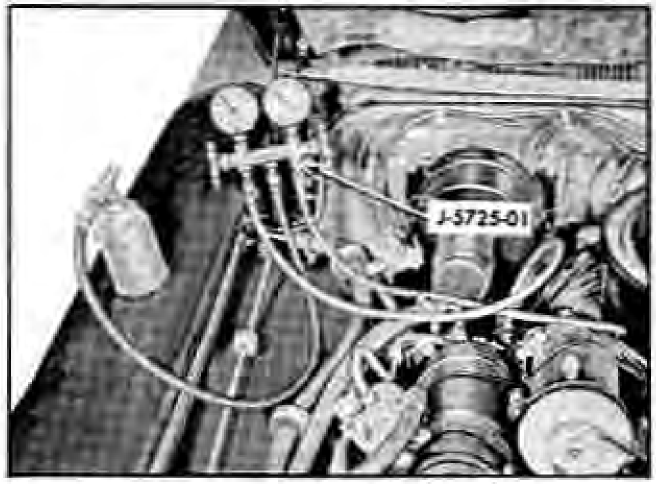


Fig. 6-57 Adding Refrigerant-12—Disposable Can Method

(5) Add an additional one pound of refrigerant by adding refrigerant from the can just weighed until can is empty. Attach another can and add refrigerant until can and valve assembly weighs the same as recorded.

6. Close valves at refrigerant drum or can.

7. Test for leaks and make operational check of system as outlined under OPERATIONAL TEST.

CHECKING COMPRESSOR OIL LEVEL AND ADDING OIL

The refrigeration system contains a total of 13 fluid oz. of Frigidaire 1000 viscosity oil. Originally all of this oil is in the compressor, but after the system has been operated the oil will have been circulated through the system with the refrigerant. For this reason, when a compressor is removed it is unlikely that it would contain 13 oz. of oil.

Whenever the system has been open to atmosphere due to a collision or severe leak for an extended period of time, the procedure under COLLISION SERVICE should be followed.

Oil level should be checked anytime there has been a loss of refrigerant from the system. If there is insufficient oil in the compressor, it will be necessary to add oil as outlined below.

Only Frigidaire 1000 viscosity oil should be used in this compressor. The specified oil is made to very exacting specifications, particularly suited to this compressor, and no substitutes should be used. This oil is available in one quart bottles.

Frigidaire 1000 viscosity oil, like all refrigeration oil, is completely dry oil. This gives it a high affinity for moisture and if exposed to air it will draw moisture out of the air. For this reason the oil container must be kept tightly capped when not in use, to prevent the absorption of moisture.

CHECKING COMPRESSOR OIL LEVEL

1. Start engine and operate air conditioner for five minutes at 1500 RPM to stabilize system. Then turn off engine.

2. Slowly loosen screw on oil test stem on bottom of compressor and allow refrigerant and oil to escape for a few seconds. Oil will invariably appear the first time the screw is loosened regardless of oil level. Tighten screw.

3. Again loosen screw on oil test stem slowly. If a heavy flow of oil continues to be ejected with the refrigerant, the second time the screw is loosened, the oil level in the compressor is satisfactory. If a heavy flow of oil does not escape, or a fine spray or mist is noticed the second time the screw is loosened, the oil level is low and oil will have to be added as outlined below.

4. Turn off engine.

ADDING OIL

1. Disconnect charging hose from suction side of compressor and remove charging hoses from low pressure and center fittings on the J-5725 gauge manifold set.

2. Attach J-7605 oil injector cylinder to low pressure fitting on the gauge manifold set so valve is away from gauge set.

3. Attach charging line to the valve end of the oil injector cylinder.

4. With both valves on the manifold gauge set closed (clockwise), attach to compressor using J-5420 Schrader valve adapter at suction gauge fitting and J-6163 Schrader valve adapter at the discharge gauge fitting.

5. With valve at oil injector cylinder open, crack low pressure and high pressure valve at manifold gauge set to purge air from the lines. (Air will be forced out the center fitting.)

NOTE: Allow refrigerant to purge low pressure side for at least five seconds to insure complete removal of air or moisture from the oil cylinder. Cap center fitting and close valves on gauge set.

6. Close valve at oil injector unit.

7. Holding oil cylinder in vertical position and away from any possibility of dirt or moisture falling onto oil cylinder, remove filler plug from top of oil cylinder.

8. Using clean Frigidaire 1000 viscosity oil fill oil injector cylinder and replace cylinder plug.

NOTE: A clean hand pump type oiler is satisfactory in performing this operation.

9. Start engine and operate air conditioner at full cold position and blower on high.

10. Open valve at bottom of oil injector cylinder and high pressure valve on gauge manifold.

11. Holding manifold gauge set in vertical position "crack" open low pressure valve on gauge set. Leave valve open for five minutes to allow all oil to be forced into the system and close low pressure and high pressure valves on gauge set.

12. Operate air conditioner for an additional five minutes at 1500 engine RPM to stabilize system and turn off engine.

13. Recheck oil level.

14. Continue to add oil in full oil injector cylinder quantities until a satisfactory oil level is obtained.

15. Remove gauge lines from compressor and replace fitting caps on compressor fittings assembly.

16. Remove the J-7605 oil injector cylinder from manifold gauge set and *cap both ends* of cylinder *immediately* to prevent air or moisture from entering the cylinder.

17. Start engine, move air conditioning temperature control lever to full down position, blower lever down for high speed. Operate for ten minutes at 1500 RPM to stabilize system.

18. Observe the refrigerant through the glass cover of the liquid indicator with the system operating to see if there are any bubbles evident.

REMOVING MALFUNCTIONING COMPRESSOR AND INSTALLING NEW COMPRESSOR

This procedure should be used any time a compressor is to be replaced due to stuck crankshaft, stuck pistons, burned bearings, broken discharge or suction reeds, or other internal difficulty which prevents compressor from working properly.

The new compressor will be minus the fittings assembly, clutch and pulley assembly, and the clutch actuating coil. The end of the shaft will be protected by aluminum foil and a plastic cap. The new compressor will be supplied with 13 fluid ounces of Frigidaire 1000 viscosity oil installed, and will have a charge consisting of a mixture of nitrogen gas and Refrigerant-12. The same refrigerant charge as stamped on old compressor *must be* stamped on the new compressor.

A compressor, shim package for rotor plate to coil housing clearance, a shim chart, and a Woodruff key is packed separate and shipped with the compressor. The proper method of determining proper shim pack is explained under COMPRESSOR REPLACEMENT.

Remove the old compressor and install the new compressor as follows:

COMPRESSOR REMOVAL

1. Connect the high and low pressure gauge lines from the gauge set to the respective connections on the old compressor on the car. Be sure valves on gauge set are fully clockwise to close gauge set to center fitting, that a J-5420 or J-6163 Schrader adapter is between low pressure hose and suction gauge fitting, and also at the discharge gauge fitting.

2. Remove the flare nut from center connection on gauge manifold or the plug in the gauge line attached to the center connection. Wrap the line at the outlet with a cloth to protect persons and car surfaces from oil or refrigerant.

3. Slowly depressurize refrigeration system.

4. While system is depressurizing remove clutch assembly and coil from old compressor as outlined under COMPRESSOR CLUTCH, COIL AND SEAL REPLACEMENT. If parts are not oil soaked and are in good condtion, lay them aside on a clean surface as they may be installed on the new compressor.

5. After the system is *completely* depressurized, disconnect temperature regulation valve from compressor, leaving lines attached to this valve.

6. Very slowly loosen screw which retains compressor fittings assembly to compressor. As screw is being loosened, work fittings assembly back and forth to break seal and carefully bleed off any remaining pressure.

CAUTION: High pressure may still exist at the discharge fitting. If this pressure is released too rapidly there will be a considerable discharge of refrigerant and oil.

7. When all pressure has been relieved, remove screw and remove fittings assembly and "O" ring seals.

8. Immediately cover compressor openings. A simple way is with a plate (similar to the one on the new compressor) which can be attached with the fittings assembly screw, using the "O" rings to provide a seal.

9. Disconnect compressor clutch coil wire and remove compressor mounting plates to bracket bolts, front and rear.

10. If there is any possibility that broken parts from the compressor got into the discharge line or the condenser, all refrigeration system parts should be cleaned and a new receiver and liquid indicator assembly should be installed.

11. Drain all oil from compressor just removed in a clean dry container and replace compressor drain plug screw. Measure amount of oil drained.

COMPRESSOR REPLACEMENT

NOTE: Before installing a new compressor, rotate compressor shaft four or five times. This permits proper lubrication of compressor seal over all its surface. Before compressor clutch is mounted to the new compressor, wipe the front face of the compressor thoroughly with a clean dry cloth and, if necessary, clean front of compressor with a solvent to remove any excess oil. Cleaning compressor in this manner will prevent any oil from being thrown onto the clutch surfaces which would cause slippage and eventual clutch failure.

1. Stamp refrigerant charge of the refrigerant system (5.0 lbs). on new compressor in space on plate provided for this information.

NOTE: If nine ounces or more oil was drained from old compressor, continue with step 2. If less than nine ounces was drained from old compressor and compressor shaft seal or other refrigerant connections were not broken or leaking, disconnect thermostatic expansion valve at evaporator and drain oil from evaporator. Reverse flush with refrigerant-12. Install new compressor with full charge of oil as received.

2. Install new compressor on car, leaving compressor fittings opening cover plate on the compressor.

3. Remove cover plate over compressor openings very slowly to bleed off pressure.

CAUTION: New compressors are charged with a

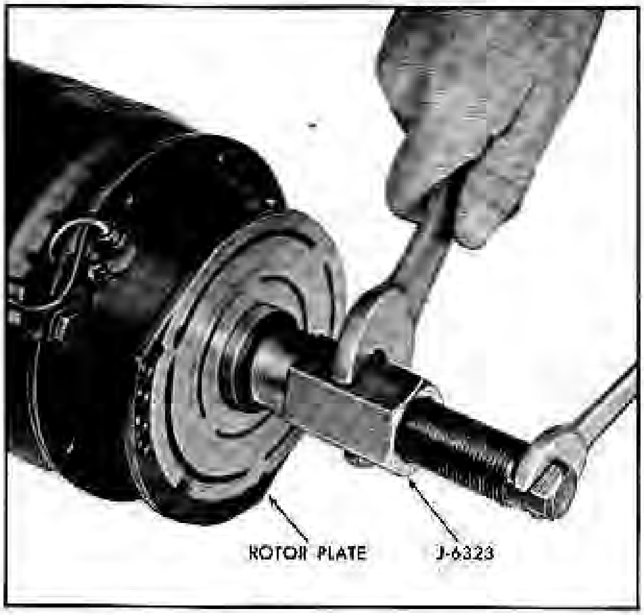


Fig. 6-58 Installing Rotor Plate

mixture of nitrogen and Refrigerant-12 and 13 fluid oz. of Frigidaire 1000 viscosity oil. If the cover is removed too rapidly, the oil will be blown out violently with the sudden release of pressure.

4. Attach temperature regulation valve and compressor fittings assembly to compressor, using new "O" ring seals and 3/8" plain lockwasher to screw. Tighten fittings attaching screw to 10-15 lb. ft. torque.

5. Install coil and clutch parts on new compressor as follows:

NOTE: Shims for positioning the rotor plate to coil housing clearance are included in envelope attached to new compressor.

a. Replace coil inner insulator (rubber), coil outer insulator (paper gasket), coil retainer and secure retainer with three screws.

b. Secure coil wires with wire retainer and attach ground wire to compressor body.

c. Install the spacer.

d. Replace the rotor plate selective spacers.

NOTE: The spacers should be of such thickness as to provide a .025"-.035" air gap between the rotor plate and coil housing when the coil is energized.

e. Replace rotor plate key. If key was damaged in removal, replace with new key.

f. If the rotor plate does not require replacement, carefully clean using a clean dry cloth.

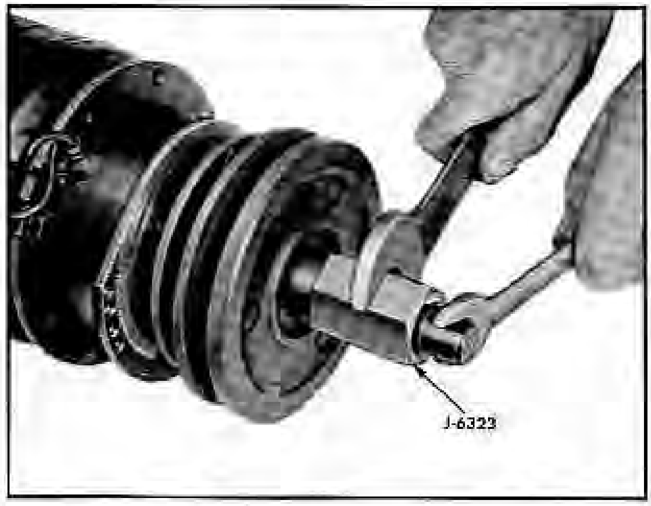


Fig. 6-59 Installing Pulley

g. Position rotor plate assembly on shaft, indexing the hub of the assembly with the Woodruff key and install with J-6323 Compressor Clutch Plate and Pulley Installer and J-6323-5 Adapter. Position the J-6323-5 adapter onto the threaded stud of the tool so the tapered end of the spacer faces the rotor plate. Thread the stud of J-6323 onto the end of the compressor shaft and holding this stud with an open end wrench to prevent the compressor shaft from turning, complete the installation of the rotor plate by turning the large hex nut until the rotor plate is firmly seated against the selective spacers.

h. Remove the J-6323 Compressor Clutch Plate and Pulley Installer and J-6323-5 Adapter.

i. Install the clutch pulley assembly using J-6323 and J-6323-5 adapter in a similar manner as installing the clutch plate assembly (Fig. 6-59).

NOTE: If a slight interference between the drive end of the tool and the pulley is experienced, grind outside diameter of drive end of tool to fit or use flat washers to assist in installing the pulley.

j. Replace compressor shaft nut lockwasher and compressor shaft nut. Tighten nut to 5-7 lb. ft. torque and bend over lockwasher tang.

k. Energize compressor clutch and check for proper air gap between the rotor plate and coil housing (Fig. 6-60). This clearance should be .025"-.035". If this clearance is not within specifications, then it will be necessary to remove the rotor plate and add or remove selective spacers as necessary.

6. Install and adjust compressor belt to 100-105 lbs. as indicated on the Borroughs Belt Tension Gauge.

Fig. 6-60 Checking Air Gap

7. Evacuate and charge system with 5.0 lbs. refrigerant.

2. Make operational test of system.

System is now ready for operation.

If compressor is replaced within warranty period, send old compressor, properly sealed and tagged, to Warranty Inspector, Salvage Department, Pontiac Motor Division, Pontiac, Michigan, using same container in which new compressor was received.

COMPRESSOR CLUTCH, COIL AND SEAL REPLACEMENT

REMOVING COMPRESSOR CLUTCH

The compressor seal may be replaced without removing the compressor.

1. Depressurize system.

2. Bend back lock retainer.

3. Energize compressor clutch and remove compressor shaft nut and lock washer.

4. De-energize compressor clutch and remove compressor belt.

5. Remove pulley from shaft, using a puller such as J-8433 Compressor Pulley Remover.

6. Using J-6322-01 Compressor Clutch Plate Puller or J-6322 Compressor Clutch Plate Puller with J-7849

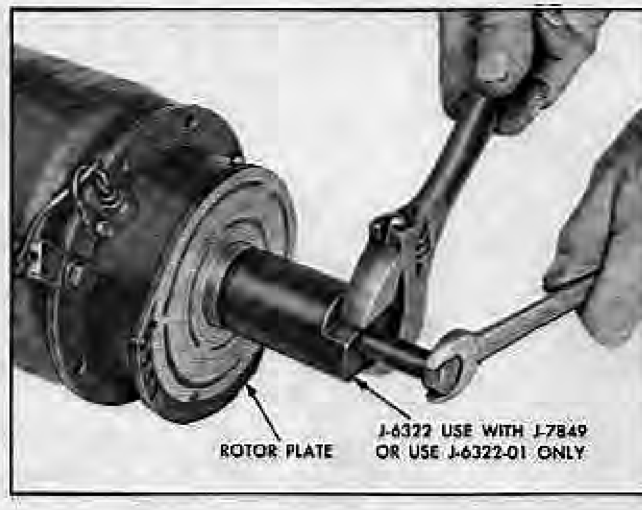


Fig. 6-61 Removing Rotor Plate

adapter attached to end of J-6322 Puller, remove the rotor plate as follows:

a. Back out pilot screw of J-6322 and thread body of tool onto threaded hub of rotor plate.

b. Holding the body of the tool with an open end wrench, tighten the screw against the compressor shaft to remove the rotor plate (Fig. 6-61).

REMOVING COMPRESSOR CLUTCH COIL

1. Remove the three screws which hold the coil retainer.

2. Remove coil wire retainer (ground wire and clamp) and detach wires.

3. Remove paper insulator from front of coil and remove coil from cavity.

NOTE: Use two pieces of stiff wire bent in "L" shape to hook behind coil and pull to remove coil.

4. Remove rubber insulator from rear of coil cavity. Inspect for brittleness or damage.

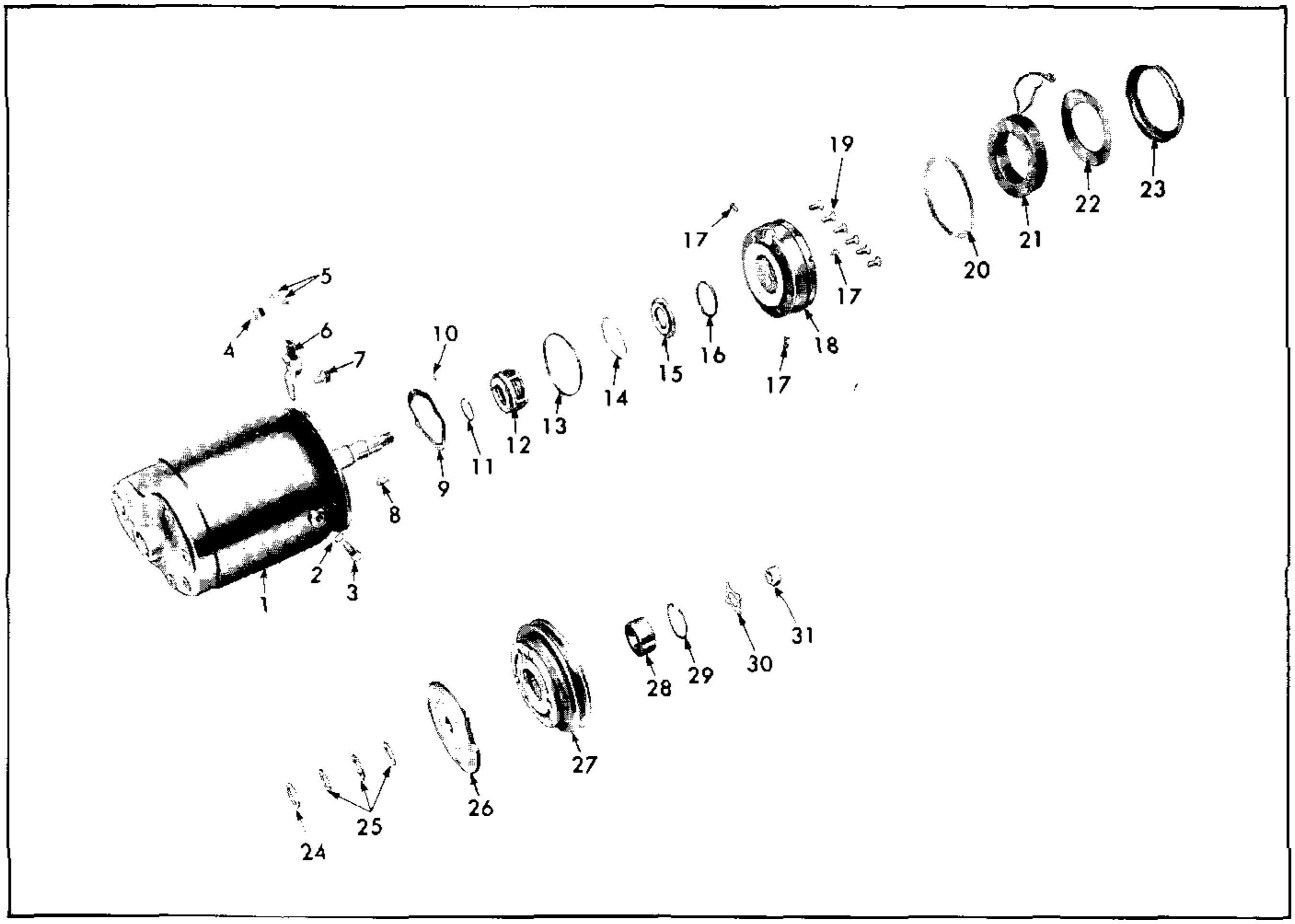
REMOVING COMPRESSOR SHAFT SEAL

1. Remove rotor plate key, clutch shim pack and seal spacer.

2. Remove the six (6) Phillips head screws behind the rubber insulator, which secure the coil housing to the compressor (loosen screws by tapping center of screw with punch or with Phillips screw driver bit). If screws were damaged during removal, obtain new screws.

3. Remove coil housing.

4. Remove shaft seal.



1. Compressor Body
2. Gasket
3. Oil Test Fitting
4. Wire Clamp
5. Screws
6. Clip and Terminal Assembly
7. Screw and Lockwasher
8. Woodruff Key
9. Wave Washer
10. Seal Pin
11. Seal Retainer Ring
12. Seal (Rotating)
13. "O" Ring (Coil Housing—External)
14. Seal Seat Retainer Ring
15. Seal Seat (Stationary)
16. "O" Ring (Coil Housing—Internal)
17. Coil Retainer Screws
18. Coil and Seal Housing
19. Screws
20. Coil Inner Gasket
21. Clutch Actuating Coil
22. Coil Outer Gasket
23. Coil Retainer
24. Spacer
25. Shims (Selective Fit)
26. Rotor Plate and Hub Assembly
27. Pulley Bearing and Armature Plate Assembly
28. Pulley Bearing
29. Pulley Bearing Retainer Ring
30. Lockwasher
31. Nut

Fig. 6-62 Compressor Clutch Assembly—Exploded View

5. Remove coil housing "O" ring seal.

6. Remove seal seat retainer and press out seal seat.

7. Remove seal seat "O" ring.

8. Thoroughly clean all parts carefully and examine any parts for scoring or damage which may have resulted in the leak. All parts of the clutch assembly (with the exception of new parts to be replaced) the rotor plate and the pulley and bearing assembly should be cleaned in a solvent and blown dry with compressed dry air.

REPLACING COMPRESSOR SHAFT SEAL

1. Make certain the square headed seal drive pin is properly aligned with the shaft and that the wave washer is in place.

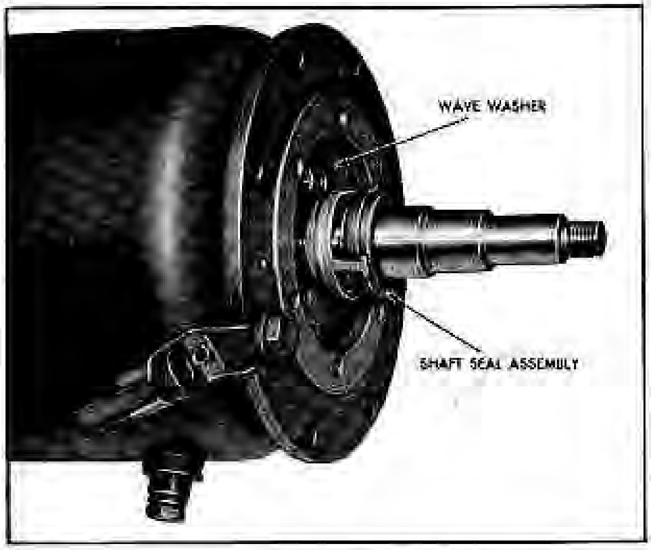


Fig. 6-63 Shaft Seal in Position

2. Position the J-6320 Compressor Seal Protector on the compressor shaft with the small tapered end of the tool towards the end of the shaft, and install seal, aligning the seal with the square pin on the compressor shaft (Fig. 6-64).

3. Install a new seal seat "O" ring, a new seal seat, and new retainer ring into the coil housing.

4. Install a new housing mounting "O" ring seal on the coil housing.

5. Complete installation of coil housing, exercising care not to damage the housing mounting "O" ring seal, and making sure that the coil housing is properly aligned with the compressor to permit proper location of coil wire. Replace the six Phillips head coil housing retaining screws.

NOTE: If the heads of these screws became burred or damaged in removal, install new screws to prevent damage to coil and also to insure that coil housing is firmly secured to compressor.

REPLACING COMPRESSOR CLUTCH COIL

1. Place the coil inner insulator gasket (rubber) into position and install coil.

2. Replace coil outer insulator (paper gasket), coil retainer and secure retainer with three screws.

3. Secure coil wires with retainer and attach ground wire to compressor body.

4. Install the spacer.

5. Replace the rotor plate selective spacers.

NOTE: The spacers should be of such thickness as to provide a .025 -.035" air gap between the rotor plate and coil housing when the coil is energized. See Fig. 6-60.

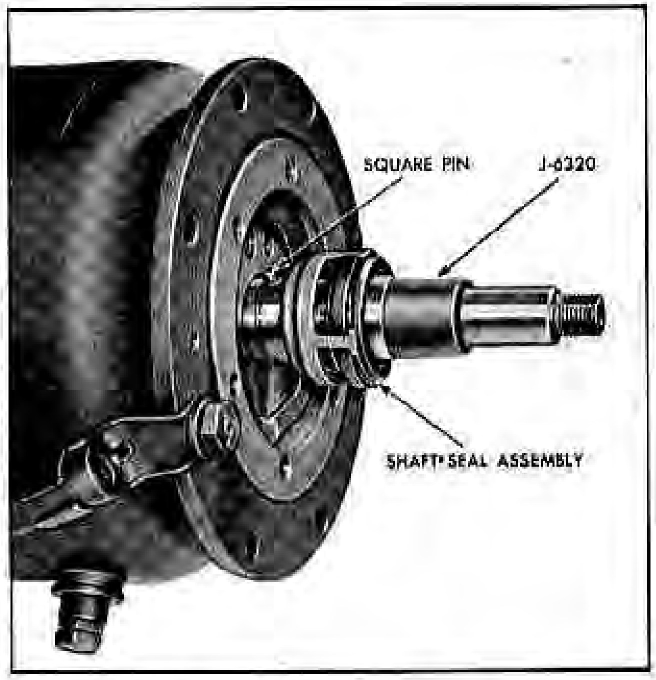


Fig. 6-64 Installing Shaft Seal

6. Replace rotor plate key. If key was damaged in removal, replace with new key.

REPLACING COMPRESSOR CLUTCH

1. If the clutch parts do not require replacement, carefully wipe the parts using a clean dry cloth.

2. Position rotor plate on shaft, indexing the hub of the assembly with the Woodruff key and install with J-6323-01 Compressor Clutch Plate and Pulley Installer or J-6323 and J-6323-5 Adapter (Fig. 6-65). Position the tool spacer onto the threaded stud of the tool so the tapered end of the spacer faces the rotor plate. Thread the stud of J-6323-01 onto the end of the compressor shaft and holding this stud with an open end wrench to prevent the compressor from turning, complete the installation of the rotor plate by turning the large hex nut until the rotor plate is firmly seated against the selective spacers.

3. Remove the J-6323-01 Compressor Clutch Plate and Pulley Installer.

4. Install the pulley assembly using J-6323-01 or J-6323 and J-6323-5 in a similar manner as installing the rotor plate (Fig. 6-66).

NOTE: If a slight interference between the drive

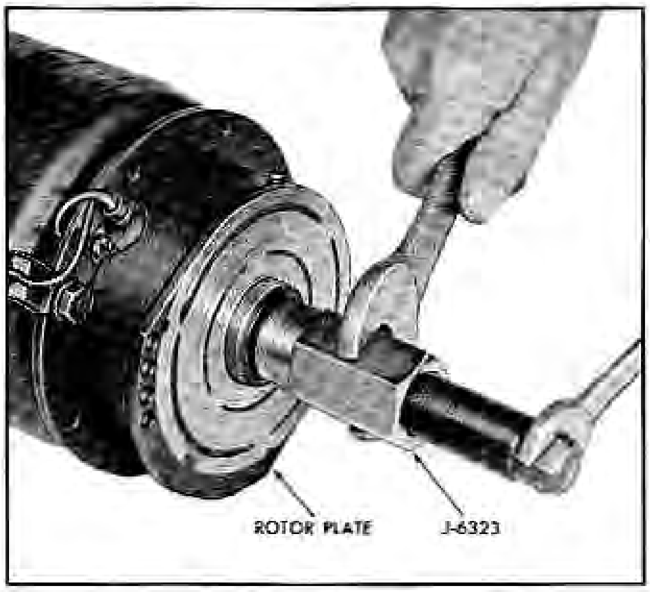


Fig. 6-65 Installing Rotor Plate

end of the tool and the pulley is experienced, grind outside diameter of drive end of tool to fit or use flat washers to assist in installing the pulley.

5. Replace compressor shaft nut lockwasher retainer and compressor shaft nut.

6. Energize compressor clutch and tighten nut to 5-7 lb. ft. torque; bend over lockwasher tang.

7. Energize compressor clutch and check for proper air gap between the rotor plate and coil housing (Fig. 6-67). This clearance should be .025"-.035". If this clearance is not within these specifications, then it will be necessary to remove the rotor plate and add or remove selective spacers as necessary.

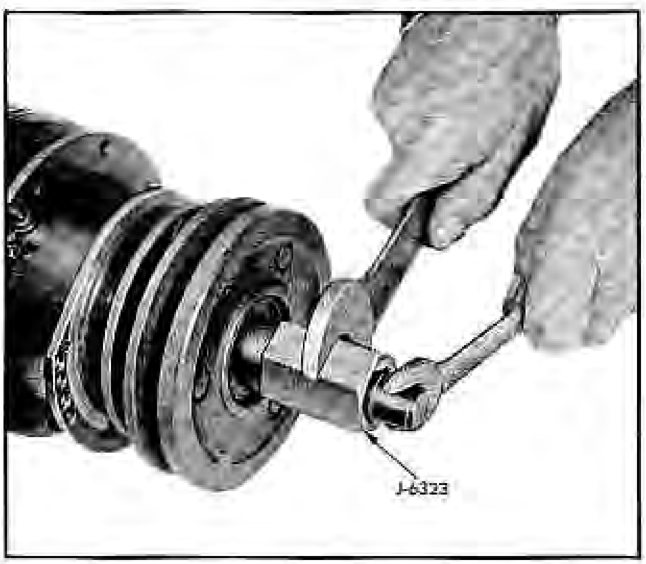


Fig. 6-66 Installing Pulley

Fig. 6-67 Checking Air Gap

8. Evacuate and charge system.

9. Check compressor oil level and add oil as necessary.

10. Test for leaks and perform operational test.

CONDENSER ASSEMBLY

REMOVE AND REPLACE

1. Depressurize the refrigeration system.

2. Remove right and left headlamp doors.

3. Remove right and left headlamp assemblies.

4. Remove right and left grille assemblies.

5. Remove hood latch and support assembly.

6. Remove compressor discharge hose clamp. Cut hose lengthwise through to the fitting just enough to disconnect hose. Cut off end of hose to remove cut portion and plug all openings.

7. Disconnect connection at condenser outlet and plug openings.

8. Remove battery and battery tray.

9. Disconnect right and left horns and remove condenser.

10. Replace condenser by reversing the above procedure, using a new rubber "O" ring seal well lubricated with clean compressor oil at each connection.

NOTE: The compressor discharge hose is long enough that it can be cut off at least once and still be usable. Do *not* use a hose that is too short, as it will cause noise.

11. Evacuate and charge system.

12. Check compressor oil level and add oil as necessary.

13. Perform operational test.

RECEIVER AND LIQUID INDICATOR ASSEMBLY

REMOVE AND REPLACE

1. Depressurize the system.

2. Disconnect inlet and outlet connections of receiver at liquid indicator assembly and plug openings.

3. Loosen receiver and liquid indicator assembly clamp screw and remove assembly.

4. Replace the receiver and liquid indicator assembly by reversing the above procedures, using new rubber "O" ring seals well lubricated with clean compressor oil at each connection.

5. Evacuate complete system.

6. Charge complete system.

7. Check compressor oil level and add oil as necessary.

8. Perform operational test.

THERMOSTATIC EXPANSION VALVE

REMOVE AND REPLACE

1. Depressurize the system.

2. Hoist front end of car.

3. Remove right front wheel and tire assembly.

4. Remove right front headlamp assembly.

5. Disconnect front fender at lower rear.

6. Remove right front fender skirt.

7. Disconnect thermostatic expansion valve capillary tube bulb at evaporator outlet pipe (Fig. 6-68).

8. Disconnect thermostatic expansion valve inlet connection carefully, as some pressure may still exist, and plug openings.

9. Remove thermostatic expansion valve, noting amount of oil that drains from evaporator, and plug openings.

10. Replace by reversing the above procedure, using new rubber "O" ring seals well lubricated with clean compressor oil at each fitting connection.

11. Evacuate and charge system.

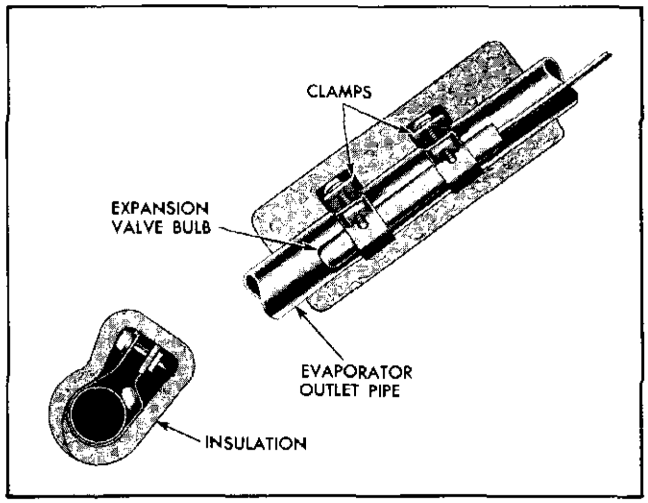


Fig. 6-68 Thermostatic Expansion Valve Bulb at Evaporator Outlet Pipe

12. Check compressor oil and add oil as necessary.

13. Perform operational test.

EVAPORATOR CORE

REMOVE AND REPLACE

1. Depressurize the system.

2. Hoist front of car.

3. Remove right front wheel and tire assembly.

4. Remove right front headlamp assembly.

5. Remove right front fender and fender skirt assembly.

6. Disconnect connection at thermostatic expansion valve inlet and plug openings (Fig. 6-69).

7. Remove hose clamps at evaporator outlet connections.

8. Cut hoses along sides through to the pipes just far enough to remove each hose and disconnect evaporator outlet connections. Plug openings.

9. Cut off ends of hoses just enough to remove length cut along sides.

10. Remove adapter connecting blower and air duct assembly to evaporator assembly.

11. Loosen blower and air inlet duct assembly as necessary to provide clearance for removal of evaporator.

12. Remove evaporator to cold air duct adapter attaching screws, remove adapter, and remove evaporator assembly.

13. Disconnect thermostatic expansion valve capillary bulb at evaporator outlet.

14. Remove thermostatic expansion valve, noting amount of oil that drains from evaporator, and plug all openings.

15. Remove evaporator core housings.

16. Replace by reversing the above procedure, making sure new rubber "O" ring seals well lubricated with clean compressor oil are at each fitting connection. Make sure that the blower to evaporator adapter is properly sealed. Make sure that the evaporator to cold air duct adapter and the cold air duct are properly sealed.

NOTE: The suction hose and the by-pass hose are long enough that they can be cut off at least once and still be usable. Do *not* cut a hose that is too short, as it will cause noise.

17. Evacuate and charge system.

18. Check compressor oil and add oil as necessary.

19. Perform operational test.

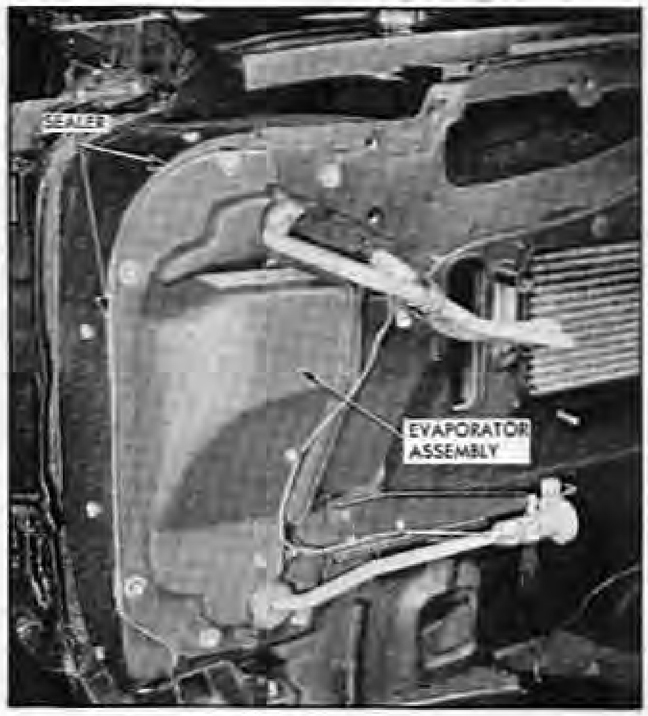


Fig. 6-69 Evaporator Assembly on Dash Shroud

TEMPERATURE REGULATION VALVE (HOT GAS BY-PASS VALVE)

REMOVE AND REPLACE

1. Depressurize the system.

2. Disconnect the temperature regulation valve cable from the valve.

3. Disconnect pipe and hose connections at the temperature regulation valve and plug openings.

4. Remove the temperature regulation valve mounting screws and remove the valve from compressor.

5. Replace the temperature regulation valve by reversing the above procedures, using new rubber "O" ring seals well lubricated with compressor oil at each connection.

6. Adjust temperature regulation valve control cable.

7. Evacuate complete system.

8. Charge complete system.

9. Check compressor oil level and add oil as necessary.

10. Perform operational test.

TEMPERATURE REGULATION VALVE

OVERHAUL (SEE FIG. 6-70)

1. Depressurize system (while depressurizing obtain overhaul kit).

2. Remove temperature regulation valve.

3. Remove cam return spring.

4. Remove mounting bracket.

5. Remove back up plate and pilot valve diaphragm.

6. Remove end cover. (This cover is spring loaded.)

7. Remove main diaphragm, pilot valve spring and pilot valve.

8. Examine all passages for foreign material and/or obstructions.

9. Reassemble by reversing the above steps, using the parts in the overhaul kit.

NOTE: Be careful to install diaphragms so they are properly centered and evenly tensioned at the contact edges.

10. Evacuate and charge system.

11. Adjust temperature regulation valve.

12. Perform operational test.

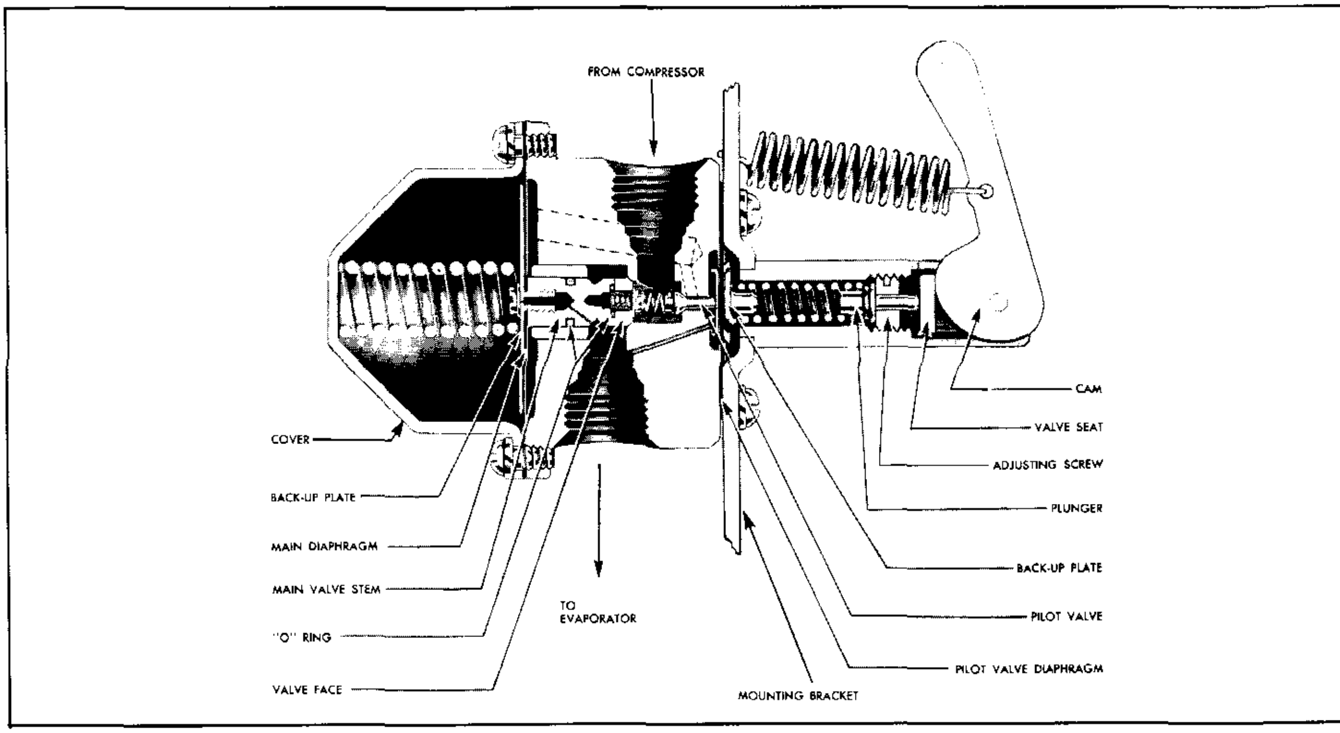


Fig. 6-70 Cross Section of Temperature Regulation Valve

COLLISION SERVICE

The severity and circumstances of the collision will determine the extent of repair work required. Good judgment must be used in deciding what steps are necessary to put the system back into operation.

Each part of the system must be carefully inspected. No attempt should be made to straighten kinked tubes or repair any bent or broken units. Check especially for cracks at soldered connections.

REFRIGERATION SYSTEM OPEN TO ATMOSPHERE

Broken tubes or units will allow air, moisture and dirt to enter. These parts should be sealed as soon as possible until such time as they are replaced.

If the system is open for more than 15 or 20 minutes (depending on humidity), the receiver and liquid indicator assembly will absorb an excessive amount of moisture and should be replaced, and each component of the system should be cleaned with dry nitrogen and flushed with liquid refrigerant to remove dirt and moisture.

FLUSHING SYSTEM

Flushing can be accomplished by connecting a refrigerant drum to the unit to be flushed, and then turning the drum upside down and opening the drum shut-off valve to pour refrigerant through the unit. The unit should be supported so that the refrigerant passing through it will be directed into an area where –21.7°F. will do no damage.

CAUTION: Remember that when liquid refrigerant is poured from the drum into an area where atmospheric pressure exists, its temperature will immediately drop to –21.7°F.

In order to keep the expansion valve open when flushing the evaporator, the expansion valve bulb must be detached from the evaporator outlet tube.

INSPECTING COMPRESSOR

If there is no visible evidence of damage, rotate compressor shaft to test for normal reaction. A quick check for broken reed valves, to turn compressor shaft (using box end wrench on compressor shaft nut) and check for resistance when turning the shaft. An irregular resistance force will be felt as each of the five pistons goes over top center for each revolution of the crankshaft. If this pattern is not felt, it indicates one or more broken compressor reed valves and the compressor must be replaced.

Inspect oil for foreign material which would indicate internal damage to the compressor. If no foreign matter is found in oil, compressor can be used. Drain oil from compressor and pour in 13 oz. avoirdupois of new Frigidaire 1000 viscosity oil.

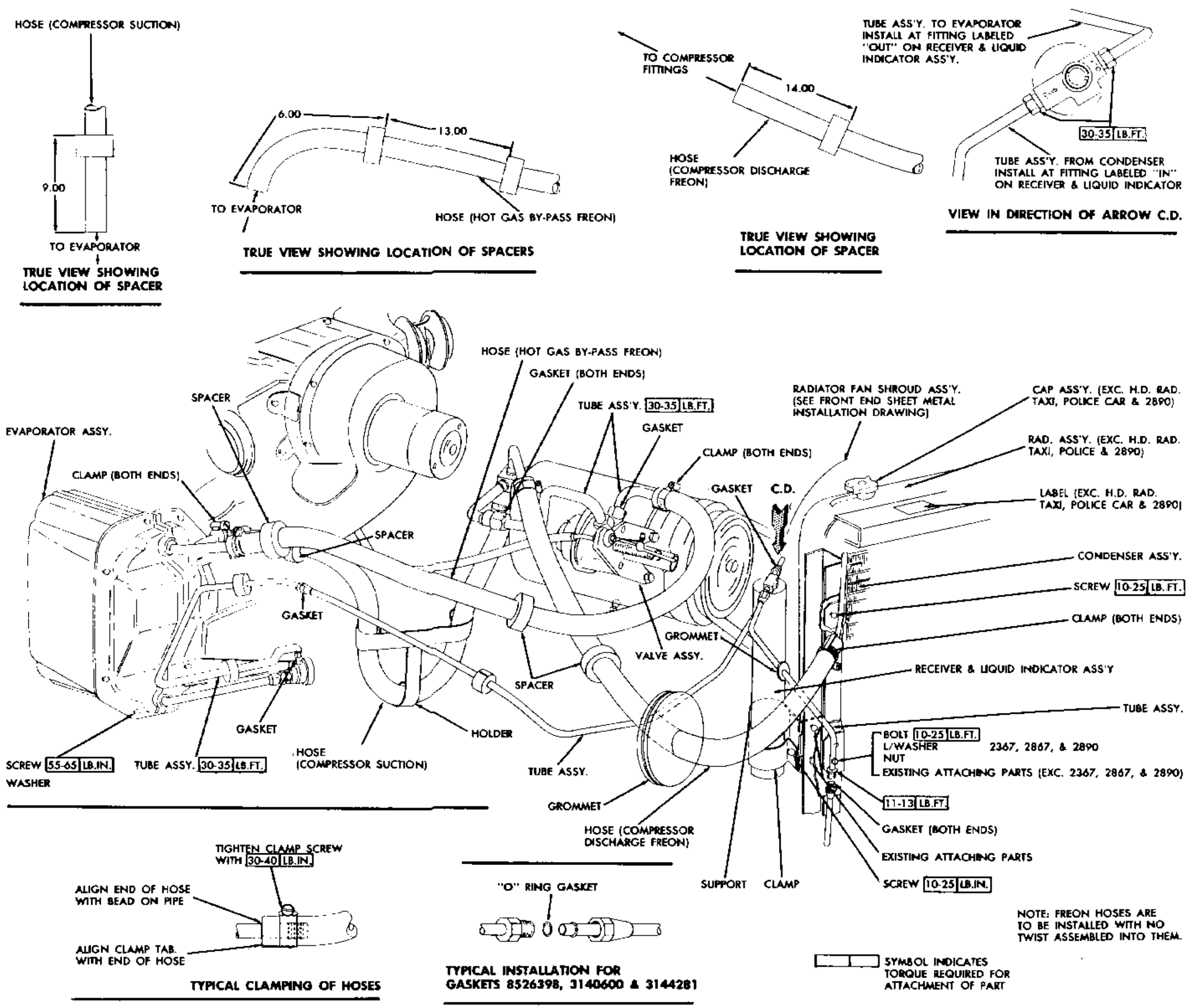


Fig. 6-71 Reference Illustration—Circ-L-Aire Conditioner Refrigeration System

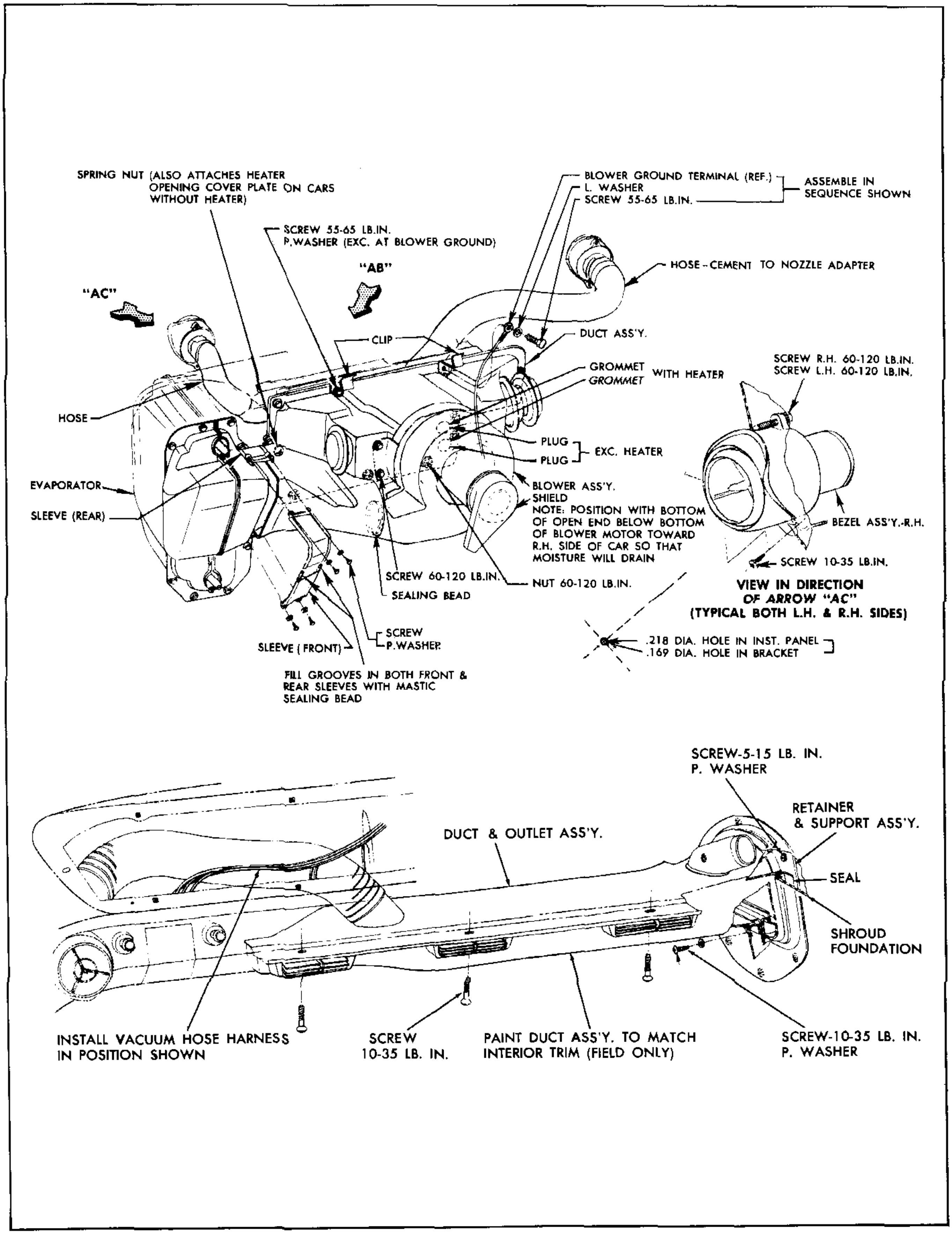


Fig. 6-72 Reference Illustration—Circ-L-Aire Conditioner Air System

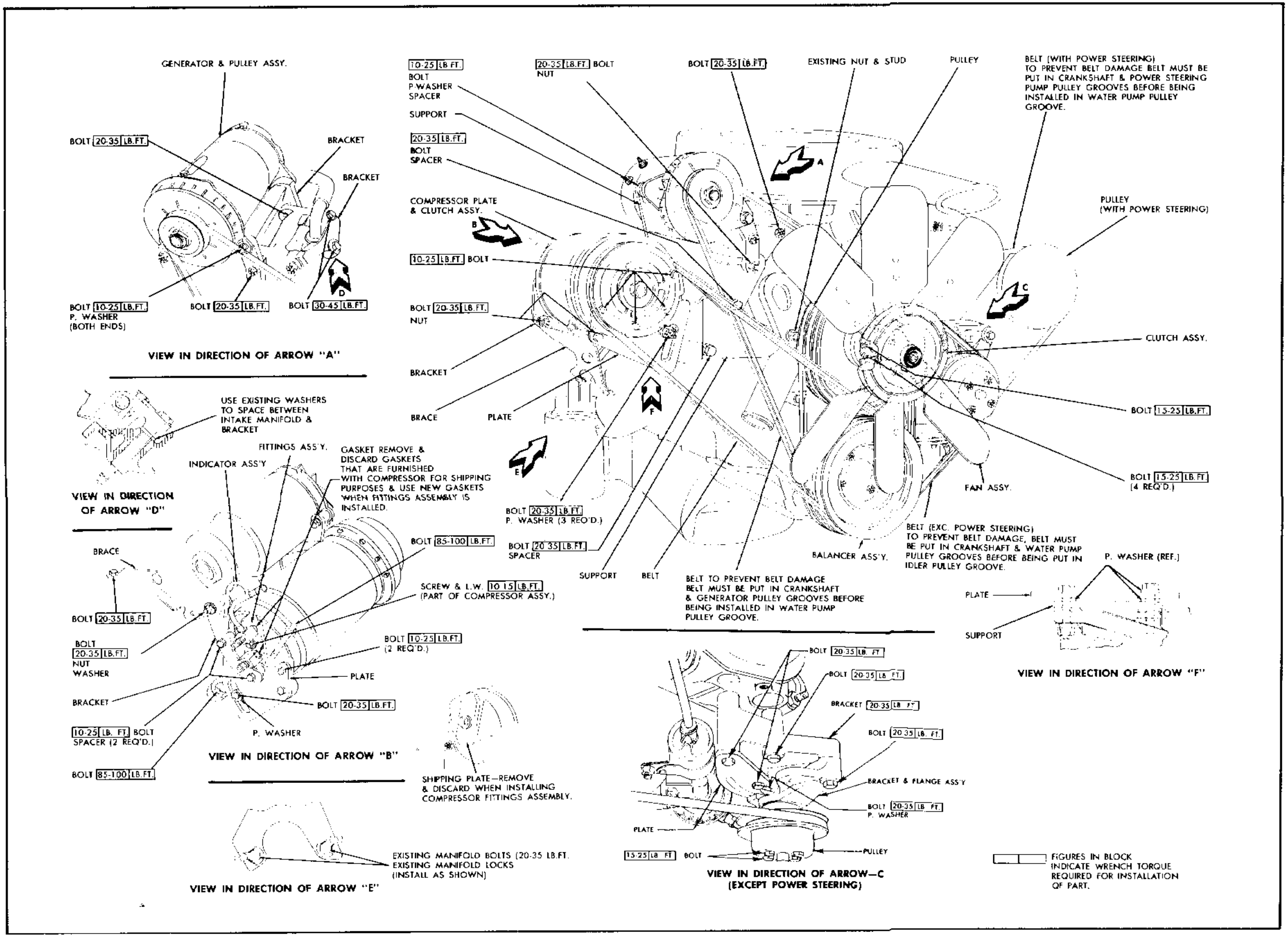


Fig. 6-73 Reference Illustration—Circ-L-Aire Conditioner Engine Parts

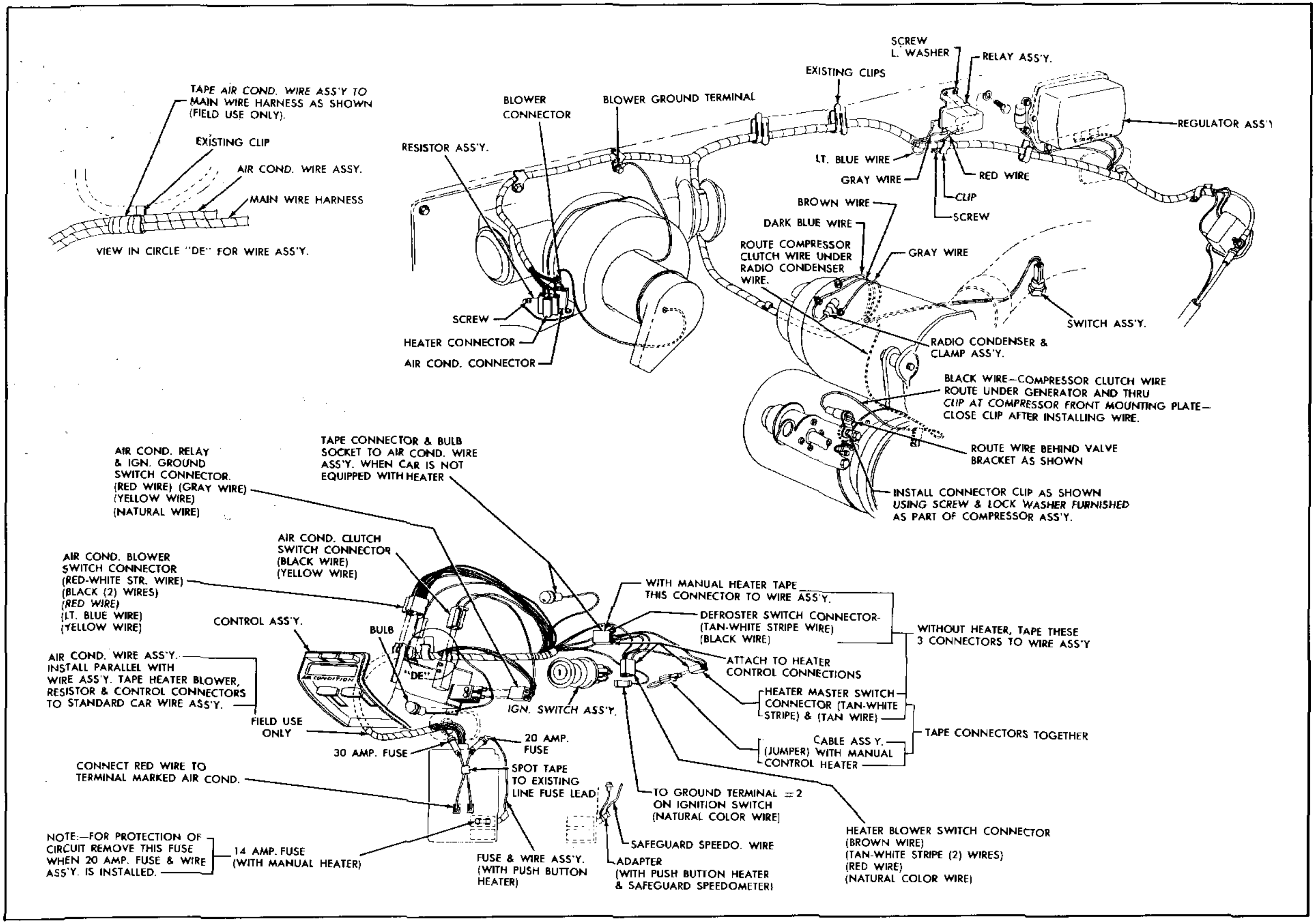


Fig. 6-74 Reference Illustration—Circ-L-Aire Conditioner Electrical Parts

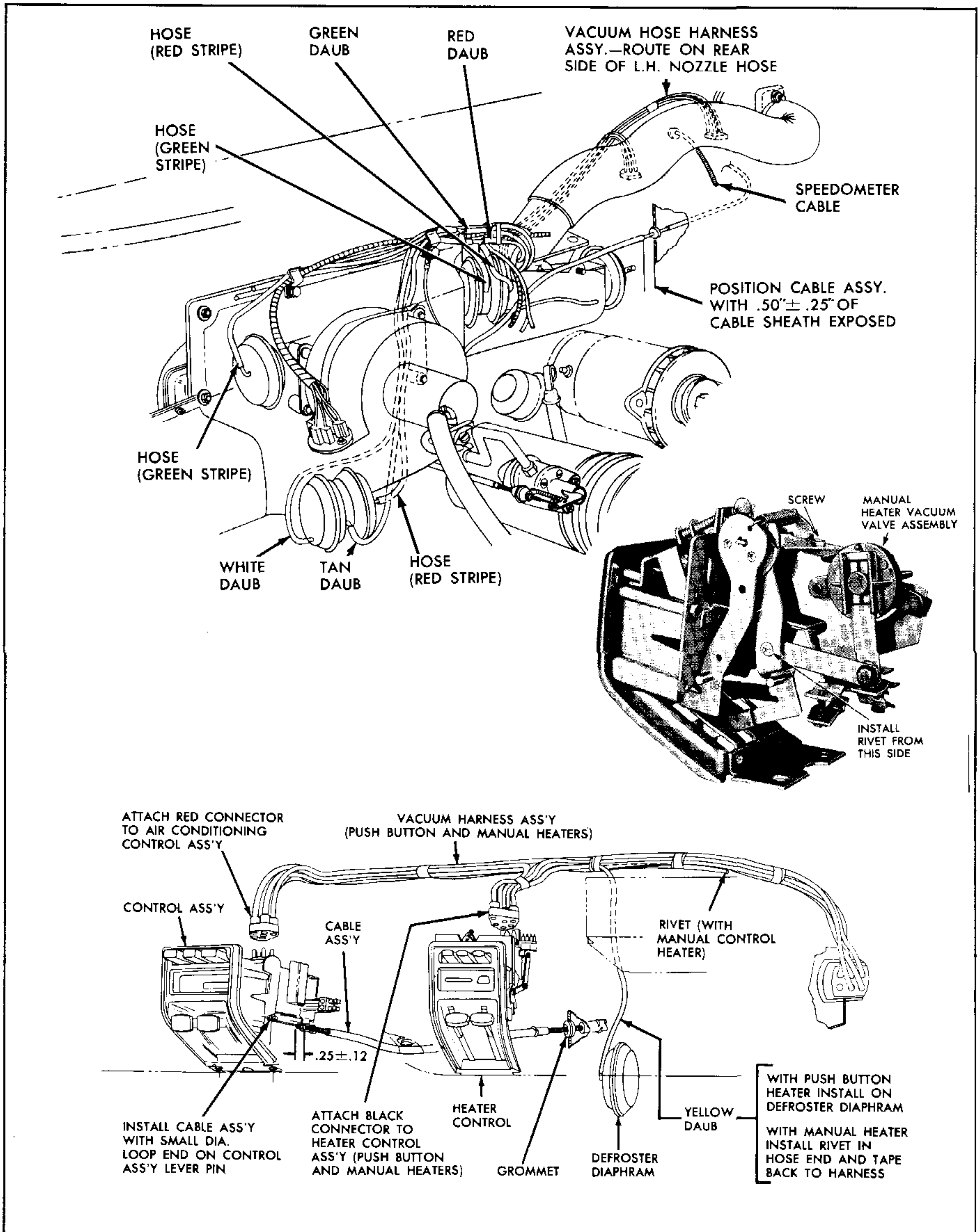


Fig. 6-75 Reference Illustration—Circ-L-Aire Conditioner Controls

TESTING AND DIAGNOSIS

CONTENTS OF THIS SECTION

TESTING

The purpose of performing an operational test is to prove that the air conditioning electrical system, air system and refrigeration system are operating properly and efficiently. Results of the test are as follows:

1. Operation of the air conditioner blower at all four speeds and engagement of the compressor clutch would indicate that the electrical circuits are functioning properly.

2. A clear sight glass would indicate a properly charged refrigeration system.

3. Proper evaporator pressure, as controlled by the temperature regulation valve, would provide the proper "freeze protection" for the evaporator.

4. Proper nozzle temperatures would indicate a system free from warm air leaks.

Check and correct all air and refrigerant leaks in the air conditioning system as well as operation of vacuum operated air valves.

Check for proper compressor oil level after refrigerant leaks are repaired, before conducting an operational test.

PRELIMINARY CHECKS

1. Check compressor belt for proper tension; if below 70 lbs. adjust to 100-105 lbs. on Borroughs Belt Tension Gauge.

2. Check all refrigeration lines for leaks, kinks, or other restrictions.

3. Check all air hoses for leaks or restrictions.

4. Check outer surfaces of evaporator and condenser cores to be sure they are not plugged with dirt, leaves or other foreign material. Be sure to check between the condenser and radiator as well as the outer surfaces.

5. Connect engine tachometer.

6. Start engine and operate at 1500 RPM with "OUTSIDE" button depressed, temperature control lever full down for maximum cooling and blower speed on "HI". Check heater controls to be certain all are in the off position. After five minutes of engine operation, observe for bubbling at the sight glass (above 70°F. ambient). If the system is low on refrigerant, refer to ADDING REFRIGERANT-12 for proper charging procedure.

7. Under the same conditions as in step 6 above, pull the temperature control lever to the full up position. This should disengage the compressor clutch. If clutch does not disengage, disconnect the clutch wire at the compressor.

a. If clutch disengages, the clutch control switch should be checked for maladjustment.

b. If clutch does not disengage, malfunction is at the clutch.

8. Gradually push temperature lever down until the clutch engages (this should occur at approximately 1/4" downward travel) and observe clutch engagement action which should be without slip. If clutch slips, check clutch for proper adjustment, short in clutch coil or leaking compressor shaft seal.

9. Change blower speed to "3", "2", and then "LO", and observe for decreases in air flow.

10. With blower on "HI", check for air leakage at defroster nozzles and heater outlet. Depress "INSIDE" button and repeat. Leakage at these points, either with the "OUTSIDE" or "INSIDE" button depressed, indicates malfunctioning of the selector air valve or improper vacuum hose harness hook-up.

11. Turn ignition key to "OFF" position.

The air conditioning refrigeration system should be checked for proper operating temperatures and pressures as follows:

INSTRUMENTATION AND TEST CONDITIONS

1. Place car in a shaded area (not under sun).

2. Remove caps from compressor gauge fittings.

3. Check calibration of suction gauge and connect low pressure side of manifold gauge set J-5725 or J-5725-01 using J-5420 Schrader valve adapter to the Schrader valve located in the suction side of the compressor fittings assembly.

4. Connect the high pressure side of the gauge set using J-6163 Schrader valve adapter (90°) to the Schrader valve located in the discharge side of the compressor fittings assembly.

5. Purge gauge lines by cracking gauge set low and high pressure hand shut-off valves.

6. Connect engine tachometer.

7. Push temperature control lever full down for maximum cooling. In this position the valve lever cam should just contact the nylon plunger. (See TEMPERATURE REGULATION VALVE CONTROL CABLE ADJUSTMENT.)

8. Depress "INSIDE" button and position blower on "HI".

9. Locate a calibrated thermometer one inch (1″) inside left nozzle so sensing element does not contact nozzle hose or metal parts.

10. Check heater controls to be certain all are in the off position.

11. Close car doors and windows.

12. Place auxiliary fan (at least 20″ in diameter) approximately 25″ in front of the air conditioning condenser.

13. Suspend a calibrated thermometer 2″ ahead of condenser in auxiliary fan air blast.

OPERATIONAL TEST PROCEDURE

NOTE: Before proceeding be sure instruments and test conditions are as explained above.

1. Start engine, increase slowly to 2900 rpm and run for 3 minutes at this speed. (Synchro-mesh transmission in Neutral and parking brake on or with Hydra-Matic Transmission in the "PARK" position and parking brake on.)

2. Observe low pressure gauge and adjust temperature regulation valve only if reading is not within specifications.

NOTE: If adjustment of temperature regulation valve is necessary, proceed as follows:

a. Remove temperature regulation valve lever and nylon plunger, and insert adjusting tool J-6389 into the front end of the valve.

b. Check CHART I—TEMPERATURE REGULATION VALVE TEST data and obtain proper psi reading on the suction gauge by turning adjusting tool clockwise to increase pressure or counterclockwise to decrease pressure (¼ turn changes top tank pressure approximately 3 lbs.).

NOTE: It is important that changes be made in small increments, with time allowed for the pressure to stabilize.

c. Replace nylon plunger spacer and valve cam lever.

d. Install and adjust temperature valve control cable at temperature regulation valve so that valve lever cam just contacts nylon plunger in maximum cold position. (See TEMPERATURE REGULATION VALVE CONTROL CABLE ADJUSTMENT.)

3. Run engine at 1500 RPM for at least 15 minutes or until refrigeration system stabilizes.

4. At the end of this time, record the following:

a. Ambient air at condenser.

b. Compressor discharge pressure.

c. Compressor suction pressure.

d. Left nozzle temperature.

Compare above with system pressures and temperature shown on the OPERATIONAL TEST CHART.

If not within the limits shown, refer to TROUBLE DIAGNOSIS for possible cause of substandard performance. Reference should be made in the order listed, with head pressure first, if not within operational test chart limits, then suction pressure and finally left nozzle temperature.

5. When all adjustments or repairs have been made, make another operational test of the system.

CHART I—TEMPERATURE REGULATION VALVE TEST

TEST CONDITIONS

Heater Control	Completely "OFF"—All levers fully raised.
Heater Temperature Control Lever	Fully raised, for no heat.
Heater Fan Switch	"OFF"
Hood	Raised
Doors and Windows	Closed
Air Conditioner Control Push Button	on "INSIDE"
Air Conditioner Fan Switch	on "HI"
Air Conditioner Temperature Control Lever	Fully depressed, for maximum cooling.
Engine Speed	2900 RPM (Stabilize at 1500 RPM).

Test where sun load is not a factor; also, an auxiliary fan must be placed in front of condenser.

If an accurate setting is to be made, it is essential that condenser air temperature and car interior temperatures be stabilized at 1500 Engine RPM, prior to checking valve (and adjusting if necessary) at 2900 RPM.

TEST READINGS—2900 RPM

Ambient Air in Degrees F. (In auxiliary fan air blast 2" ahead of condenser)	70	80	90	100	105	110
Average Low Pressure Gauge Reading—psi (Adjust if not within 1½ psi)	20½	20½	20½	21	21½	22

CHART II—OPERATIONAL TEST

TEST CONDITIONS

Heater Control	Completely "OFF"—All levers fully raised.
Heater Temperature Control Lever	Fully raised, for no heat.
Heater Fan Switch	"OFF"
Hood	Raised
Doors and Windows	Closed
Air Conditioner Control Push Button	on "INSIDE"
Air Conditioner Fan Switch	on "HI"
Air Conditioner Temperature Control Lever	Fully depressed, for maximum cooling.
Engine Speed	1500 RPM

Test where sun load is not a factor; also, an auxiliary fan must be placed in front of condenser.

TEST READINGS—1500 RPM

Ambient Air in Degrees F. (In Auxiliary Fan Air Blast 2" ahead of Condenser)	70	80	90	100	110
Average Compressor Discharge—psi (12 psi range is normal)	100-150	130-180	160-210	190-240	220-275
Average Compressor Suction—psi	23-26	23½-27	24-28	24-28	24-28
Left Nozzle Temperature—Degrees F.	35-39	35-40	36-42	38-44	40-46

CAUTION: Sensing element on test thermometer must not contact hose or metal parts.

TROUBLE DIAGNOSIS

INSUFFICENT COOLING

COMPLAINT OR CAUSE	REMEDY
Nozzle temperature too high.	See NOZZLE TEMPERATURE TOO HIGH and also SUCTION PRESSURE TOO HIGH.
	Check blower operation.
	Check for obstructions, proper routing and proper connection of the air distribution hoses.
Insufficient air flow.	Flush evaporator core. If evaporator is iced, de-ice and check adjustment of temperature regulation valve.
Heater temperature control valve *not off* in the "OFF" position.	Adjust heater temperature control cable and/or temperature control valve (air mix valve.)
Ventilator and/or heater air valve or controls not in the "OFF" position.	Advise owner on proper operation of air conditioning system.
Nozzle temperature varies too much.	A 70°F. frequent variation at nozzle during operational check indicates temperature regulation valve is "hunting" excessively and the valve should be replaced.

COMPRESSOR DISCHARGE PRESSURE TOO HIGH

CAUSE	REMEDY
Engine overheated.	See Shop Manual.
Overcharge of refrigerant or air in system.	Systems with excess discharge pressures should be *slowly* depressurized at the receiver inlet connection, observing the behavior of the high pressure gauge indicator.
	1. If discharge pressure drops rapidly, it indicates air (with the possibility of moisture) in the system. When pressure drop levels but still indicates in excess of specifications shown in the OPERATIONAL TEST CHART, slowly bleed system until bubbles appear in the sight glass and stop. Add refrigerant until bubbles clear, then add one (1) pound of refrigerant. Recheck operational pressures. If discharge pressure still remains above specifications and the suction pressure is slightly above normal, then a restriction exists in the high pressure side of the system.
	2. If discharge pressure drops slowly, it indicates excessive refrigerant. If pressures drop to specifications and sight glass remains clear, stop depressurizing and recheck operational pressures. If pressures are satisfactory, depressurize until bubbles appear in the sight glass, stop depressurizing, then add one (1) pound of refrigerant. Recheck operational pressures.

COMPRESSOR DISCHARGE PRESSURE TOO HIGH—Continued

CAUSE	REMEDY
Overcharge of refrigerant or air in system—Continued	3. If discharge pressure remains high after depressurizing the system, continue depressurizing until bubbles appear in the sight glass. If suction pressures also remain high, then the temperature regulation valve may require adjustment, as well as a possibility of a restriction in the high pressure side of the refrigeration system. The system will by-pass more frequently under this condition. See also COMPRESSOR SUCTION PRESSURE TOO HIGH. NOTE: A system that continually by-passes will dump compressor oil into the evaporator and will starve the compressor of oil, as well as indicate a much higher nozzle temperature.
Restriction in condenser, receiver-liquid indicator, or any high pressure line.	Remove parts, inspect, and clean or replace.
Condenser air flow blocked.	Clean condenser and radiator core surfaces as well as the space between the condenser and radiator.
Compressor suction pressure too high.	See COMPRESSOR SUCTION PRESSURE TOO HIGH.

COMPRESSOR DISCHARGE PRESSURE TOO LOW

CAUSE	REMEDY
Insufficient refrigerant.	Check for presence of bubbles or foam in liquid indicator. If bubbles or foam are noted, add refrigerant until sight glass clears, then add an additional one lb. Adding refrigerant in excess of 1/4 lb. beyond the charge specification would indicate a leak in the system.
Defective compressor and/or broken compressor reed valves.	Replace compressor. A quick check for broken reed valves is to turn compressor shaft (using box end wrench on compressor shaft nut) and check for resistance when turning the shaft. An irregular resistance force will be felt as each of the five pistons goes over top center for each revolution. If this pattern is not felt, it indicates one or more broken compressor reed valves.
Plug in refrigerant system.	Remove high pressure line to condenser at compressor and suction hose from evaporator at the temperature regulation valve; also disconnect union in high pressure line between condenser and expansion valve. It should be possible to blow air through both ends of union; if not, investigate for plug in line through which air cannot be blown. If none of the refrigerant lines are plugged see COMPRESSOR SUCTION PRESSURE TOO LOW.
Compressor suction pressure too low.	See COMPRESSOR SUCTION PRESSURE TOO LOW.

COMPRESSOR SUCTION PRESSURE TOO HIGH

CAUSE	REMEDY
Thermostatic expansion valve capillary tube bulb not tight to evaporator tube.	Remove insulation and check clamps for tightness and foreign material between bulb and evaporator tube.
Thermostatic expansion valve inoperative.	Immerse capillary tube bulb alternately in hot and cold water. If suction pressure does not change, replace thermostatic valve.
Temperature regulation valve improperly adjusted or inoperative.	Conduct temperature regulation valve check. If compressor suction pressure cannot be brought down to proper specification, pinch shut temperature regulation valve to evaporator hose, using caution not to cut or otherwise damage hose. If compressor suction pressure falls below proper specifications, repair or replace temperature regulation valve.

COMPRESSOR SUCTION PRESSURE TOO LOW

CAUSE	REMEDY
Temperature regulation valve improperly adjusted or inoperative.	Conduct temperature regulation valve check. If compressor suction pressure cannot be raised to proper specification and compressor to temperature regulation valve by-pass line is hot, repair or replace temperature regulation valve.
Thermostatic expansion valve capillary tube broken, inlet screen plugged, or valve otherwise failed.	Conduct temperature regulation valve check. If compressor suction pressure cannot be raised to proper specification and compressor to temperature regulation valve by-pass line is hot, remove thermostatic expansion valve. If inlet screen is not plugged, replace valve. If screen is plugged, it should be cleaned, the valve back flushed with Refrigerant-12 and reinstalled.
Restriction in system tubes or hoses.	Replace kinked tube or restricted hose.

NOZZLE OUTLET TEMPERATURE TOO HIGH

NOTE: When owner complains of not enough cooling and operational test shows that system is functioning properly, check fit of rear of hood to cowl seal. An air leak at this point will result in hot engine compartment air passing directly into the cowl air intake.

CAUSE	REMEDY
Warm air leaks.	Locate and correct as necessary.
Heater temperature control valve *not off* in "OFF" position.	Adjust heater temperature control cable and/or temperature control valve (air mix valve).
Heater air control *not* in "OFF" position.	Advise owner of proper control settings.

NOZZLE OUTLET TEMPERATURE TOO HIGH—Continued

CAUSE	REMEDY
Poor seal—evaporator core to evaporator outlet case.	Correct sealing at evaporator core to evaporator outlet case.
Defective or missing evaporator drain hose.	Replace drain hose.
Air hoses not properly connected.	Inspect and connect air hoses.
Vacuum control hoses not connected properly.	Check for proper vacuum hoses and for proper connections.
Insufficient refrigerant.	If bubbles appear in the liquid indicator with blower on "HI" and temperature control lever in full cold position, add refrigerant until bubbles disappear and then add one lb. additional. If there are no bubbles in the liquid indicator, add one lb. of refrigerant and recheck nozzle temperatures. If nozzle temperature does not change, bleed off refrigerant until bubbles do appear, then add one lb. of refrigerant. Recheck and compare with operational test data.
Thermostatic expansion valve improperly adjusted.	Replace valve.
Temperature regulation valve improperly adjusted.	Adjust temperature regulation valve.
Evaporator core freezes.	Check for proper connections at temperature regulation valve and/or adjust valve.
	Replace thermostatic expansion valve.

NOZZLE OUTLET TEMPERATURE TOO LOW

CAUSE	REMEDY
Defective or improperly adjusted thermostatic expansion valve.	Replace valve.
Temperature regulation valve improperly adjusted.	Adjust temperature regulation valve.
Insufficient air flow from nozzles.	Check for blocked evaporator, improperly installed air outlet housing to nozzle hoses and inoperative blower.

See INSUFFICIENT COOLING.

MISCELLANEOUS

TROUBLE	REMEDY
Hissing or wheezing noise when moving temperature control to warmer position.	Temperature regulation valve by-passing hot gas. This is normal condition.

SPECIFICATIONS

Current flow at Circ-L-Aire and heater blower control positions

NOTE: Heater control in OFF position, at room temperature–70°F, all windows closed.

AIR CONDITIONING CONTROL SETTING	RELAY VOLTAGE	BLOWER SPEED	BLOWER VOLTAGE	BLOWER AMPERES	RESISTOR VOLTAGE
INSIDE HI	12.2	2940	11.5	16.3	–
INSIDE HI	13.5	3120	12.7	17.75	–
INSIDE HI	14.5	3240	13.65	19.0	–
INSIDE MED. 3	12.2	2610	9.6	14.0	2.01
INSIDE MED. 3	13.5	2790	10.7	15.25	2.19
INSIDE MED. 3	14.5	2910	11.5	16.3	2.32
INSIDE MED. 2	12.2	2010	6.5	10.25	5.15
INSIDE MED. 2	13.5	2160	7.3	11.2	5.65
INSIDE MED. 2	14.5	2250	7.9	11.9	6.0
INSIDE LO	12.2	1560	4.75	7.9	7.05
INSIDE LO	13.5	1680	5.3	8.7	6.6
INSIDE LO	14.5	1800	5.7	9.8	8.3
OUTSIDE HI	12.2	2910	11.5	16.25	–
OUTSIDE HI	13.5	3150	12.75	17.8	–
OUTSIDE HI	14.5	3270	13.7	19.0	–
OUTSIDE MED. 3	12.2	2550	9.55	14.1	2.02
OUTSIDE MED. 3	13.5	2730	10.6	15.4	2.22
OUTSIDE MED. 3	14.5	2880	11.4	16.4	2.38
OUTSIDE MED. 2	12.2	1980	6.6	10.3	5.2
OUTSIDE MED. 2	13.5	2130	7.25	11.25	5.7
OUTSIDE MED. 2	14.5	2220	7.85	12.0	6.05
OUTSIDE LO	12.2	1530	4.6	7.9	7.2
OUTSIDE LO	13.5	1620	5.1	8.8	7.95
OUTSIDE LO	14.5	1740	5.6	9.4	8.45

NOTE: Air Conditioning Control was in OFF position. *Voltage at Regulator–80°F Ambient.

HEATER CONTROL SETTING	INPUT VOLTAGE*	BLOWER SPEED	BLOWER VOLTAGE	BLOWER AMPERES	RESISTOR VOLTAGE
DE ICE	12.2	2595	8.95	12.7	1.72
DE ICE	13.5	2790	9.9	13.8	1.87
DE ICE	14.5	2925	10.7	14.8	2.2
NORMAL HI	12.2	2115	6.45	9.9	4.3
NORMAL HI	13.5	2280	7.25	10.9	4.65
NORMAL HI	14.5	2400	7.8	11.7	4.95
NORMAL MED.	12.2	1890	5.4	8.75	5.6
NORMAL MED.	13.5	2040	6.0	9.6	6.1
NORMAL MED.	14.5	2130	6.5	10.2	6.5
NORMAL LO	12.2	1440	3.75	7.0	7.35
NORMAL LO	13.5	1575	4.25	7.7	8.1
NORMAL LO	14.5	1680	4.65	8.3	8.6

Compressor

Make .... Frigidaire (9.28 cu. in.)
Oil .... Frigidaire 1000 Visc.
Oil Contents (new) .... 13 oz. fluid or 12 oz. avoirdupois

Clearances

Compressor Rotor Plate to Coil Housing with Clutch Energized .... .025"-.035"

Compressor Belt

Size .... $^{15}/_{32}$"
Tension .... 100-105 lbs. indicated on Borroughs Belt Tension Gauge

Compressor Coil

Current .... 2.07 amps

Compressor to Engine Ratio .... 1.52 to 1

Cooling System Capacity .... less heater 18.5 qts.
with heater 19.5 qts.

Engine Idle Speed—Air Conditioner off (Hydra-Matic Transmission in Drive) .... 540-560 RPM
(Synchro-Mesh Transmission in Neutral) .... 540-560 RPM

Fan .... 6 blades

Refrigerant-12 Capacity .... 5.0 lbs.

Fuse

In line in front of fuse block .... 30 amp.
At battery terminal of generator regulator (engine electrical system) .... 60 amp.
At heater terminal in fuse block or in jumper wire .... 20 amp.

Generator

Model 1102220
Brush Tension .... 28 oz.
Cold Output .... 45 amps., 14 volts at 2600 RPM
Field Current (12V at 80°F.) .... 2.66-2.86 amps.
Generator to engine drive ratio .... 2.76 to 1

Generator Regulator

Model 1119623
(Includes 1119600 regulator and 1945171—60 amp. fuse assembly.)

Cutout Relay

Air Gap .... .020"
Point Opening .... .020"
Closing Voltage .... 11.8-13.0 Volts

Voltage Regulator

Air Gap .... .067"
Upper Contact Opening .... .016"
Normal Range .... 13.8-14.6 Volts
Lower Contact Setting .... 0.1-0.3 Volts lower than the normal range

Current Regulator

Air Gap .... .075"
Allowable limits at 125°F. .... 38-45 amps.

Radiator Cap .... 15 lbs.

Torque

Compressor shaft nut .... 5-7 lb. ft.
Compressor valve body attaching screw .... 10-15 lb. ft.

Hose and Tubing Connections Torque Chart

Metal Tube Outside Diameter	Thread and Fitting Size	Steel Tubing Torque Lb.-Ft.	Aluminum or Copper Tubing Torque Lb.-Ft.	Nominal Torque Wrench Span
1/4	7/16	10-15	5-7	5/8
3/8	5/8	30-35	11-13	3/4
1/2	3/4	30-35	11-13	7/8
5/8	7/8	30-35	18-21	1 1/16
3/4	1 1/16	30-35	23-28	1 1/4

If a connection is made with steel to aluminum or copper, use torques for aluminum. In other words, use the lower torque specification.

Use steel torques only when both ends of connection are steel.

COOL PACK CONDITIONER

CONTENTS OF THIS SECTION

DESCRIPTION AND OPERATING INSTRUCTIONS

GENERAL DESCRIPTION

PONTIAC

Pontiac's Cool Pack Conditioner can be operated at any time the engine is running. This feature permits its use any time for circulating inside air for added ventilation, cooling or dehumidifying. All air entering the system is inside air which is recirculated, providing air free of undesirable automobile exhaust fumes or odors.

The cooling unit is suspended from the center of the instrument panel providing minimum vibration and an efficient location for distributing cooled air with a minimum of space requirement for this type air conditioning.

The driver has fingertip control of the temperature of conditioned air in the car. When air conditioning is desired, the Cool Pack blower forces air taken

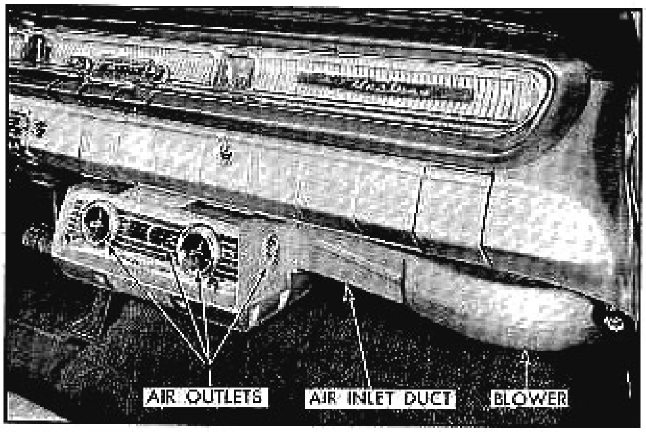


Fig. 7-1 Pontiac Cool Pack Conditioner Air Outlets

from over the right front passenger's feet through the cooling unit core and then through the air outlets.

Pontiac's refrigeration portion of the Cool Pack Conditioning system is efficiently and completely contained within the engine compartment and under the instrument panel.

GENERAL DESCRIPTION

TEMPEST

The Tempest unit is very similar to the one in the Pontiac. The major difference is that the right hand cowl vent grille is replaced by a blower air inlet fitting. By pulling out the right hand cowl vent control and when at normal highway speeds, a percentage of outside air may be used for removal of smoke or odors from the car.

AIR OUTLETS AND CONTROLS

AIR OUTLETS

Refrigerated air enters the interior of the car through five discharge outlets; two revolvable, louvered registers on the sides of the evaporator, designed to rotate 360°; through two ball nozzle outlets which can be adjusted to direct air flow in any direction, and through a vaned rotary valve which can be adjusted to change vertical direction of air flow.

The outlets located on each side of the evaporator case are for foot cooling of passenger and driver.

CONTROLS

The controls are located at the front of the evaporator case assembly; a "FAN" (blower) control lever at the lower left and a temperature control lever at the lower right (Fig. 7-3).

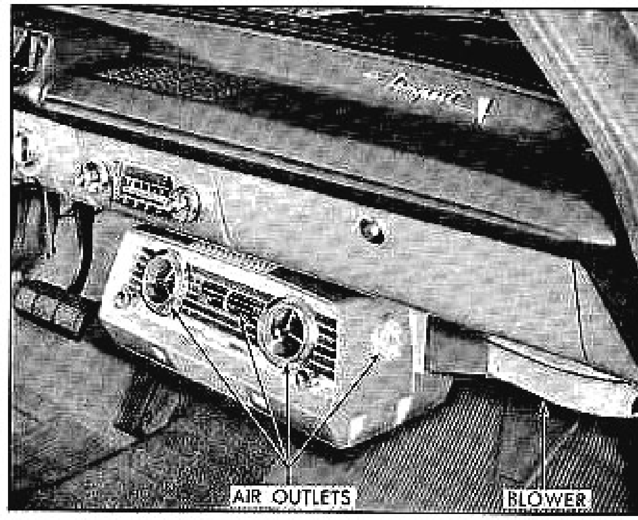


Fig. 7-2 Tempest Cool Pack Conditioner Air Outlets

BLOWER CONTROL

A "FAN" control knob turns on and controls three blower speeds to regulate the amount of forced air movement.

When the blower control is at the full counterclockwise position, the blower is "OFF" with no current flowing to the blower or clutch. Moving the blower control knob progressively clockwise supplies current to the blower to operate at "LO", medium, and "HI" speed respectively and provides a path for current to the compressor clutch.

The Cool Pack blower circuit is so wired that should the Cool Pack blower be operating at "HI" speed it will automatically drop back to medium speed when the parking lamps or headlamps are turned on. Also, when this air conditioner is on, the *heater* blower is automatically shut off.

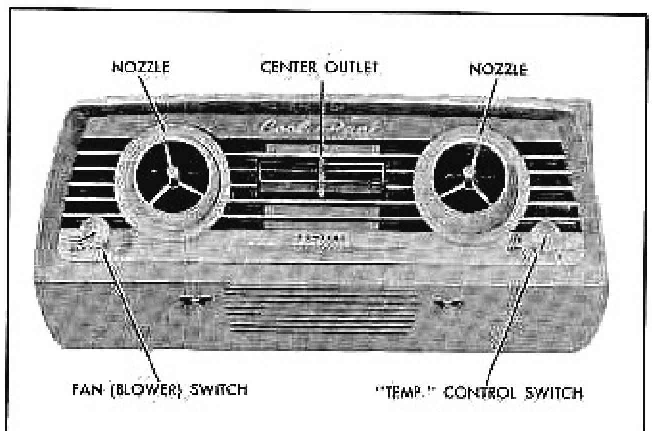


Fig. 7-3 Cool Pack Conditioner Controls

TEMPERATURE CONTROL

The temperature control (located at the lower right corner) rotates to provide no cooling when forced air is desired for ventilation only and also provides for varying levels of cooling.

This control is attached to a temperature control switch which activates the compressor. In the full counterclockwise position, the switch is opened mechanically and no cooling can be obtained. Minimum cooling is provided with the temperature control knob moved just a bit clockwise from the full counterclockwise position. Moving this knob from full counterclockwise to clockwise progressively increases the amount of cooling. Maximum cooling is obtained when the knob is at the extreme clockwise position (as shown by the direction of the arrow).

OPERATING INSTRUCTIONS

To cool a car under various weather and driving conditions, use the following control settings:

FAST COOL DOWN

(CAR WHICH HAS BEEN STANDING IN HOT SUN)

CONTROL	SETTING
Blower control knob	Clockwise, for high speed.
Temperature control knob	Clockwise, for maximum cooling.
Nozzles	Position as desired.
Car windows	Wide open for two or three minutes to expel hot air, then closed.

SLOW CITY DRIVING

CONTROL	SETTING
Blower control knob	Clockwise, for high speed.
Temperature control knob	Clockwise, for maximum cooling.
Nozzles	Position as desired.
Car windows	Closed.

NORMAL WARM WEATHER HIGHWAY CRUISING

CONTROL	SETTING
Blower control knob	Low speed, or medium speed.

NORMAL WARM WEATHER HIGHWAY CRUISING—Continued

CONTROL	SETTING
Temperature control knob	Position to obtain desired temperature at nozzles.
Nozzles	To direct air stream for indirect cooling.
Car windows	Closed.

HOT WEATHER HIGHWAY CRUISING

CONTROL	SETTING
Blower control knob	Clockwise, for high speed.
Temperature control knob	Clockwise, for maximum cooling.
Nozzles	Position as desired.
Car windows	Closed.

TIPS ON USE OF COOL PACK CONDITIONING SYSTEM

KEEPING COMFORTABLE IN EXTREMELY HUMID 'MUGGY' WEATHER

When the relative humidity is extremely high causing discomfort on a day when the temperature is 75-80°F., turn the temperature control knob a little more than a quarter turn from the full counterclockwise position. This will operate the refrigeration system and provide minimum cooling. Move the blower control lever to the "LO" speed. Recirculating inside air, in this manner, rapidly dehumidifies the air inside the car.

KEEPING COMFORTABLE IN MILD WEATHER

When the weather is cool, but the sun is very bright, as in spring or fall or at high altitudes, use the air conditioner, setting the temperature controls, blower speed, and nozzle positions for low range operation to give the desired comfort.

CONTROLLING TEMPERATURE IN CAR

The most satisfactory method of controlling the temperature in the car is to:

1. Set blower speed for your personal comfort.

2. Position temperature control knob as necessary to maintain the desired temperature in the car.

3. Use sun visors to reduce direct sun rays on front seat passengers.

NOTE: E-Z-Eye glass is a great aid in keeping cool since it aids in protecting passengers from much of the direct rays of the sun.

USING THE AIR CONDITIONING SYSTEM FOR VENTILATION

The air conditioning system is designed so that it can also be used for ventilation when it is not necessary to cool the air by refrigeration. Ventilation may be obtained by placing the temperature control knob in the extreme counterclockwise position, placing the blower control knob in the "LO", medium, or "HI" speed position for the amount of air flow desired. Opening the right front door vent will assist in distributing outside air throughout the interior of the car.

DESCRIPTION AND OPERATION OF INDIVIDUAL UNITS

CONTENTS OF THIS SECTION

DESCRIPTION AND OPERATION OF INDIVIDUAL UNITS

Figs. 7-4 and 7-5 illustrate the location of units of the Cool Pack Conditioning system. Each of the units in the air conditioning system is described on the following pages.

COMPRESSOR

The comperssor is a five cylinder, horizontal, reciprocating type compressor. The five cylinders are mounted axially around the compressor shaft. Pistons are actuated by rods connected to a socket plate which is caused to wobble or wave by a special cam type ball bearing on the shaft. See Fig. 7-6.

Reed type suction and discharge valves are mounted on a valve plate between the cylinder assembly and the head.

The cylinder head contains two cavities, one in the center which indexes with the suction reeds, and one around the outside which indexes with the discharge reeds. These cavities are sealed from each other with a teflon seal molded onto the cylinder head. The discharge cavity is sealed from the outside of the compressor by an "O" ring seal which rests in a groove in the cylinder head and compresses against the compressor body.

An oil pump mounted at the front of the compressor (ahead of the front ball bearing) picks up oil from the bottom of the compressor and pumps it to the seal and to the internal parts of the compressor.

The compressor is fitted with a pressure relief valve (Figs. 7-7 and 7-8). If the discharge pressure ever exceeds approximately 440 psi, the relief valve opens automatically to relieve the pressure and closes again when the pressure reduces. Opening of the relief valve will be accompanied by a loud popping noise and perhaps the ejection of some oil with the refrigerant. Any condition that causes this valve to open should be corrected immediately.

An oil test outlet is located on the under side of the compressor shell. The proper method of checking oil level is outlined under CHECKING OIL LEVEL AND ADDING OIL.

The compressor serial number is located on a plate on top of the compressor. This number should be included in all P.I. reports, AFAs or correspondence concerning the compressor. The compressor part number is also shown on the serial number plate and bears the reference of "Model 6550117" for Pontiac, "Model 6550083" for Tempest 195 engine (L-4), and "Model 6550085" for Tempest 215 engine (V-8).

CLUTCH AND PULLEY ASSEMBLY

The pulley assembly contains an electrically controlled magnetic clutch, permitting the compressor to operate only when refrigerated air is desired.

When the blower control lever is in the "OFF" position, the circuit to the compressor clutch is open and the clutch is released. The compressor shaft does not turn, although the pulley is still being turned by the compressor belt.

CONSTRUCTION

The principal parts of the clutch (Fig. 7-9) are the pulley and armature assembly (to which is attached the clutch armature plate by connecting springs) which turns on a ball bearing on the compressor shaft, the rotor plate (which is keyed to the compressor shaft), and the clutch coil which controls the clutch.

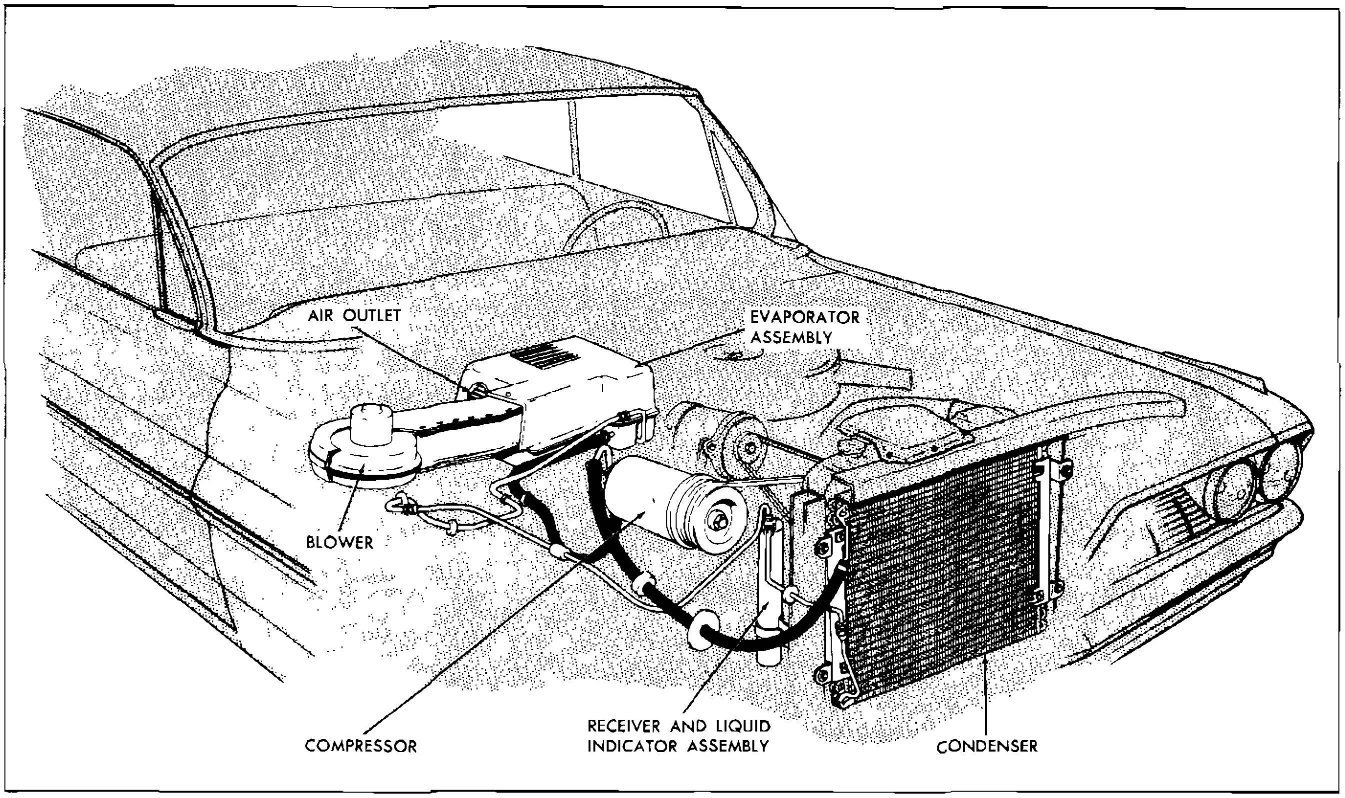


Fig. 7-4 Location of Units in the Pontiac Cool Pack Conditioner System

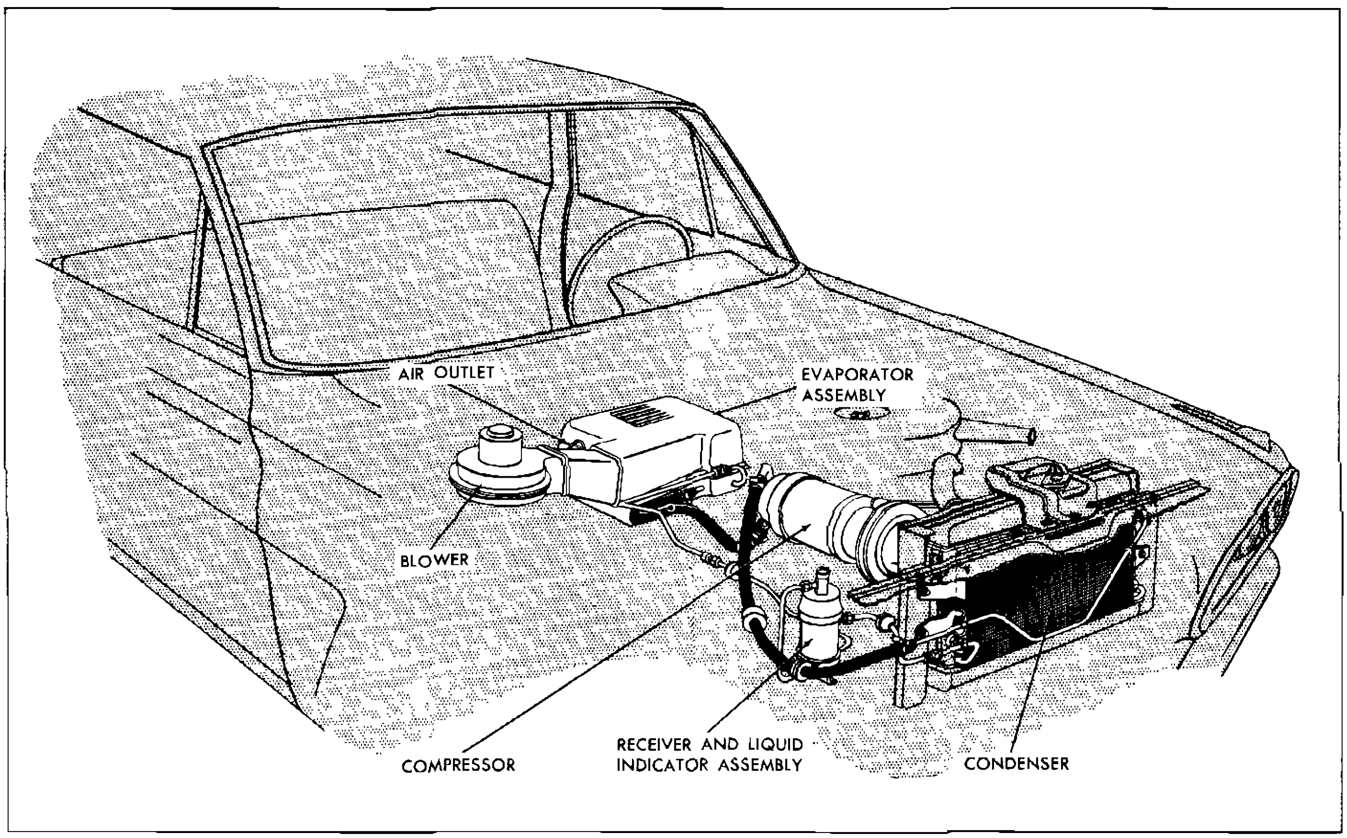


Fig. 7-5 Location of Units in the Tempest Cool Pack Conditioner System

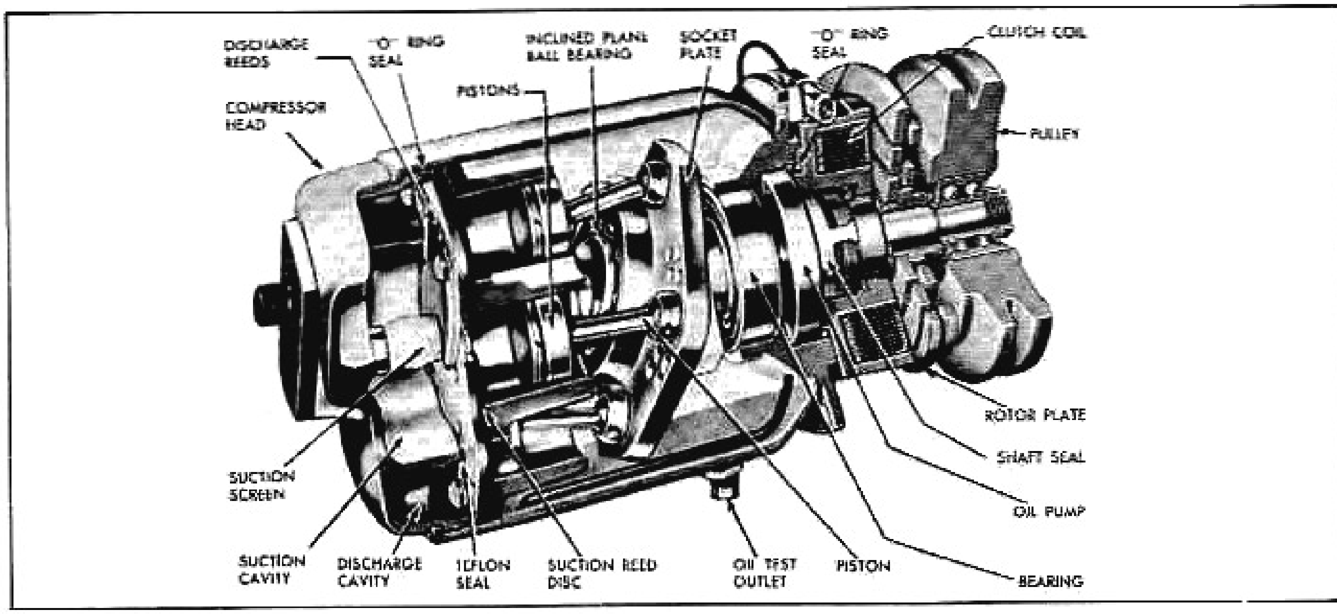


Fig. 7-6 Cross Section of Compressor (Pontiac Pulley)

OPERATION

With the blower control knob at the "LO", medium, or "HI" position, demand for cooling is met when the temperature control switch closes the electrical circuit to the clutch. Current flowing through the coil creates a magnetic force which draws the armature plate (on the pulley assembly) rearwardly toward the coil.

As the armature plate moves away from the pulley, it contacts the rotor plate face (which is keyed to the compressor shaft).

In this condition, the plates and pulley are locked together as a unit. Since the armature plate is secured to the pulley by connecting springs and the rotor plate is pressed on and keyed to the compressor shaft, the compressor shaft will then turn with the pulley. The design of the clutch and coil is such that maximum magnetic holding force is obtained to magnetically lock the armature and rotor plate together.

When the temperature leaving the evaporator is lower than setting of the thermostat, or when blower control knob is at "OFF" position, electric circuit to the compressor clutch is opened and magnetic pull on the clutch no longer exists. The armature plate to pulley connecting springs will then pull the armature plate toward the pulley and the clutch plates lose contact with each other. With the clutch released, the pulley rotates freely on its bearing. In this condition, the compressor shaft does not rotate.

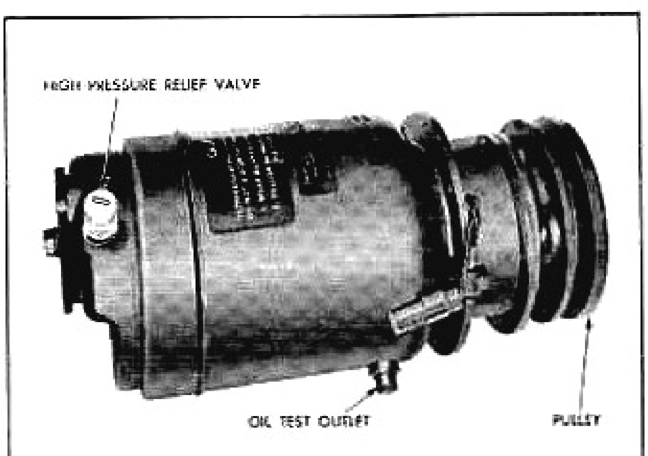


Fig. 7-7 Pontiac and Tempest V-8 Compressor Assembly

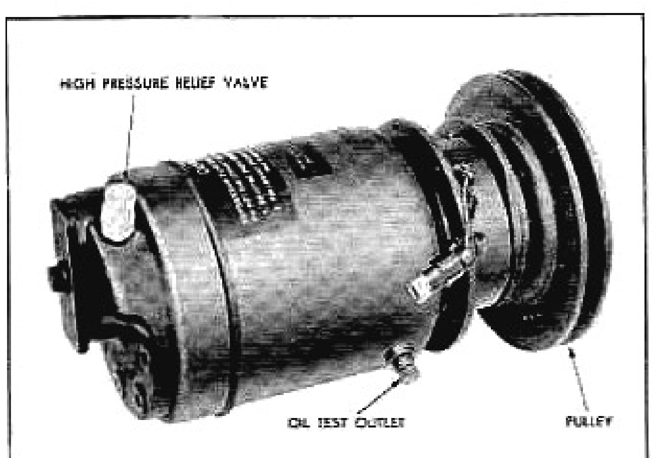


Fig. 7-8 Tempest L-4 Compressor Assembly

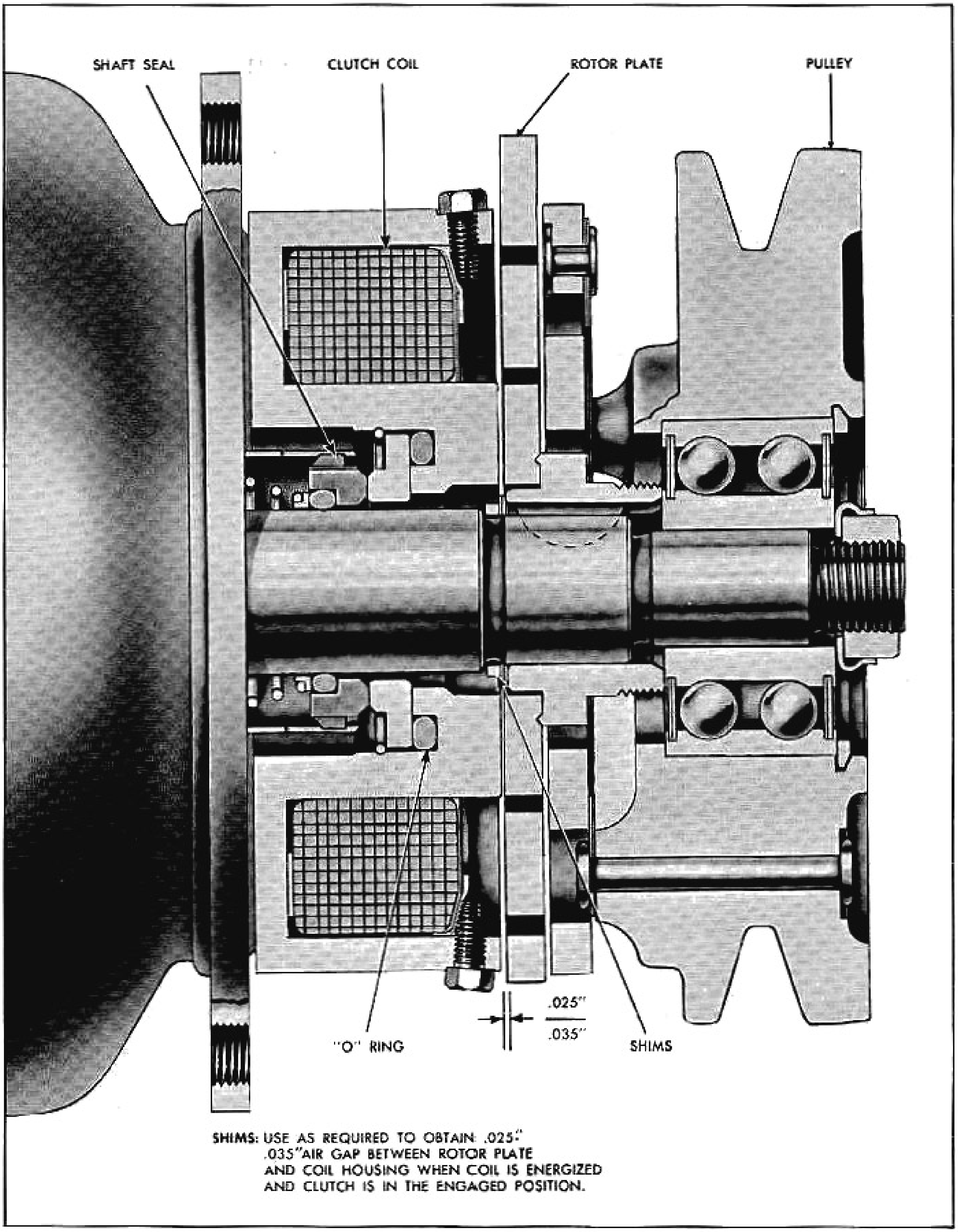


Fig. 7-9 Cross Section of Compressor Clutch Assembly (Pontiac and Tempest V-8 Pulley Shown)

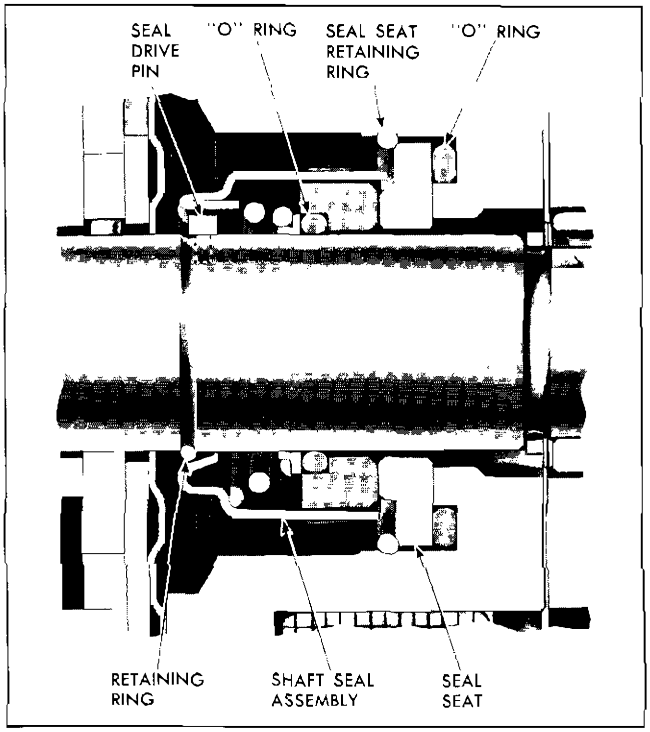


Fig. 7-10 Cross Section of Compressor Shaft Seal

COMPRESSOR SHAFT SEAL

A replaceable seal is used at the front of the compressor shaft to seal the air conditioning system from atmosphere when the compressor is operating or at rest, regardless of pressures in the compressor.

The components of the seal (Fig. 7-10) are the retaining ring, the small "O" ring, the compressor shaft seal, the cast iron seal seat and the large "O" ring. The seal indexes with the seal drive pin to turn with the compressor shaft. A spring in the shaft seal assembly holds the seal against the seal seat which is held stationary in the coil housing. The small "O" ring seals between the shaft and the seal, and the large "O" ring seals the area between the seal seat and the coil housing.

COMPRESSOR FITTINGS ASSEMBLY

The compressor fittings assembly (Fig. 7-11) contains an open passage into the compressor from the evaporator (low pressure) and an open passage from the compressor to the condenser and temperature regulation valve (high pressure).

Gauge fittings containing Schrader valves are located in the suction and discharge passages to permit pressure gauge readings at any time. These valves are also the means of servicing the refrigeration system whenever it is necessary to depressurize, evacuate or charge the system.

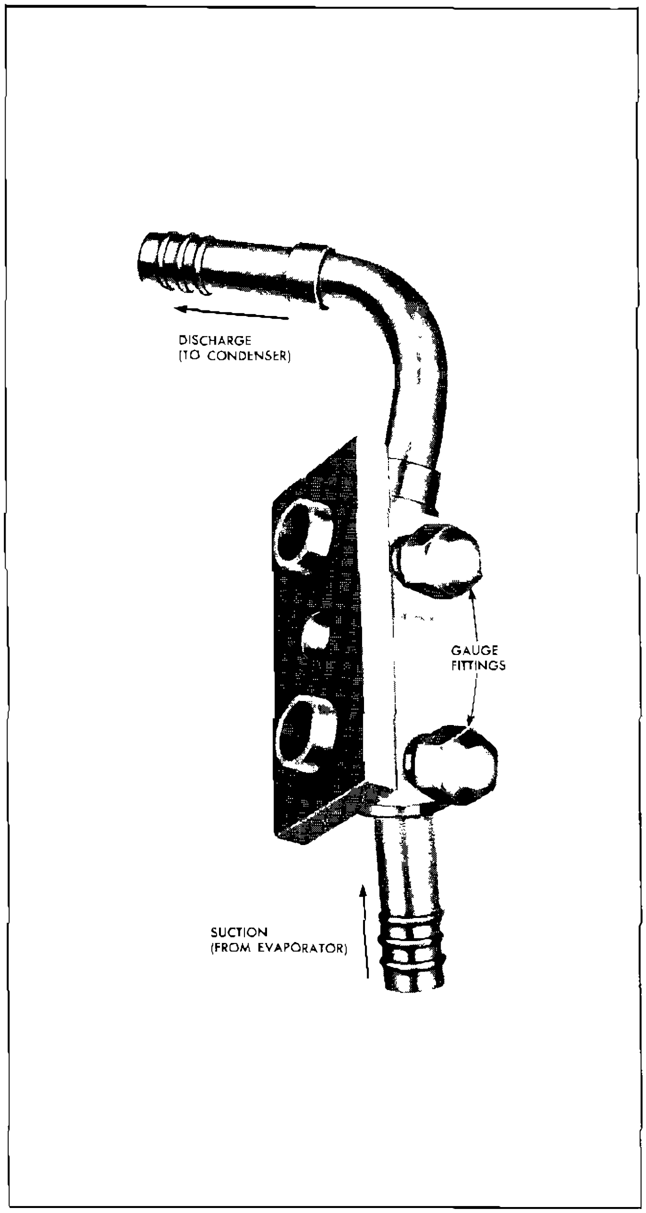


Fig. 7-11 Compressor Fittings Assembly

CONDENSER

The condenser is similar to the ordinary car radiator but is designed to withstand much higher pressures. It is made up of tubes which carry the refrigerant and cooling fins which provide rapid transfer of heat. All parts of the condenser are made of aluminum.

The condenser is located in front of the engine cooling system radiator so that it receives a high volume of air from the movement of the car and

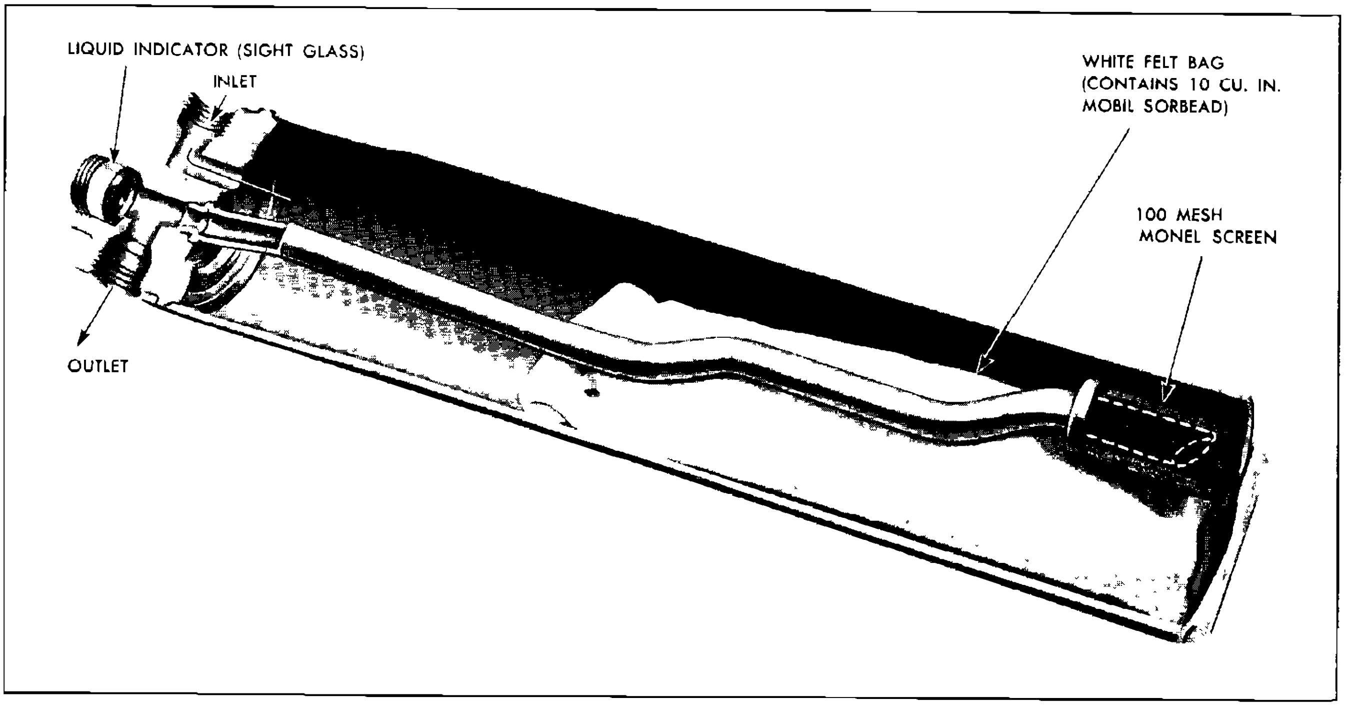


Fig. 7-12 Cross Section of Pontiac Receiver and Liquid Indicator Assembly

from the engine fan. Air passing over the condenser cools the hot high pressure refrigerant gas, causing it to condense into high pressure liquid refrigerant.

RECEIVER AND LIQUID INDICATOR ASSEMBLY

The receiver and liquid indicator assembly is mounted vertically behind the radiator right baffle assembly.

The purpose of the receiver part of this assembly is to insure a solid column of liquid refrigerant to the thermostatic expansion valve at all times, provided the system is properly charged.

The liquid indicator (many times referred to as a sight glass) serves no purpose in the refrigeration system except as an aid to diagnosis. It is possible to look into the interior of the receiver chamber through a glass window. The appearance of bubbles or foam beneath the sight glass (liquid indicator) above 70°F. ambient indicates air or a shortage of refrigerant in the system. Foam may be noted in the sight glass below 70°F. ambient with a system free of air and properly charged. Details of these conditions are in the TROUBLE DIAGNOSIS section.

Liquid refrigerant from the condenser enters the receiver and flows into the upper portion of the receiver, which contains desiccant confined into a 60

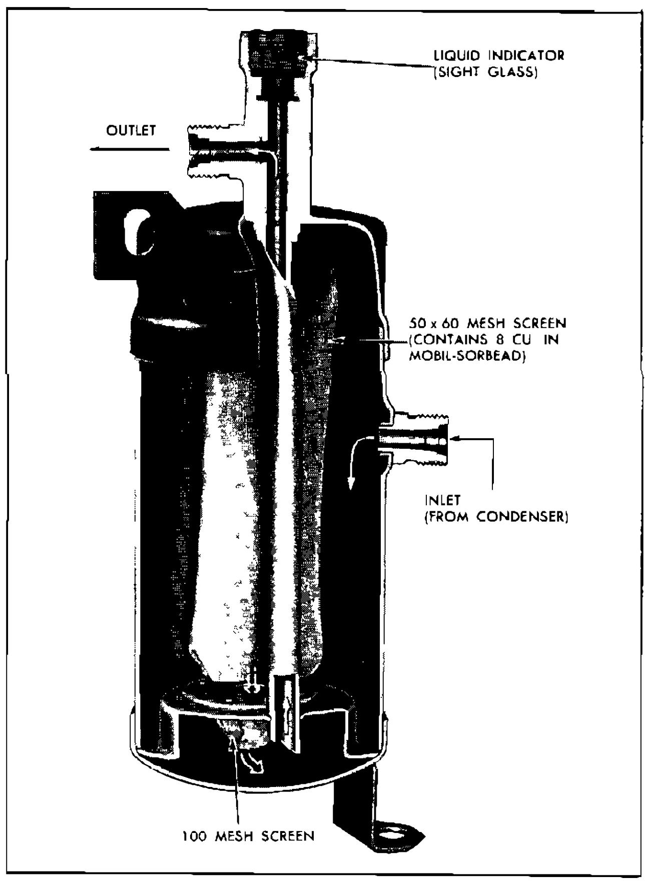


Fig. 7-13 Cross Section of Tempest Receiver and Liquid Indicator Assembly

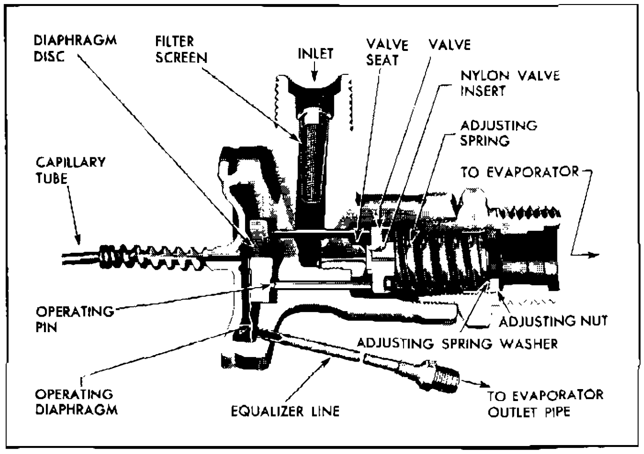


Fig. 7-14 Cross Section of Thermostatic Expansion Valve

mesh screen sack on the Tempest models and in a white felt bag in Pontiac models. The sack is not attached to anything but merely rests on the baffle in the lower portion of the receiver. As the refrigerant flows through an opening in the lower portion of the receiver, it is also filtered through a 100 mesh screen attached to a baffle at the bottom of the receiver.

The desiccant in this assembly is to absorb any moisture that might be present in the system after assembly. The screen traps any foreign material which may enter the system during assembly. These features of the assembly prevent obstruction to the valves or damage to the compressor.

THERMOSTATIC EXPANSION VALVE

DESCRIPTION

The thermostatic expansion valve (Fig. 7-14) consists of a capillary bulb and tube which is connected to an operating diaphragm (which is sealed within the valve itself) and an equalizer line which connects the valve and the low pressure return pipe.

The valve contains three operating pins (spaced approximately 120° apart), valve stationary seat, valve, valve carriage, adjusting spring and screw, an inlet which has a fine mesh screen, and an outlet connection (which attaches to the evaporator). The fine mesh screen at the inlet of the valve provides protection to the valve by preventing dirt and other foreign material from entering the valve.

While this valve is located at the inlet of the evaporator (at the upper left front of the evaporator), the thermo bulb is attached to the evaporator outlet pipe (at the lower left rear corner, Fig. 7-15).

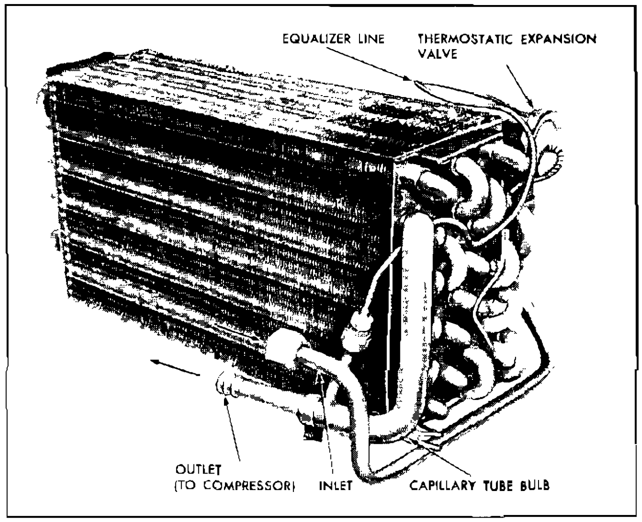


Fig. 7-15 Thermostatic Expansion Valve Bulb at Evaporator Outlet Pipe

The equalizer line joins the expansion valve to the evaporator outlet so that evaporator outlet pressure will register in the expansion valve. This is necessary because of the evaporator design which causes a pressure drop within the evaporator.

FUNCTION

The purpose of the thermostatic expansion valve is to regulate the flow of liquid refrigerant into the evaporator automatically in accordance to the requirements of the evaporator.

This valve is the dividing point in the system between high pressure liquid refrigerant supplied from the receiver and relatively low pressure liquid and gaseous refrigerant in the evaporator. It is so designed that the temperature of the refrigerant at the evaporator outlet must have 4°F. of superheat before more refrigerant is allowed to enter the evaporator. Superheat is an increase in temperature of the gaseous refrigerant above the temperature at which the refrigerant vaporized.

A capillary tube filled with carbon dioxide and the equalizer line provide the temperature regulation of the expansion valve. This capillary tube is fastened to the low pressure refrigerant pipe coming out of the evaporator so that it communicates the temperature of the refrigerant at this point to the expansion valve. If the superheat at the outlet decreases below 4°F., the expansion valve will automatically reduce the amount of refrigerant entering the evaporator, thus reducing the amount of cooling. If the superheat increases, the expansion valve will automatically allow more refrigerant to enter the evaporator, thus increasing the cooling.

The equalizer line joining the evaporator outlet with the area behind the operating diaphragm acts with the capillary to measure superheat.

It is the temperature of the air passing over the evaporator core that determines the amount of refrigerant that will enter and pass through the evaporator. When the air is very warm, the heat transfer from the air to the refrigerant is great and a greater quantity of refrigerant is required to cool the air and to achieve the proper superheat on the refrigerant gas leaving the evaporator. When the air passing over the evaporator is cool, the heat transfer is small and a lesser quantity of refrigerant is required to cool the air and to achieve the proper superheat on the refrigerant gas leaving the evaporator.

A mechanical adjusting nut located within the valve is provided to regulate the amount of refrigerant flow through the valve and moves the spring seat to increase or decrease the tension on the valve carriage spring. By varying the tension on this spring, it is possible to regulate the point at which the valve begins to open or close, thereby regulating refrigerant flow into the evaporator. As this adjustment feature is inside the valve, no external adjustment is possible. All valves are preset at the time of manufacture.

Since the evaporator outlet pressure is proportionate to the amount of heat (superheat) picked up by the refrigerant gas in passing through the evaporator, it can be seen that adjusting spring tension which works against capillary pressure and equalizer line pressure controls the volume of refrigerant entering the evaporator as signaled by the temperature and pressure in the evaporator outlet pipe.

OPERATION

When the air conditioning system has not been operating, all pressures within the thermostatic expansion valve assembly will have equalized at the ambient (surrounding air) temperature, thus the pressure above and below the operating diaphragm and at the inlet and outlet side of the valve will be equal (Fig. 7-14). (Pressure under the diaphragm is evaporator pressure. It reaches this area by means of clearance around the operating pins in the valve body which connects the area under the diaphragm with the evaporator pressure area.) While pressures in the expansion valve are almost equal, the addition of the valve adjusting spring pressure behind the valve will hold the valve over to close the valve orifice.

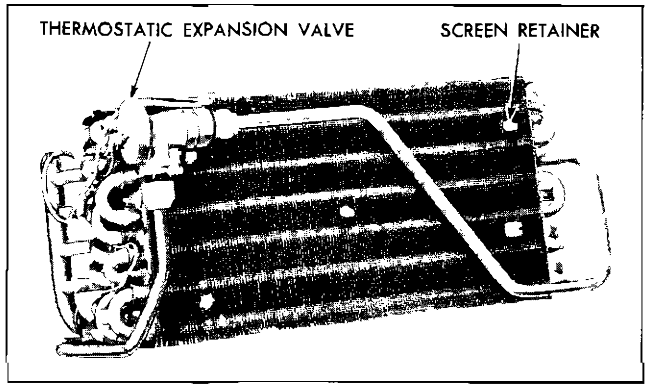


Fig. 7-16 Thermostatic Expansion Valve at Evaporator

When the air conditioning system first begins to operate, the compressor will immediately begin to draw refrigerant from the low pressure lines, equalizer tube and evaporator, lowering the pressure in the evaporator and in the area under the operating diaphragm. As the pressure in this area decreases, the pressure above the diaphragm exerted by the carbon dioxide in the capillary tube will overcome spring pressure and push the diaphragm against the operating pins, which in turn will force the valve off its seat.

Refrigerant will then pass through the expansion valve into the evaporator where it will boil at a temperature corresponding to the pressure in the evaporator. This will begin cooling the air passing over the evaporator, and also, it will begin to cool the evaporator outlet pipe.

As the evaporator outlet pipe cools, the pressure of the carbon dioxide in the capillary tube (contacting this outlet pipe) decreases, exerting less force on the operating diaphragm.

The valve adjusting spring is calibrated so that the pressure of the refrigerant in the evaporator outlet pipe and equalizer line to the valve plus the spring force, will equal the force above the operating diaphragm when the temperature of the refrigerant in the evaporator outlet is 4°F. above the temperature of the refrigerant entering the evaporator. In other words, the refrigerant should remain in the evaporator long enough to completely vaporize and then warm (superheat) 4°F.

If the temperature differential begins to go below 4°F. (outlet pipe becoming too cold) carbon dioxide pressure in the capillary tube and area above the diaphragm decreases, allowing the valve adjusting spring to move the valve towards its seat closing off the flow of refrigerant past the valve.

If the temperature differential begins to go above 4°F. (outlet pipe too warm), the pressure in the capillary tube and area above the operating diaphragm will increase, pushing this diaphragm against the operating pins to open the valve further admitting more refrigerant to the evaporator.

EVAPORATOR

DESCRIPTION

The evaporator assembly consists of the evaporator core, thermostatic expansion valve, thermostat and thermostat controls, master relay, resistor assembly, and blower control switch. All these parts are enclosed in an evaporator housing assembly which contains a condensate drain pan.

The housing, constructed of plastic, incorporates five outlets; two plastic, removable, louvered registers designed to rotate 360° (at the ends of the evaporator housing), two nozzle outlets which can be adjusted to direct air flow in any direction, and a vaned rotary valve which can be adjusted to change vertical direction of air flow. The outlets located on each side of the evaporator case are for cooling of passenger and driver floor areas.

Two drain holes in the condensate drain pan (one on each side) direct condensate to tubes extending through the floor pan.

The evaporator core is aluminum tube and fin and is of serpentine tube construction. The inlet separates into two sections to make up twenty tubes in parallel (interconnected at both ends) with a two tube outlet connected to a common outlet pipe (to compressor). The core and case assembly is approximately 16" wide, 7" high and 3½" thick.

An aluminum pipe (to connect the thermostatic expansion valve equalizer line) is welded to the evaporator outlet pipe (to compressor) between the suction hose fitting and the evaporator core.

The only service required on the unit is periodic flushing of the *outside of the* core with water to keep the outside core surface clean.

FUNCTION

The evaporator is actually the device which cools and dehumidifies the air. High pressure liquid refrigerant flows through the orifice in the thermostatic expansion valve into the low pressure area of the evaporator. This regulated flow of refrigerant boils immediately. Heat from the core surface is lost to the boiling and vaporizing refrigerant which is cooler than the core, thereby cooling the core. The heat in the air passing over the evaporator loses its heat to the cooler surface of the core, thereby cooling the air. As the process of heat loss from the air to the evaporator core surface is taking place, any moisture (humidity) in the air condenses on the outside surface of the evaporator core and is drained off as water, through drain tubes and onto the road.

Since Refrigerant-12 will boil at 21.7° F. below zero at atmospheric pressure while water freezes at 32°F., it becomes obvious that the temperature in the evaporator must be controlled so that the water collecting on the core surface will not freeze in the fins of the core and block off the air passages. In order to control the temperature, it is necessary to control the amount of refrigerant entering the core and the pressure inside the evaporator.

To obtain maximum cooling, the refrigerant must remain in the core long enough to completely vaporize and then superheat a minimum of 4°F. If too much or too little refrigerant is present in the core, then maximum cooling efficiency is lost. A thermostatic expansion valve in conjunction with the temperature thermostat is used to provide this necessary refrigerant volume control.

The tube and fin coils used in the evaporator are very long. This length, in combination with the relatively small inner diameter, causes the pressure of the refrigerant to decrease as it passes through the coils.

Because of this pressure drop, the pressure at the core inlet is greater than the pressure at the outlet. Also, the outlet pressure is allowed to fall below 30 psi (the pressure at which refrigerant will boil at 32 F.), without the danger of water freezing on the core surface providing the blower is always turned on when the air conditioner is being operated. This low pressure control is possible since the drop in inlet pressure, caused by the length of the tubes, is gradual with only a very small portion of the tube end maintaining pressures below 30 psi. The average temperature of entire evaporator core is at or above 32°F. as long as there is air flow through the core.

TEMPERATURE CONTROL SWITCH (THERMOSTAT)

DESCRIPTION

The temperature control switch (thermostat) is a "cold sensitive" electrical switch and is located on the right rear side of the evaporator assembly (under

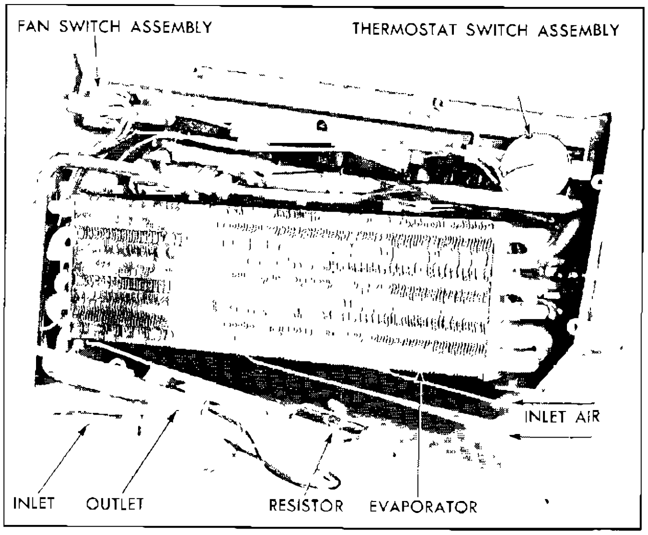


Fig. 7-17 Viewing Evaporator Asesmbly with Lower Pan Removed

the instrument panel). See Fig. 7-17. A part of the thermostat is a gas filled (sulphur dioxide) capillary tube which is located at the air outlet side of the evaporator.

A cam at the end of the switch of the thermostat contacts a lever in such a manner as to increase or decrease tension on a range spring. One end of the range spring is attached to this lever which is actuated by the cam while the other end of the range spring is attached to the temperature adjusting screw (for calibration by the factory) and bellows lever. This mechanism is actuated by the end of the capillary tube bellows assembly. See Fig. 7-18.

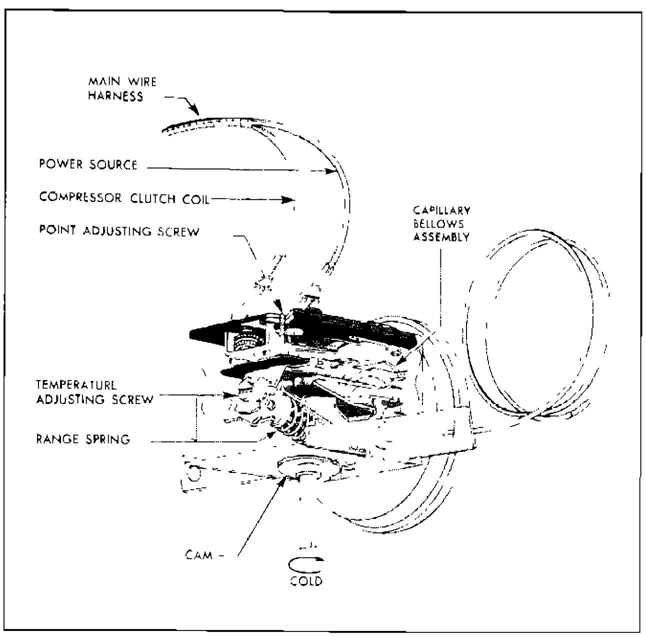


Fig. 7-18 Phantom Section of Temperature Control Switch

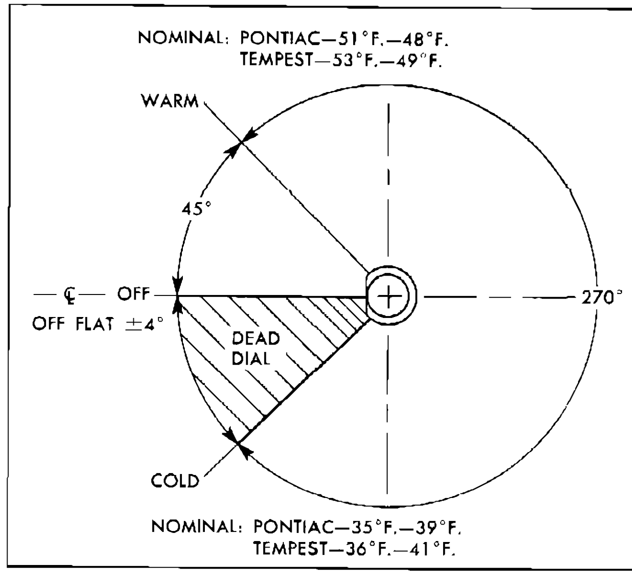


Fig. 7-19 Cam Action of Temperature Control Switch

Power source from the car battery is to and from the switch points via the two terminals on the forward side of the thermostat assembly.

The opening and closing of the circuit to the compressor clutch is performed by points which are in the plastic portion of the thermostat.

A thermostat control knob connected directly to the thermostat varies the desired temperature.

FUNCTION

The function of the air conditioning thermostat is to prevent the evaporator core from freezing and to maintain a given conditioned air temperature as selected by the position of the air conditioning control knob. The thermostat automatically controls the operation of the compressor clutch which in turn operates the compressor.

OPERATION

When the air conditioning control knob is full counterclockwise the thermostat is manually positioned to "OFF". 45° in the clockwise direction from the "OFF" position the switch is at its "warmest" setting. Progressive movement of the control knob clockwise positions the thermostat progressively colder until its "coldest" position is reached when the control is at the extreme clockwise position. At this setting the thermostat is so set that the air leaving the evaporator is as cold as possible. Any further reduction in air temperature (as might result from tampering with the thermostat) will only result

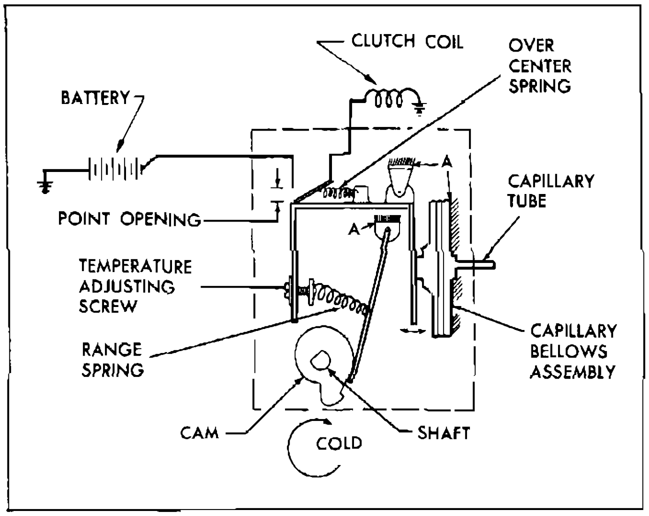


Fig. 7-20 Schematic Diagram of Temperature Control Switch

in a momentary gain in cooling but will be followed by evaporator core icing and results in loss of cooling. The thermostat capillary tube, located in the air outlet side of the evaporator, communicates air temperature to the thermostat to open or close the electrical circuit to the compressor clutch.

When the temperature of the air leaving the evaporator is higher than the setting on the thermostat, the gas in the capillary tube is heated and creates a pressure in the capillary tube and against the bellows causing the bellows to expand. The bellows, which contacts the bellows lever, moves the bellows lever to contact the thermostat switch. See Fig. 7-20. As the bellows continue to expand the thermostat switch is closed permitting current to flow through the switch to the compressor clutch and the compressor operates to force refrigerant through the system. (The areas indicated by the letter "A" designates a stationary surface.)

As the air leaving the evaporator cools to a temperature less than the setting on the thermostat, gas in the capillary tube is cooled and contracts reducing the pressure in the capillary tube and bellows assembly. The range spring which keeps the bellows lever tight against the bellows assembly causes the thermostat switch to open (through the action of the switch over-center spring) breaking the electrical circuit to the compressor clutch and the compressor ceases to operate.

When the temperature of the air leaving the evaporator becomes warmer than the setting of the themostat, the cycle is again repeated.

At the warm setting of the thermostat maximum tension is on the range spring and very high pressure in the capillary tube is required to overcome range spring tension to cause the range spring mechanism to close the circuit to the compressor clutch.

At the cold setting of the thermostat minimum tension is placed on the range spring and very little pressure in the capillary tube is required to cause the range spring mechanism to close the circuit to compressor clutch.

REFRIGERATION CIRCUIT IN THE COOL PACK CONDITIONER

Cool Refrigerant-12 gas is drawn into the compressor from the evaporator and pumped from the compressor to the condenser under high pressure (Fig. 7-21). This high pressure gas being pumped to the condenser will also have a high temperature as a result of being subjected to the process of compression. As it passes through the condenser, the high pressure, high temperature gas rejects its heat to the outside air as the air passes over the metal surfaces of the condenser. This cooling of the gas causes it to condense into liquid refrigerant. The liquid refrigerant, still under high pressure, then passes from the bottom of the condenser into the receiver and liquid indicator assembly, of which the receiver portion of this assembly acts as a reservoir.

Liquid refrigerant from the receiver and liquid indicator assembly flows to the thermostatic expansion valve.

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

Refrigerant passing through the evaporator is returned to the compressor where the refrigeration cycle is repeated.

When the pressure in the evaporator becomes low enough to cause any moisture condensing on the

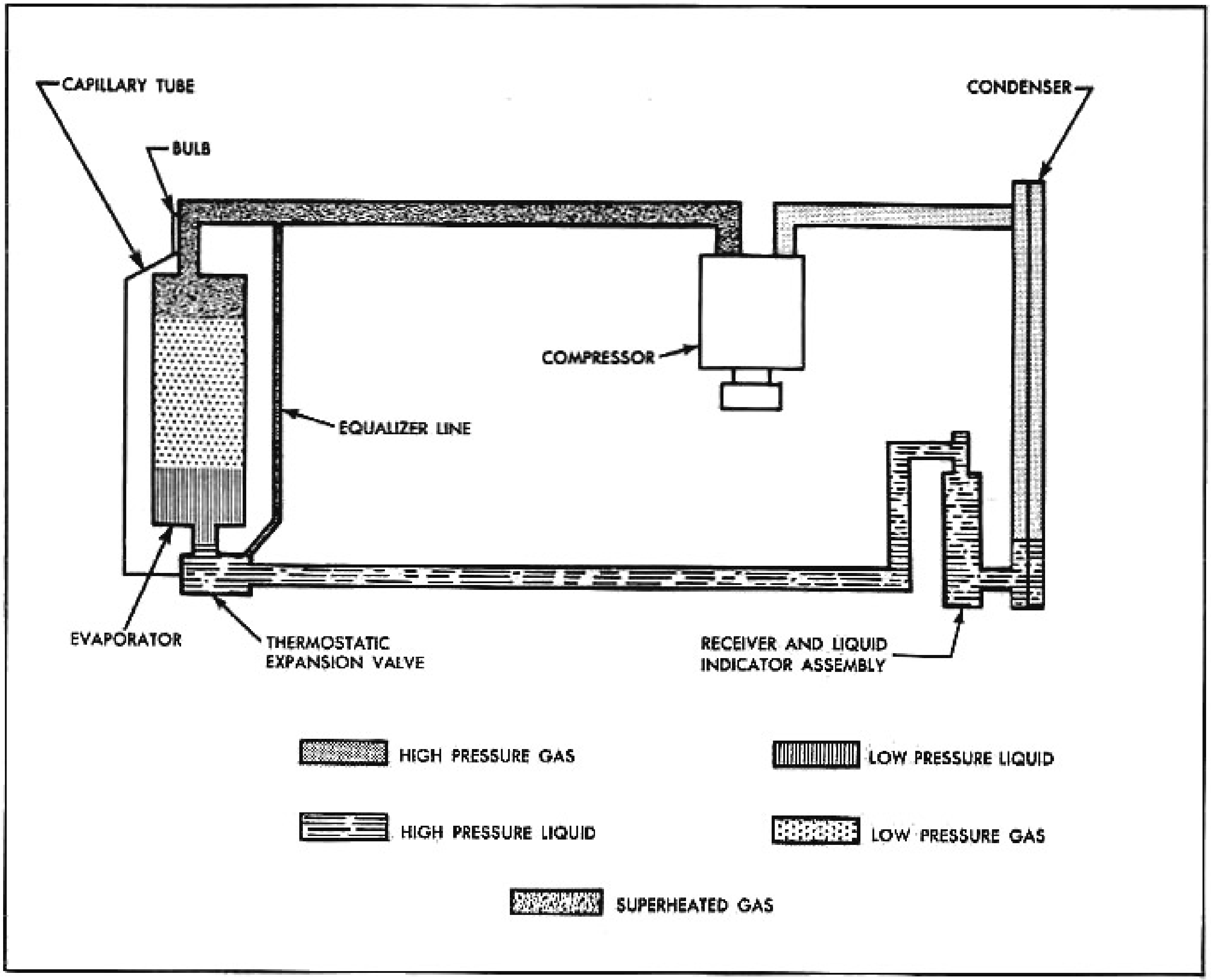


Fig. 7-21 Schematic Diagram of the Cool Pack Refrigeration System

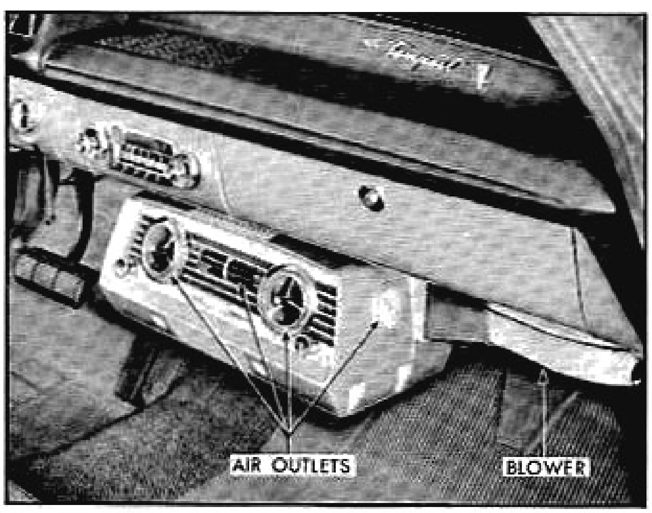


Fig. 7-22 Component Parts of Tempest Cool Pack Air System

evaporator surface to freeze, the temperature of the air leaving the evaporator will be cooler than the minimum temperature required to keep the thermostat closed and the thermostat points open. This action opens the circuit to the compressor clutch, disengages the clutch and the compressor ceases to operate to force refrigerant through its cycle.

When the temperature of the air leaving the evaporator is warmer than the setting of the thermostat, the thermostat closes the electrical circuit to the compressor clutch to start the compressor and the refrigeration cycle is again repeated.

AIR SYSTEM

Since the Cool Pack Conditioner has its evaporator and blower inside the car, air inside of the car is pulled from over the right front passenger's feet and

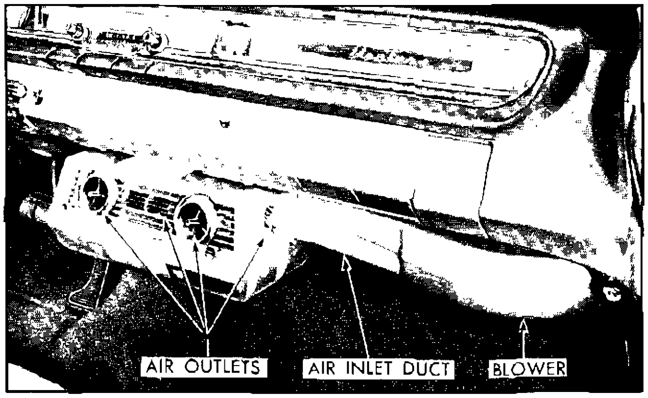


Fig. 7-23 Component Parts of Pontiac Cool Pack Air System

forced through the air duct and evaporator assembly to be cooled. This arrangement operates to process 100% inside air or "recirculation" at all times.

With the Tempest, when at normal highway speeds, a percentage of outside air may be added by pulling out the right hand cowl vent control knob. This will help remove smoke or odors from the car.

When the blower switch is at the "OFF" position, no air is forced through the evaporator and no current flows through the electrical circuit.

Moving the blower control switch to "LO", medium, or "HI" closes the electrical circuit to the blower to force air through the evaporator for cooling where the air escapes through five outlets in the evaporator case assembly.

ELECTRICAL SYSTEM

The blower circuit of this air conditioner receives its electrical supply directly from the heater terminal on the fuse block via the main wire assembly. Overload protection is provided by the 14 amp fuse at the fuse block when Cool Pack Conditioner is being operated when the car headlights are off.

When the Cool Pack is being operated on "HI" blower with the car headlights on, an additional overload protection is obtained from a 7½ amp. fuse in an orange wire and fuse holder assembly connecting the "tail" terminal of the fuse block with the relay (located on the forward side of the evaporator assembly). When the headlamps are turned on current flows through the orange colored wire to energize the relay to open the "HI" blower speed circuit to the Cool Pack blower so that only "LO" or medium blower speeds are available when headlamps or parking lamps are on. This relay operates whether the Cool Pack is turned on or not.

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

Wires for the *heater* blower switch and the *air conditioning* blower switch are contained in separate wire harnesses; and are connected in parallel. This arrangement allows the use of the *heater* blower switch only when the Cool Pack blower control is in "OFF" position. The *heater* blower switch will then receive its current through the "OFF" terminal on the Cool Pack blower switch. (See Figs. 7-24 and 7-26).

The Cool Pack conditioner blower switch is a four position switch and provides for three blower speeds: "OFF", "LO", medium and "HI". Cool Pack blower is fed through two connections at its input; a black colored wire which carries current as directed by "HI" blower switch position, and a yellow colored wire which carries "LO", medium and "HI" speed current as directed by the respective blower switch positions.

CURRENT FLOW AT THE COOL PACK CONTROL POSITIONS

Four positions of the Cool Pack blower control provide current to the blower as follows:

"OFF" no current flow to the Cool Pack but closes the circuit to the car heater control panel.

"LO" speed current flows from the fuse block via the main wire harness and a tan colored wire in the Cool Pack wire harness to the blower switch. In this position the heater blower circuit is open. From here, current is separated, one path flows to the thermostat via a light blue colored wire, through the switch and to the compressor clutch. Current also flows through a dark blue wire to the resistor block (located at the lower back side of the evaporator case), through the resistor block and a yellow colored wire to the blower.

"MED" speed current flows from the fuse block via the main wire harness and a tan wire in Cool Pack wire harness to the blower switch. In this position the heater circuit is open. (In the "MED" position, the "MED" and "LO" switch terminals are connected mechanically inside the switch.) From here, current flows to the "LO" terminal, through a dark blue wire

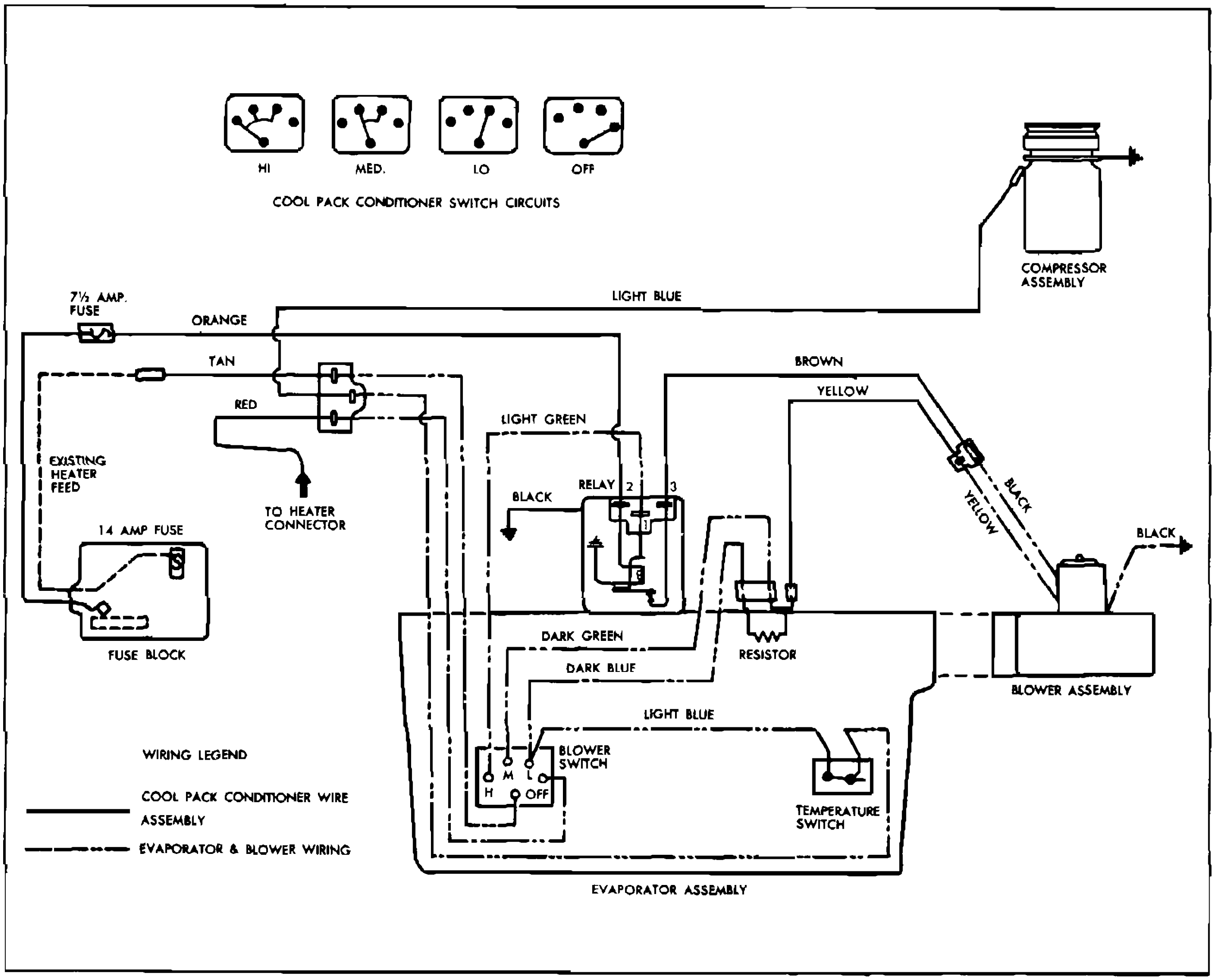


Fig. 7-24 Schematic Diagram of Pontiac Cool Pack Conditioner Electrical System

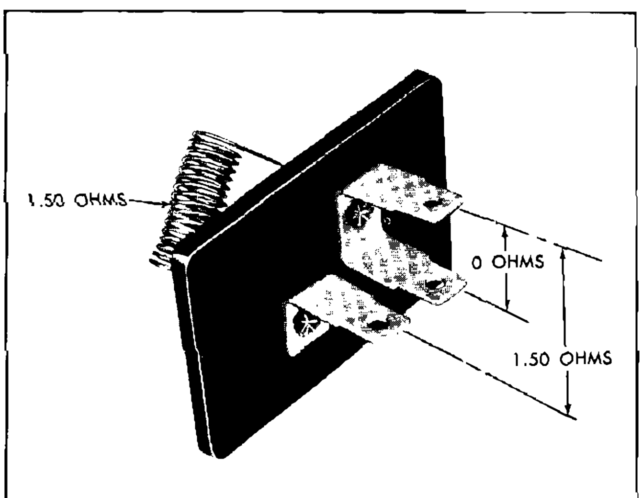


Fig. 7-25 Cool Pack Resistor Assembly

to the resistor block terminal. Current also flows from the "MED" blower switch terminal through a dark green colored wire to a terminal on the resistor block (to by pass the resistor) and continues to the blower via a yellow wire.

"HI" speed current flows from the fuse block via the main wire harness and a tan wire in the Cool Pack wire harness to the blower switch. In this position the heater circuit is open. (In the "HI" position, the "HI", "MED" and "LO" switch terminals are connected mechanically inside the switch.) From here current is divided to flow as follows: to the "LO" terminal through a dark blue wire to the resistor block terminal and also to the thermostat; to the "MED" terminal through a dark green wire to a terminal on the resistor block (to by pass the resistor) and continues to the blower via a yellow wire; from

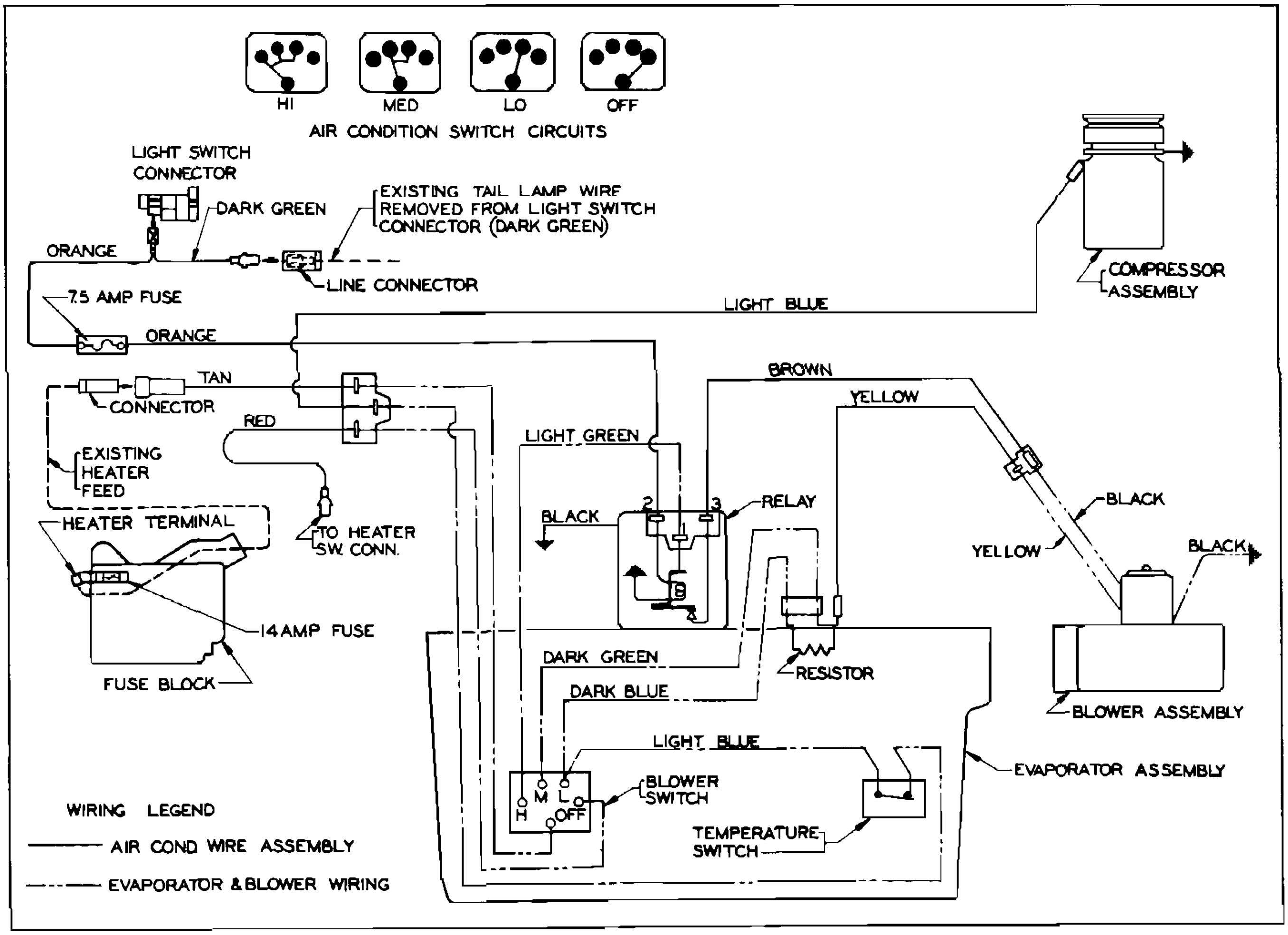


Fig. 7-26 Schematic Diagram of Tempest Cool Pack Conditioner Electrical System

the "HI" blower switch terminal via a light green wire to and through the relay, then to a black wire to the blower.

An orange colored wire having a 7½ amp. fuse and holder connects the "tail" (and headlight) terminal on underside of the fuse block with a terminal on the relay. Should the blower be operating at "HI" speed, it automatically drops back to "MED" speed whenever car headlights are turned on. This occurs when current flows from the fuse block via the orange wire to the relay to energize the relay and opens the "HI" current feed to the blower. This is necessary to prevent the battery from being discharged should an electrical overload exist.

CURRENT FLOW THROUGH HEATER AND DEFROSTER CONTROL POSITIONS

Current flow through heater and defroster control positions cannot be obtained until the Cool Pack blower switch is in the "OFF" position.

With the Cool Pack blower switch in the "OFF" position current flows from the fuse block via the main wire harness and a tan wire in the air conditioning wire harness to the blower switch. From here, current flows through the switch, then via a red wire to the heater master switch connector and to the other electrical components.

Current flow through the heater and defroster switch positions is explained under the HEATER section.

INSPECTION AND PERIODIC SERVICE

CONTENTS OF THIS SECTION

NEW CAR PRE-DELIVERY INSPECTION

1. Check compressor belt tension to give 100-105 lbs. indicated on the Borroughs Belt Tension Gauge.

2. Operate system and check for correct operation in all control positions.

NOTE: This step and step 5 can be done in conjunction with the pre-delivery road test.

3. Check for refrigerant leaks (Fig. 7-27 and observe the refrigerant passing through the liquid indicator with system operating to see if there is any evidence of bubbles.

NOTE: This check can be made immediately after the pre-delivery road test provided the system was operated during the road test.

a. If a refrigerant leak is detected, correct leak. If necessary to replace parts, evacuate and charge system after new parts are installed.

b. If a refrigerant leak is detected and the leak can be corrected without changing parts, bleed system slowly through discharge valve until bubbles appear in the liquid indicator (above 70°F. ambient). Add one-half pound of refrigerant. See ADDING REFRIGERANT-12.

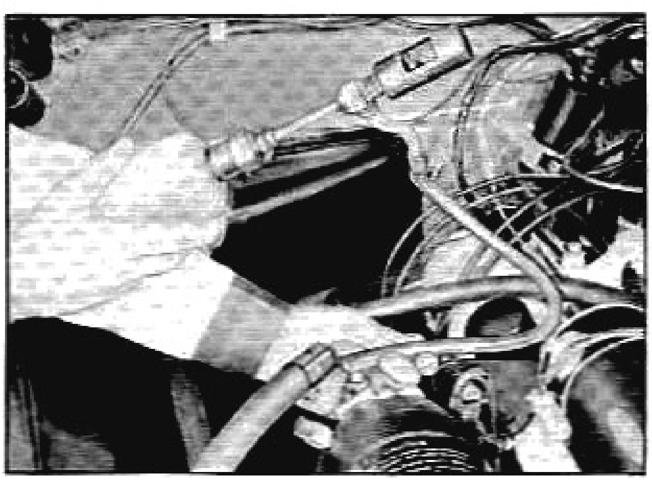


Fig. 7-27 Searching for Leaks

c. If bubbles are visible in the liquid indicator (above 70°F. ambient) with the blower on "HI", the temperature control knob in the full cold position, and no leaks are evident, it indicates partial or complete plug in a line or a lack of refrigerant in the system. Correct condition. Add refrigerant until the liquid indicator clears, then add another one-half pound of refrigerant.

4. Check ambient air temperature and air temperature at outlets on evaporator assembly in accordance with operational test procedure.

5. Check and adjust engine idle with air conditioning off (Hydra-Matic or Auto-Matic transmission in drive range, Synchro-Mesh transmission in neutral).

Pontiac (all)—Hydra-Matic	540-560 rpm.
Synchro-mesh	540-560 rpm.
Tempest (2 bbl)—Auto-Matic	580-600 rpm.
Synchro-mesh	580-600 rpm.
Tempest (1 bbl and 4 bbl)—	
Auto-Matic	630-650 rpm.
Synchro-mesh	680-700 rpm.

2,000 MILE INSPECTION

1. Inspect all connections for presence of oil on any of the refrigeration system parts which could indicate a refrigeration leak. If oil is evident, check for leaks and repair as necessary.

a. If a refrigerant leak is detected, correct leak. If necessary to replace parts, evacuate and charge system after new parts are installed.

b. If a refrigerant leak is detected with temperature control at full cold position and the leak can be corrected without changing parts, bleed system slowly through discharge fitting valve until bubbles

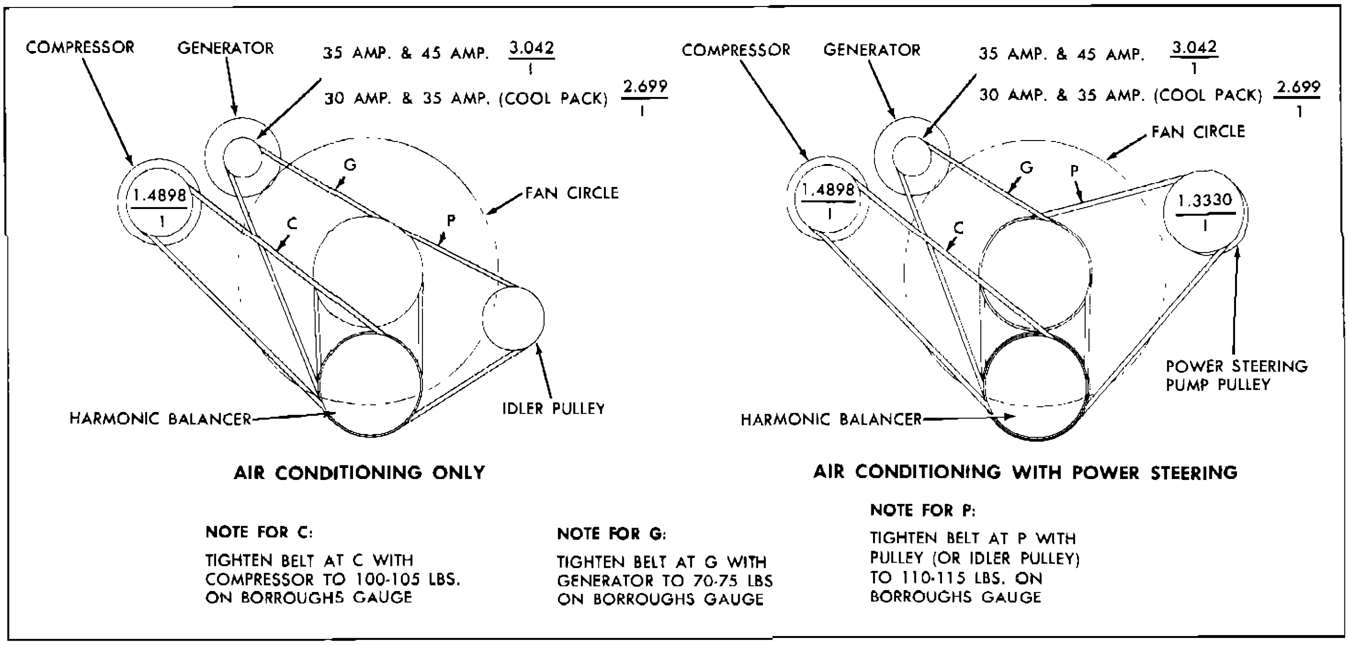


Fig. 7-28 Pontiac Engine Drive Belt Combinations

appear in the liquid indicator (above 70°F. ambient). Add one-half pound of refrigerant. See ADDING REFRIGERANT-12.

c. If bubbles are visible in the liquid indicator (above 70°F. ambient) and no leaks are evident, it indicates partial or complete plug in a line or a lack of refrigerant in the system. Correct condition. Place blower on "HI" and temperature control knob for full cold. Add refrigerant until the liquid indicator clears, then add another one-pound of refrigerant.

2. Adjust compressor belt tension to give 100-105 lbs. indicated on the Borroughs Belt Tension Gage.

3. Operate system for five minutes at 1500 RPM with temperature control knob at full cold and blower control knob on "HI" speed. Liquid indicator should be clear.

If bubbles are visible (above 70°F. ambient) when temperature control knob is at full cold position, it indicates lack of refrigerant in the system. Correct as necessary and charge system as explained in step one above.

NOTE: This check can be made immediately after the regular road test which is part of the 2000 Mile Inspection, provided the system is operated during the road test.

PERIODIC SERVICE

EVERY 2,000 MILES

1. Inspect condenser and radiator cores to be sure they are not plugged with leaves or other foreign material. Be sure to check between the condenser and radiator cores as well as the outer surfaces.

2. Check to see if evaporator core is clean and free of foreign material. If not, carefully remove any material obstructing air flow through the core.

3. Check to insure that the evaporator drains are open.

TWICE A YEAR OR EVERY 10,000 MILES

Twice a year or every 10,000 miles make a complete maintenance schedule test of the system.

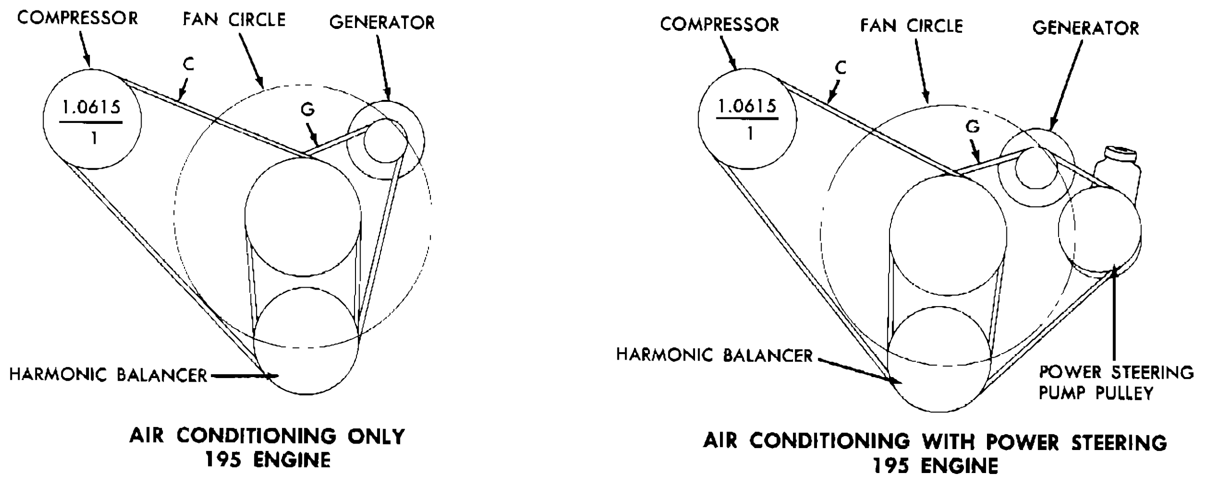
1. Clean out front of condenser to remove all obstruction, such as leaves, bugs, dirt, etc. Be sure that the space between the condenser and radiator is also free of this material.

2. Check to ensure that the evaporator drains are open.

3. Check compressor for sufficient oil.

4. Inspect compressor drive belt. Check and adjust belt tension.

5. Check to see that the air nozzles operate freely.



NOTE FOR C:
TIGHTEN BELT AT C WITH COMPRESSOR TO 70-75 LBS. ON BORROUGHS GAUGE

NOTE FOR G:
TIGHTEN BELT AT G WITH GENERATOR TO 70-75 LBS. ON BORROUGHS GAUGE.

NOTE FOR P:
TIGHTEN BELT AT P WITH POWER STEERING PULLEY TO 70-75 LBS. ON BORROUGHS GAUGE

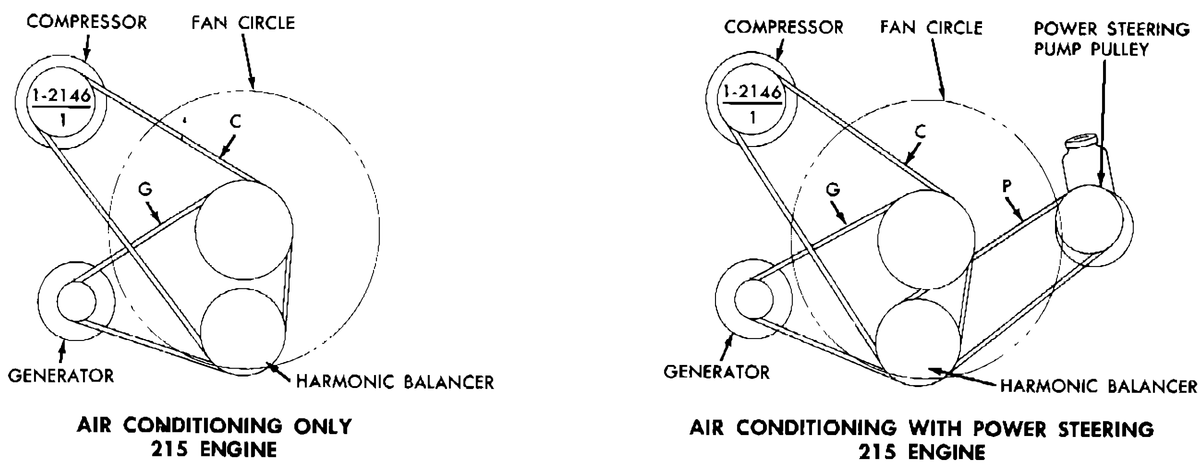


Fig. 7-29 Tempest Engine Drive Belt Combinations

PONTIAC THERMOSTAT CONTROL SWITCH ADJUSTMENT TABLE

NOTE: Cam knob to be set in full cold position (knob rotated fully clockwise).

Barometric Pressure—In. Hg. (inches of mercury) (Call your local airport or radio station for barometric pressure)	25	26	27	28	29	30
Break Limits—Highest temperature at which contact points open °F. Min.	32	33	33	34	34	35
Max.	35	36	37	37	38	39

Make Limits—Minimum temperature at which contact points close should be 3 to 4°F. higher than break limits temperature.

Fig. 7-30 Pontiac Thermostat Control Switch Adjustment Table

6. Check electrical circuit for proper operation of headlamp relay, compressor clutch and blower control switch.

7. Adjust engine idle with air conditioning off. (Hydra-Matic or Auto-Matic transmission in drive range, Synchro-Mesh transmission in neutral).

Pontiac (all)—Hydra-Matic		540-560 rpm.
	Synchro-Mesh	540-560 rpm.
Tempest (2 bbl)—Auto-Matic		580-600 rpm.
	Synchro-Mesh	580-600 rpm.
Tempest (1 bbl and 4 bbl)—		
Auto-Matic		630-650 rpm.
Synchro-Mesh		680-700 rpm.

8. Perform operational test.

ADJUSTMENTS ON CAR

COMPRESSOR BELT

Check compressor belt tension. Adjust if looseness is indicated by slipping or tension is below 70 lbs. on Borroughs Belt Tension Gauge. Adjust as follows:

1. Loosen front and rear compressor mounting plate (at adjusting slot) bolts and front and rear compressor pivot bolts. On Pontiac, loosen bolt at rear brace.

2. Install Borroughs Belt Tension Gauge on compressor belt.

3. Move air conditioning compressor toward right front fender using flat prybar in slot of compressor front mounting plate to obtain 100-105 lbs. on the Borroughs Belt Tension Gauge.

4. Retain the proper tension and tighten front and rear adjusting slot bolts and pivot bolts. Tighten rear brace bolt on Pontiac.

5. Remove Borroughs Belt Tension Gauge.

TEMPERATURE CONTROL SWITCH ADJUSTMENT

This adjustment is to be made only after the operational test shows right nozzle temperatures significantly different from operational test chart.

1. Remove temperature control switch from evaporator assembly.

2. Rotate knob to full clockwise position.

3. Check to find the exact temperature at which the points open as follows:

a. Call local airport or radio station for barometric pressure at their altitude.

b. Refer to the temperature switch adjustment table for the make and break temperatures for the barometric pressure just obtained.

c. Cool water to a temperature of at least 1°F. below the minimum temperature shown on the chart for the barometric pressure.

d. Immerse capillary portion of switch assembly in the cooled water.

NOTE: It is important that no ice that may be still in the cooled water touch the capillary, as any local cold area will cause an erroneous action of *the switch.*

e. Switch contacts should open. If not, refer to the table below for the proper "Break Limits" temperature and adjust as outlined in step 10.

f. If contacts open, remove capillary tube from bath and add sufficient warm water to raise bath temperature approximately 1°F.

4. Again immerse capillary in bath.

5. If contacts open, again remove capillary from bath and add sufficient warm water to raise bath an additional 1°F. Repeat until a bath temperature is

TEMPEST THERMOSTAT CONTROL SWITCH ADJUSTMENT TABLE

NOTE: Cam knob to be set in full cold position (knob rotated fully clockwise).

Barometric Pressure—In. Hg. (inches of mercury) (Call your local airport or radio station for barometric pressure)		25	26	27	28	29	30
Break Limits—Highest temperature at which contact points open °F.	Min.	33	33½	34½	35	36	36
	Max.	37	37½	38½	39	40	41

Make Limits—Minimum temperature at which contact points close should be 3 to 4°F. higher than break limits temperature.

Fig. 7-31 Tempest Thermostat Control Switch Adjustment Table reached where the contacts do not click open when immersed in the bath. The highest temperature at which the contacts open is the "break" temperature.

6. If the "Break Limits" temperature is within the limits shown below, the switch does not require adjustment. In this case continue with steps 7 thru 16. If it does not fall within the limits shown, adjust as outlined in step 10.

7. Reimmerse capillary in bath.

8. Open points by momentarily rotating switch knob to warmer position. Return knob immediately to maximum cold position.

9. With capillary still immersed, gradually add small quantities of warm water until contacts close. This temperature should not be more than 4°F. higher than the temperature at which the contacts open. If significantly above this, install a new temperature control switch.

10. To adjust temperature control switch, remove fiber door and turn screw counterclockwise to lower break temperature (colder) and clockwise to raise break temperature (warmer). See Fig. 7-18. One turn will change break temperature approximately 4°F.

11. When properly adjusted continue with steps 7 thru 9 above.

12. Replace temperature control switch being careful not to bend or kink capillary tube.

PONTIAC MINOR SERVICES AND REPAIRS—MECHANICAL

CONTENTS OF THIS SECTION

The following services and repairs concern parts of the air conditioning system which can be serviced without opening the refrigeration system. Before attempting any repairs which require opening refrigerant connections, see MINOR SERVICE AND REPAIRS—REFRIGERATION.

HEADLAMP RELAY

REMOVE AND REPLACE

1. Remove glove box.

2. Disconnect evaporator from right and left mounting brackets.

3. Remove evaporator center bracket to instrument panel screws and lower evaporator.

4. Disconnect wires from relay.

5. Remove relay attaching screws and relay.

6. Replace by reversing above procedure, making sure relay ground wire is under relay attaching screw (if this wire is not attached to evaporator left bracket to evaporator attaching screw) and that evaporator drain hoses are connected.

BLOWER ASSEMBLY AND/OR BLOWER TO EVAPORATOR DUCT

REMOVE AND REPLACE (SEE FIG. 7-33)

1. Disconnect evaporator drain hoses at pan.

2. Remove glove box.

3. Disconnect evaporator case from mounting brackets.

4. Remove blower and mounting bracket from right cowl inner panel and instrument panel flange as an assembly. The blower to evaporator duct comes off at the same time.

5. Disconnect wires to blower motor and remove blower motor.

6. Replace by reversing the above procedure making sure evaporator drain hoses are connected to the drain pan.

AIR OUTLETS

REMOVE AND REPLACE

SIDE OUTLETS

Since side outlets are retained by a wire spring, move the assembly outward and down. This will permit access to the wire which can be easily moved to remove the outlet assembly.

Replace by reversing the above procedure.

FRONT NOZZLES AND/OR CENTER OUTLET

1. Remove "FAN" and "TEMP" control knobs.

2. Remove six screws from face of Cool Pack grille

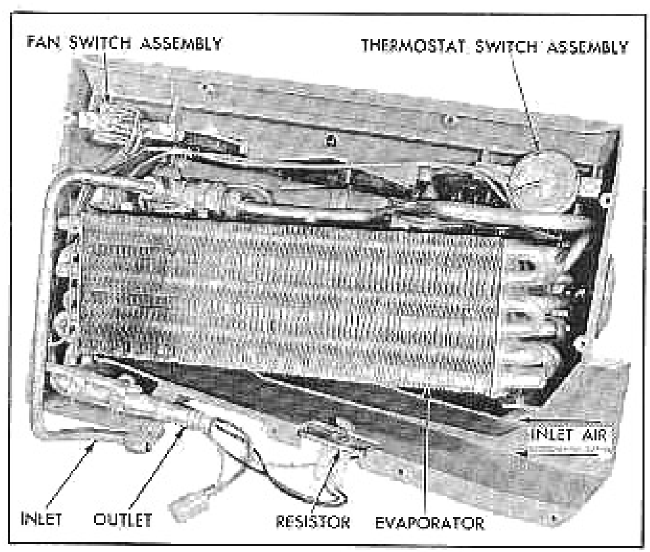


Fig. 7-32 Viewing Evaporator with Lower Pan Removed

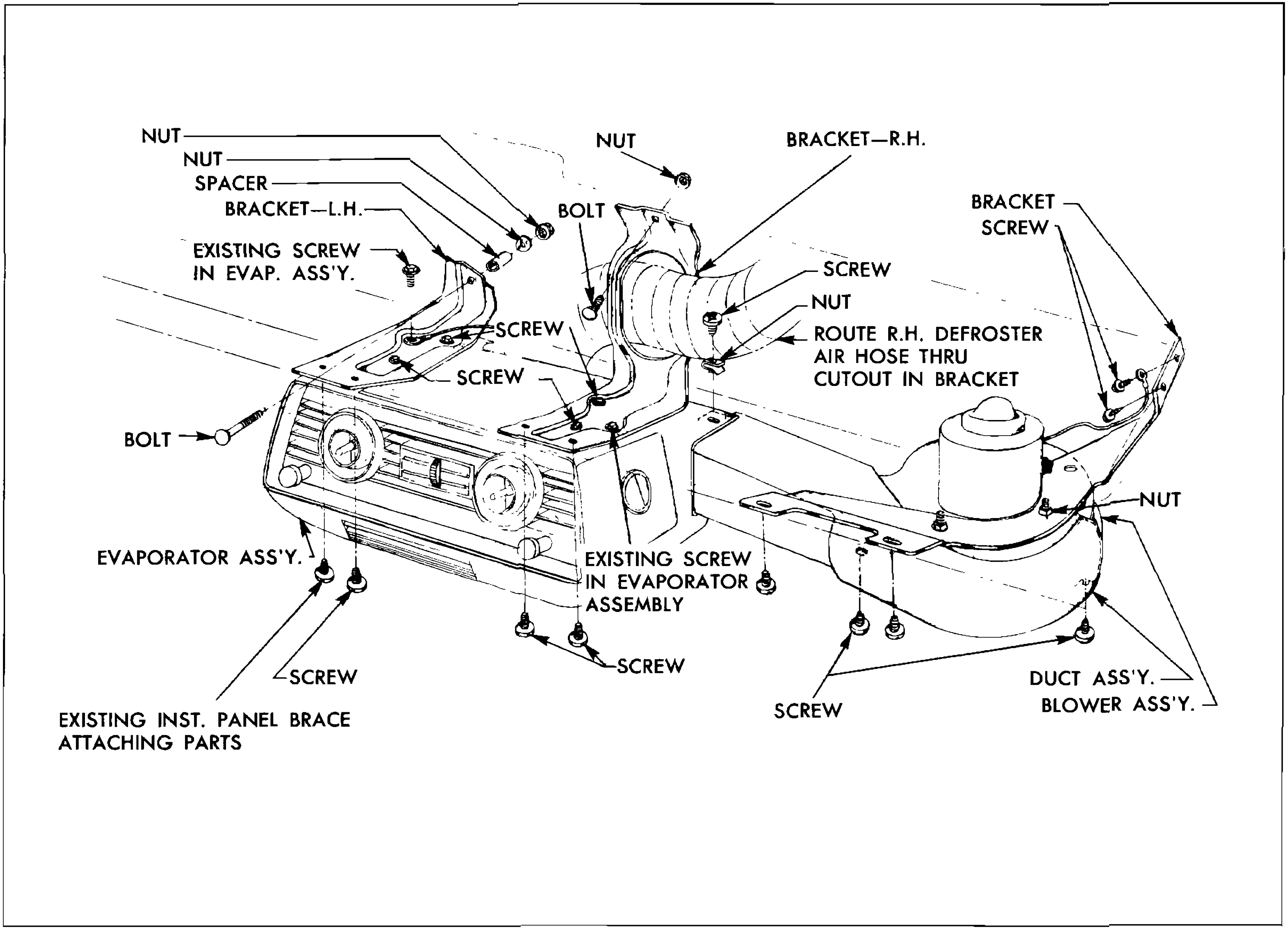


Fig. 7-33 Installation of Pontiac Cool Pack Body Interior Parts

assembly. Note that the two upper center screws are longer than the other four screws.

3. Remove grille to gain access to nozzles and center outlet (Fig. 7-34).

4. Replace by reversing the above procedure, making sure long grille screws are installed at upper center holes.

REMOVING COMPRESSOR TO SERVICE ENGINE

1. Disconnect compressor clutch coil wire at compressor.

2. Remove compressor belt.

3. Remove compressor rear brace to cylinder head brace bolt.

4. Remove compressor front plate to front bracket lower bolts.

5. Remove compressor rear plate to rear bracket lower bolts.

6. Pad fender and fender skirt and place compressor near top of fender skirt, securing compressor to right fender brace (with wire, rope, or similar means).

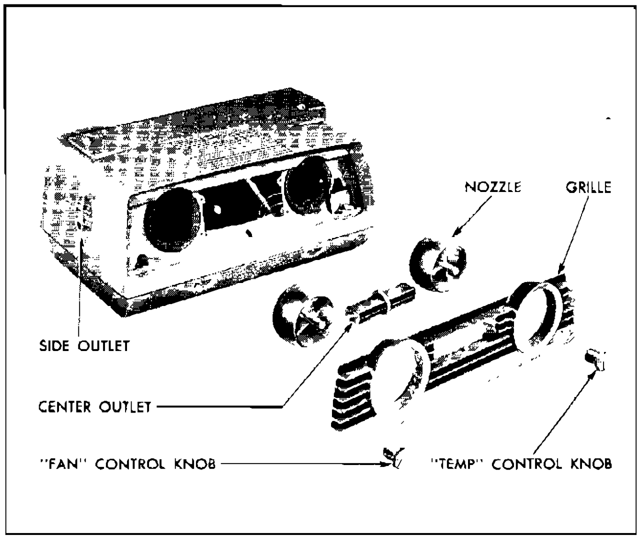


Fig. 7-34 Nozzles and Grille—Exploded View

CAUTION: DO NOT KINK ANY HOSES OR PLACE EXCESSIVE TENSION ON THE HOSES.

7. Replace by reversing the above procedure.

8. Tighten compressor belt to 100-105 lbs. indicated on the Borroughs Belt Tension Gauge.

TEMPEST MINOR SERVICES AND REPAIRS—MECHANICAL

CONTENTS OF THIS SECTION

The following services and repairs concern parts of the air conditioning system which can be serviced without opening the refrigeration system. Before attempting any repairs which require opening refrigerant connections, see MINOR SERVICE AND REPAIRS—REFRIGERATION.

HEADLAMP RELAY

REMOVE AND REPLACE

1. Remove glove box.
2. Disconnect evaporator from right and left mounting brackets.
3. Remove evaporator center bracket to instrument panel screws and lower evaporator.
4. Disconnect wires from relay.
5. Remove relay attaching screws and relay.
6. Replace by reversing above procedure, making sure relay ground wire is under relay attaching screw (if this wire is not attached to evaporator left bracket to evaporator attaching screw) and that the evaporator drain hoses are connected.

RESISTOR ASSEMBLY

REMOVE AND REPLACE

1. Remove eleven screws retaining evaporator lower housing to upper evaporating housing and then lower pan.
2. Disconnect wires at resistor and remove resistor.
3. Replace by reversing the above.

BLOWER SWITCH

REMOVE AND REPLACE

1. Remove "FAN" and "TEMP" control knobs.
2. Remove six screws from face of Cool Pack grille assembly. Note that the two upper center screws are longer than the other four screws.
3. Disconnect evaporator drain hoses.
4. Remove eleven screws retaining evaporator lower housing to upper evaporator housing and then lower pan.
5. Remove two screws retaining blower switch to evaporator housing and remove switch assembly.
6. Disconnect wires at temperature control switch and headlamp relay (Fig. 7-36).
7. Replace by reversing the above procedure, making sure long grille screws are at upper center holes.

TEMPERATURE CONTROL SWITCH (THERMOSTAT)

REMOVE AND REPLACE

1. Remove "FAN" and "TEMP" control knobs.
2. Remove six screws from face of Cool Pack grille assembly. Note that the two upper center screws are longer than the other four screws.

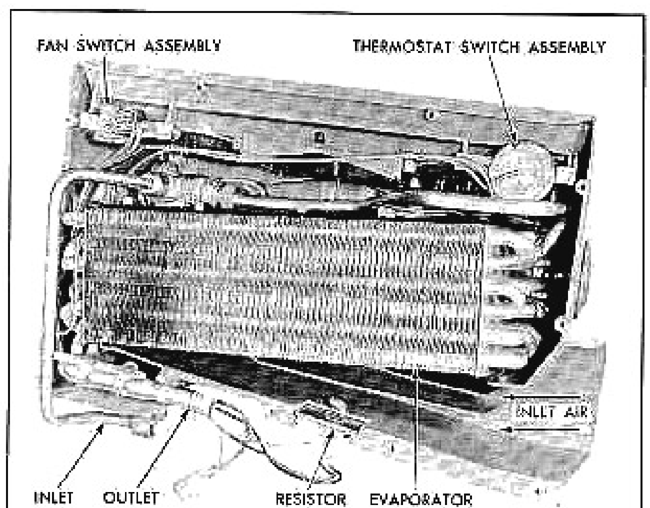


Fig. 7-35 Viewing Evaporator with Lower Pan Removed

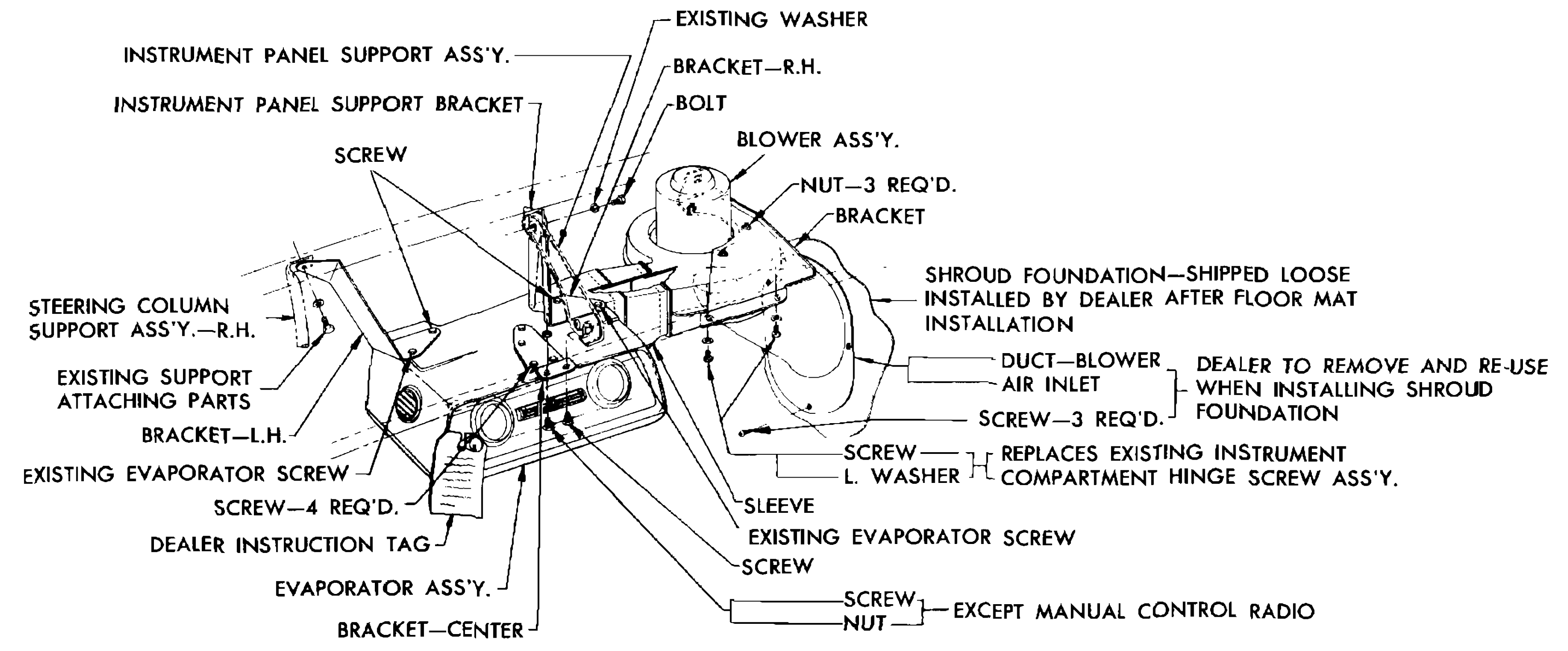


Fig. 7-36 Installation of Tempest Cool Pack Body Interior Parts

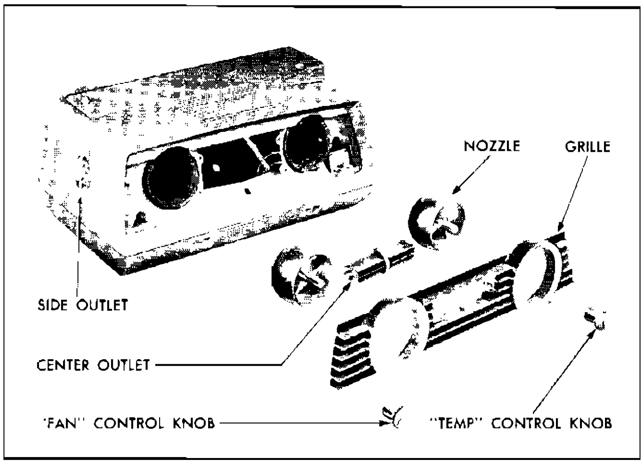


Fig. 7-37 Nozzles and Grille—Exploded View

3. Disconnect evaporator drain hoses.

4. Remove eleven screws retaining evaporator lower housing to upper evaporator housing and then lower pan.

5. Remove two screws retaining temperature control switch to evaporator housing.

6. Disconnect switch capillary tube from capillary tube retainer and remove switch assembly.

7. Disconnect wires at temperature control switch.

8. Replace by reversing the above procedure, making sure long grille screws are at upper center holes.

BLOWER ASSEMBLY

REMOVE AND REPLACE (See Fig. 7-36)

1. Remove glove box.

2. Remove right vent air duct.

3. Remove three blower to blower bracket nuts. One nut is behind the blower.

4. Lower blower and disconnect blower wires.

5. Attach blower ground wire to dash shroud.

6. Attach blower to evaporator sleeve so long side of sleeve for evaporator is toward engine.

7. Holding blower in position, secure with three nuts.

8. Connect blower wires.

9. Replace right side air duct.

10. Replace glove box.

AIR OUTLETS

REMOVE AND REPLACE

SIDE OUTLETS

Since side outlets are retained by a wire spring, move the assembly outward and down. This will permit access to the wire which can be easily moved to remove the outlet assembly.

Replace by reversing the above procedure.

FRONT NOZZLES AND/OR CENTER OUTLET

1. Remove "FAN" and "TEMP" control knobs.

2. Remove six screws from face of Cool Pack grille assembly. Note that the two upper center screws are longer than the other four screws.

3. Remove grille to gain access to nozzles and center outlet (Fig. 7-37).

4. Replace by reversing the above procedure, making sure long grille screws are installed at upper center holes.

REMOVE COMPRESSOR TO SERVICE ENGINE

1. Disconnect compressor clutch coil wire at compressor.

2. Remove front and rear compressor mounting plate to compressor bolts.

3. Remove compressor belt.

4. Pad fender and fender skirt and place compressor near top of fender skirt, securing compressor to right fender brace or hood hinge. (Use wire, rope, or similar means.)

CAUTION: DO NOT KINK ANY HOSES OR PLACE EXCESSIVE TENSION ON THE HOSES.

5. Replace by reversing the above procedure, making sure engine dipstick upper tube assembly bracket is retained by compressor rear pivot bolt on 195(L-4) engines.

6. Tighten compressor belt to 100-105 lbs. on Borroughs Belt Tension Gauge.

MINOR SERVICES AND REPAIRS—REFRIGERATION

CONTENTS OF THIS SECTION

PRECAUTIONARY SERVICE MEASURES

Before any service is attempted which requires the opening of refrigeration pipes or units, the person doing the work should be thoroughly familiar with GENERAL INFORMATION ON REFRIGERATION SERVICE. Also, he should follow very carefully the instructions given on the following pages for the unit being serviced.

The major reasons behind these measures are to prevent dirt and moisture from getting into the system. Dirt contaminant is apt to cause leaky valves or wear in the compressor, and moisture will freeze into ice at the expansion valve and freeze the valve.

PRE-ASSEMBLY

1. All sub-assemblies are shipped sealed and dehydrated and are to remain sealed until just prior to making connections.

2. All sub-assemblies should be at room temperature before uncapping. (This prevents condensation of moisture from air that enters into the system.)

3. If for any reason the caps are removed, but connections are not made, then hoses and other parts should not remain unsealed for more than 15 minutes. Reseal connections if period is to be longer.

4. Service compressors are shipped with 13 oz. of Frigidaire 1000 Viscosity oil and charged with a mixture of Refrigerant-12 and dry nitrogen at atmospheric pressure.

ASSEMBLY

1. All precautions should be taken to prevent damage to fittings or connections. Even minute damage to the connection could cause it to leak.

2. Any fittings getting grease or dirt on them should be wiped clean with a cloth dampened with alcohol. Do not use chlorinated solvents such as trichloroethylene for a cleaning agent as they are contaminants. If dirt, grease or moisture gets inside the pipes and cannot be removed, the pipe is to be replaced.

3. Sealing caps should be removed from sub-assemblies just prior to making connections for final assembly.

4. Use a small amount of clean refrigeration oil (525 or 1000 viscosity) on all tube and hose joints, and dip the "O" ring gasket in this oil before assembling the joint, as this oil will help in making a leak-proof joint. When tightening joints, use another wrench to hold the stationary part of the connection so that a solid feel can be attained, which will

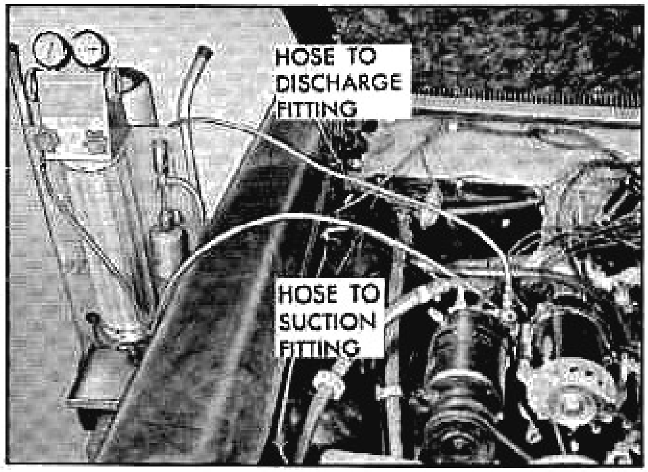


Fig. 7-38 Evacuating System with J-8393 (Pontiac Shown)

indicate proper assembly. When tightening a flexible hose connection, use a second stationary wrench on the hex on the hose to prevent hose kinking as kinked hoses are apt to transmit noise and vibration.

CAUTION: Tighten all hose and tubing connections with the proper torque. Insufficient torque when tightening can result in loose joints and excessive torque when tightening can result in distorted joint parts. Either condition can result in refrigerant leakage.

5. Do not connect receiver and liquid indicator assembly until all other sealed sub-assemblies have been connected. This is necessary to insure optimum dehydration and maximum moisture protection of the refrigerant system.

CAUTION—LIQUID INDICATOR

Under normal conditions, the liquid indicator will show clear with about 2.0 to 2.5 pounds of refrigerant in the system. However, the air conditioner will not produce its best performance until 3.25 lbs. of refrigerant are in the Pontiac system and 3.0 lbs. in the Tempest system. *Do not overcharge with refrigerant* as this will result in extremely high head pressures and the compressor safety valve will "blow off".

DEPRESSURIZING THE SYSTEM

Anytime the system is to be opened, it must first be depressurized. Depressurize the system as follows:

1. Remove caps from suction and discharge valve gauge fittings on compressor.

2. With both valves on the manifold gauge set J-5725-01 closed (clockwise), attach manifold to compressor using J-5420 Schrader valve adapter at the suction gauge fitting and J-6163 Schrader valve adapter at the discharge gauge fitting.

3. Crack open the high pressure valve on manifold gauge set to allow slow escape of refrigerant from the system through the manifold gauge set and out the center fitting and hose. (Place end of hose in clean container.) If oil drips from the hose into the container, refrigerant is escaping too rapidly.

4. When hissing ceases (indicating all refrigerant has escaped) close high pressure valve on manifold gauge set by turning valve clockwise.

EVACUATING THE SYSTEM

When the refrigeration system is depressurized and opened for service, some air will enter the lines regardless of how quickly the openings are capped. In order to remove this air and as much as possible of the moisture it contains, the complete system must be "evacuated". Evacuating is merely the process of removing all air from the system, thereby creating a vacuum in the system.

CAUTION: Under no circumstances should alcohol be used in the system in an attempt to remove moisture regardless of the successful use of alcohol in other refrigeration systems.

PREPARATIONS FOR EVACUATING COMPLETE SYSTEM

Due to the arrangement of the compressor fittings assembly, the system may be evacuated through the manifold gauge set using the following procedure.

1. Check low pressure gauge for proper calibration with the gauge disconnected from the refrigeration system. Be sure that the pointer on the gauge indicates to the center of "O". Tap the gauge a few times lightly to be sure pointer is not sticking. If necessary, calibrate as follows:

a. Remove the cover from the gauge.

b. Holding gauge pointer adjusting screw firmly with one hand, carefully force pointer in the proper direction in the proper amount to position the pointer through the center of the "O" position. Tap gauge lightly a few times to be sure pointer on gauge is not sticking. Replace gauge cover.

2. If gauge set is not already connected to the compressor, connect gauge set to compressor as follows:

a. Close hand shut-off valves on gauge set by turning clockwise.

b. Remove caps from gauge fittings on compressor suction and discharge valves.

c. Attach Schrader valve adapter J-5420 to end of hose from low pressure gauge and connect this adapter fitted hose to the discharge valve gauge.

d. Attach Schrader valve adapter J-6163 to end of hose from high pressure gauge and connect this adapter fitted hose to the discharge valve gauge fitting.

3. Attach a flexible gauge hose to the center fitting of the gauge set and attach the other end of this hose to the vacuum pump J-5428. (See Fig. 7-39).

4. The system can now be evacuated as follows:

EVACUATING COMPLETE SYSTEM

1. Turn hand shut-off valve on low pressure gauge of gauge set to the full clockwise position.

2. Slowly turn valve on high pressure gauge counterclockwise from the full clockwise position letting any pressure build up escape completely. Close high pressure valve.

3. Check oil level in vacuum pump and add Frigidaire 150 viscosity oil if necessary, to bring to proper level. *Make sure dust cap on discharge side of* vacuum pump has been removed.

4. Start the vacuum pump and *slowly* open the low and high pressure sides of the manifold gauge set to avoid forcing oil out of the refrigeration system and the pump. Pressure is now being reduced on both sides of the refrigeration system.

NOTE: If oil is blown from the pump, it should be refilled to proper level with Frigidaire 150 viscosity oil as indicated under GENERAL INFORMATION ON REFRIGERATION SERVICE.

5. Observe low pressure gauge and operate vacuum pump until gauge shows 26-28" vacuum. Continue to run pump for ten additional minutes.

NOTE: In all evacuating procedures the specification of 26-28" of vacuum is used. This evacuation can only be attained at or near sea level. For each 1000 feet above sea level where this operation is being performed, the specification should be lowered by one inch of mercury vacuum. For example, the specification for altitudes of 5000 feet elevation would only be 21-23" of vacuum.

If vacuum cannot be pulled to minimum specification for the specified altitude, it indicates a leak in the system, gauge connections or a defective vacuum

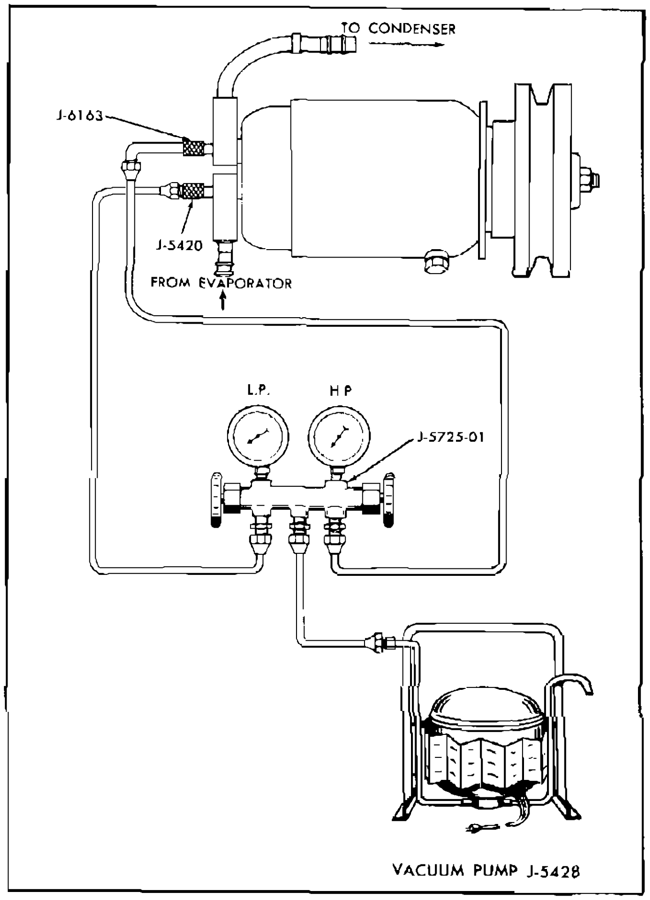


Fig. 7-39 Schematic Showing Connections and Tools for Evacuating Refrigeration System

pump. In this case, it will be necessary to check for leaks as outlined below after a small amount of refrigerant has been added to the low side of the system.

a. Turn the hand shut-off valves at the high pressure gauge and suction gauge of the gauge set to the full clockwise position with the vacuum pump operating, then stop pump.

b. Connect flexible line from center fitting of gauge set to refrigerant drum (drum should be at room temperature).

NOTE: It may be necessary to use reducer J-5462-4 with sealing washer J-5462-3 and fitting J-5462-9 to attach flexible hose to refrigerant drum.

c. Open shut-off valve on drum and loosen flexible line fitting at center fitting on gauge set so that refrigerant will purge all air from line. Tighten flexible fitting when certain all air has been purged from line.

d. Open suction valve on gauge set. This will allow refrigerant to pass from the drum into the system. When pressure stops rising, close suction valve

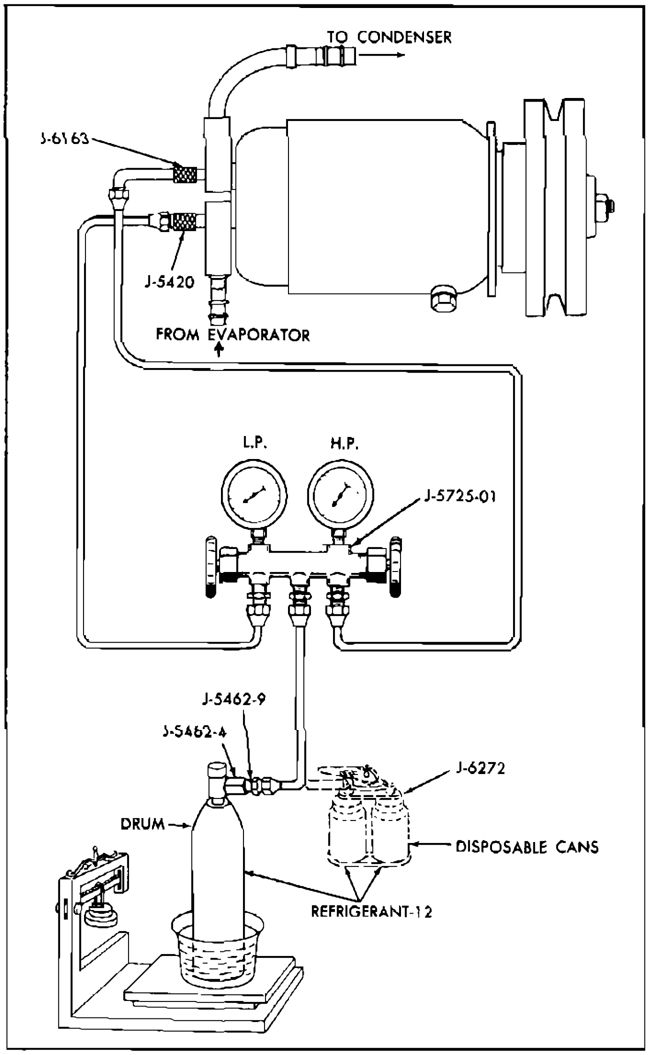


Fig. 7-40 Schematic Showing Connections and Tools for Charging Refrigeration System

on gauge set and valve at refrigerant drum. (As refrigerant drum is at room temperature, only a small refrigerant charge will enter the system.)

e. Using leak detector J-6084, check all fittings in the system, compressor shaft seal and on the gauge set for evidence of leakage. When general area of leak has been found with the test torch, a liquid leak detector may be helpful in locating the exact point of leakage. After leak has been corrected, evacuate the system again.

6. Turn hand shut-off valve at high pressure gauge of gauge set to full clockwise position with vacuum pump operating, then stop pump. Carefully check low pressure gauge to see that vacuum remains constant. If vacuum reduces, it indicates a leak in system or gauge connections. See "a" through "e" in step 5 above for method of locating leak.

CHARGING THE SYSTEM

The system should be charged only after being evacuated as outlined in EVACUATING THE SYSTEM.

REFRIGERANT-12 DRUM METHOD

1. Connect center flexible line of gauge set to refrigerant drum.

NOTE: It may be necessary to use reducer J-5462-4 with sealing washer J-5462-3 and fitting J-5462-9 to attach flexible line to refrigerant drum. (See Fig. 7-40).

2. Place refrigerant drum in a pail of water which has been heated to a maximum of 125°F.

CAUTION: Do not allow temperature of water to exceed 125°F. High temperature will cause excessive pressure and possible softening of the fusible safety plugs in the refrigerant drum. It may not be necessary to use hot water if a large drum is used (over approximately 100 lbs.).

3. Place refrigerant drum (in pail of water) on scales (bathroom or commercial, preferably commercial) as shown in Fig. 7-40.

CAUTION: Do not turn refrigerant drum upside down as this would allow liquid refrigerant to enter compressor, which may cause damage.

4. If line at center gauge fitting has not been purged of air, loosen line at center fitting on gauge set and "crack" valve on refrigerant drum to evacuate air from line. Retighten line at center fitting and record exact weight of refrigerant tank in water on the scales.

5. Open valve on refrigerant drum and both valves on gauge set to allow refrigerant to flow into the system. Continue charging until the scales show that 3.25 lbs. for Pontiac and 3.0 lbs. for Tempest of refrigerant have been transferred from refrigerant drum to the system.

NOTE: If full charge cannot be attained, close both valves on gauge set, start engine, turn air conditioner on, and position temperature control knob to full cold position. Open low pressure valve on gauge set slowly and leave open until full charge of refrigerant is taken in.

CAUTION: Observe high pressure gauge while charging with compressor running. Shut off engine if pressure exceeds 350 psi. A large fan placed in front of the car will help reduce excessively high head pressure.

6. Close both valves on gauge set (high pressure valve will already be closed if charging was completed by running compressor) and close valve on refrigerant drum.

NOTE: If the engine was used to complete the refrigerant charge into the system, close valve on refrigerant drum to permit compressor to draw any refrigerant left in the line from the drum to the center fitting of the gauge set, then close the low pressure valve on the gauge set.

7. Operate engine at 1500 RPM with temperature control at full cold position and blower control on "HI" speed. After 5 minutes of operation, observe appearance of refrigerant in liquid indicator. If bubbles are observed, open low pressure gauge valve and valve on refrigerant drum to allow more refrigerant to enter system. Close valve when liquid indicator clears up.

NOTE: If ambient air temperature is below 70°F. when this check is made, bubbles may appear even though the proper amount of refrigerant is in the system. Ambient air temperature must be 70°F. or above to make an accurate check. In no case should the system be charged with more refrigerant than 3.25 lbs. for Pontiac and 3.0 lbs. for Tempest.

8. When refrigerant has been installed, continue to operate system and test for proper operation as outlined under OPERATIONAL TEST.

9. When satisfied that air conditioning system is operating properly, stop engine, remove gauge set and replace protective caps on valves.

NOTE: A considerable amount of refrigerant will collect in the high pressure line, since some of this refrigerant will have condensed into liquid refrigerant. Wrap the high pressure gauge fitting at the compressor with a shop cloth before disconnecting the Schrader valve from the gauge fitting to prevent damage or injury to personnel.

10. Using leak detector J-6084, check complete system for leaks, as explained under LEAK DETECTORS.

REFRIGERANT-12 DISPOSABLE CAN METHOD

After having depressurized, repaired (if necessary), and evacuated the refrigeration system, the system may be charged as follows when using Refrigerant-12 disposable cans:

1. Obtain four one pound cans of Refrigerant-12 for Pontiac and three one pound cans for Tempest. (Actually the net weight of refrigerant is 15 ozs. per can.)

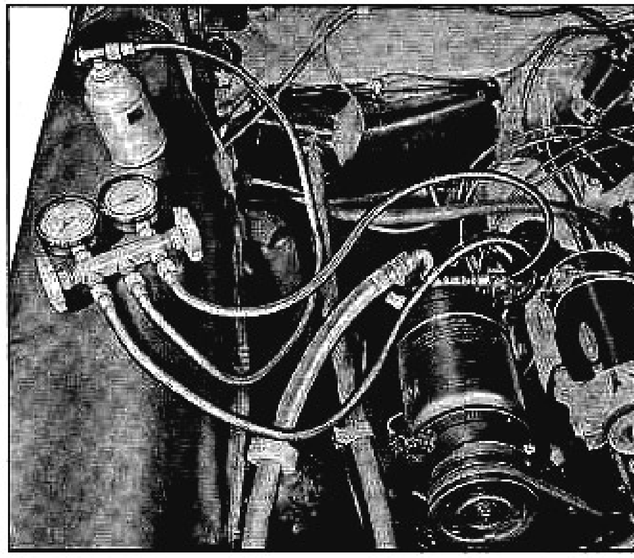


Fig. 7-41 Charging the System—Pontiac Shown (Disposable Single Can Method)

2. Mount three cans in J-6282 No. 3 Multi-opener or attach J-6271 Fitz-All Valve (single can opener valve) on one can.

CAUTION: MAKE SURE OUTLET VALVE ON OPENER IS CLOSED (CLOCKWISE) BEFORE INSTALLING OPENER.

a. If the J-6272 No. 3 Multi-opener is used, raise locking lever, position three cans of refrigerant and force the locking lever down to secure cans and at the same time puncture the top of the can to make it ready for charging.

b. If the J-6271 Fitz-All Valve is used, back off the valve from the can top retainer, slip the valve onto the can and turn the valve into the retainer until tight. Do not open outlet valve during this operation as turning the valve into the retainer punctures the top of the can to make it ready for charging.

3. Connect center flexible line of gauge set to the fitting on a can opener valve. (See Fig. 7-41).

NOTE: If line at center gauge fitting has not been purged of air, loosen line at center fitting on gauge set and "crack" valve at can opener (for a second or two) to force air from the line. Retighten line at center fitting.

4. Open valve on No. 3 Multi-opener (or on single can) and also low pressure and high pressure valves on manifold gauge set. Leave can valve open until

all refrigerant has entered the refrigeration system. Close valve on can.

a. If the system is charged using single cans and the J-6271 valve, disconnect valve from can leaving valve closed to flexible line to the center fitting of the manifold gauge set. Install valve on a new and full disposable can of Refrigerant-12 and repeat until three and one-half of the four "one pound" cans of refrigerant have been used to charge the system for Pontiac and only three one pound cans for Tempest. Since the "can" only contains 15 ozs. of refrigerant, three cans will charge the Tempest system with three ozs. less than the required refrigerant charge of 3.0 pounds.

b. If the system is charged using the 3 can Multi-opener J-6272, close the valve on the opener after all cans are empty. This will charge a Tempest system. For Pontiac, release the locking lever and discard the three empty cans. If this tool will be used to complete the charge with one additional can to bring the required refrigerant charge to 3.25 lbs. for Pontiac, then leave two of the cans just emptied in position, locate the one full can and lock the lever into place. (The empty cans balance the assembly and prevent the loss of refrigerant out the open "series" passage. Allow approximately one half of the contents of the fourth can to enter the system.)

NOTE: Align the pierced hole in the empty cans with the punch in the cover of the tool.

If the J-6271 Fitz-All Valve for single cans is available, complete charging as explained in 4a above.

5. Close valves on manifold gauge set.

6. Operate engine at 1500 RPM with temperature control knob at full cold position and blower control on "HI" speed. After five minutes of operation, observe appearance of refrigerant in liquid indicator. If bubbles are observed (above 70°F. ambient), open low pressure gauge valve and valve on refrigerant drum to allow more refrigerant to enter system. Close valve when liquid indicator clears up.

NOTE: If ambient air temperature is below 70°F. when this check is made, bubbles may appear even though the proper amount of refrigerant is in the system. Ambient air temperature must be 70°F. or above to make an accurate check. In no case should the system be charged with more than the specified amount of refrigerant.

7. When refrigerant has been installed, continue to operate system and test for proper operation as outlined under OPERATIONAL TEST.

8. When satisfied that air conditioning system is operating properly, stop engine, remove gauge set and replace protective caps on valves.

NOTE: A considerable amount of refrigerant will collect in the high pressure line, since some of this refrigerant will have condensed into liquid refrigerant. Wrap the high pressure fitting at compressor with a shop cloth before disconnecting Schrader valve from gauge fitting to prevent damage or injury to personnel.

9. Using leak detector J-6084, check complete system for leaks as explained under LEAK DETECTORS.

SERVICE STATION METHOD

INSTALLING J-8393

1. Be certain compressor hand shut-off valves are closed to gauge fittings (counterclockwise).

2. Be certain all valves on charging station are closed.

3. Connect high pressure gauge line (with J-6163 attached) to compressor high pressure gauge fitting.

4. Turn high pressure hand shut-off valve one turn clockwise, and high pressure control (2) one turn counterclockwise (open). Crack open low pressure control (1) and allow refrigerant gas to hiss from low pressure gauge line for three seconds, then connect low pressure gauge line to low pressure gauge fitting on compressor. (Place J-6163 adapter on hose, then attach adapter to gauge fitting.)

FILLING CHARGING CYLINDER

1. Open control valve on refrigerant container.

2. Open valve on bottom of charging cylinder allowing refrigerant to enter cylinder.

3. Bleed charging cylinder top valve (behind control panel) only as required to allow refrigerant to enter cylinder. When refrigerant reaches desired charge level (3.25 lbs. for Pontiac and 3.0 lbs. for Tempest), close valve at bottom of charging cylinder and be certain cylinder bleed valve is closed securely.

NOTE: While filling the cylinder, it will be necessary to close the bleed valve periodically to allow boiling to subside so that refrigerant level in the charging cylinder can be accurately read.

CHARGING THE SYSTEM

1. Turn on vacuum pump and open vacuum control valve (3).

2. With refrigeration system purged of refrigerant, run pump until 26-28 inches of vacuum is obtained. Continue to run pump for 15 minutes after the system reaches 26-28 inches vacuum.

NOTE: In all evacuating procedures, the specification of 26-28 inches of Mercury vacuum is used. These figures are only attainable at or near sea level. For each 1000 feet above sea level where this operation is being performed, the specifications should be lowered by 1 inch. Example: at 5000 ft. elevation, only 21 to 23 inches vacuum can normally be obtained.

3. If 26-28 inches vacuum (corrected to sea level) cannot be obtained, close vacuum control valve (3) and shut off vacuum pump. Open refrigerant control valve (4) and allow ½ pound of refrigerant to enter system. Locate and repair all leaks.

4. After evacuating for 15 minutes, add ½ pound of refrigerant to system as described above. Purge this ½ pound and re-evacuate for 5 minutes. This second evacuation is to be certain that as much contamination is removed from the system as possible.

5. After evacuating as above, system is ready for charging. Note reading on sight glass of charging cylinder. If it does not contain a sufficient amount for a full charge, fill to the proper level.

6. Close low-pressure valve (1). Fully open refrigerant control valve (4) and allow all liquid refrigerant to enter system. When full charge of refrigerant has entered system (3.25 lbs. for Pontiac and 3.0 lbs. for Tempest), turn off refrigerant control valve (4) and close both hand shut-off valves.

7. If full charge of refrigerant will not enter system, close high pressure control and refrigerant control valve (4). Start engine and run at slow idle with compressor operating. Crack refrigerant control valve (4) and low pressure control (1). Watch low side gauge and keep gauge below 50 psi by regulating refrigerant control valve (4). Closing valve will lower pressure. This is to prevent liquid refrigerant from reaching the compressor while the compressor is operating. When required charge has entered system, close refrigerant control valve (4) and close low pressure control (1).

8. System is now charged and should be performance tested before removing gauges.

ADDING REFRIGERANT

The following procedure should be used in adding small amounts of refrigerant that may have been lost by leaks, or while opening system for servicing the compressor. Before adding refrigerant to replace that lost by leaks, check compressor oil level and add oil if necessary. See ADDING OIL.

1. Remove caps from compressor suction and discharge valve gauge fittings. Attach gauge set to gauge fittings making sure Schrader adapter J-5420 is between low pressure gauge hose and suction valve gauge fitting, and J-6163 is between high pressure gauge hose and discharge valve gauge fitting.

2. Start engine, move air conditioning temperature control to full cold and position blower on "HI" speed. Operate for five minutes at 1500 RPM to stabilize system.

3. Observe the refrigerant through the glass cover of the liquid indicator with the system operating to see if there are any bubbles evident.

a. If no bubbles are seen, then bleed system slowly through the discharge valve until bubbles appear in the liquid indicator. Add one-half pound of refrigerant as explained under CHARGING THE SYSTEM.

b. If bubbles are visible in the liquid indicator, with the temperature control knob at the full cold position and the blower on "HI" speed, it indicates partial or complete plug in a line or a shortage of refrigerant or both. Correct condition. Add refrigerant until the sight glass clears, then add another one-half pound of refrigerant as explained below.

4. Attach flexible hose from center fitting of gauge set loosely to refrigerant drum or on disposable can valves. Open high and low pressure valves on the gauge set slightly to purge pressure gauge lines of air. Tighten fitting of refrigerant drum, or can, when satisfied that all air has been removed from gauge lines. Close (clockwise) both hand shut-off valves of gauge set.

5. Partially charge system as follows:

a. Refrigerant-12 Drum Method

(1) Place pail containing hot water that does not have a temperature exceeding 125°F. on scales, place refrigerant drum in pail containing water, note weight, and open only low pressure valve on gauge set.

(2) Start engine, move temperature control knob to full cold position and place blower on "HI" speed.

Operate engine for ten minutes at 1500 RPM to stabilize system.

(3) With compressor operating, open valve on refrigerant drum slowly and allow refrigerant to flow into system (through suction side of gauge set) until liquid indicator clears up and immediately shut off valve at gauge set or on refrigerant drum. Check weight of refrigerant drum and pail of water. Then open suction valve on gauge set (or refrigerant drum) slowly and add one-half pound of refrigerant. Note total amount of refrigerant added.

b. Refrigerant-12 Disposable Can Method

(1) Make sure the outlet valve on the J-6271 Fitz-All Valve is fully clockwise and attach the J-6271 to a "one pound" can of refrigerant as follows: back off the valve from the top of the retainer, slip the valve onto the can and turn the valve into the retainer until tight. Do not open outlet valve during this operation as turning the valve into the retainer punctures the top of the can to make it ready for charging.

(2) Connect center flexible line of gauge set to the fitting of the valve (Fig. 7-41).

(3) Start engine, move temperature control knob to full cold position and place blower knob on "HI" speed. Operate engine for five minutes at 1500 RPM to stabilize system.

(4) With compressor operating, open valve on refrigerant can slowly and allow refrigerant to flow into system (through suction side of gauge set) until liquid indicator clears up and immediately shut off valve at gauge set and on refrigerant can. Check weight of can and valve assembly and record, then add one-half pound refrigerant. It may be necessary to attach another can to obtain the additional one-half pound refrigerant.

c. Service Station Method

1. Installing J-8393.

(a) Be certain compressor hand shut-off valves are closed to gauge fittings (counterclockwise).

(b) Be certain all valves on charging station are closed.

(c) Connect high pressure gauge line (with J-6163 attached) to compressor high pressure gauge fitting.

(d) Turn high pressure hand shut-off valve one turn clockwise, and high pressure control (2) one turn counterclockwise (open). Crack open low pressure control (1) and allow refrigerant gas to hiss from low pressure gauge line for three seconds, then connect low pressure gauge line to low pressure gauge fitting on compressor. (Place J-6163 adapter on hose, then attach adapter to gauge fitting.)

2. Filling charging cylinder.

(a) Open control valve on refrigerant container.

(b) Open valve on bottom of charging cylinder allowing refrigerant to enter cylinder.

(c) Bleed charging cylinder top valve (behind control panel) only as required to allow refrigerant to enter cylinder. When refrigerant reaches full level of 5 pounds, close valve at bottom of charging cylinder and be certain cylinder bleed valve is closed securely.

NOTE: While filling the cylinder, it will be necessary to close the bleed valve periodically to allow boiling to subside so that refrigerant level in the charging cylinder can be accurately read.

3. Partial charging.

(a) With charging station installed as previously described, remove low pressure gauge line at compressor.

(b) Crack open high (2) and low (1) pressure control valves, and allow refrigerant gas to purge from system. Purge slow enough so that oil does not escape from system along with refrigerant.

(c) Start engine, move temperature control knob to full cold position and place blower knob on "HI" speed. Operate engine for ten minutes at 1500 RPM to stabilize system.

(d) With compressor operating, open refrigerant control valve (4) slowly and allow refrigerant to flow into system (through suction side of gauge set) until liquid indicator clears up and immediately shut off valve (4) at gauge set. Then open valve (4) slowly and add one-half pound of refrigerant. Note total amount of refrigerant added.

6. Close all valves (refrigerant drum or can and gauge set).

7. Test for leaks and make operational check of system as outlined under OPERATIONAL TEST.

CHECKING COMPRESSOR OIL LEVEL AND ADDING OIL

The refrigeration system contains a total of 11 fluid ozs. of Frigidaire 1000 viscosity oil. Originally all of this oil is in the compressor, but after the system has been operated the oil will have been circulated through the system with the refrigerant. For this reason, when a compressor is removed it is unlikely that it would contain 11 oz. of oil.

Whenever the system has been open to atmosphere due to collision or severe leak for an extended period of time, the procedure under COLLISION SERVICE should be followed.

Oil level should be checked anytime there has been a loss of refrigerant from the system. If there is insufficient oil in the compressor, it will be necessary to add oil as outlined below.

Only Frigidaire 1000 viscosity oil should be used in this compressor. The specified oil is made to very exacting specifications particularly suited to this compressor and no substitutes should be used. This oil is available in one quart bottles.

Frigidaire 1000 viscosity oil, like all refrigeration oil, is a completely dry oil. This gives it a high affinity for moisture and if exposed to air it will draw moisture out of the air. For this reason the oil container must be kept tightly capped, when not in use, to prevent the absorption of moisture.

CHECKING COMPRESSOR OIL LEVEL

1. Start engine and operate air conditioner for ten minutes at 1500 RPM to stabilize system. Then turn off engine.

2. Slowly loosen oil test stem bolt on bottom of compressor and allow refrigerant and oil to escape for a few seconds. Oil will invariably appear the first time the bolt is loosened regardless of oil level. Tighten bolt.

3. Again loosen oil test stem bolt slowly. If a heavy flow of oil continues to be ejected with the refrigerant the second time the bolt is loosened, the oil level in the compressor is satisfactory. If a heavy flow of oil does not escape, or a fine spray or mist is noticed the second time the nut is loosened, the oil level is low and oil will have to be added as outlined below.

ADDING OIL

1. Remove charging hoses from low pressure and center fittings on the J-5725 gauge manifold set.

2. Attach J-7605 oil injector cylinder to low pressure fitting on the gauge manifold set so valve is away from gauge set.

3. Attach charging line to the valve end of the oil injector cylinder.

4. With both valves on the manifold gauge set closed (clockwise), attach to compressor using J-5420 Schrader valve adapter at suction gauge fitting and J-6163 Schrader valve adapter at the discharge gauge fitting.

5. With valves at oil injector cylinder open, crack low pressure and high pressure valve at manifold gauge set to purge air from the lines. (Air will be forced out the center fitting.)

NOTE: Allow refrigerant to purge low pressure side for at least five seconds to insure complete removal of air or moisture from the oil cylinder. Cap center fitting and close valves on gauge set.

6. Close valve at oil injector unit.

7. Holding oil cylinder in vertical position and away from any possibility of dirt or moisture falling onto oil cylinder, remove filler plug from top of oil cylinder.

8. Using clean Frigidaire 1000 viscosity oil, fill oil injector cylinder and replace cylinder plug.

NOTE: A clean hand pump type oiler is satisfactory in performing this operation.

9. Start engine and operate air conditioner at full cold position with blower on high.

10. Open valve at bottom of oil injector cylinder and high pressure valve on gauge manifold.

11. Holding manifold gauge set in vertical position "crack" open low pressure valve on gauge set. Leave valve open for five minutes to allow all oil to be forced into the system and close low pressure and high pressure valves on gauge set.

12. Operate air conditioner for an additional five minutes at 1500 engine rpm to stabilize system and turn off engine.

13. Recheck oil level.

14. Continue to add oil in full oil injector cylinder until a satisfactory oil level is obtained.

15. Remove gauge lines from compressor and replace fitting caps on compressor fittings assembly.

16. Remove the J-7605 oil injector cylinder from manifold gauge set and *cap both ends* of cylinder *immediately* to prevent air or moisture from entering the cylinder.

17. Start engine, move air conditioning temperature control knob to full cold and position blower knob on "HI" speed. Operate for five minutes at 1500 RPM to stabilize system.

18. Observe the refrigerant through the glass cover of the liquid indicator with the system operating to see if there are any bubbles evident.

REMOVING MALFUNCTIONING COMPRESSOR AND INSTALLING NEW COMPRESSOR

This procedure should be used any time a compressor is to be replaced due to stuck crankshaft, stuck pistons, burned bearings, broken discharge or suction reeds, or other internal difficulty which prevents compressor from working properly.

The new compressor will be minus the fittings assembly, clutch and pulley assembly, and the clutch actuating coil. The end of the shaft will be protected by aluminum foil and/or a plastic cap. The new compressor will be supplied with 13 fluid ounces of Frigidaire 1000 viscosity oil installed, and will have a charge consisting of a mixture of nitrogen gas and Refrigerant-12. The same refrigerant charge as stamped on old compressor *must be* stamped on the new compressor.

A shim package for clutch plate to coil housing clearance, a shim chart, and a Woodruff key is packed separately and shipped with the compressor. Proper method of determining proper shim pack is explained under COMPRESSOR REPLACEMENT.

Remove the old compressor and install the new compressor as follows:

COMPRESSOR REMOVAL

1. Connect the high and low pressure gauge lines from the gauge set to the respective connections on the old compressor on the car. Be sure valves on gauge set are fully clockwise to close gauge set to center fitting, that J-5420 or J-6163 Schrader adapter is between low pressure hose and suction valve gauge fitting and also at the discharge gauge fitting.

2. Remove the flare nut from center connection on gauge manifold or the plug in the gauge line attached to the center connection. Wrap the line at the outlet with a cloth to protect persons and car surfaces from oil or refrigerant.

3. Slowly depressurize refrigeration system.

4. While system is depressurizing remove clutch assembly and coil from old compressor as outlined (under COMPRESSOR SEAL REPLACEMENT). If parts are in good condition and not oil soaked, lay them aside on a clean surface as they may be installed on the new compressor.

5. After the system has *completely* depressurized, very slowly loosen screw which retains compressor fittings assembly to compressor. As screw is being loosened, work fittings assembly back and forth to break seal and carefully bleed off any remaining pressure.

CAUTION: High pressure may still exist at the discharge valve. If this pressure is released too rapidly there will be a considerable discharge of refrigerant and oil.

6. When all pressure has been relieved, remove fittings assembly and "O" ring seals.

7. Immediately cover compressor openings. A simple way is with a plate (similar to the one on the new compressor) which can be attached with the valve body screw using the "O" rings to provide a seal.

8. Disconnect compressor clutch coil wire and remove compressor mounting plates to bracket bolts (front and rear.)

9. If there is any possibility that broken parts from the compressor got into the discharge line or the condenser, all refrigeration system parts should be cleaned and a new receiver and liquid indicator assembly should be installed.

10. Drain all oil from the compressor just removed in a clean dry container and replace compressor drain plug screw. Measure amount of oil drained.

COMPRESSOR REPLACEMENT

NOTE: Before installing a new compressor, rotate the compressor shaft four or five times. This permits proper lubrication of the compressor seal over all its surface. Before the compressor clutch is mounted to the new compressor, wipe the front face of the compressor thoroughly with a clean dry cloth and, if necessary, clean front of compressor with a solvent to remove any excess oil. The cleaning of the compressor in this manner will prevent any oil from being thrown onto the clutch surface, which would cause slippage and eventual clutch failure.

1. Stamp refrigerant charge of the refrigerant system (3.25 lbs. for Pontiac and 3.0 lbs. for Tempest) on new compressor in space on plate provided for this information.

NOTE: If nine ounces or more oil was drained from old compressor, continue with step 2. If less than nine ounces was drained from old compressor

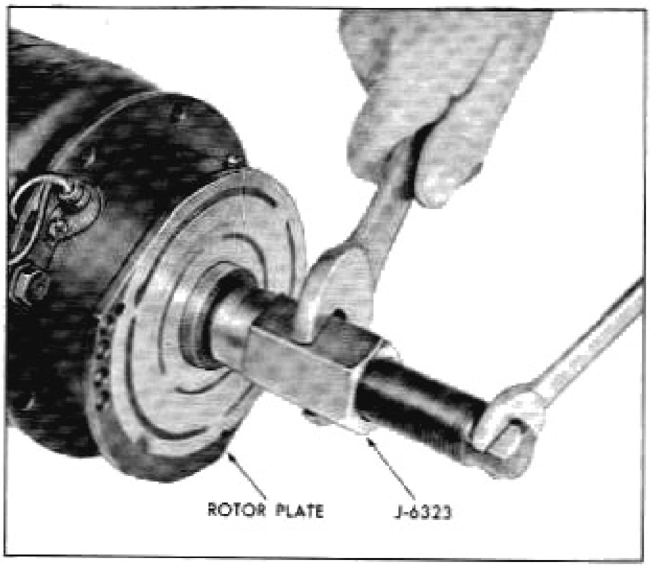


Fig. 7-42 Installing Rotor Plate

and compressor shaft seal or other refrigerant connections were not broken or leaking, disconnect thermostatic expansion valve at evaporator and drain oil from evaporator. Reverse flush with Refrigerant-12. Install new compressor with full charge of oil as received.

2. Install new compressor on car leaving compressor fittings opening cover plate on the compressor.

3. Remove cover plate over compressor openings very slowly to bleed off any pressure that may still be in the compressor.

CAUTION: New compressors are charged with a mixture of nitrogen and refrigerant and Frigidaire 1000 viscosity oil. If the cover is removed too rapidly, the oil will be blown out violently with the sudden release of pressure.

4. Install coil and clutch parts on new compressor as follows:

NOTE: Shims for positioning the rotor plate to coil housing clearance are included in envelope attached to new compressor.

a. Replace coil inner insulator (rubber), coil, outer insulator (paper gasket), coil retainer, and secure retainer with three screws.

b. Secure coil wires with retainer and attach ground wire to compressor body.

c. Install the spacer.

d. Replace rotor plate selective spacers.

NOTE: The spacer should be of such thickness as to provide a .025"-.035" air gap between the rotor plate and coil housing when the coil is energized.

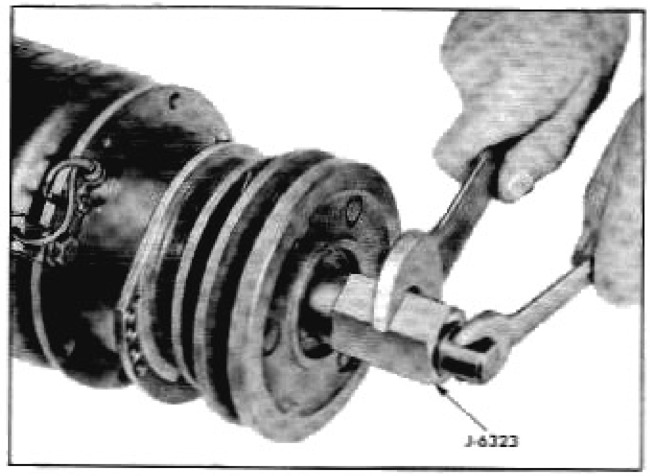


Fig. 7-43 Installing Pulley

e. Replace rotor plate key. If key was damaged in removal, replace with new key.

f. If the rotor plate does not require replacement, carefully wipe clean using a clean dry cloth.

g. Position rotor plate assembly on shaft, indexing the hub of the assembly with the Woodruff key and install with J-6323 Compressor Clutch Plate and Pulley Installer and J-6323-5 Adapter. Position the J-6323-5 Adapter onto the threaded stud of the tool so the tapered end of the spacer faces the rotor plate. Thread the stud of J-6323 onto the end of the compressor shaft and, holding this stud with an open end wrench to prevent the compressor shaft from turning, complete the installation of the rotor plate by turning the large hex nut until the rotor plate is firmly seated against the selective spacers.

h. Remove the J-6323 Compressor Clutch Plate and Pulley Installer and J-6323-5 Adapter.

i. Install the pulley assembly using J-6323 and J-6323-5 Adapter in a similar manner as installing the rotor plate assembly (Figs. 7-42 and 7-43).

NOTE: If a slight interference between the drive end of the tool and the pulley is experienced, grind outside diameter of drive end of tool to fit or use flat washers to assist in installing the pulley.

j. Replace compressor shaft nut lockwasher and compressor shaft nut. Tighten nut to 5-7 lb. ft. torque and bend over lockwasher tang.

k. Energize compressor clutch and check for proper air gap between the rotor plate and coil hous-

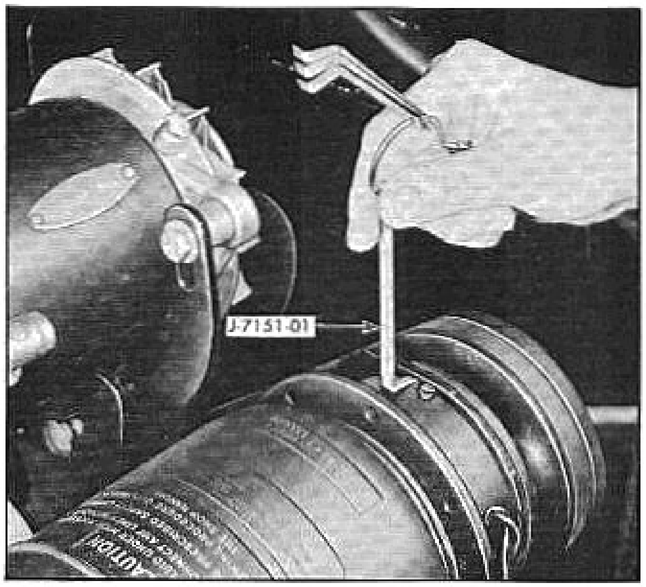


Fig. 7-44 Checking Air Gap—Pontiac and Tempest V-8

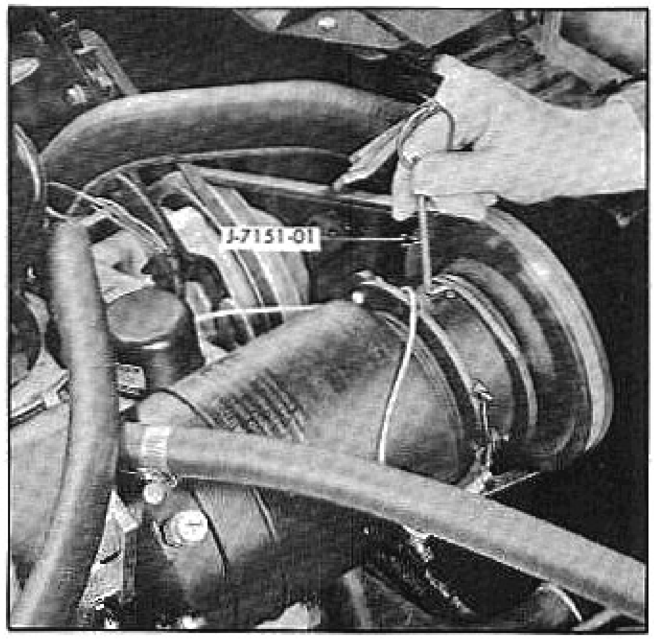


Fig. 7-45 Checking Air Gap—Tempest L-4

ing (Figs. 7-44 and 7-45). This clearance should be .025"-.035". If this clearance is *not* within specifications, then it will be necessary to remove the rotor plate and add or remove selective spacers as necessary.

5. Install and adjust compressor belt to 100-105 lbs. as indicated on the Borroughs Belt Tension Gauge.

6. Evacuate and charge system with 3.25 lbs. Refrigerant-12 for Pontiac and 3.0 lbs. for Tempest.

7. Make operational test of system.

System is now ready for operation.

If compressor was replaced within the warranty period, send old compressor properly sealed and tagged to Warranty Inspector, Salvage Department, Pontiac Motor Division, Pontiac, Michigan, using same container in which new compressor was received.

COMPRESSOR CLUTCH, COIL AND SEAL REPLACEMENT

REMOVING COMPRESSOR SEAL

The compressor clutch, coil or seal may be replaced without removing the compressor on Pontiac and Tempest 215 engines (V-8). Compressors must be detached from mounting plates on Tempest 195 engines (L-4).

1. Depressurize system.

2. Bend back compressor shaft nut lock retainer.

3. Energize compressor clutch and remove compressor shaft nut and lock washer.

4. De-energize compressor clutch and remove compressor belt.

5. Remove pulley from shaft, using a puller such as J-8433 Compressor Pulley Remover (Fig. 7-46).

6. Using J-6322-01 Compressor Clutch Plate Puller or J-6322 Compressor Clutch Plate Puller with J-7849 adapter attached to end of J-6322 Puller, remove the rotor plate assembly as follows:

a. Back out pilot screw of J-6322 and thread body of tool onto threaded hub of rotor plate (Fig. 7-47).

b. Holding the body of the tool with an open end wrench, tighten the screw against the compressor shaft to remove the rotor plate.

REMOVING COMPRESSOR CLUTCH COIL

1. Remove the three screws which hold the coil retainer.

2. Remove coil wire retainer (round wire and clamp) and detach wires.

3. Remove paper insulator from front of coil and remove coil from cavity.

NOTE: Use two pieces of stiff wire bent in "L" shape to hook behind coil and pull to remove coil.

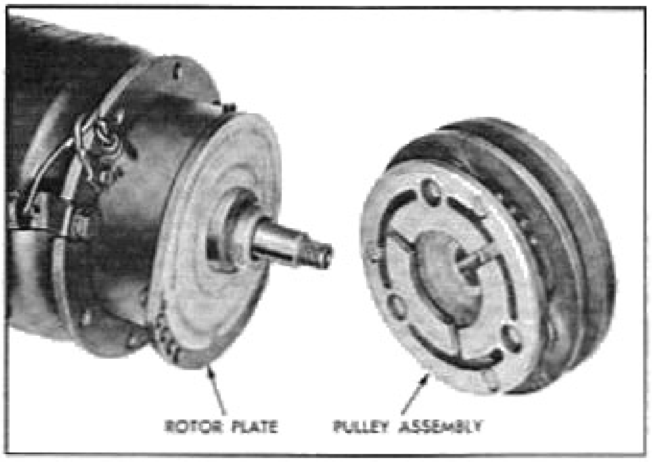


Fig. 7-46 Pulley Removed from Compressor Shaft

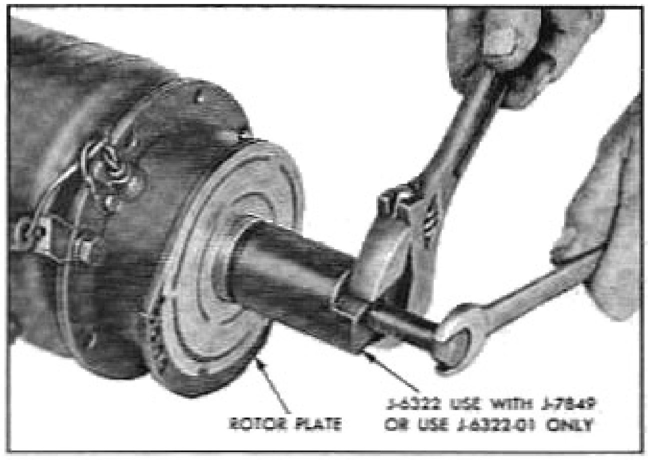


Fig. 7-47 Removing Rotor Plate

4. Remove rubber insulator from rear of coil cavity. Inspect for brittleness or damage.

REMOVING COMPRESSOR SHAFT SEAL

1. Remove rotor plate key, shim pack and spacer.

2. Remove six (6) Phillips head screws behind rubber insulator which secure coil housing to compressor (loosen screws by tapping center of screw with punch or with Phillips screw driver bit). If screws were damaged during removal, obtain new screws.

3. Remove coil housing (Fig. 7-48).

4. Remove shaft seal.

5. Remove coil housing "O" ring seal.

6. Remove seal seat retainer and press out seal seat.

7. Remove seal seat "O" ring.

8. Thoroughly clean all parts carefully and examine any parts for scoring or damage which may have resulted in the leak. All parts of the clutch assembly (with the exception of new parts to be replaced) the rotor plate and the pulley and bearing assembly should be cleaned in a solvent and blown dry with compressed dry air.

REPLACING COMPRESSOR SEAL

1. Make certain the square headed seal drive pin is properly aligned with the shaft and that the wave washer is in place.

2. Position the J-6320 Compressor Seal Protector on the compressor shaft with the small tapered end of the tool towards the end of the shaft, and install seal, aligning the seal with the square pin on the compressor shaft (Fig. 7-49).

3. Into the coil housing, install a new seal seat "O" ring, a new seal seat and new retainer ring.

4. Install a new housing mounting "O" ring seal on the coil housing.

5. Complete installation of coil housing, exercising care not to damage the housing mounting "O" ring seal and making sure that the coil housing is properly aligned with the compressor to permit proper location of coil wire. Replace the six Phillips head coil housing retaining screws.

NOTE: If the heads of these screws became burred or damaged in removal, install new screws to pre-

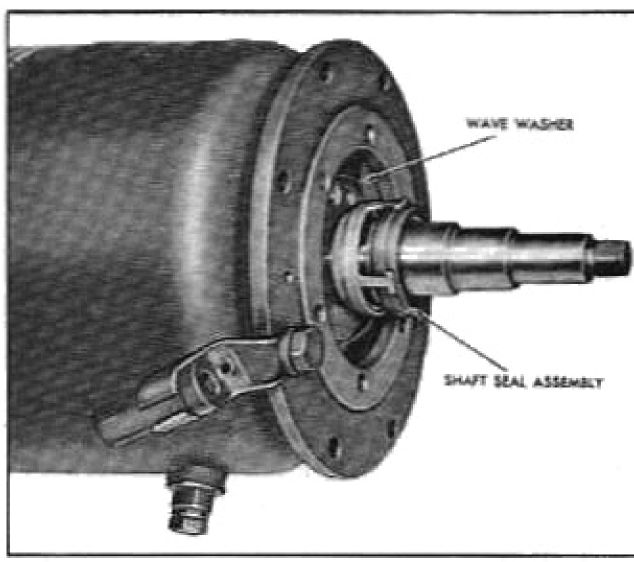


Fig. 7-48 Location of Shaft Seal in Position

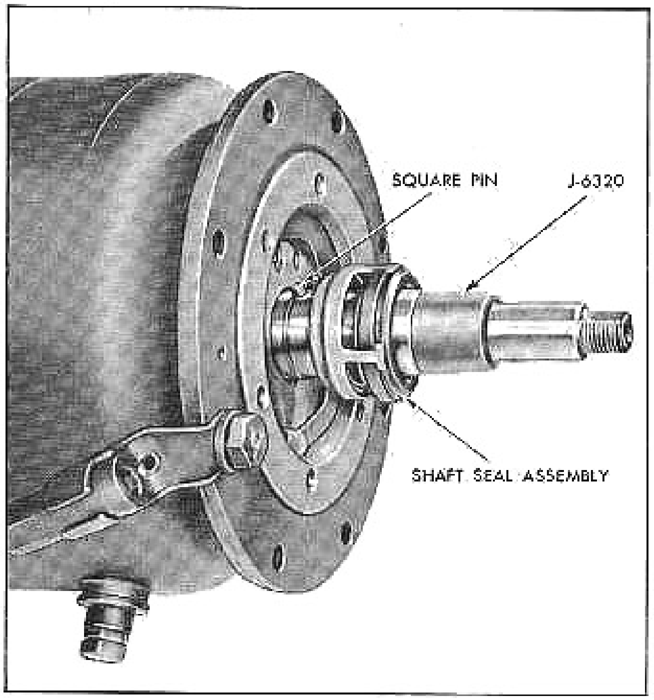


Fig. 7-49 Installing Shaft Seal

vent damage to coil and also to insure that coil housing is firmly secured to compressor.

REPLACING COMPRESSOR CLUTCH COIL

1. Place the coil inner insulator gasket (rubber) into position and install coil.

2. Replace coil outer insulator (paper gasket), coil retainer and secure retainer with three screws.

3. Secure coil wires with retainer and attach ground wire to compressor body.

4. Install the spacer.

5. Replace the rotor plate selective spacers.

NOTE: The spacers should be of such thickness as to provide a .025"-.035" air gap between the rotor plate and coil housing when the coil is energized.

REPLACING COMPRESSOR CLUTCH

1. Replace rotor plate key. If key was damaged in removal, replace with new key.

2. If the clutch parts do not require replacement, carefully wipe the parts using a clean dry cloth.

3. Position rotor plate on shaft, indexing the hub of the assembly with the Woodruff key and install with J-6323-01 Compressor Clutch Plate and Pulley Installer or J-6323 and J-6323-5 Adapter (Fig. 7-50). Position the tool spacer onto the threaded stud of the tool so the tapered end of the spacer faces the rotor plate. Thread the stud of J-6323-01 onto the end of the compressor shaft and holding this stud with an open end wrench to prevent the compressor shaft from turning, complete the installation of the rotor plate by turning the large hex nut until the rotor plate is firmly seated against the selective spacers.

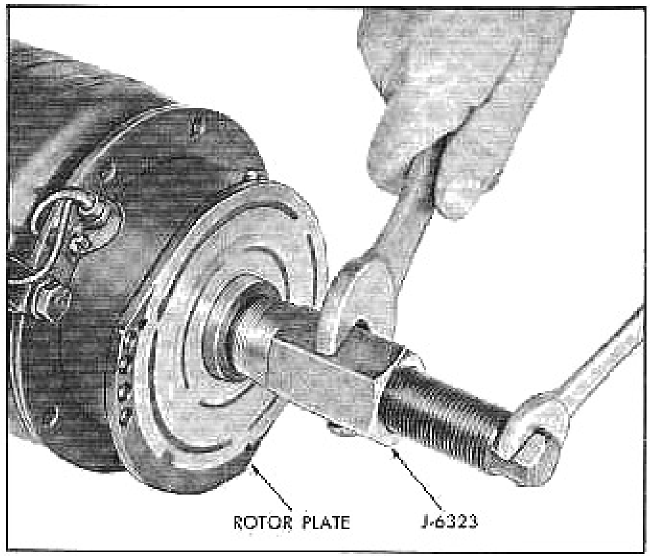


Fig. 7-50 Installing Rotor Plate

4. Remove the J-6323-01 Compressor Clutch Plate and Pulley Installer.

5. Install the pulley assembly using J-6323-01 or J-6323 and J-6323-5 in a similar manner as installing the rotor plate (Fig. 7-51).

NOTE: If a slight interference between the drive end of the tool and the pulley is experienced, grind outside diameter of drive end of tool to fit or use flat washers to assist in installing the pulley.

6. Replace compressor shaft nut lockwasher retainer and compressor shaft nut.

7. Energize compressor clutch and tighten nut to 5-7 lb. ft. torque and bend over lockwasher tang.

8. Energize compressor clutch and check for proper air gap between the rotor plate and coil housing (Fig. 7-52). This clearance should be .025"-.035". If this clearance is not within these specifications, then it will be necessary to remove the rotor plate and add or remove selective spacers as necessary.

9. Evacuate and charge system.

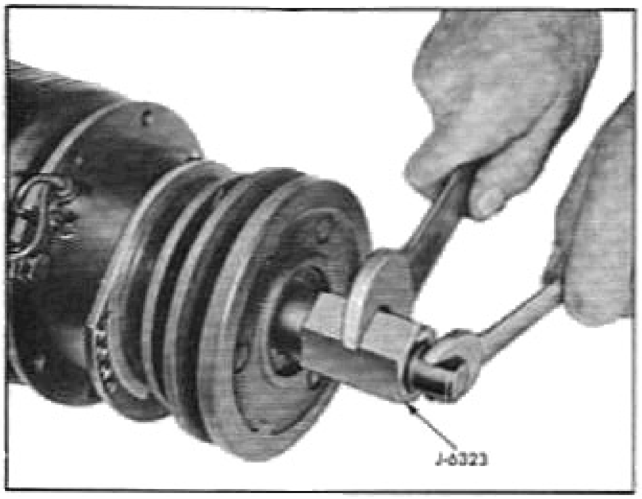


Fig. 7-51 Installing Pulley

10. Check compressor oil level and add oil as necessary.

11. Test for leaks and perform operational test.

PONTIAC CONDENSER ASSEMBLY

REMOVE AND REPLACE

1. Depressurize the refrigeration system.

2. Remove right and left headlamp doors.

3. Remove right and left headlamp assemblies.

4. Remove right and left grille assemblies.

5. Remove hood latch and support assembly.

6. Cut compressor discharge hose along side through to the fitting just enough to disconnect hose. Cut end of hose to remove cut portion and plug all openings.

7. Disconnect connection at condenser outlet and plug openings (Fig. 7-53).

8. Remove battery and battery tray.

9. Disconnect right and left horns and remove condenser.

10. Replace condenser by reversing the above procedures using a new rubber "O" ring seal well lubricated with clean compressor oil at each connection.

11. Evacuate and charge system.

12. Check compressor oil level and add oil as necessary.

13. Perform operational test.

Fig. 7-52 Checking Air Gap (Pontiac Shown)

PONTIAC RECEIVER AND LIQUID INDICATOR ASSEMBLY

REMOVE AND REPLACE

1. Depressurize the system.

2. Disconnect the inlet and outlet connection at the receiver and liquid indicator assembly and plug all openings.

3. Loosen receiver and liquid indicator assembly clamp screw and remove assembly.

4. Replace the receiver and liquid indicator assembly by reversing the above procedure, using new rubber "O" ring seals well lubricated with clean compressor oil at each connection.

5. Evacuate complete system.

6. Charge complete system.

7. Check compressor oil level and add oil as necessary.

8. Perform operational test.

PONTIAC RESISTOR ASSEMBLY

REMOVE AND REPLACE

1. Depressurize refrigerant system.

2. Remove glove box.

3. Disconnect evaporator drain hose at evaporator.

4. Disconnect evaporator case from mounting brackets.

5. Disconnect air inlet duct at evaporator.

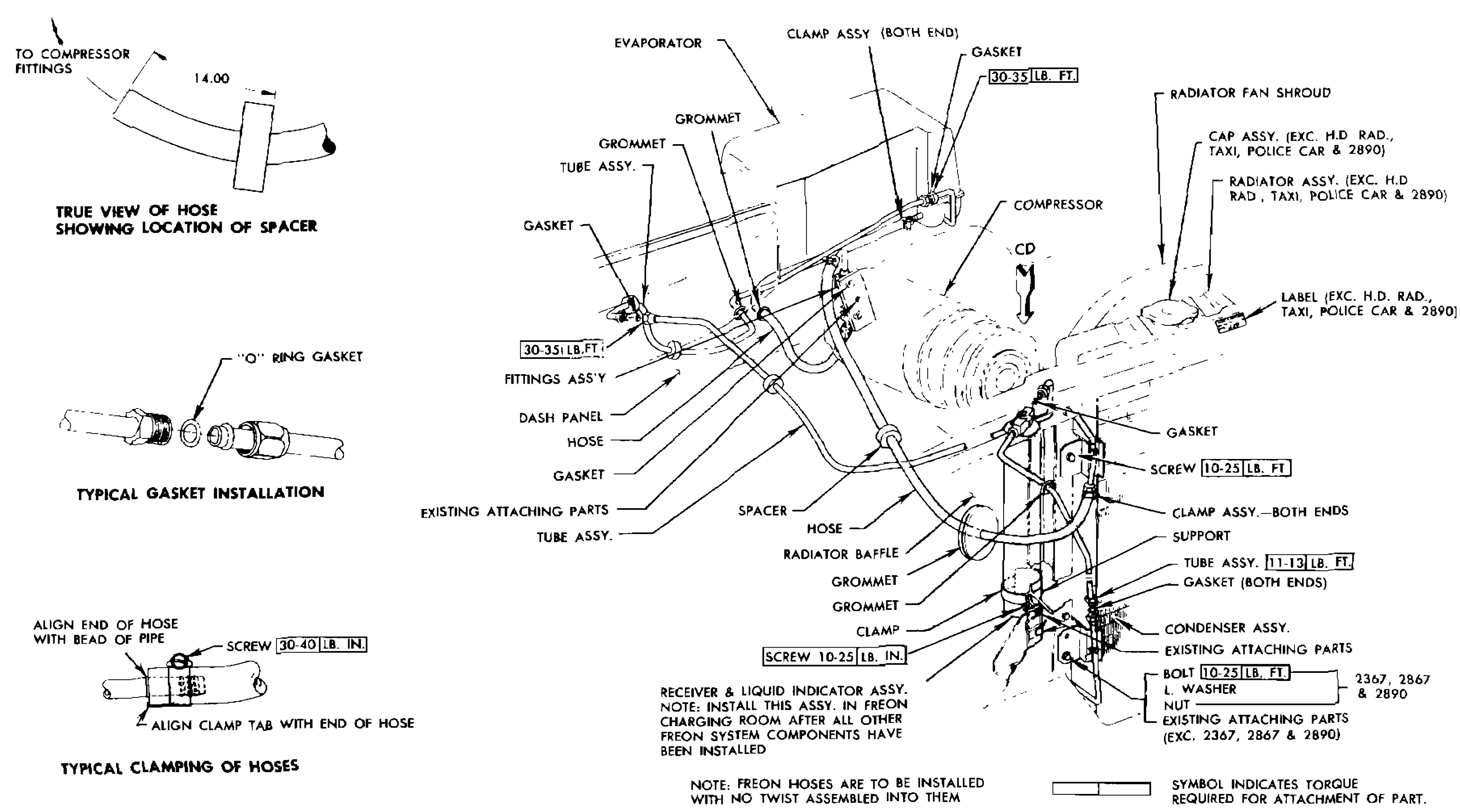


Fig. 7-53 Reference Illustration—Pontiac Cool Pack Refrigeration System

6. Disconnect receiver to evaporator pipe at evaporator.

7. Disconnect wires at rear of evaporator.

8. Remove eleven screws retaining evaporator lower housing to upper housing.

9. Remove resistor assembly.

10. Replace by reversing the above procedure.

11. Evacuate and charge refrigeration system.

12. Perform operational test.

PONTIAC BLOWER SWITCH

REMOVE AND REPLACE

1. Depressurize refrigerant system.

2. Remove glovc box.

3. Disconnect evaporator drain hose at evaporator.

4. Disconnect evaporator case from mounting brackets.

5. Disconnect air inlet duct at evaporator.

6. Disconnect receiver to evaporator pipe at evaporator.

7. Disconnect wires at rear of evaporator.

8. Remove eleven screws retaining evaporator lower housing to upper housing.

9. Remove blower control switch, control knob.

10. Remove two screws retaining blower switch to upper housing.

11. Disconnect wires at blower switch and headlamp relay.

12. Replace by reversing the above procedure.

13. Evacuate and charge refrigeration system.

14. Perform operational test.

TEMPERATURE CONTROL SWITCH (THERMOSTAT)

REMOVE AND REPLACE

1. Depressurize refrigerant system.

2. Remove glove box.

3. Disconnect evaporator drain hose at evaporator.

4. Disconnect evaporator case from mounting brackets.

5. Disconnect air inlet duct at evaporator.

6. Disconnect receiver to evaporator pipe at evaporator.

7. Disconnect wires at rear of evaporator.

8. Remove eleven screws retaining evaporator lower housing to upper housing.

9. Remove temperature control switch (thermostat) control knob.

10. Remove two screws retaining thermostat to upper housing.

11. Disconnect thermostat capillary tube at plastic retainer and remove temperature control switch.

12. Immerse switch in ice water and warm water alternately to check again operation of switch.

13. If switch operates to open and close the points, adjust thermostat as outlined under TEMPERATURE CONTROL SWITCH (THERMOSTAT)—CHECK AND ADJUST. If switch fails to operate, replace switch.

14. Replace by reversing the above procedure.

15. Evacuate and charge refrigeration system.

16. Perform operational test.

PONTIAC OR TEMPEST THERMOSTATIC EXPANSION VALVE

REMOVE AND REPLACE

1. Depressurize refrigerant system.

2. Remove glove box.

3. Disconnect evaporator drain hose at evaporator.

4. Disconnect evaporator case from mounting brackets.

5. Disconnect air inlet duct at evaporator.

6. Disconnect receiver to evaporator pipe at evaporator.

7. Disconnect wires at rear of evaporator.

8. Remove eleven screws retaining evaporator lower housing to upper housing.

9. Remove two screws from evaporator housing.

10. Disconnect thermostat capillary tube at plastic retainer and remove evaporator core and thermostatic expansion valve as an assembly.

11. Disconnect pipe at the thermostatic expansion valve and plug openings.

12. Disconnect thermostatic expansion valve capil-

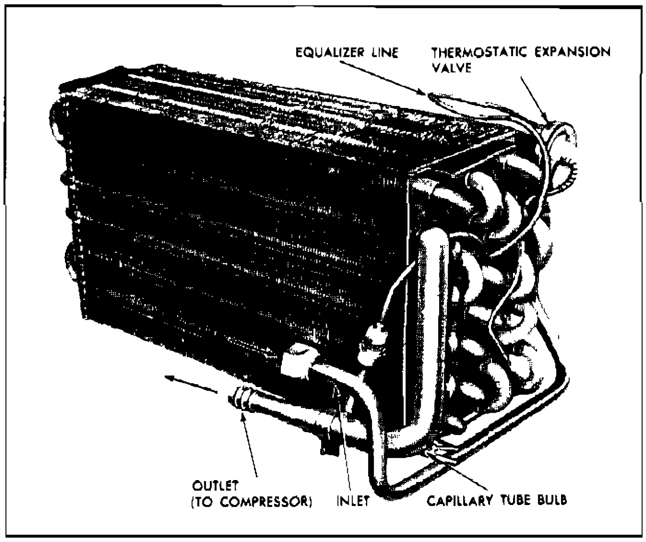


Fig. 7-54 Thermostatic Expansion Valve Bulb at Evaporator Outlet Pipe

lary tube bulb and equalizer line at evaporator outlet pipe and plug all openings (Fig. 7-54).

13. Remove thermostatic expansion valve, drain any oil from evaporator noting amount, and plug openings.

14. Replace by reversing the above procedure, making sure new rubber "O" ring seals, well lubricated with clean compressor oil, are at each thermostatic expansion valve connection.

15. Evacuate and charge system.

16. Check compressor oil and add oil as necessary.

17. Perform operational test.

PONTIAC OR TEMPEST EVAPORATOR CORE

REMOVE AND REPLACE

1. Depressurize refrigerant system.

2. Remove glove box.

3. Disconnect evaporator drain hose at evaporator.

4. Disconnect evaporator case from mounting brackets.

5. Disconnect air inlet duct at evaporator.

6. Disconnect receiver to evaporator pipe at evaporator.

7. Disconnect wires at rear of evaporator.

8. Remove eleven screws retaining evaporator lower housing to upper housing.

9. Disconnect thermostat capillary tube at plastic retainer and remove evaporator core and thermostatic expansion valve as an assembly.

10. Disconnect pipe at the thermostatic expansion valve and plug openings.

11. Cut evaporator to compressor hose approximately two (2) inches from its end on the evaporator fitting and plug openings.

12. Disconnect thermostatic expansion valve capillary tube bulb and equalizer line at evaporator outlet pipe, drain any oil from evaporator noting amount, and plug openings.

13. Remove thermostatic expansion valve, drain any oil from evaporator noting amount, and plug openings.

14. Remove evaporator to compressor hose clamp at evaporator fitting. Slit hose and remove from fitting.

15. Replace evaporator core by reversing the above procedure, making sure new rubber "O" ring seals, well lubricated with clean compressor oil, are at each thermostatic expansion valve connection.

NOTE: Attach evaporator to compressor hose at evaporator core, making sure hose clamp is properly positioned. This hose is made sufficiently long so it may be reused again in spite of the two (2) inches cut off when the core was removed.

16. Evacuate and charge system.

17. Check compressor oil level and add oil as necessary.

18. Perform operational test.

TEMPEST CONDENSER ASSEMBLY

REMOVE AND REPLACE

1. Depressurize refrigeration system.

2. Remove battery.

3. Remove right headlamp door.

4. Remove right radiator grille assembly (four screws across the top and one at the right of the headlamp and lift grille up).

5. Remove left headlamp door and left radiator grille assembly.

6. Remove hood latch bracket.

7. Remove front fender and radiator brace assembly.

8. Disconnect inlet and outlet connections of the condenser assembly and plug openings.

9. Remove inlet pipe to condenser clamp at right side of condenser.

10. Remove condenser attaching bolts and remove condenser (Fig. 7-55).

11. Replace by reversing the above procedure, using new rubber O-ring seals well lubricated with refrigeration oil at each condenser connection.

NOTE: Before replacing grille assemblies, remove retainers and place into position in the grille.

TEMPEST RECEIVER AND LIQUID INDICATOR ASSEMBLY

REMOVE AND REPLACE

1. Depressurize the refrigeration system.

2. Disconnect inlet and outlet connections at the receiver and liquid indicator assembly and plug openings.

3. Remove receiver and liquid indicator assembly.

4. Replace receiver by reversing the above procedure, using new rubber O-ring seals well lubricated with clean compressor oil at each connection.

5. Evacuate and charge refrigeration system.

6. Check compressor oil level and add oil as necessary.

7. Perform operational test.

COLLISION SERVICE

The severity and circumstances of the collision will determine the extent of repair work required. Good judgment must be used in deciding what steps are necessary to put the system back into operation.

Each part of the system must be carefully inspected. No attempt should be made to straighten kinked tubes or repair any bent or broken units. Check especially for cracks at soldered connections.

REFRIGERATION SYSTEM OPEN TO ATMOSPHERE

Broken tubes or units will allow air, moisture, and dirt to enter. These parts should be sealed as soon as possible until such time as they are replaced.

If the system is open for more than 15 or 20 minutes (depending on humidity), the receiver and liquid indicator assembly will absorb an excessive amount of moisture and should be replaced, and each component of the system should be cleaned with dry nitrogen and flushed with liquid Refrigerant-12 to remove dirt and moisture.

FLUSHING SYSTEM

Flushing can be accomplished by connecting a refrigerant drum to the unit to be flushed, and then turning the drum upside down and opening the drum shut-off valve to pour refrigerant through the unit. The unit should be supported so that the refrigerant passing through it will be directed into an area where a temperture of −21.7°F. will do no damage.

CAUTION: Remember that when liquid refrigerant is poured from the drum into an area where atmospheric pressure exists, its temperature will immediately drop to −21.7°F.

In order to keep the expansion valve open when flushing the evaporator, the expansion valve bulb must be detached from the evaporator outlet tube.

INSPECTING COMPRESSOR

If there is no visible evidence of damage, rotate compressor shaft to test for normal reaction. A quick check for broken reed valves is to turn compressor shaft (using box end wrench on compressor shaft nut) and check for resistance when turning the shaft. An irregular resistance force will be felt as each of the five pistons goes over top center for each revolution of the crankshaft. If this pattern is not felt, it indicates one or more broken compressor reed valves and the compressor must be replaced.

Inspect oil for foreign material which would indicate internal damage to the compressor. If no foreign matter is found in oil, compressor can be used. Drain oil from compressor and pour in 11 oz. avoirdupois of new Frigidaire 1000 viscosity oil.

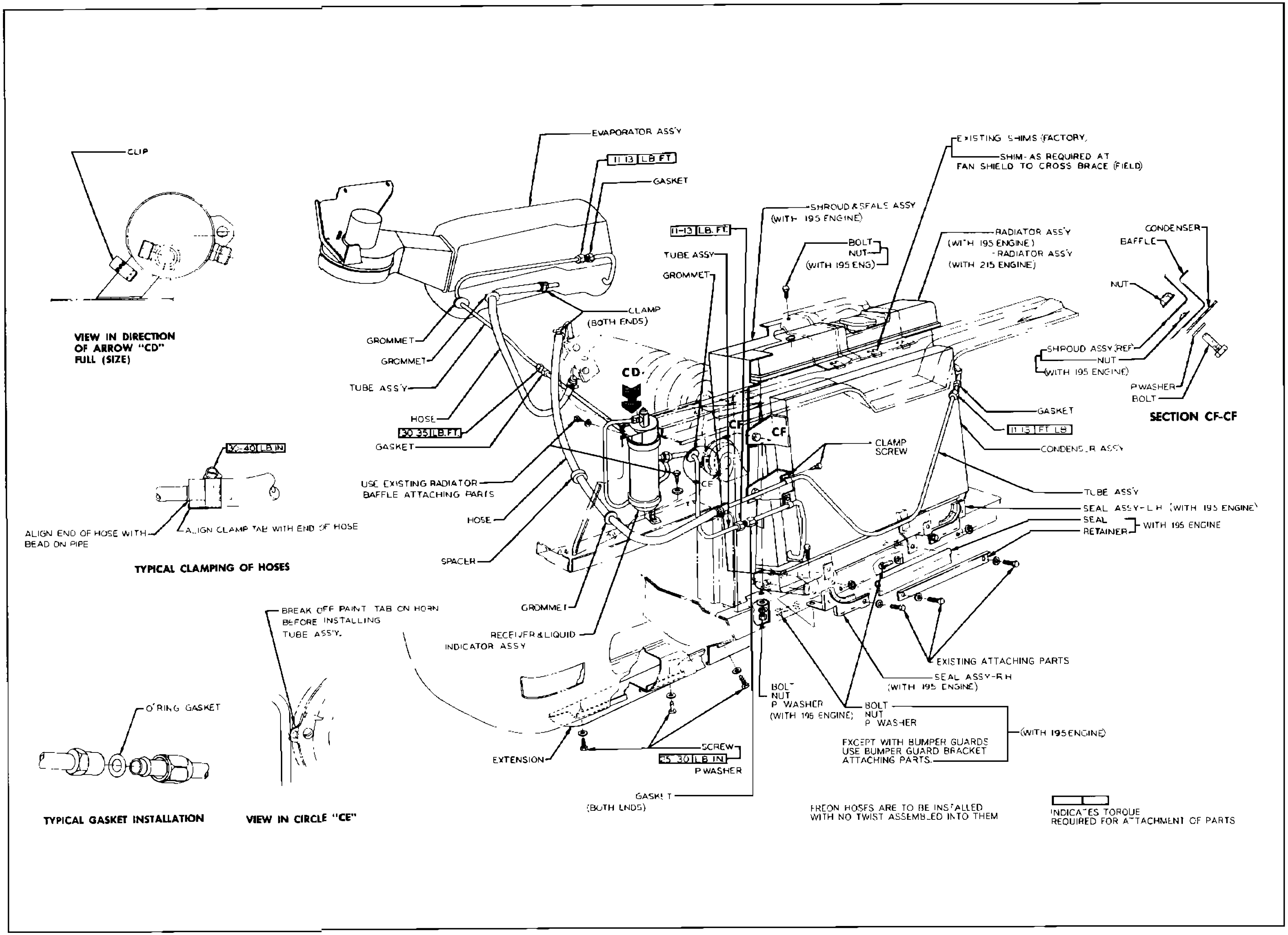


Fig. 7-55 Reference Illustration—Tempest Cool Pack Refrigeration System

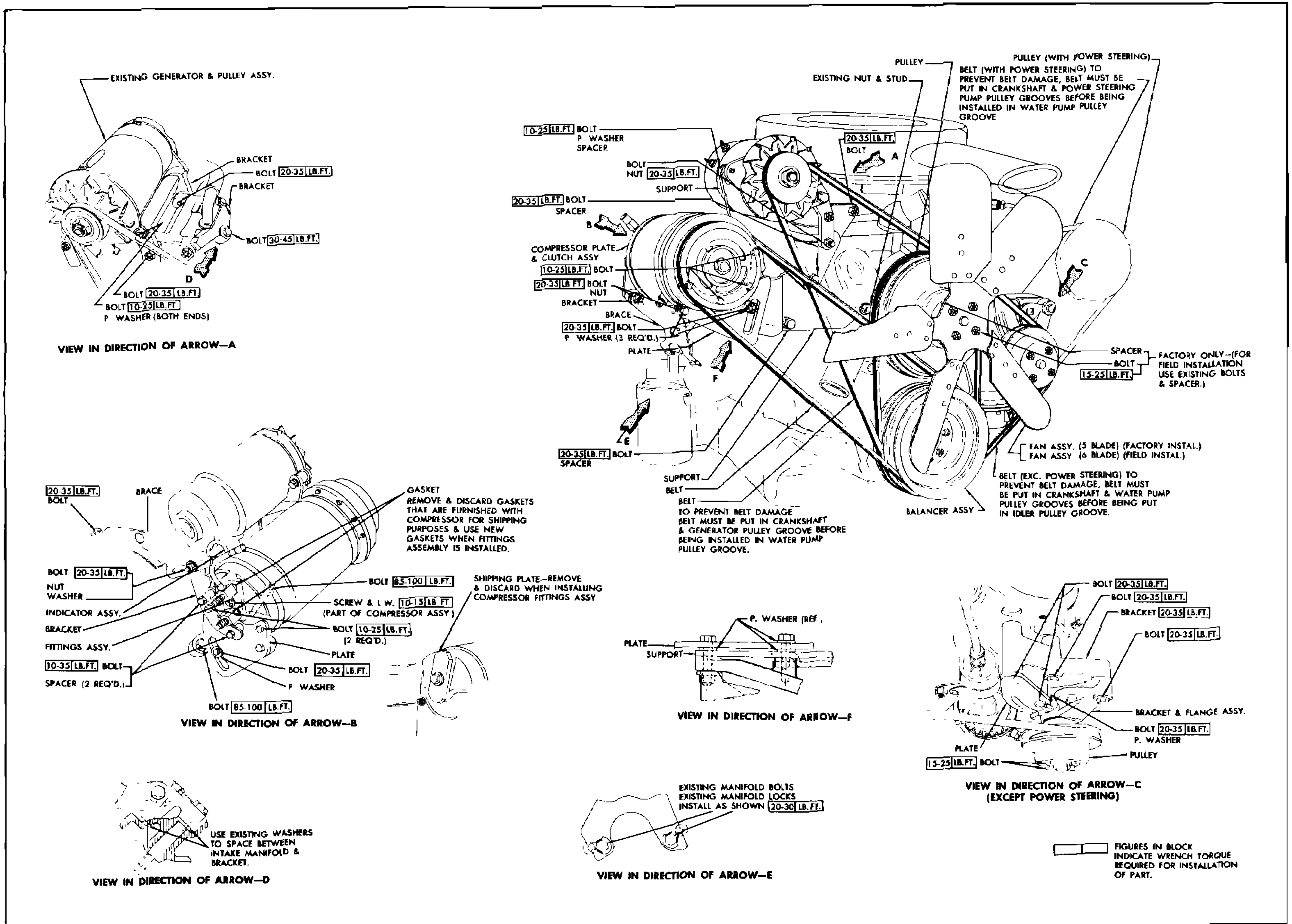


Fig. 7-56 Reference Illustration—Pontiac Cool Pack Engine Compartment

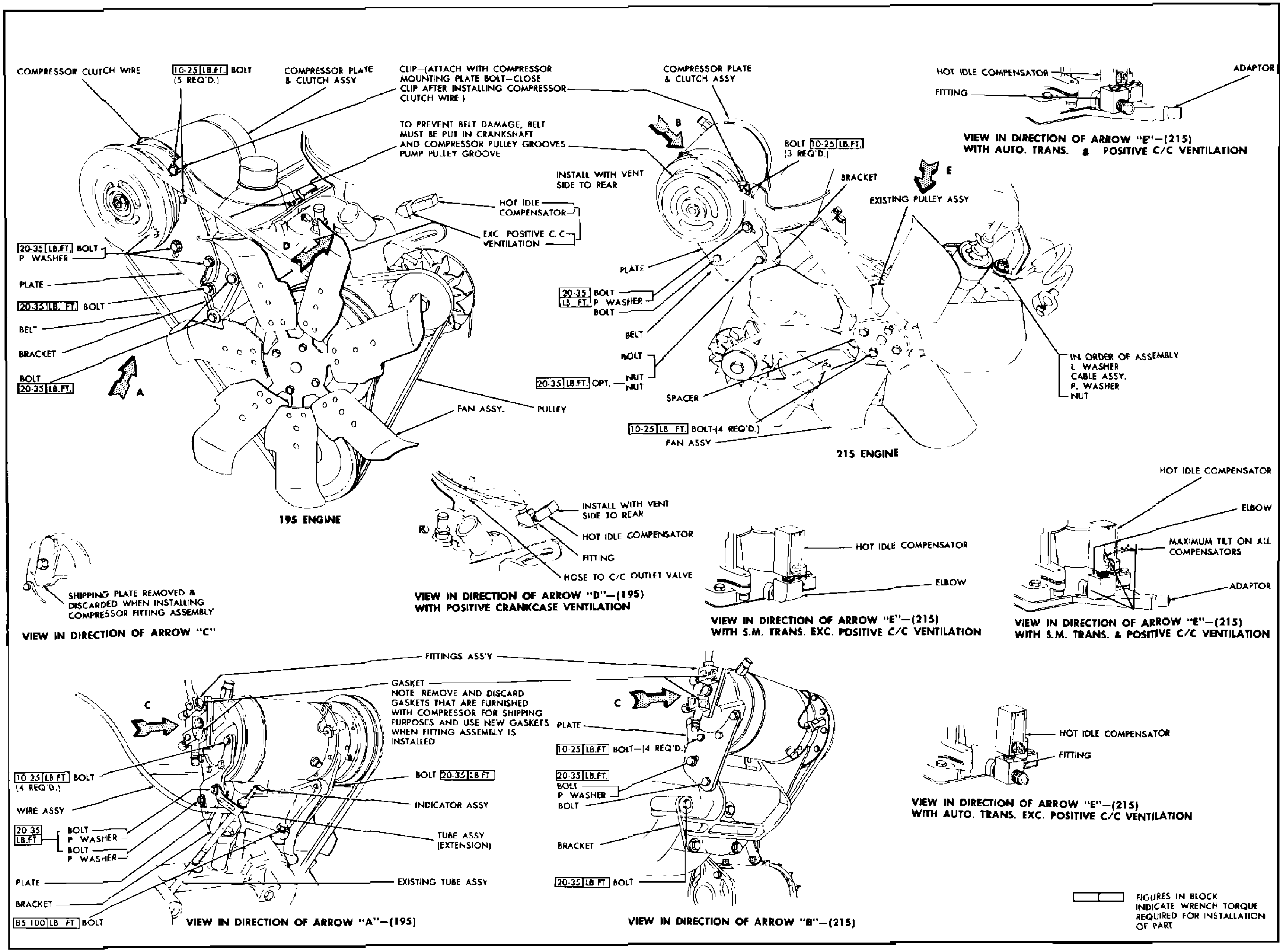


Fig. 7-57 Reference Illustration—Tempest Cool Pack Engine Compartment

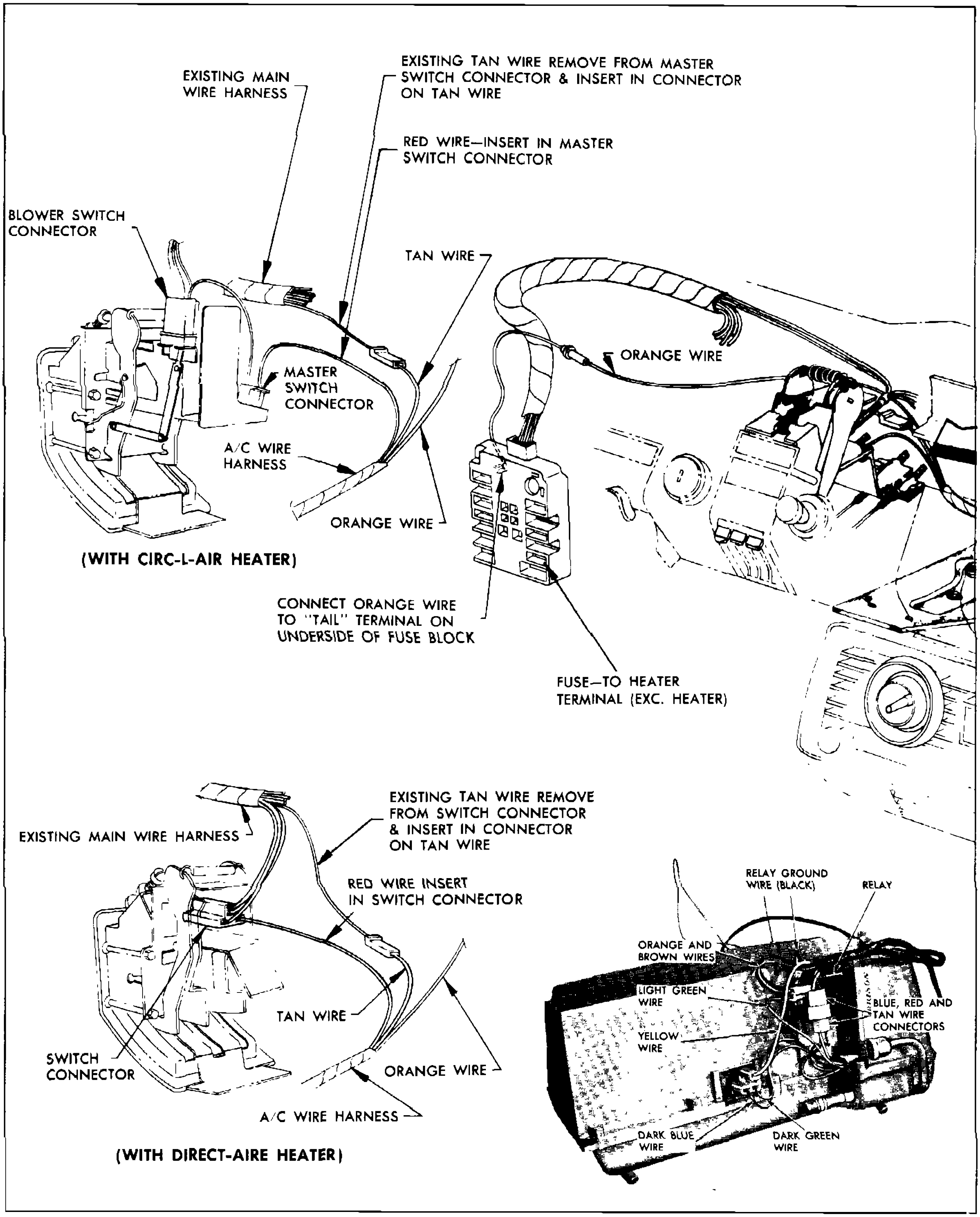


Fig. 7-58 Reference Illustration—Pontiac Cool Pack Electrical Parts

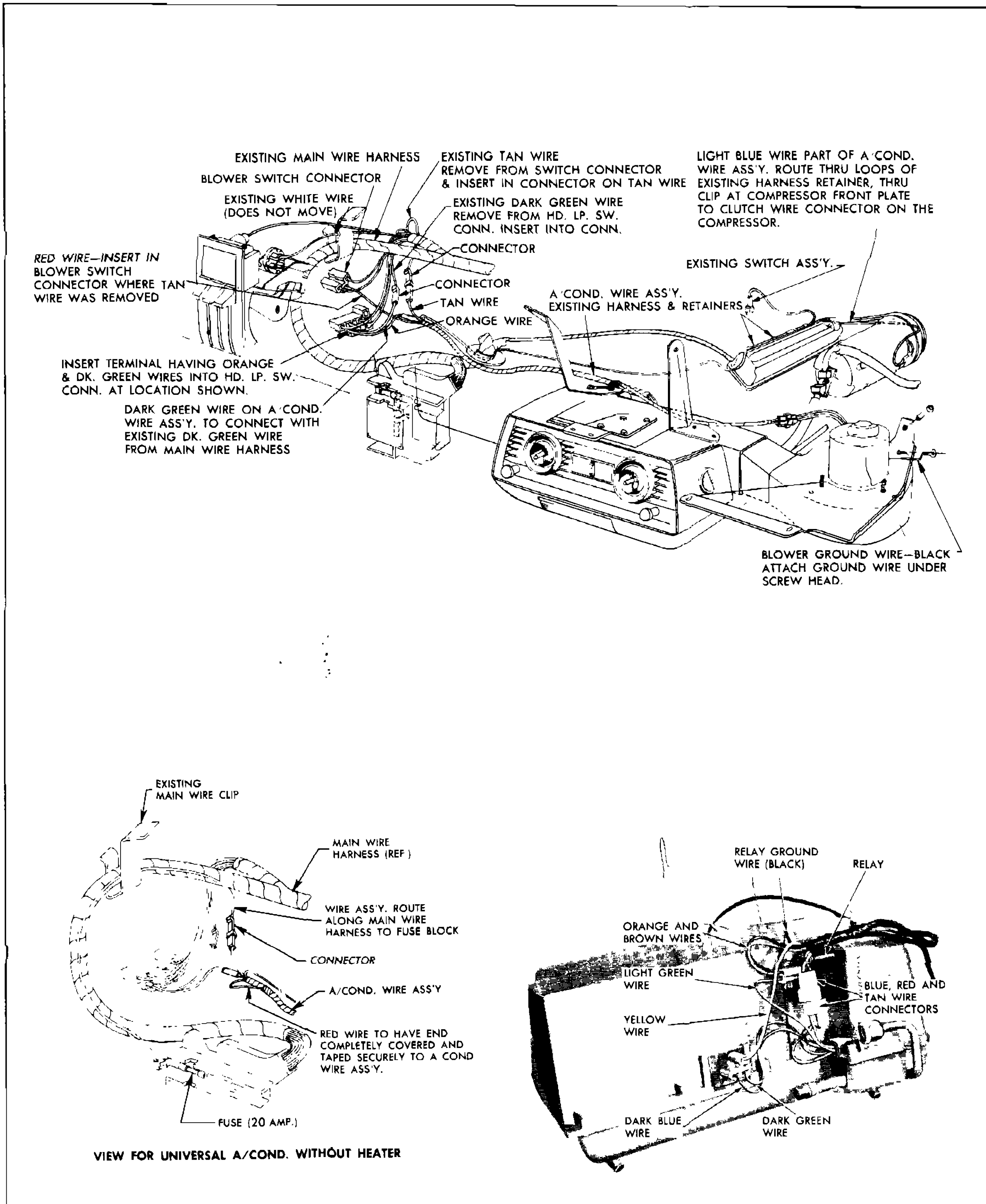


Fig. 7-59 Reference Illustration—Tempest Cool Pack Electrical Parts

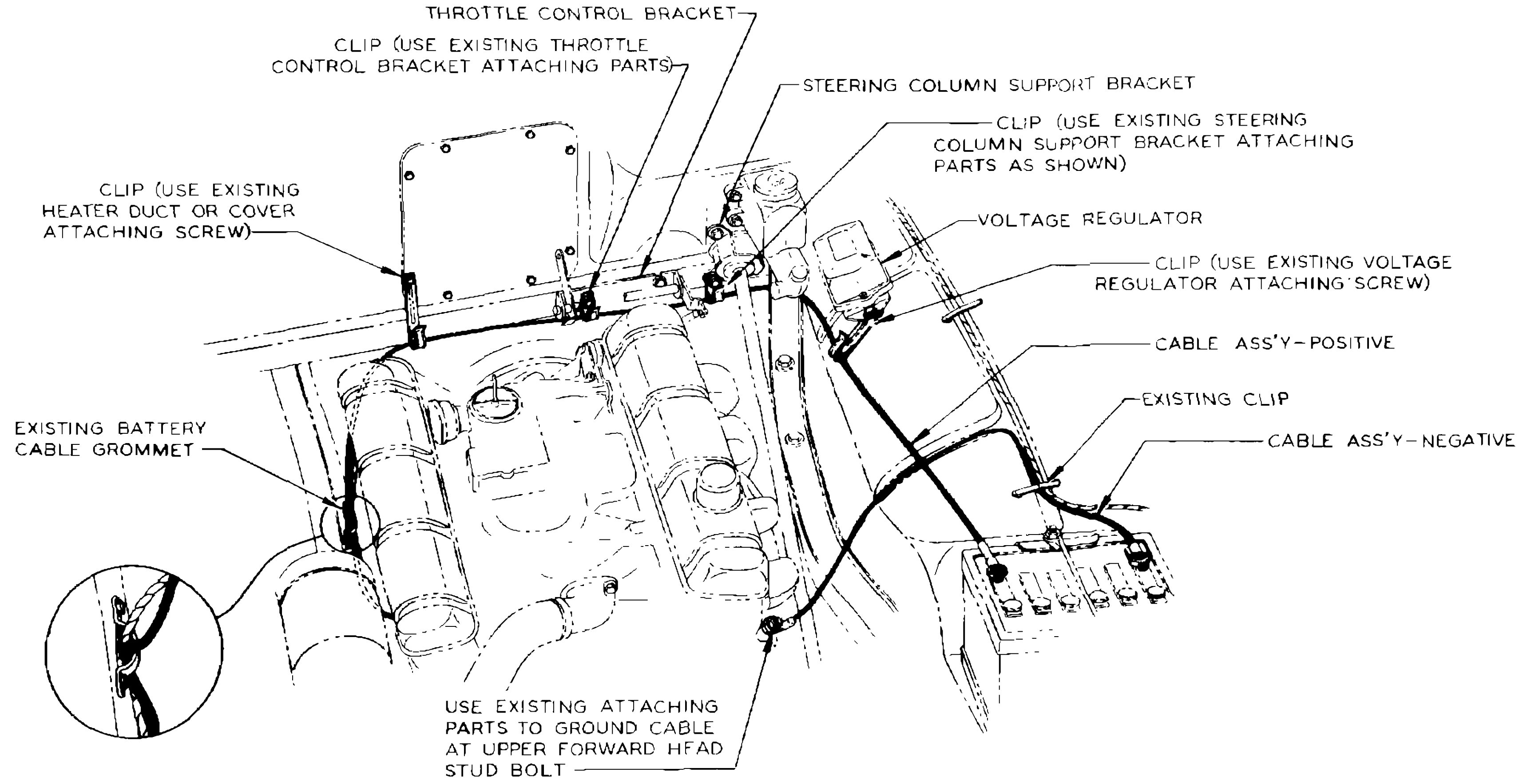


Fig. 7-60 Reference Illustration—Tempest V-8 Battery Cable Routing

TESTING AND DIAGNOSIS

CONTENTS OF THIS SECTION

TESTING

The purpose of performing an operational test is to prove that the air conditioning electrical system, air system, and refrigeration system are operating properly and efficiently. Results of the test are as follows:

1. Operation of the blower at all three speeds, high blower speed going to medium speed when headlamps are turned on, and engagement and cycling of the compressor clutch would indicate that the electrical circuits are functioning properly.

2. A clear sight glass would indicate a properly charged refrigeration system.

3. *Proper evaporator pressure, plus proper com*pressor clutch cycling as controlled by the temperature control switch, would provide the proper "freeze protection" for the evaporator.

Check and correct all refrigerant leaks in the air conditioning system.

Check for proper compressor oil level after refrigerant leaks are repaired before conducting an operational test.

PRELIMINARY CHECKS

1. Check compressor belt for proper tension; 100-105 lbs. on the Borroughs Belt Tension Gauge.

2. Check all refrigerant lines for leaks, kinks, or other restrictions.

3. Check surfaces of radiator and condenser cores to be sure they are not plugged with dirt, leaves or other foreign material. Be sure to check between the condenser and radiator as well as the outer surfaces.

4. Connect engine tachometer.

5. Start engine and operate at 1500 RPM. Move temperature control knob fully clockwise for maximum cooling and blower speed on "HI". Check heater controls to be certain all are in off position. After five minutes of engine operation, observe for bubbling at the sight glass (above 70°F. ambient). If the system is low on refrigerant, refer to ADDING REFRIGERANT for proper charging procedure.

6. Under the same conditions as in step 5 above, turn the blower knob to the "OFF" position. This should disengage the compressor clutch. If clutch does not disengage, disconnect the clutch wire at the compressor.

a. If clutch disengages, the clutch control switch (blower switch) should be checked for proper connection.

b. If clutch does not disengage, malfunction is at the clutch.

7. Under the same conditions as in step 5 above, turn the "TEMP" control knob to the full counterclockwise position. This should disengage the compressor clutch. If clutch does not disengage, disconnect the clutch wire at the compressor.

a. If clutch disengages, the temperature control switch (thermostat) should be checked for proper connection. If connections are proper, adjust or replace switch.

b. If *clutch does not disengage, malfunction is* at the clutch.

8. Observe clutch engagement action which should be without slip. If clutch slippage occurs, check clutch for proper adjustment, short in clutch coil, leaking compressor shaft seal (which might indicate oil on the clutch surfaces), and oil on clutch surface.

9. Turn blower switch to "HI" position and switch on headlights. Blower speed should decrease. If not, check headlamp relay at forward side of evaporator housing and also that the relay and blower motor ground wire is installed.

10. Turn headlights off and change blower speed to medium, and then "LO", and observe for decreases in air flow.

11. Set air conditioner blower switch to "OFF" position and check heater blower motor operation. Heater blower motor should operate. If heater blower does not operate, check for proper connection to air conditioning blower switch.

12. Place heater controls to "OFF" position.

13. Turn ignition key to "OFF" position.

The air conditioning refrigeration system should be checked for proper operating temperatures and pressures as follows:

INSTRUMENTATION AND TEST CONDITIONS

1. Move car to a shaded area (not under sun).

2. Remove caps from compressor gauge fittings.

3. Check calibration of suction gauge and connect low pressure side of the manifold gauge set J-5725 or J-5725-01 using J-5420 or J-6163 Schrader valve adapter to the Schrader valve located in the suction side of the compressor fittings assembly.

4. Connect the high pressure side of that gauge set using J-6163 Schrader valve adapter (90°) to the Schrader valve located in the discharge side of the compressor fittings assembly.

5. Purge gauge lines by cracking gauge set low and high pressure hand shut-off valves.

6. Connect engine tachometer.

7. Turn temperature control knob fully clockwise for maximum cooling; place blower on "HI" speed.

8. Rotate main outlets to aim air straight out. Aim side outlets to direct air towards toe pan. Open center valve.

9. Locate a calibrated thermometer in center of right main outlet.

NOTE: Use caution that sensing bulb does not touch metal.

10. Check heater control to be certain all controls are in "OFF" position.

11. Close car doors and windows.

12. Place auxiliary fan (at least 20" in diameter) approximately 25" in front of the air conditioning condenser.

13. Suspend a calibrated thermometer 2" ahead of condenser in auxiliary fan air blast.

OPERATIONAL TEST PROCEDURE

NOTE: Before proceeding be sure instruments and test conditions are as explained above.

1. Place transmission in "neutral" with parking brake on.

2. Start engine and set temperature control knob full clockwise for maximum cooling and blower knob for "HI" blower speed.

3. Set engine speed at 1500 RPM and allow engine to run for 5 minutes, observing pressure gauges.

NOTE: If at any time during test compressor head pressure exceeds 375 psi, discontinue test and check the following:

a. Engine cooling system.

b. Restricted receiver and liquid indicator assembly.

c. Air in refrigeration system indicated by bubbles in the sight glass or overcharge of Refrigerant-12.

d. Quantity of auxiliary fan air on radiator and condenser.

e. Defective or improperly adjusted temperature control switch (thermostat).

4. At the end of this time (five minutes stabilization period), record the following:

a. Ambient air at condenser, compressor suction and compressor discharge pressure.

b. Right nozzle temperature.

c. Record time in seconds that clutch is engaged and disengaged. (This can be done by watching the compressor pulley nut.) All readings should fall within limits shown in the OPERATIONAL TEST CHART.

5. If nozzle temperature and clutch cycle time are not within the limits in the OPERATIONAL TEST CHART, it may be necessary to adjust the temperature control switch. (See TEMPERATURE CONTROL SWITCH ADJUSTMENT.)

Compare above with system pressures and temperatures shown on the OPERATIONAL TEST CHART.

If not within the limits shown, refer to TROUBLE DIAGNOSIS for possible cause of substandard performance. Reference should be made in the order listed with discharge pressure first, if not within OPERATIONAL TEST CHART limits, then suction pressure and finally outlet temperature.

6. When all adjustments or repairs have been made, make another operational test of the system.

PONTIAC OPERATIONAL TEST CHART

TEST CONDITIONS

Heater Control	Completely "OFF"—All levers fully raised
Heater Temperature Lever	Fully raised for no heat
Heater Fan Switch	"OFF"
Hood	Raised
Doors and Windows	Closed
Air Conditioner Main Nozzles	Concentric
Air Conditioner Center Valve	Open
Air Conditioner Side Outlets	Toward Toe Pan
Air Conditioner Fan Knob	On "HI"
Air Conditioner Temperature Knob	Fully clockwise for maximum cooling
Engine Speed	1500 RPM

Test where sun load is not a factor; also, an auxiliary fan must be placed in front of condenser.

PONTIAC SYSTEM PRESSURES AND TEMPERATURES TEST READINGS

Condenser Air—°F. (In auxiliary fan air blast 2" ahead of condenser)		60	70	80	90	100	110
Compressor Suction—PSI (Read just prior to clutch disengagement)		9-13	10-14	11-16	13-17	14-18	15-19
Compressor Discharge—PSI (Read just prior to clutch disengagement)		70-90	95-115	125-145	152-172	180-200	207-227
Right Hand Nozzle Temperature—°F. (See note below)	Min.	29	29	29	30	31	32
	Max.	43	43	43	44	45	46
Clutch Time—Seconds	On	2-8	4-10	6-12	8-14	10-16	12-18
	Off	22-28	20-26	18-24	16-22	14-20	12-18

NOTE: Right hand nozzle air temperature swing is 10-12°F.; however, only a rapidly responding thermometer will show this. If a glass thermometer is used to measure temperature, swing will be less but should fall within chart limits.

TROUBLE DIAGNOSIS

INSUFFICIENT COOLING

COMPLAINT OR CAUSE	REMEDY
Outlet temperature too high.	See OUTLET TEMPERATURE TOO HIGH and also SUCTION PRESSURE TOO HIGH.
	Check blower operation. Check for obstructions at blower screen or in air duct assembly.
	Right cowl vent open or opened to excess.

TEMPEST OPERATIONAL TEST CHART

TEST CONDITIONS

Heater Control . . . . Completely "OFF"—All levers fully raised
Heater Temperature Lever . . . . Fully raised for no heat
Heater Fan Switch . . . . "OFF"
Hood . . . . Raised
Doors and Windows . . . . Closed
Air Conditioner Main Nozzles . . . . Concentric
Air Conditioner Center Valve . . . . Open
Air Conditioner Side Outlets . . . . Toward Toe Pan
Air Conditioner Fan Knob . . . . On "HI"
Air Conditioner Temperature Knob . . . . Fully clockwise for maximum cooling
Engine Speed . . . . 1500 RPM

Test where sun load is not a factor; also, an auxiliary fan must be placed in front of condenser.

TEMPEST SYSTEM PRESSURES AND TEMPERATURES TEST READINGS

Condenser Air—°F. (In auxiliary fan air blast 2″ ahead of condenser)		60	70	80	90	100	110
Compressor Suction—PSI (Read just prior to clutch disengagement)		12-16	13-17	14-18	17-21	20-24	23-27
Compressor Discharge—PSI (Read just prior to clutch disengagement)		110-130	120-140	140-160	165-185	188-208	212-232
Right Hand Nozzle Temperature—°F.	Min.	34	34	35	35	36	37
(See note below)	Max.	51	51	51	52	52	53
Clutch Time—Seconds	On	4-10	5-11	6-12	7-13	8-14	9-15
	Off	31-38	28-35	25-32	22-30	20-27	18-24

NOTE: Right hand nozzle air temperature swing is 10-12°F.; however, only a rapidly responding thermometer will show this. If a glass thermometer is used to measure temperature, swing will be less but should fall within chart limits.

INSUFFICIENT COOLING—Continued

COMPLAINT OR CAUSE	REMEDY
Insufficient air flow.	Clean evaporator core. If evaporator is iced, de-ice and check adjustment of thermostat.
Heater temperature control valve <u>*not off*</u> in the "OFF" position.	Adjust heater temperature control cable and/or replace heater temperature control valve (on Tempest only). Adjust heater "mix" valve (temperature control) on Pontiac.
Heater air valve or controls in the "OFF" position.	Advise owner on proper operation of air conditioning system.

COMPRESSOR DISCHARGE PRESSURE TOO HIGH

CAUSE	REMEDY
Engine overheated.	See Shop Manual.
Overcharge of refrigerant or air in system.	Systems with excess discharge pressures should be slowly depressurized at the condenser inlet connection on Tempest models and at receiver inlet on Pontiac models, observing the behavior of the high pressure gauge indicator. 1. If discharge pressure drops rapidly, it indicates air (with possibility of moisture) in the system. When pressure drop levels but still indicates in excess of specifications shown in the OPERATIONAL TEST CHART, slowly bleed system until bubbles appear in the sight glass and stop. Add refrigerant until bubbles clear, then add one-half pound of refrigerant. Recheck operational pressures. If system pressures still remain above specifications and the suction pressure is slightly above normal, then a restriction exists in the high pressure side of the system. 2. If discharge pressure drops slowly, it indicates excessive refrigerant. If pressures drop to specifications and sight glass remains clear, stop depressurizing and recheck operational pressures. If pressures are satisfactory, depressurize until bubbles appear in the sight glass, stop depressurizing, then add one-half pound refrigerant. Recheck operational pressures. 3. If discharge pressure remains high after depressurizing the system, continue depressurizing until bubbles appear in the sight glass. If suction pressures also remain high, there is a possibility of a restriction in the high pressure side of the refrigeration system. The clutch will cycle less frequently under this condition. See also COMPRESSOR SUCTION PRESSURE TOO HIGH. NOTE: A system that continually operates longer than required will starve the compressor of oil as well as indicate a much higher nozzle temperature due to evaporator icing.
Restriction in condenser, receiver-liquid indicator, or any high pressure line.	Remove parts, inspect, and clean or replace.
Condenser air flow blocked.	Clean condenser and radiator core surfaces as well as the space between the condenser and radiator.
Compressor suction pressure too high.	See COMPRESSOR SUCTION PRESSURE TOO HIGH.

COMPRESSOR DISCHARGE PRESSURE TOO LOW

CAUSE	REMEDY
Insufficient refrigerant.	Check for presence of bubbles or foam in liquid indicator. If bubbles or foam are noted (after five minutes of operation) refrigerant should be added until sight glass clears, then add an additional ½ lb. Adding refrigerant which exceeds ¼ lb. beyond the specification indicates a leak in the system.
Low suction pressure.	See COMPRESSOR SUCTION PRESSURE TOO LOW.
Defective compressor (broken compressor reed valves).	Replace compressor. A quick check for broken reed valves is to turn compressor shaft (using box end wrench on compressor shaft nut) and check for resistance when turning the shaft. An irregular resistance force will be felt as each of the five pistons goes over top center for each revolution of the crankshaft. If this pattern is not felt, it indicates one or more broken compressor reed valves.

COMPRESSOR SUCTION PRESSURE TOO HIGH

(This will be accompanied by air outlet temperature at nozzles too high.)

CAUSE	REMEDY
Thermostatic expansion valve capillary tube bulb not tight to evaporator outlet tube.	Check clips for tightness.
Thermostatic expansion valve improperly adjusted.	Replace valve.
Thermostatic expansion valve inoperative.	To check for an inoperative thermostatic expansion valve after the bulb has been checked for tightness on the evaporator outlet tube, remove the bulb from the tube. Immerse bulb in a container of ice water and check the suction pressure. Then immerse the bulb in container of warm water and check the suction pressure. If the suction pressure does not change, thermostatic valve assembly should be replaced.
Thermostat inoperative.	If the thermostat is so set as to keep the compressor from running long enough, suction pressure will remain high. With a "jumper" wire, by-pass the thermostat (connect wire to compressor clutch coil and battery) to see if suction pressure reduces to figure within limits according to System Pressures and Temperatures Chart. If it will, adjust thermostat. (Remove thermostat to adjust.)
Evaporator core freezing.	Check "Make" and "Break" limits of switch; if incorrect, then adjust thermostat. a. Remove thermostat.

COMPRESSOR SUCTION PRESSURE TOO HIGH—Continued

CAUSE	REMEDY
Evaporation core freezing - continued	b. Remove the pressed paper door on the thermostat. c. Pressing down on the plastic bar, which is in the center of the opening, make sure the points open. d. The lower portion of the opening exposes a temperature adjusting screw. Just below the screw is an arrow pointing in a counterclockwise direction with the letters "COLD" stamped just below the arrow. If the owner advises that air coming from the nozzles turned warm in a relatively short period of time (½ hour country driving or from 15 to 20 minutes city driving), and the thermostat point opening did not require adjustment then turn the temperature adjusting screw ½ turn clockwise OPPOSITE TO THE DIRECTION INDICATED BY THE ARROW. If the thermostat points required adjustment *do not* tamper with temperature adjusting screw. If the owner advises that an hour's driving was required to cause freeze-up, then move the temperature adjusting screw ¼ turn clockwise. In either case check calibration of thermostat. e. Reposition the pressed paper door on the thermostat.

COMPRESSOR SUCTION PRESSURE TOO LOW

CAUSE	REMEDY
Thermostatic expansion valve improperly adjusted.	Replace valve.
Thermostatic expansion valve capillary tube broken.	Replace valve.
Restricted inlet screen in thermostatic expansion valve.	Depressurize system. Disconnect inlet tube from thermostatic expansion valve. Remove valve, clean screen and reinstall. Charge system completely.
Restriction in system tubes or hoses.	Replace kinked tube or restricted hose.

NOZZLE OUTLET TEMPERATURE TOO HIGH

CAUSE	REMEDY
Insufficient refrigerant.	If bubbles appear in the liquid indicator, add Refrigerant-12 until bubbles disappear and then add additional ½ lb. refrigerant.
Thermostatic expansion valve improperly adjusted.	Replace valve.

NOZZLE OUTLET TEMPERATURE TOO HIGH—Continued

CAUSE	REMEDY
Thermostat inoperative or operating improperly.	Using a "jumper" wire (connected to the compressor coil and battery) check system with thermostat by-passed for proper nozzle temperature and suction pressure as outlined under SUCTION PRESSURE TOO HIGH.
Evaporator core freezing.	Check "Make" and "Break" limits of switch. If incorrect, then adjust thermostat. a. Remove thermostat. b. Remove the pressed paper door on the thermostat. c. Pressing down on the plastic bar, which is in the center of the opening, make sure thermostat points open. d. The lower portion of the opening exposes a temperature adjusting screw. Just below the screw is an arrow pointing in a counterclockwise direction with the letters "COLD" stamped just below the arrow. If the owner advises that air coming from the nozzle turned warm in a relatively short period of time (½ hour country driving or from 15 to 20 minutes city driving), and the thermostat point opening did not require adjustment then turn the temperature adjusting screw ½ turn clockwise OPPOSITE TO THE DIRECTION INDICATED BY THE ARROW. If the thermostat points required adjustment *do not* tamper with temperature adjusting screw. If the owner advises that an hour's driving was required to cause freeze-up, then move the temperature adjusting screw ¼ turn clockwise. In either case check calibration of thermostat. e. Reposition the pressed paper door on the thermostat.
Compressor operating improperly.	An improperly operating compressor could cause too high a nozzle temperature. It also will be indicated by an improper suction and discharge pressure. Replacing the compressor would only be done after checking all other components.

NOZZLE OUTLET TEMPERATURE TOO LOW

CAUSE	REMEDY
Defective or improperly adjusted thermostatic expansion valve.	Check thermostatic expansion valve as outlined under SUCTION PRESSURE TOO HIGH. How-

NOZZLE OUTLET TEMPERATURE TOO LOW—Continued

CAUSE	REMEDY
Defective or improperly adjusted thermostatic expansion valve—continued	ever, if the expansion valve is allowing too much refrigerant into the evaporator, it would ordinarily be indicated by an initial air outlet temperature too low and as the evaporator frosts over restricting the air flow, the outlet temperature would increase. Adjust *thermostat or replace expansion valve as indicated.*
Thermostat improperly adjusted.	Check "Make" and "Break" limits of switch. If incorrect, adjust thermostat. a. Remove thermostat. b. Remove the pressed paper door on the thermostat. c. Pressing down on the plastic bar, which is in the center of the opening, make sure the thermostat points open. d. The lower portion of the opening exposes a temperature adjusting screw. Just below the screw is an arrow pointing in a counterclockwise direction with the letters "COLD" stamped just below the arrow. If the owner advises that air coming from the nozzles turned warm in a relatively short period of time (½ hour country driving or from 15 to 20 minutes city driving), and the thermostat point opening did not require adjustment, then turn the temperature adjusting screw ½ turn clockwise OPPOSITE TO THE DIRECTION INDICATED BY THE ARROW. If the thermostat points require adjustment *do not* tamper with temperature adjusting screw. If the owner advises that an hour's driving was required to cause freeze-up, then move the temperature adjusting screw ¼ turn clockwise. In either case check calibration of thermostat. e. Reposition the pressed paper door on the thermostat.
Insufficient air flow from nozzles.	Check for blocked evaporator or defective blower.
See INSUFFICIENT COOLING.	Check switch operation and wiring.

SPECIFICATIONS

Only those specifications which are different from cars not equipped with air conditioning are shown.

Blower Switch Positions (Pontiac and Tempest Cool Pack)

NOTE: Data for conditions of car windows open, engine not running, and ambient temperature of 70°F.

Voltage at *Regulator*	Switch *Position*	Motor *Amperes*	Motor *Volts*	Impeller *R.P.M.*
12.2	High	8.4	11.05	2361
13.5	High	9.1	12.25	2517
14.5	High	9.75	13.2	2631
12.2	Med.	4.7	11.45	1869
13.5	Med.	5.05	12.7	1980
14.5	Med.	5.35	13.15	2079
12.2	Low	3.1	6.9	1293
13.5	Low	3.35	7.7	1404
14.5	Low	3.6	8.3	1488

Compressor

Make .... Frigidaire (9.28 cu. in.)

Oil .... Frigidaire 1000 Viscosity

Oil Contents (new as received from factory or in field package) .... 11 oz. fluid or 10 oz. avoirdupois

(new service compressor) .... 13 oz. fluid or 12 oz. avoirdupois

Clearances

Compressor Rotor Plate to Coil Housing with Clutch Energized .... .025"-.035"

Compressor Belt

Size .... 15/32"

Tension .... *100-105 lbs. indicated on Borroughs Belt Tension Gauge*

Compressor Coil

Current .... 2.07 amps

Compressor to Engine Ratio .... Pontiac—1.489 to 1
Tempest L-4—1.061 to 1
Tempest V-8—1.214 to 1

Cooling System Capacity .... Pontiac—without heater 18.5 qts.
with heater 19.5 qts.

Tempest—without heater 11.6 qts.
with heater 12.6 qts.

SPECIFICATIONS

Engine Idle Speed with Air Conditioner off. (Automatic trans. in Drive range) Pontiac All: HM—540-560 RPM
(Synchro-Mesh trans. in Neutral) SM—540-560 RPM

Tempest: 2 bbl Auto—580-600
SM—580-600

Tempest: 4 bbl Auto—630-650
SM—680-700

Fan .... Pontiac 6 blades
Tempest 7 blades

Fuse

In orange colored line in front of fuse block .... 7.5 amps

Heater fuse in fuse block .... 14 amps

Radiator Cap .... Pontiac and Tempest V-8—15 lbs.
Tempest L-4—13 lbs.

Refrigerant-12 Capacity .... Pontiac 3.25 lbs.
Tempest 3.0 lbs.

Torque

Compressor Shaft Nut .... 5-7 lb. ft.

Compressor Fittings Assembly Attaching Screw .... 10-15 lb. ft.

Condenser Inlet (Tempest) .... 11-13 lb. ft.

Hose and Tubing Connections except Condenser Inlet .... 20-25 lb. ft.

Metal Tube Outside Diameter	Thread and Fitting Side	Steel Tubing Torque Lb-Ft.	Aluminum or Copper Tubing Torque Lb-Ft.	Nominal Torque Wrench Span
1/4	7/16	10-15	5-7	5/8
3/8	5/8	30-35	11-13	3/4
1/2	3/4	30-35	11-13	7/8
5/8	7/8	30-35	18-21	1 1/16
3/4	1 1/16	30-35	23-28	1 1/4

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