

SECTION 11

ACCESSORIES

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GASOLINE HEATER—500, 700 AND 900 SERIES

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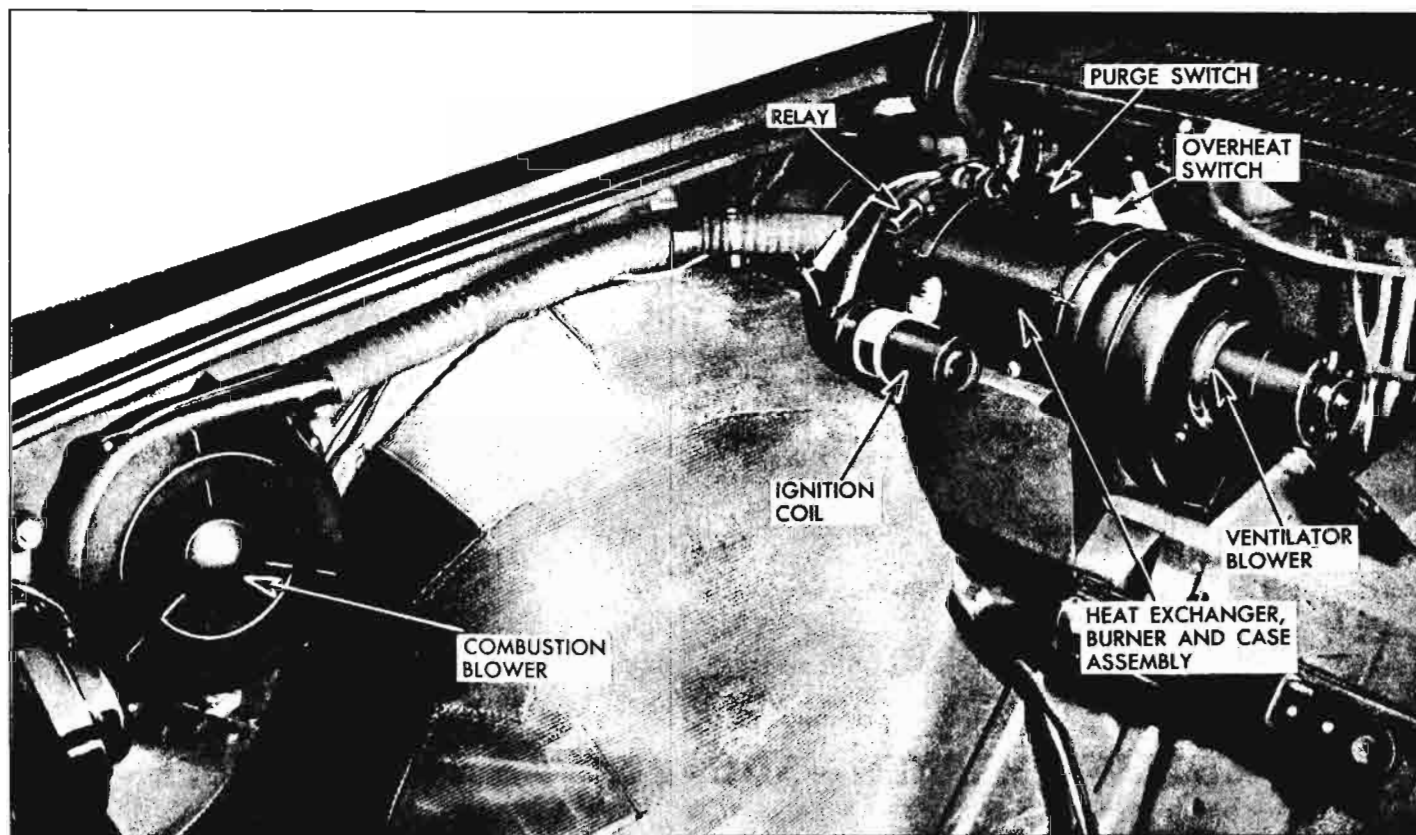


Fig. 11-1—Heater Components Mounted in Front Compartment

GENERAL DESCRIPTION

The Corvair gasoline heater is designed to provide an ample volume of outside heated air within two minutes after the switch is turned on, thus reducing the customary wait for engine warm-up and windshield defrosting.

Basically the heating system consists of the following components:

HEATING SYSTEM COMPONENTS

Refer to Figures 11-1, 11-2 and 11-3.

Heat Exchanger and Burner Assembly—The heat exchanger and burner assembly consists of a cylindrical stainless steel heat exchanger and a burner assembly which are enclosed in a case and mounted on the right side of the dash panel in the front compartment. Outside air is drawn through the cowl vent and into the heater through an opening in the right of the fender wheelhouse area and forced into the car interior through the blower case and air distributor assembly. The case surrounding the heat exchanger provides a channel through which outside air flows into the air distributor.

The burner is equipped with a nozzle to spray the fuel, a mixer cup to mix the fuel with combustion air and a spark plug to ignite the mixture. A solenoid-operated on-off valve controls the flow of fuel.

An overheat switch is provided to open the electric circuit to the solenoid fuel valve and shut off the fuel in the event the temperature should rise above a predetermined maximum. This switch will automatically reset itself when the heater cools down.

Ignition System—The ignition coil is mounted on the outside of the heater case. The combustion blower operates the breaker points. When the current is interrupted by the opening of the points, a high-voltage current is generated by the coil's secondary circuit which fires the spark plug.

Thermostat—The output of the heater is regulated by the thermostat in the air distributor. The thermostat contains a bimetal helix which is affected by temperature and which controls a microswitch through an adjustable linkage. The microswitch, in turn, cycles the fuel and ignition, on and off, to maintain the desired temperature in the passenger compartment.

Purge Switch—The purge switch is located on the upper half of the heater case and supplies current to the combustion blower when the heater is turned on. It is designed to allow the blower to run up to two minutes after the car ignition is turned off. During this period, a properly operating purge switch will purge the combustion chamber of all products of combustion.

Solenoid Relay—The purpose of the fuel solenoid relay is to break the fuel circuit and thus prevent the

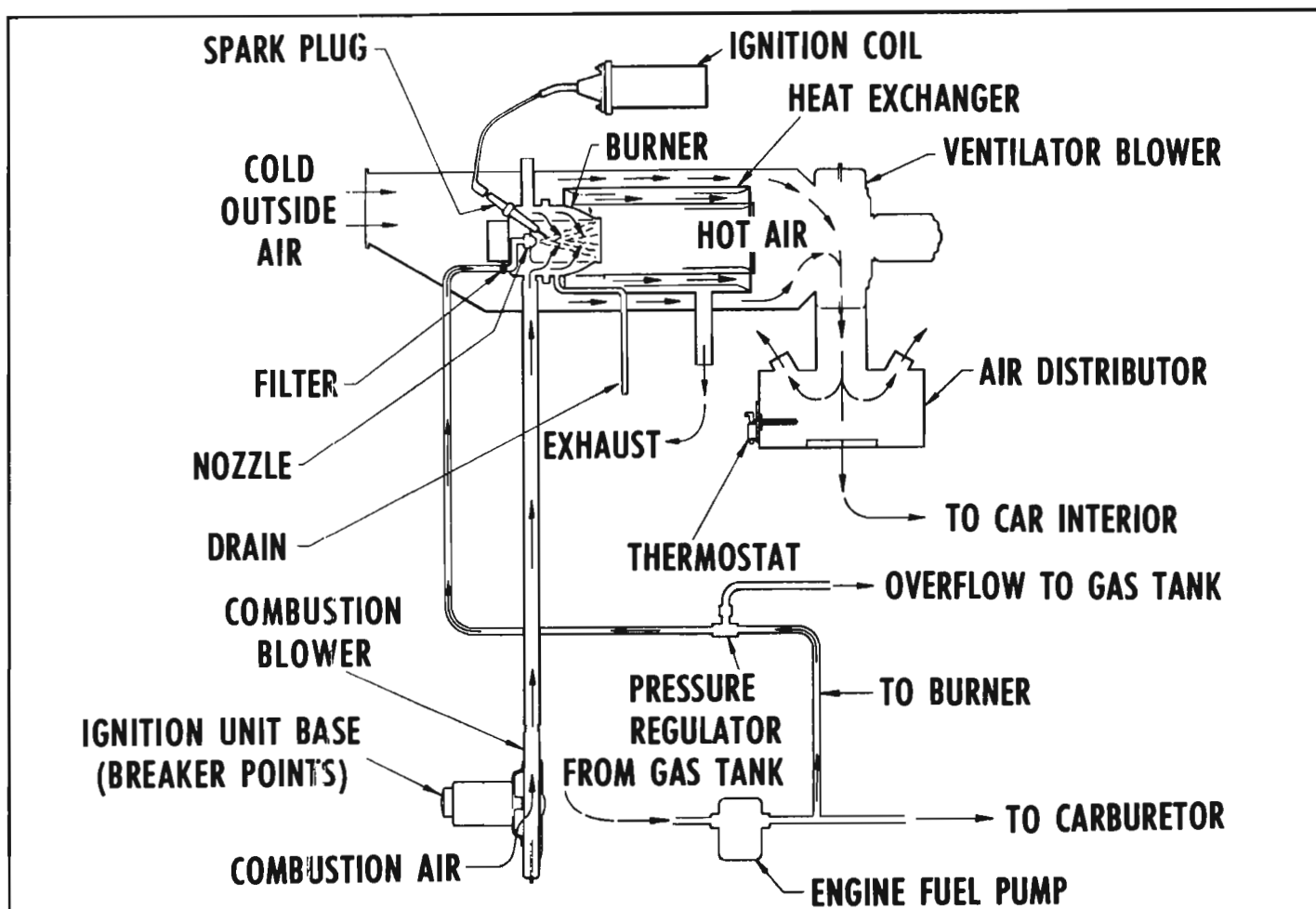


Fig. 11-2—Heating System Schematic

flow of fuel to the combustion chamber in the event of any interruption of the electrical supply to the combustion blower. The relay is mounted on the top half of the heater case, just above the ignition coil.

Heater Control Switch—The heater control (Fan) switch is installed on the right side of the air distributor and is actuated by an air shutoff door to the ventilator blower. The door is provided to shut off outside ram air when the heater is not in use. The heater control switch is connected to the door through a lever arm. This arrangement insures that the air door will be open whenever the heater is used.

The switch controls the speed of the ventilating air blower and also provides power to the heater thermostat, which, in turn, controls heater operation.

Ventilator Blower—The ventilating air blower is mounted on the heater case and pulls air in through the cowl vent and across the heat exchanger, blowing it into the air distributor. The blower system permits selection of high or low volume air.

Combustion Blower—The combustion air blower is designed to provide the proper amount of air for combustion of the gasoline which is admitted to the burner

through the nozzle. The blower, itself, is mounted on the right fender skirt inside the baggage compartment. The breaker points are attached to the end of the motor and are actuated by the cycling of a two-lobed cam which is fitted over an extended shaft of this motor.

Distributor and Defroster Components—An air distributor is mounted to the interior of the car at the dash panel below the plenum chamber and serves to direct air received from the ventilating air blower either directly to the car interior through an opening at the floor area or through defroster openings, hoses and outlets to the windshield area. A control cable operated door in the distributor proportions the amount of air directed to windshield or floor areas. The distributor contains the thermostat which regulates the output of the heater and the heater control (Fan) switch which controls the ventilation blower speed and provides power to the heater system.

Control Assembly

The heater control assembly is mounted to the lower flange of instrument panel at center of panel (without

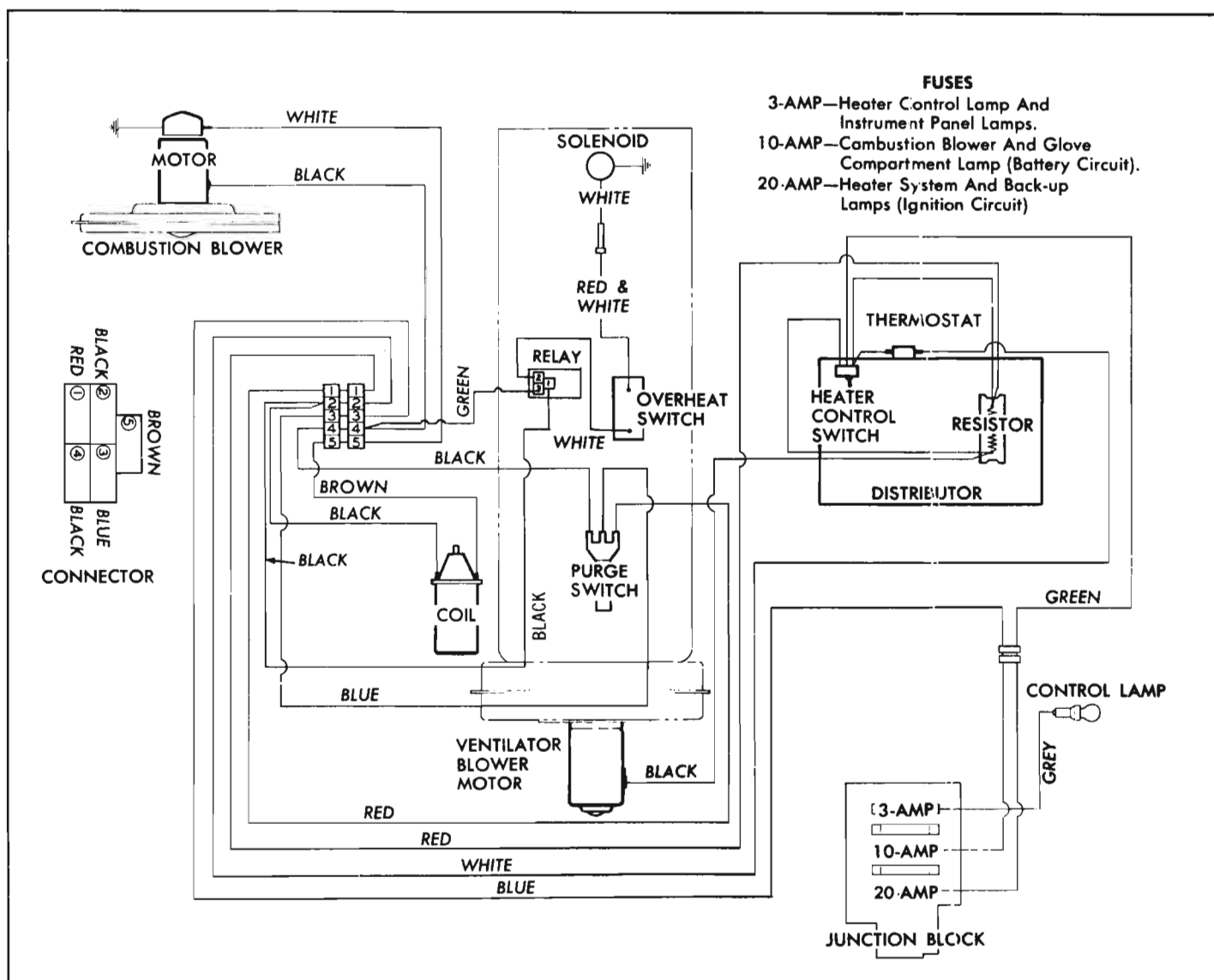


Fig. 11-3—Heater Wiring Diagram

radio) or to the bottom of radio unit. Three controls, *Fan*, *Heat* and *Def*, operate the blowers, thermostat and air distributor defroster door respectively to provide the desired volume, temperature and air flow.

To Heat—Push *Fan* lever down from off position to the desired blower speed. For adequate rear seat heating, operate blower at high speed while regulating heat with *Heat* lever.

Set *Heat* for the desired outlet air temperature. Full down will provide the maximum heat.

To Defrost—set *Def* lever full down to divert almost all of the heated air flow to defroster ducts for extreme defrosting operation; push partially down to divert only part of air flow for normal defogging operation.

CYCLE OF OPERATION

Refer to Figures 11-2 and 11-3.

The heater switch is connected through the ignition

switch. If the *Fan* control is left at low or high blower during cold weather, the heater will start when the engine is started and will produce heat rapidly. When the heater starts, four things occur simultaneously.

- The combustion air blower starts.
- The solenoid fuel valve opens. This will occur only if the thermostat is calling for heat.
- The ignition coil is energized and a hot spark occurs at the spark plug inside the heater. This will occur only if the thermostat is calling for heat.
- The ventilating air blower starts and pulls air across the heat exchanger and blows it into the interior of the car.

Fuel sprays into the burner cup in a fine mist where it mixes with the combustion air from the combustion blower. The air enters the burner with a swirling movement caused by the louver plate on the burner

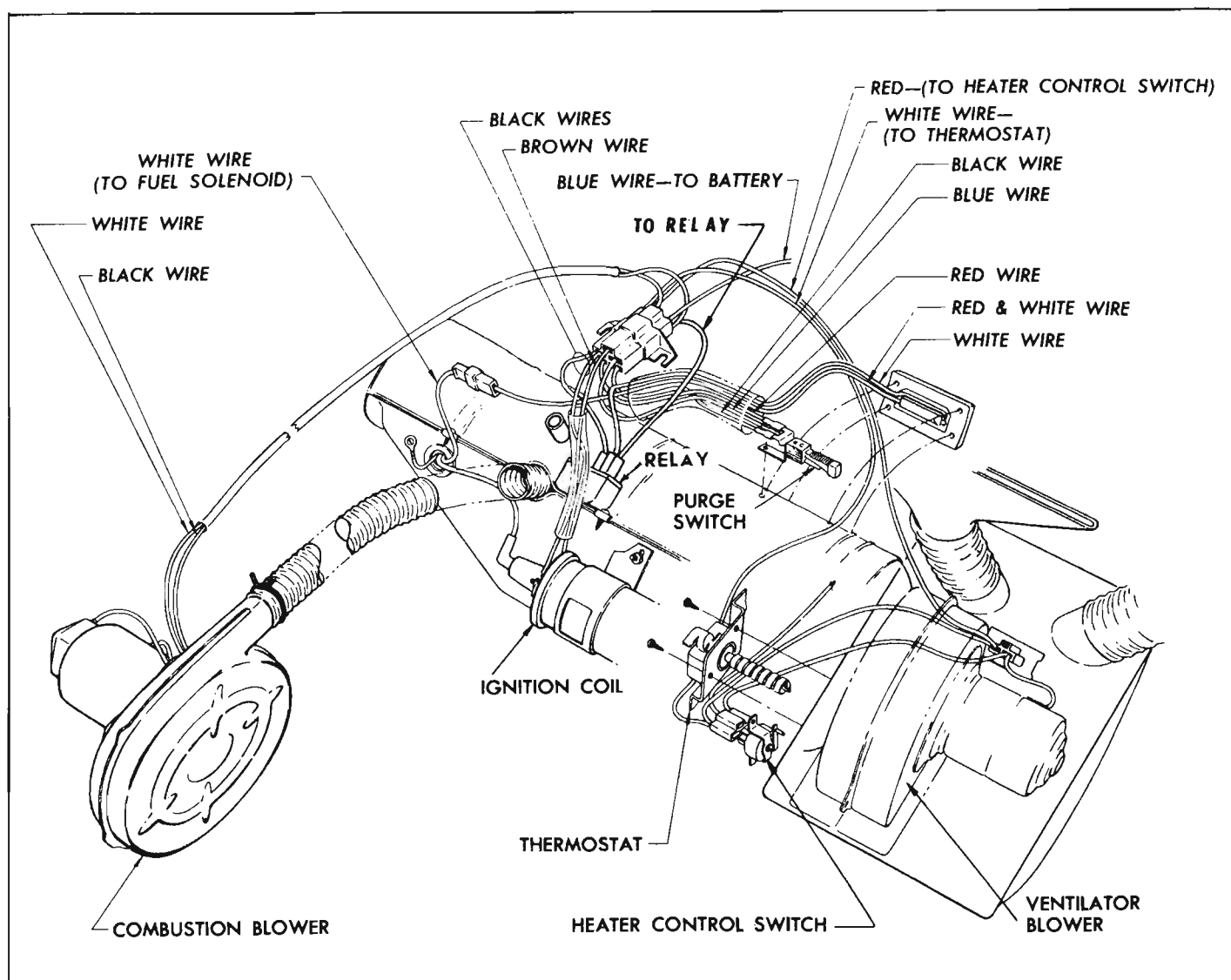


Fig. 11-4—Pictorial Wiring Diagram

cup and is thoroughly mixed with the fuel. This highly combustible mixture is ignited instantly by the spark plug and an intense flame is established in the heater. The flame quickly heats the walls of the heat exchanger to a high temperature and the heat is absorbed by the ventilating air which is drawn in through the cowl vent by the ventilating air blower. The warm air enters the air distributor inside the car and the temperature begins to rise. This entire process takes place very quickly. The very rapid temperature rise is the result of the flame intensity and the construction of the heat exchanger, which absorbs very little heat itself. Since it is not necessary to heat water or any other component of the vehicle, heat is obtained quickly.

The hot gases which result from burning in the combustion chamber pass out through a slot at the top of the inner cylinder of the heat exchanger and are then forced through the outer wrap before they pass out the

exhaust tube at the bottom. The scrubbing action of the gases as they pass through the narrow channels causes the heat to be transferred to the ventilating air stream and produces a high level of heating efficiency in the system.

During the starting and warm-up period, the thermostat will remain closed until the heated air reaches the temperature of the thermostat setting. When the desired temperature is achieved, the thermostat will open and shut off the heater ignition system and fuel flow by de-energizing the solenoid valve. The combustion air blower and ventilating air blower will continue to operate.

Since the temperature in the distributor begins to drop as soon as burning stops, the thermostat switch soon closes. The solenoid valve then opens to supply fuel, spark is made and combustion occurs. After ignition, the temperature rises and the entire cycle is repeated. This on-off operation occurs at a rapid rate so

that temperature variations will not be noticeable to the occupants of the car. The effect is to produce an even regulated temperature at the level of the thermostat setting.

The on and off time of the heater will be determined by the outside temperature and the thermostat setting, but in general, the heater will operate only a portion of the total time. The heater will burn continuously only under conditions of extreme cold and very high driving speeds.

A purge switch is automatically energized by heat

when the heater has operated a few seconds and provides an optional closed circuit from the battery to the combustion air blower. When the heater is turned off, either at the heater (Fan) switch or car ignition switch, the combustion air blower will continue to operate for a few seconds in order to purge the combustion chamber. When the switch cools, the optional circuit opens and the blower will stop.

If power to the combustion blower fails for any reason, a relay will open the fuel solenoid circuit and shut off the flow of fuel into the combustion chamber.

SERVICE DIAGNOSIS

INTRODUCTION

The gasoline heater consists of the following major components:

- Control assembly
- Heat exchanger and burner assembly
- Combustion blower assembly (with breaker points)
- Ventilator blower
- Thermostat
- Purge switch
- Ignition coil
- Air distributor and defroster components
- Heater control switch
- Wiring

Each of the above main components performs a specific function in heater operation and any diagnosis or repair of the heating system is greatly simplified if the performance of each component is checked separately and in a systematic manner.

The following **Diagnosis Guide** is included for the convenience of the serviceman to provide the neces-

sary information to enable him to "trouble shoot" the heater components in logical sequence. The procedure is arranged in order of simplicity so that the tests requiring the least time can be conducted first to avoid unnecessary disassembly of the heater.

Following the **Diagnosis Guide** and referenced in the guide is presented more detailed information which will enable the serviceman to carry out the checks outlined for him.

Before beginning any diagnosis, first check the operation of the heater to eliminate the possibility of improper heater control operation on the part of the owner as a cause of the complaint. Once the validity of the complaint has been established, the diagnosis should then be approached in the orderly manner outlined.

As a general reminder, the importance of proper control installations cannot be over-emphasized. Since faulty or improperly connected controls are a frequent cause of heater troubles and can be quickly detected, they should always be checked early in any diagnosis approach where it is indicated that controls are a possible cause of the trouble. Control cables and conduits should be tightly connected at both ends and should provide the full design range of operation for the components being actuated.

DIAGNOSIS GUIDE

Determine Trouble—Check Items Indicated for Defects or Improper Installation in Sequence Shown—Consult Referenced Item Following Guide

Trouble	Item To Be Checked	Reference
Heater fails to start—combustion air blower does not run.	Fuse; hot lead connection; wiring	A
	Combustion blower motor ground	C
	Combustion blower motor	C
	Fan control cable; Fan (heater) switch	A, J
	Purge switch	I

DIAGNOSIS GUIDE (Continued)

Combustion blower runs but heater fails to ignite.	Wiring	A
	Heat (thermostat) control cable; thermostat.....	D
	Combustion air hose.....	C
	Fuel flow	K, M
	Combustion blower fan.....	C
	Heater exhaust (for restriction).....	N
	Breaker points	E
	Ignition coil	F
	Fuel solenoid coil (for open circuit).....	M
	Spark plug	G
	Overheat switch	H
	Fuel valve stuck on valve seat; clogged fuel nozzle	M
Combustion blower starts but stops after a short time.	Relay	P
	Carbon bridge across spark plug electrodes.....	G
Combustion blower starts a few seconds after system is turned on.	Purge switch	I
	Fuse; wiring	A
Combustion blower does not turn off within 2 minutes after heater or ignition switch is turned off.	Purge switch	I
Combustion blower stops immediately when heater is turned off.		
Heater ignites, burner operates, but no warm air delivered.	Ventilating air blower.....	B
	Heater switch wiring.....	A
	Ventilating system (for restriction).....	B
	Heat (thermostat) control cable; thermostat.....	D
Popping noise when heater starts or cycles on.	Spark plug gap and electrode location.....	G
	Breaker points	E
	Ignition coil (weak or intermittent)	F
	Spark plug cable	F
	Combustion air (insufficient).....	C
	Nozzle (for looseness or leakage at seat)	M
	Solenoid valve (for leakage)	M
	Fuel Spray	M
Air leaks.	Fuel pressure	K
	Purge switch	I
Air leaks.	Door weather strips sealed ineffectively.....	Q
	Cowl kick-pad vents are not adjusted to close tightly	Q
	Weld seam not sealed between the baggage compartment floor pan, the toe pan, and the dash panel	Q
	Unused and unsealed dash panel holes.....	Q
Odor of raw gasoline in car.	Fuel line connection at burner casting	L
	Solenoid valve cup (for leakage)	L

DIAGNOSIS GUIDE (Continued)

No control over heat output.	Heat (thermostat) control cable	D
	Thermostat (for shorts)	D
	Wiring (at switches)	A
Heat output too low.	Heat (thermostat) control cable; thermostat	D
	Fuel line	K
	Fuel pressure	K
Heat output too high.	Heat (thermostat) control cable; thermostat	D
Heater burns continuously—heat output too low.	Fuel pressure	K
	Nozzle or fuel system	M
Continuous excessive smoke from heater exhaust during heater operation.	Combustion air hose	C
	Wiring	A
	Combustion blower motor ground	C
	Combustion blower motor (for slow speed)	C
	Nozzle	M
	Purge switch	I
Breaker points burned, pitted or blued.	Poorly soldered condenser joints, broken condenser leads or shorted condenser	E
	Contamination of the points with oil and other material	E
	Binding of nylon bushing used in movable contact arm	E
	Breaker point cam opening the points too slowly or less than .015"	E
	High current caused by excessive voltage	E
Excessive smoke from heater exhaust only when heater starts or cycles on.	Fuel valve (for leakage)	M
Noisy combustion.	Exhaust pipe; burner clamp (for looseness or air leaks at clamp)	N
	Nozzle	M
	Lack of resonance holes	N
Odor of burned gasoline (exhaust gas) in car.	Burner clamp; heater exhaust ferrule (for leakage)	N
	Exhaust tube	N
	Heat exchanger	O

A. Wiring

The heater fuses are located under the left side of the instrument panel on a fuse block.

Three fuses are provided for the heater system: a 20 amp fuse in the ignition circuit protects the entire heater system (and back-up lamp circuit) while a 10 amp fuse in the battery circuit protects the combustion blower (and glove compartment lamp and courtesy lamp circuit) in a circuit through the purge switch. The control lamp circuit utilizes the 3 amp fuse provided for the instrument panel lamps.

The heater is controlled by control knobs located on the instrument panel. The heater will be operated (combustion blower and ventilating air blower will run) by pushing the *FAN* lever. The burner of the heater will operate only when heat is desired and the thermostat (located in the air distributor) is calling for heat. The thermostat may cycle the burner on and off rapidly, several times per minute in mild weather, with the "on" time depending upon the heat required. The heater will not operate without the *FAN* control lever in the low or high position.

The heater hot lead is a red wire routed from the heater switch and through the firewall to the heater harness on the heater case. The thermostat has two terminals; if either of these terminals is disconnected, the combustion blower will run, but the spark and fuel circuits will not be energized.

When checking wiring, carefully inspect for wiring defects such as frayed or broken wires, damaged insulation, shorts, loose connections and incorrect wiring.

For heater wiring refer to Figures 11-3 and 11-4 and to heater wiring diagram in Section 8. Refer to *Item J* in this section for Heater Control Switch checks.

B. Ventilator Blower

Symptoms of ventilating air blower failure are (1) no air flow from distributor, (2) no heat inside the car, (3) overheating and cycling on the overheat switch and (4) poor heat control. Since a flow of air is necessary for proper thermostatic action, failure of the blower can cause the heater to operate properly while the car is in motion but overheat at low speeds or when the car is stopped. The heater switch is linked to the distributor air shut off door and the heater will not operate unless the door is open.

To check the blower, turn on the ignition and the heater (Fan) switches. The blower should start immediately whether the engine is on or off and air should be discharged from the heater outlet. Blower failure can be caused by a blown fuse, damaged wiring, a defective switch, an improperly adjusted switch, or a defective motor. Check these causes and repair or replace as required.

C. Combustion Blower

The combustion air blower should start at the same time as the ventilating air blower and causes of failure are almost the same. If the ventilating air blower starts but the combustion blower does not, the causes could be defective wiring, failure of the motor, binding of the fan blades, or a defective purge switch. The blower should operate at speeds in excess of 3,000 RPM at 12 volts. A separate ground lead is attached to the motor and this lead must be connected to some part of the car body to properly ground the motor. Without a good ground connection, the motor will run slow, or not at all, thereby resulting in an inoperative heater or one which smokes excessively during operation. When checking the combustion air blower, make sure the hose is in good condition and is not pinched or leaking air. Any restriction of combustion air flow will affect burning in the combustion chamber and may cause excessive carbon deposits or failure of the heater to start. This blower will continue to operate for a few seconds after the heater is turned off to purge the system.

D. Thermostat

Before checking thermostat, make sure *Heat* control is properly positioned during checkout of heater per-

formance. Inspect control cable installation and check to see that thermostat is being operated through its full range. Refer to *Control Adjustments* under *Service Operations* in this section.

To check the thermostat, proceed as follows:

1. Turn ignition switch to *ON* position.
2. Connect a test light to the cold side of the thermostat and provide an adequate ground for the light.
3. Turn heater switch on.

Move the temperature control from low to high position. The test light should come on, indicating that the thermostat has made contact. In a very cold building the thermostat may remain on when the control is in low position since the lowest temperature setting of the thermostat is approximately 60°. If the thermostat contact fails to close, check bowden cable or replace the entire unit.

NOTE: The thermostat is factory preset to a temperature range of 60° ± 10° - 150° ± 5° F. No internal adjustment of the thermostat should be attempted as damage to the heater may result. The low limit (60° ± 10°) is taken at a point 1-5/16" of cable travel back from the full clockwise travel.

The thermostat may be checked for a short by depressing the metal actuating arm of the microswitch. The light should be extinguished. If the light continues to glow, the microswitch is shorted and the entire thermostat should be replaced.

E. Breaker Points

The ignition system consists of a set of breaker points, a condenser, an ignition coil and a spark plug. Defective ignition is a common cause of backfiring or "popping" noises and it should be checked carefully. Intermittent flashing at the breaker points, instead of a steady, light arc, is a sure indication of intermittent ignition and resulting "popping" noise. Bright flashing may be caused by an open circuit in the condenser connections or a defective condenser. If the condenser is defective, the ignition base unit (breaker point) assembly should be replaced.

The breaker points are installed on the end of the combustion air motor and are actuated by a two-lobed cam, with right hand threads, on the extended shaft of the motor. The points are protected from water and dirt by a metal, snap-on cover. After removing the cap with blower dismounted, the points may be inspected visually and if burning or pitting is evident a new ignition unit base (breaker point) assembly should be installed.

When burning or pitting occurs, current will not pass between the points. Thus, an open circuit results and spark is not produced.

The following are primary causes of breaker point bluing:

- a. Poorly soldered condenser joints.
- b. Broken condenser leads.

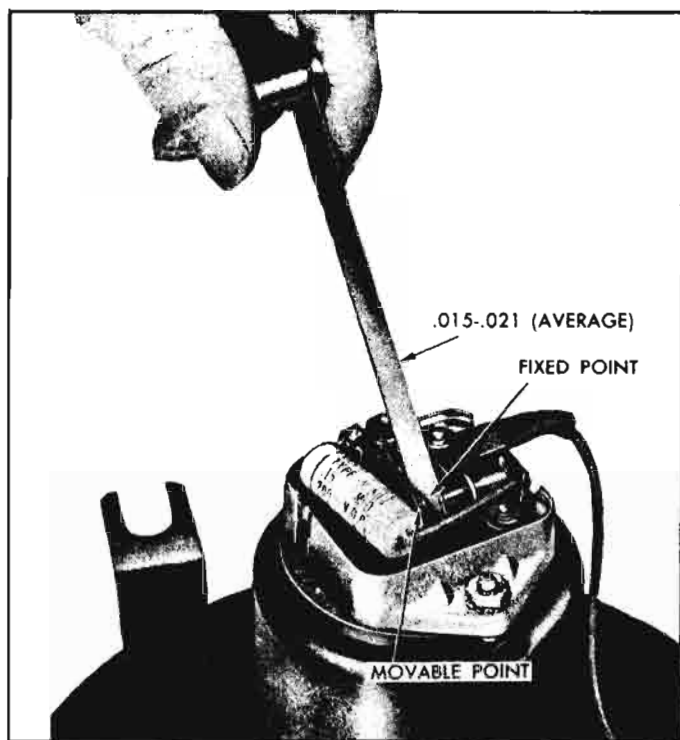


Fig. 11-5—Checking Breaker Points Gap

- c. Internal shorts in the condenser.
- d. Excessive arcing caused by an abundance of oil on breaker contacts. This oil is liberated from the combustion blower motor.
- e. Defective movable arm.
- f. Worn cam.
- g. Blown combustion blower fuse.

The gap may also be checked after removing the cap (fig. 11-5). The gap should be .015" to .022" as the average of the settings on each lobe. Gap on first lobe plus the gap on the second lobe divided by 2 should be equal to .015" to .021". If adjustment is required, install a new breaker cam and recheck the gap. The cams should be smooth and not scored or worn, as this will result in improper gap. If the gap is still out of tolerance a new ignition unit base assembly should be installed.

Set the gap by adjusting the threaded contact to the prescribed setting. When the proper setting is attained, lock the adjustable contact in place with solder. Use resin core solder only.

The condenser solder joints should be inspected for loose connections, which will result in weak and intermittent spark, causing heater backfiring or popping.

F. Ignition Coil

The ignition coil is mounted outside the heater case. Inspect the spark plug cable for damage which may result if it is pinched. Also examine the cable to see if it is securely screwed into the suppressor inserted in the end of the coil and inspect wiring connectors on

the coil. If breaker points test was satisfactory and a coil test is desired, proceed in the following manner:

1. Disconnect the electrical connection to the fuel solenoid coil (white wire—single connector on heater case) and position it so that it does not touch a ground point.
2. Remove the spark plug cable from the ignition coil and insert a cable with a standard automotive plug gapped to .085" in it. Provide a ground for the plug.
3. Place the ignition switch in ON position and set temperature controls for maximum heat output. If a hot steady spark is present, the coil and breaker points are operating satisfactorily. If the spark is weak or intermittent and the breaker points have previously been proved satisfactory, the coil is probably defective.

G. Spark Plug

The spark plug, located in the burner assembly, has a single electrode, with the ground electrode welded to the mixer cup. It is extremely important that the ground electrode be positioned in the proper location and that the spark gap should be correct. Otherwise, carbon may accumulate on the electrodes. The result will be failure to ignite (no heat) or backfiring or popping noises.

If a complaint of "no heat" is received and the source of trouble cannot be otherwise located it is possible that a "carbon bridge" has formed across the spark plug electrodes. A "carbon bridge" may be caused by low fuel pressure to the heater, an improperly positioned spark plug ground electrode, incorrect spark plug gap, improper spray pattern or slow combustion motor speed caused by fan switch overtravel. A simple test may be made as follows:

1. Break the connection from the overheat switch to the solenoid lead on the solenoid coil (white wire) to prevent fuel flow. Be sure the terminal does not touch ground.
2. Set Heat control in high heat position, turn the ignition switch on and put the Fan control on low. The combustion blower and the ventilating air blower should run. In a relatively quiet area it should be possible to detect a slight buzzing sound under the instrument panel. In a noisy area, disconnect combustion hose from combustion blower, hold hose to ear and listen for buzzing sound. The sound is generated by the spark.

If no sound is heard it means that the spark is not jumping the spark plug gap, perhaps because of a "carbon bridge" being formed across the gap. The "carbon bridge" may often be easily removed by the following procedure. Pull the center wire out of the heater coil and hold it 1/4" from the coil center terminal. This will cause the spark voltage to increase to a higher value necessary for the spark to jump the gap between the wire and coil terminal. This results in a stronger spark at

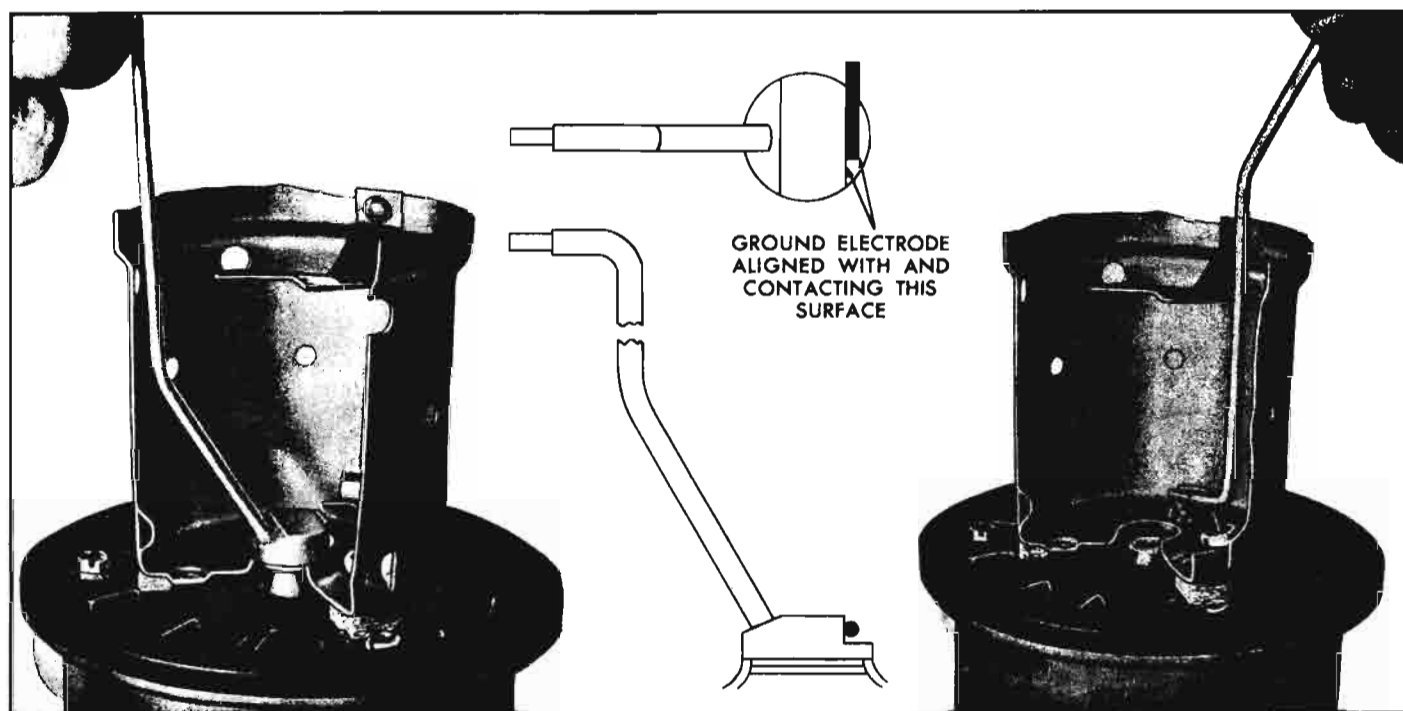


Fig. 11-6—Checking Spark Plug Alignment and Gap with Tool J-8368

- the spark plug gap. The stronger spark will usually remove the "carbon bridge" from the spark plug gap. If the problem occurs often it will be necessary to dismantle the heater unit and check the spark gap positioning and fuel spray pattern.
3. If a buzzing sound still cannot be heard, turn the heater off, open the case and remove the burner assembly.
4. Remove the spark plug and clean with emery cloth or steel wool.
5. Inspect the spark plug for cracked porcelain and eroded or bent electrodes. If these faults exist replace the spark plug or correct the off-center condition.
6. Reinstall the spark plug, using 2 washers on the plug.
7. Check and adjust ground electrode alignment and spark plug gap, using gauge J-8368, as follows (refer to Figure 11-6):
 - a. Check alignment of ground electrode by inserting alignment (larger diameter) end of gauge into mixer cup and piloting end of gauge into center flanged hole in mixer cup. Rotate gauge to align step of gauge with ground electrode. Ground electrode should contact surface of gauge step along entire length of step without forcing gauge into position.
 - b. If misaligned, bend ground electrode with long-nose pliers to obtain above alignment.
 - c. With ground electrode properly aligned, check gap between plug electrode and ground electrode by inserting opposite (.085") end of gauge between electrodes.

- d. Adjust gap by bending ground electrode in a plane which will maintain the parallelism established in Steps a and b.
- e. Recheck parallelism (Steps a and b) and repeat Steps a-d as required until correct gap and alignment is established.

Before reinstalling the burner, connect the plug lead and check the arc, visually. Be sure the burner assembly is grounded when conducting any tests with the spark plug. There should be a steady, intense, bluish-appearing arc.

Since the burner must be removed for the above work, it is suggested that tests of the fuel valve and nozzle be performed before reinstalling the heater. See *Item M*.

If carbon bridging continues to be a problem with proper spray pattern and properly positioned electrodes, relief may be obtained by moving the ground electrode away from the nozzle center line up to .020" additional to gauge distance. Gauge locates ground electrode .220" from nozzle center line.

H. Overheat Switch

An overheat switch, mounted on the heater case, is wired in series electrically with the fuel solenoid coil. The switch contains a bi-metal blade which will open the circuit to the solenoid coil if the air temperature rises excessively. This switch will automatically reset itself when the air cools. If there is a loss of air or if the thermostat fails to cycle the heater off, the heater will cycle on the overheat switch. The overheat switch continuity may be checked by an ohmmeter, test light

or test buzzer through the white and the red and white leads. A direct circuit should always be present since the overheat switch opens only at a high temperature. If there is no circuit, the overheat switch should be replaced.

I. Purge Switch

A properly operating purge switch should allow the combustion blower to start immediately when the blower is turned on and, after the blowers have operated for one minute, should allow the combustion blower to continue to run for up to 2 minutes after the car ignition or heater switch is turned off. If the combustion blower does not operate as described, replace the purge switch. If the motor does not operate at all, check all 3 terminals of the purge switch with a test light. Current should be available at all three terminals. If current is present at the red and blue terminal and not at the black terminal the switch is defective and must be replaced. If no current is available at the red and blue terminal check for complete circuit continuity. If necessary contact points may be cleaned with a piece of smooth, lint-free, non-abrasive paper.

J. Heater Control Switch

There are three terminals on the heater control switch mounted in the air distributor. When switch is in low position, two terminals are "hot". When switch is in high position, all three terminals are "hot". Check continuity by placing test lamp or similar testing device between each switch terminal and ground.

K. Fuel Supply

Fuel is supplied from the engine fuel system by means of a fitting installed at the fuel pump cross fitting. A pressure regulator, which resembles a tee fitting, is located on the underbody below the front seat and near the fuel junction. The leg of this tee should be horizontal or above the horizontal to properly vent vapor or bubbles through the by-pass line. The heater fuel pressure should be between $4\frac{1}{2}$ and $5\frac{1}{2}$ psi for proper heater operation. Check fuel pressure at the fuel line connection to the heater assembly. If the pressure is lower than $4\frac{1}{2}$ psi and all lines are clear, the engine fuel pump probably requires repair or replacement. (Check fuel pump by attaching gauge to the fuel pump after the outlet fuel line has been removed and the heater fuel supply line blocked off.) If the fuel pump pressure is satisfactory but the heater fuel pressure is not up to specifications, replace or clean and adjust the regulator. The fuel flows through the heater fuel line, pressure regulator, heater case, and into the burner assembly. If this fuel line is kinked or damaged, fuel delivery may be reduced, which prevents the heater from operating properly. The fuel line connection at the burner assembly should be tight and must not leak. A leak at this point will

cause raw gas fumes to be drawn inside the car by the ventilating air.

If it seems necessary to clean and adjust the regulator, proceed as follows:

1. Remove overflow fuel line at pressure regulator "T."

NOTE: Take all necessary precautions to prevent fire when gasoline is exposed.

2. Remove the staked-in adjusting screw, counting the number of turns.
3. Remove spring and nylon disc.

NOTE: It may be necessary to tap regulator valve with a wooden block to remove nylon disc.

4. Clean edges of disc until it falls freely past threaded section of regulator.
5. Reassemble regulator, installing adjusting screw to the same depth.
6. Install fuel pressure gauge as stated previously. Place pan under "T" to catch gasoline.
7. Start engine, turn adjusting screw in or out until fuel pressure is 4-5 psi.

NOTE: Gasoline flowing out of regulator overflow outlet will wash out any chips caused by breaking the stakes.

8. Turn off engine, install fuel lines.
9. Start engine and check for fuel leaks.

L. Inspection of Burner

The nozzle and mixer assembly should receive a special inspection after removal from the heater and before further disassembly since the condition of these parts will be an indication of the cause of unsatisfactory operation. The nozzle and the inside of the mixer can around the nozzle will normally be covered with a medium layer of black carbon and the nozzle should have a small gray opening at the orifice. The outer end of the mixer will usually be burned to a gray or reddish color and some scaling of loose particles may be present. These are indications of normal burning and should not be considered defects. Never attempt to clean a nozzle by wiping since this will force carbon into the orifice.

Indications of improper operation are an uneven buildup of black carbon, or an excessively burned or eroded spot on the mixer. The openings in the mixer cup must not be clogged with carbon since this will prevent entry of the proper amount of combustion air. If this condition is present, it will not be remedied by cleaning, since it is caused by a one-sided spray from the nozzle or by dripping or leakage around the nozzle seat. The spark plug electrodes will operate properly with a considerable accumulation of carbon and lead but must not be shorted out. If the electrodes are burned, this indicates an improperly directed spray and the nozzle or nozzle seat is at fault. Inspect the nozzle seating surface of the burner casting; also the

condition of threads in the fuel inlet and the sealing surface of the solenoid valve cup in the housing casting. Replace the housing if defective in these respects.

M. Checking the Nozzle and Fuel Solenoid

The fuel valve in the burner assembly is solenoid operated, controlling fuel flow in response to the thermostat. The valve parts consist of a solenoid coil, a rubber-tipped, spring-loaded valve, and a metal valve seat held in place by a retaining screw. When the thermostat calls for heat, the solenoid coil is energized and the valve is pulled off the valve seat allowing fuel to flow through the seat and fuel nozzle.

The nozzle has a special built-in screen which cannot be removed and replaced. The nozzle cannot be disassembled or cleaned and no attempt should be made to repair it or blow it out with air. A fuel distributor, inside the nozzle, contains very fine passages which may be clogged if high pressure air is used as the usual service supply of air is not sufficiently clean.

The possibility of malfunction of the nozzle is extremely remote. Many nozzles are replaced in a routine manner when the real difficulty lies elsewhere.

The ideal fuel nozzle will emit an even conical-shaped spray inside the mixer cup.

No gasket is used between the nozzle and the burner casting. A leak can develop if the seating surface is pitted, scored or uneven.

The following checks may be made after the burner assembly has been removed from the heater.

To check the solenoid coil:

1. Connect burner ground wire to a suitable ground.
2. Disconnect the wire from solenoid coil making sure that it does not touch a grounded point.
3. Supply a hot lead from the battery to the terminal of the solenoid.
4. Touch the hot lead to the terminal of the solenoid. If a slight click is heard, the coil is good and the valve is being pulled off the valve seat. If no click is noted either the coil has an open circuit or the valve is stuck on the valve seat.

The coil should have approximately 50 ohm resistance when checked with an ohmmeter or it should show about .24 amps at 12 volts when checked with an ammeter. If neither an ohmmeter or ammeter are available, the strong attraction of steel tools to the solenoid cup is sufficient indication that the coil is satisfactory.

To check the valve:

Remove the three screws which fasten the solenoid cup to the housing. Use caution when removing this cup so that the valve spring located in the valve will not be lost. Inspect the casting for particles of dirt, metal chips or other foreign matter.

Access to the seat is gained by removing the fuel nozzle, the rubber spacer behind the nozzle and the valve-seat retaining screw which requires an Allen

wrench for removal. Visual inspection will determine the need for removing the seat. Unless the passage cannot be cleared with an air hose, or the seat is obviously damaged, it will seldom be necessary to remove the seat. If the seat is removed, the gasket, used to prevent seepage around the seat, should be replaced. The rubber spacer behind the nozzle is inserted to decrease the cavity behind the nozzle and prevent accumulation of fuel at this point.

To check the nozzle and spray pattern:

1. Remove louver plate and mixer cup assembly from the burner.
2. Remove spark plug.
3. Place the burner assembly on spray pattern Checking Gauge J-8367 with the nozzle pointing vertically downward (fig. 11-7) and provide a suitable ground for the burner.

NOTE: Do not use a gasket between burner assembly and gauge.



Fig. 11-7—Installing Burner on Checking Gauge J-8367

4. Connect a fuel line from the vehicle to the burner with the hose provided with the gauge.
5. Connect a jumper wire to the fuel solenoid and take this to a hot lead well away from the gauge area.
6. Start the car engine.
7. Touch the jumper wire to the hot lead for a few seconds. There should be fuel spray. If there is no fuel spray check the fuel pressure, fuel solenoid and valve.
8. The spray pattern should contact the walls of the gauge (as evidenced by wetting of the walls)

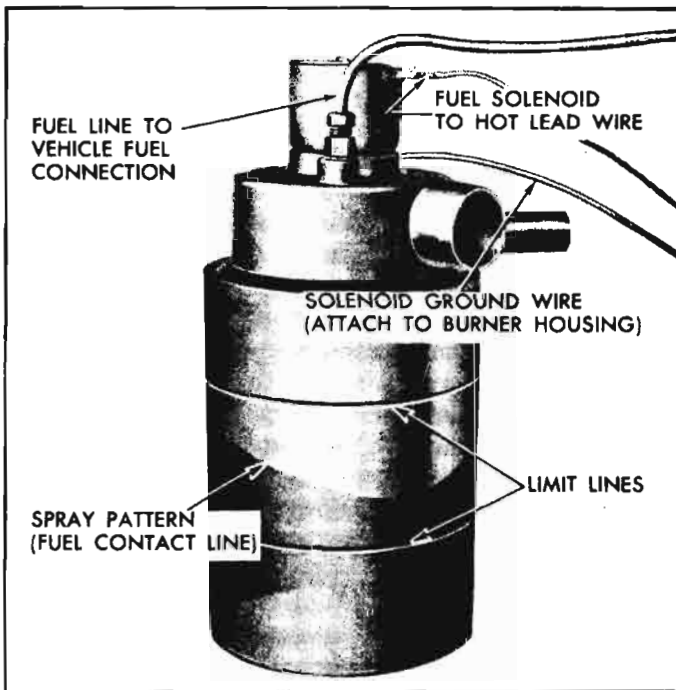


Fig. 11-8—Checking Spray Pattern—Acceptable Pattern Shown

between the two limit lines on the gauge (fig. 11-8). If any part of initial contact line lies outside of limit lines, fuel pressure is not normal or nozzle is defective.

CAUTION: Do not continue fuel spray for more than a few seconds to avoid danger of excess gasoline fumes.

9. If the pressure is correct ($4\frac{1}{2}$ to $5\frac{1}{2}$ psi) the nozzle should be replaced. Excessively high pressure re-

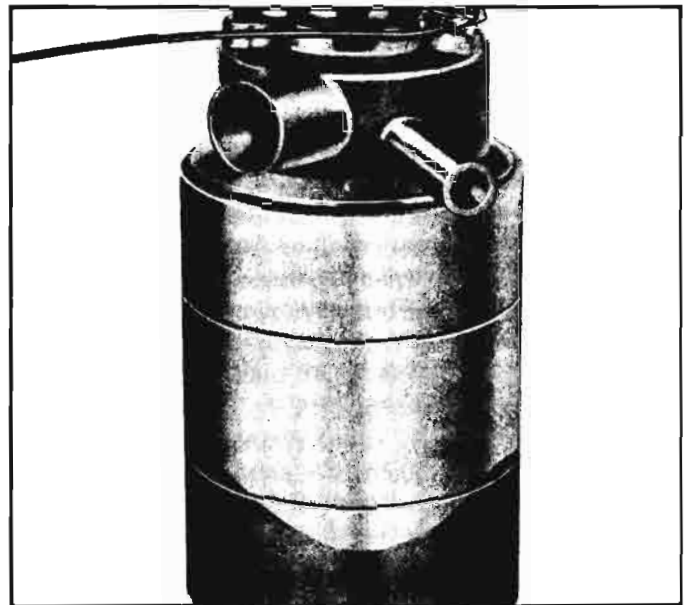


Fig. 11-10—Low Pressure Pattern Below Limit Line

sults in a spray pattern above the limit line; too low a pressure will give a pattern contact below the lower limit line. Refer to Figures 11-9 and 11-10.

NOTE: Skewing or irregularities of the pattern line on the gauge walls does not indicate a defective pattern as long as all portions of the pattern lie within the limit lines on the gauge.

Immediately after shutting off the spray there frequently will be some residual fuel remaining in the nozzle, but there should not be a continuous flow. A slight amount of dribbling is normal. If the valve is leaking continuously, check for missing parts or dirt under valve seat.

If fuel seepage is present between the nozzle and the nozzle seating surface, the nozzle is either loose or the seating surface is defective. Tighten the nozzle to 100 in. lbs. (approx. 8 ft. lbs.) of torque. If tightening the nozzle does not eliminate the leak, the nozzle seating surface of the burner is defective and the burner housing must be replaced.

N. Exhaust Tube

A restriction in the exhaust system may result in an inoperative heater. The exhaust tubing should also be inspected for rust and to make certain that it is attached to the heater exhaust outlet. A short exhaust or a missing one will result in excessive noise during heater operation. Another cause of noisy combustion is the flow of combustion gases through the exhaust pipe at high speeds. This creates a harmonic vibration which results in excessive combustion noise. Two $\frac{1}{4}$ " holes are drilled in the underside of the exhaust pipe. These holes are located for maximum reduction of noise and are $3\frac{3}{8}$ " and $12\frac{3}{4}$ ", respectively, from the front of the exhaust pipe mounting bracket. An exhaust gasket is used on the heater exhaust outlet where it protrudes



Fig. 11-9—High Pressure Pattern Above Limit Line

through the heater case and should be installed properly on the flanged portions of the heater case between case and heat exchanger. This is to prevent products of combustion from being drawn into the system.

O. Heat Exchanger

The heat exchanger is constructed of heavy duty stainless steel and should seldom need to be replaced. Failure of the heat exchanger would be detected by the presence of products of combustion in the air being delivered to the passenger compartment.

P. Relay

If combustion blower runs but heater fails to ignite, connect jumper wire from black to white wire of relay. If heater then ignites, replace relay.

Q. Air Leaks

Cold air leaks can cause unjustified insufficient heat complaints when the heater is operating correctly. Weather strips should be sealed properly and ventilator louvers should be adjusted to close tightly. Another source of air entry into the passenger compartment is through the weld seam between the baggage compartment floor pan, the toe pan, and the dash panel. This air leak can be stopped by applying body sealer. The left end of the weld seam can be sealed from inside the baggage compartment and the right side from inside the passenger compartment after the floor mat is turned down. While the mat is down, any unused holes in the dash panel can be sealed and the sponge rubber seal around the steering tunnel can be checked.

SERVICE OPERATIONS

VENTILATOR BLOWER MOTOR REPLACEMENT

Refer to Figures 11-11 and 11-12.

1. Disconnect electrical connection to blower motor.
2. Remove the five screws attaching the motor and fan assembly to the blower case and remove motor, fan and gasket.
3. Remove the nut (clip) or loosen the set screw securing the fan to the motor shaft and separate fan from motor and mounting plate assembly.
4. Install fan on new motor, install nut (clip) or tighten set screw to secure fan to motor shaft and reinstall motor, fan and gasket into blower case.
5. Connect wiring to blower motor.

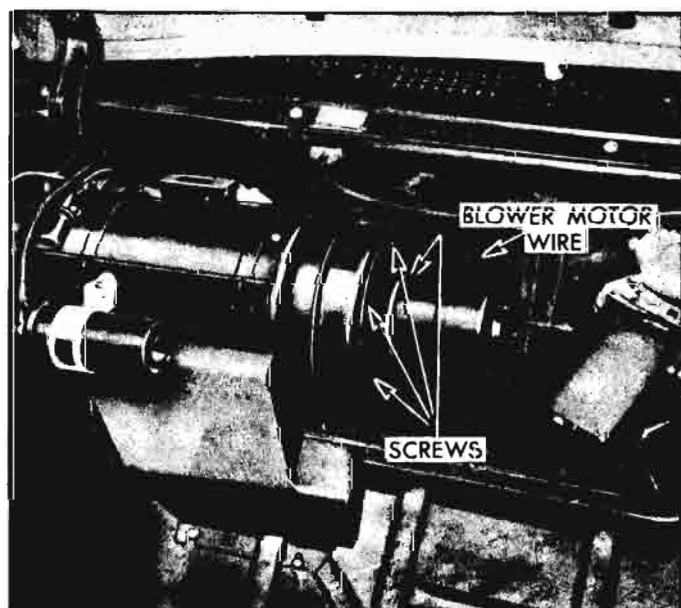


Fig. 11-11—Ventilator Blower Motor Mounting

COMBUSTION BLOWER MOTOR REPLACEMENT

Refer to Figures 11-13 and 11-14.

1. Disconnect clamp holding combustion hose to blower case assembly and remove hose.
2. Loosen white and black wires from clamps, disconnect black wire from five-way connector and separate black wire from white wire. Disconnect green wire from 3-way connector at relay.
3. Remove three combustion blower assembly mounting screws, remove ground wire and remove blower, and place blower on fender to remove ignition base unit.
4. Remove cap and two nuts and lockwashers holding ignition unit base (breaker point) assembly in place and remove assembly.

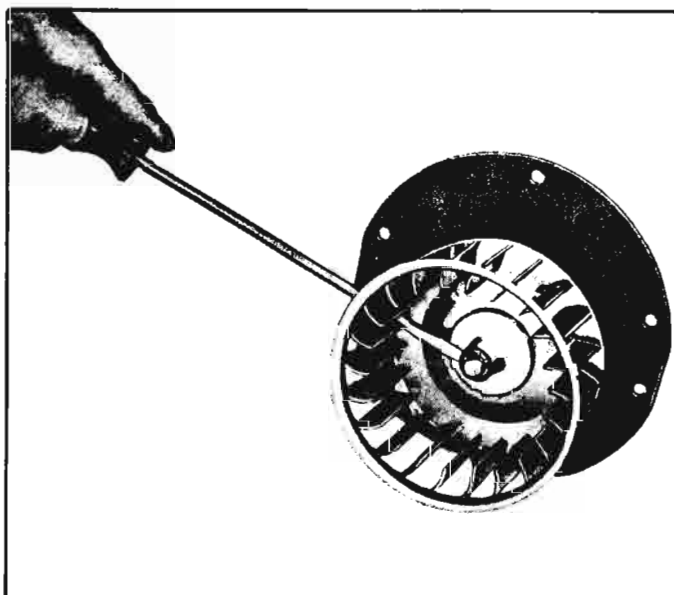


Fig. 11-12—Removing Ventilator Blower Fan Nut

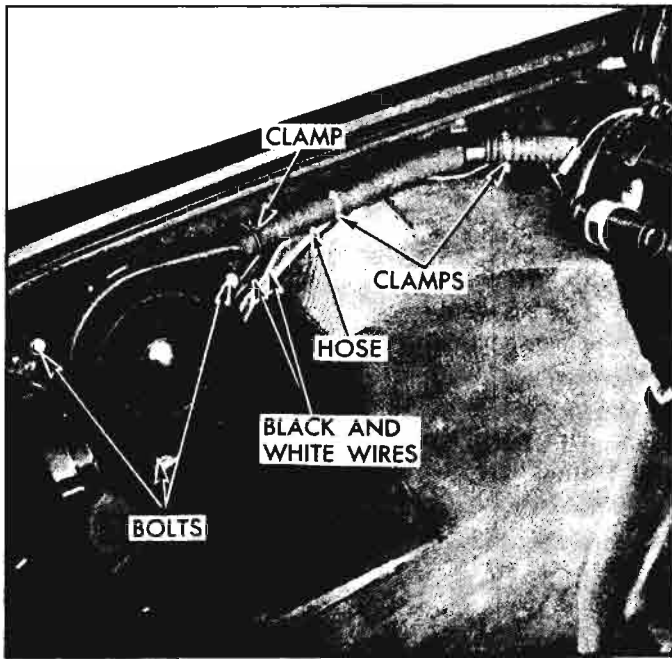


Fig. 11-13—Combustion Blower Mounting

5. Remove cam from extended shaft of combustion blower motor.

6. Remove four screws holding combustion blower case together and separate case halves.
7. Loosen set screw or remove nut (clip) holding fan on combustion blower motor shaft and remove fan.
8. Remove two nuts and lockwashers holding blower motor on motor half of blower case and remove motor and gasket.
9. Separate white wire from black wire on new motor and discard white wire.
10. Install gasket and motor half of blower case on new motor and attach with two nuts and lockwashers.
11. Replace fan on motor shaft and tighten set screw or install nut (clip) to secure fan to shaft.
12. Assemble both halves of blower case and install four screws to secure case halves together.
13. Replace cam on extended shaft of new motor and attach ignition unit base assembly (breaker points) with two nuts and lockwashers.
14. Check breaker points for proper gap. Refer to Item E—Breaker Points in the *Diagnosis Guide*.
15. Replace cap on ignition unit base assembly.

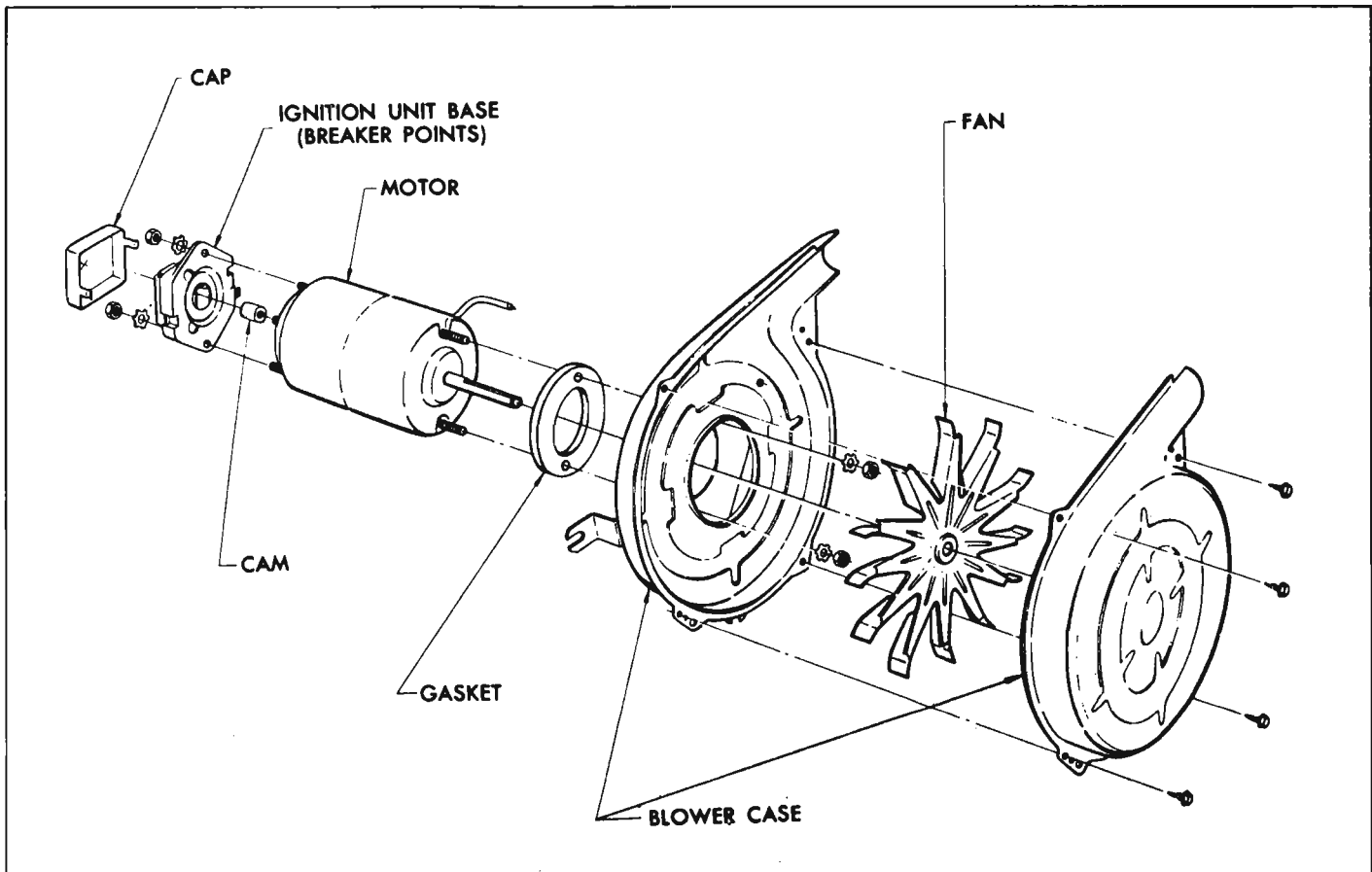


Fig. 11-14—Exploded View of Combustion Blower Motor, Fan, Case and Ignition Unit Base Assembly

16. Install combustion blower assembly in front compartment, position ground wire and attach with three screws. Attach ground wire with upper rear screw.
17. Attach combustion blower hose and hose clamp and install black wire from blower motor into five way connector. Secure white and black wires to hose with clamps.
18. Connect green wire from 5-way connector to relay 3-way connector.

THERMOSTAT REPLACEMENT

Refer to Figure 11-15.

1. Remove three screws holding cover on air distributor case and remove cover. Heater control switch wiring connector must be removed from switch to completely remove cover.
2. Remove two wires from thermostat.
3. Remove two screws holding thermostat in place and remove the thermostat.
4. Install new thermostat and secure in place with two screws.
5. Install two wires on thermostat. White wire should be at rear of thermostat when it is mounted in the air distributor case.
6. Adjust thermostat and bowden cable so that *Heat* control knob gives full operation of the thermostat (see *Control Adjustments*).
7. If removed, install heater control switch wiring connector to switch through cover hole, then replace cover on air distributor case and secure with three screws.



Fig. 11-15—View of Thermostat and Heater Control Switch Mounted to Distributor (Cover Removed)

HEATER CONTROL SWITCH REPLACEMENT

Refer to Figure 11-15.

1. Remove three screws securing heater control switch cover to air distributor and remove cover.
2. Disconnect wiring from switch.
3. Remove two screws securing switch and remove switch.
4. Position new switch at mounting location, making sure switch crank is engaged in small track on bottom of air door. Tab on switch mounting bracket must engage locating hole.
5. Install the two switch mounting screws.
6. Connect switch wiring.
7. Operate car ignition switch and *Fan* control to check for proper operation of door and switch. Adjust if necessary.
8. Install cover, passing switch wiring through hole in cover, and secure cover with three screws.

IGNITION UNIT BASE ASSEMBLY (BREAKER POINTS) REPLACEMENT

1. Remove combustion blower motor assembly from front compartment and place on fender as described in Steps 1-3 of *Combustion Blower Motor Replacement*.
2. Remove cap from ignition unit base assembly.
3. Remove white wire from the ignition unit by unsoldering connection. Caution should be taken to keep heat localized.
4. Remove two nuts holding ignition unit base assembly and remove assembly. Remove cam from extended shaft of combustion blower motor.
5. Install new cam on combustion blower motor shaft. Install new ignition unit base assembly and attach with two nuts.
6. Solder white wire to terminal. Use rosin core solder only.
7. Rotate cam so that movable point is in open position giving maximum gap.
8. Using feeler gauge to measure gap, rotate fixed point until a gap of .018" is obtained.
9. Rotate cam to opposite lobe and measure gap. This gap should be between .012" and .024" in order to obtain a gap of .015" to .021" as the average of the settings on each lobe. Adjust the fixed point as required to obtain the above average setting. Refer to Figure 11-5.
10. Solder the fixed point in place using rosin core solder only.
11. Replace cap on ignition unit base assembly.
12. Install combustion blower assembly in front compartment as described in Steps 16 and 17 of *Combustion Blower Motor Replacement*.

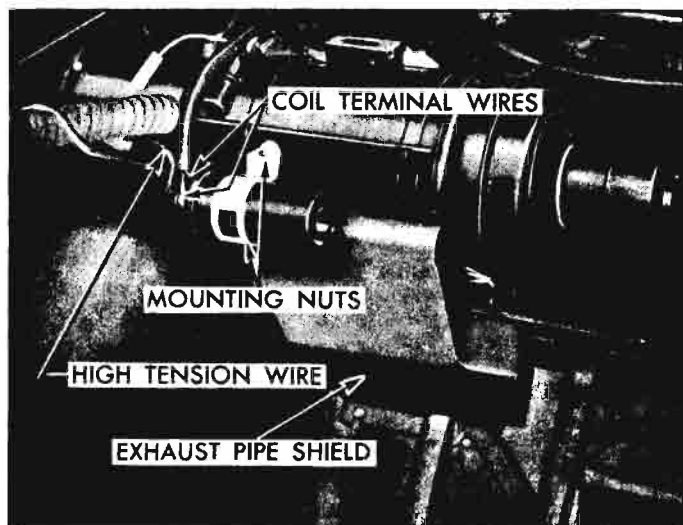


Fig. 11-16—Ignition Coil

IGNITION COIL REPLACEMENT

Refer to Figure 11-16.

1. Remove exhaust pipe shield.
2. Remove the two coil support mounting nuts and remove coil.
3. Remove high tension wire shield and remove two wires from terminals on coil.
4. Pull high tension wire from center terminal of coil.
5. Place high tension lead securely in center terminal of new coil, install high tension wire shield and connect black lead to (+) terminal and brown lead to (—) terminal. Secure with nuts.
6. Place new coil in position and install attaching nuts.

CAUTION: While the heater coil resembles a standard automotive coil, replacement must be made only with correct part number replacement coil.

7. Replace exhaust pipe shield.

OVERHEAT SWITCH REPLACEMENT

Refer to Figures 11-4 and 11-17.

1. Disconnect one overheating switch lead (white) from relay connector and disconnect second lead (red and white) from solenoid (single) connector.
2. Disconnect black lead from coil.
3. Remove four screws securing the overheating switch in place.
4. Install new overheating switch and secure with four screws.
5. Connect white wire in multiple connector.
6. Connect red and white wire in connector to fuel solenoid wire.
7. Connect black wire to coil.

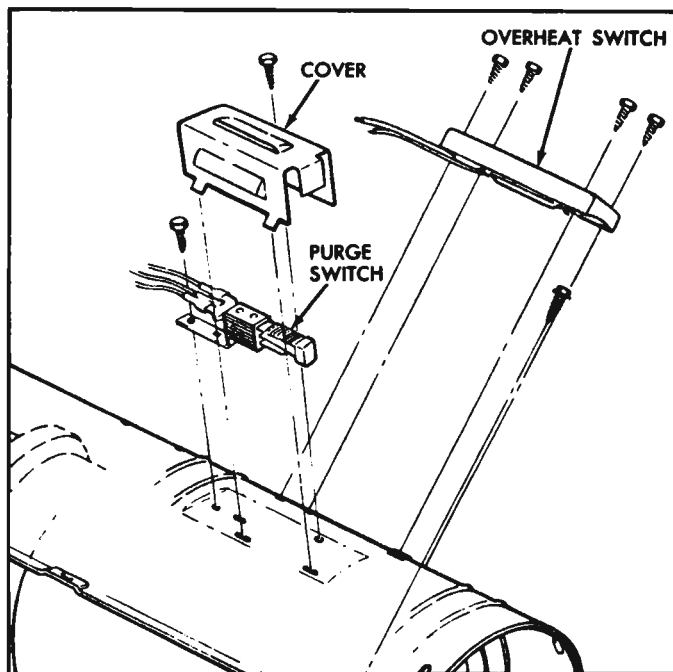


Fig. 11-17—Overheat and Purge Switches

PURGE SWITCH REPLACEMENT

Refer to Figures 11-4 and 11-17.

1. Remove screws holding purge switch cover in place.
2. Remove three leads from purge switch by unsoldering connections.
3. Remove screw holding purge switch in place and remove purge switch.
4. Install new purge switch and secure with screw.
5. Solder three wires to terminals of purge switch. Viewing the switch mounted on the heater case from the burner end, attach blue lead to lower terminal, red lead to left terminal, black lead to right terminal.
6. Check for continuity and attach purge switch cover.

RELAY REPLACEMENT

Refer to Figures 11-4 and 11-20.

1. Disconnect 3-way connector from relay.
2. Remove two mounting screws.
3. Install new relay and connect 3-way connector.
4. Check heater operation.

BURNER ASSEMBLY

Removal

Refer to Figures 11-4, 11-20 and 11-21.

1. Separate five way gang connector on heater case.
2. Separate fuel solenoid wire in-line connector and disconnect green wire from 3-way connector at relay.

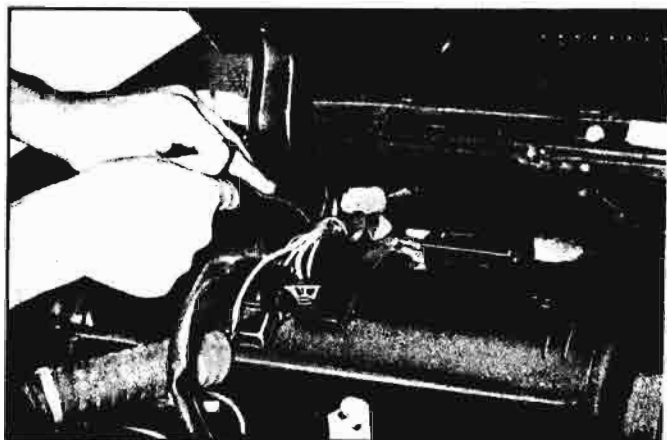


Fig. 11-18—Loosening Heater Straps

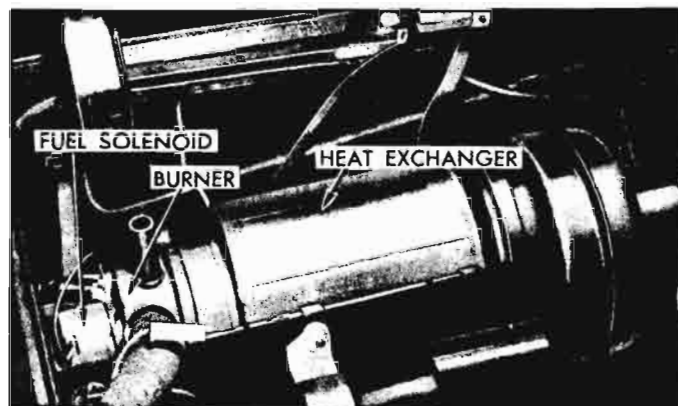


Fig. 11-19—Heater Unit with Upper Case Half Removed

3. Remove three screws holding heater straps in place, and push straps to the rear, bending them away from the heater case (fig. 11-18).
4. Remove two screws holding upper heater case to ventilator blower case.
5. Remove two screws holding upper heater case flange to fender sheet metal and loosen two screws holding five-way connector to heater case and remove connector.
6. Turn upper heater case cover over toward front of front compartment, exposing burner and heat

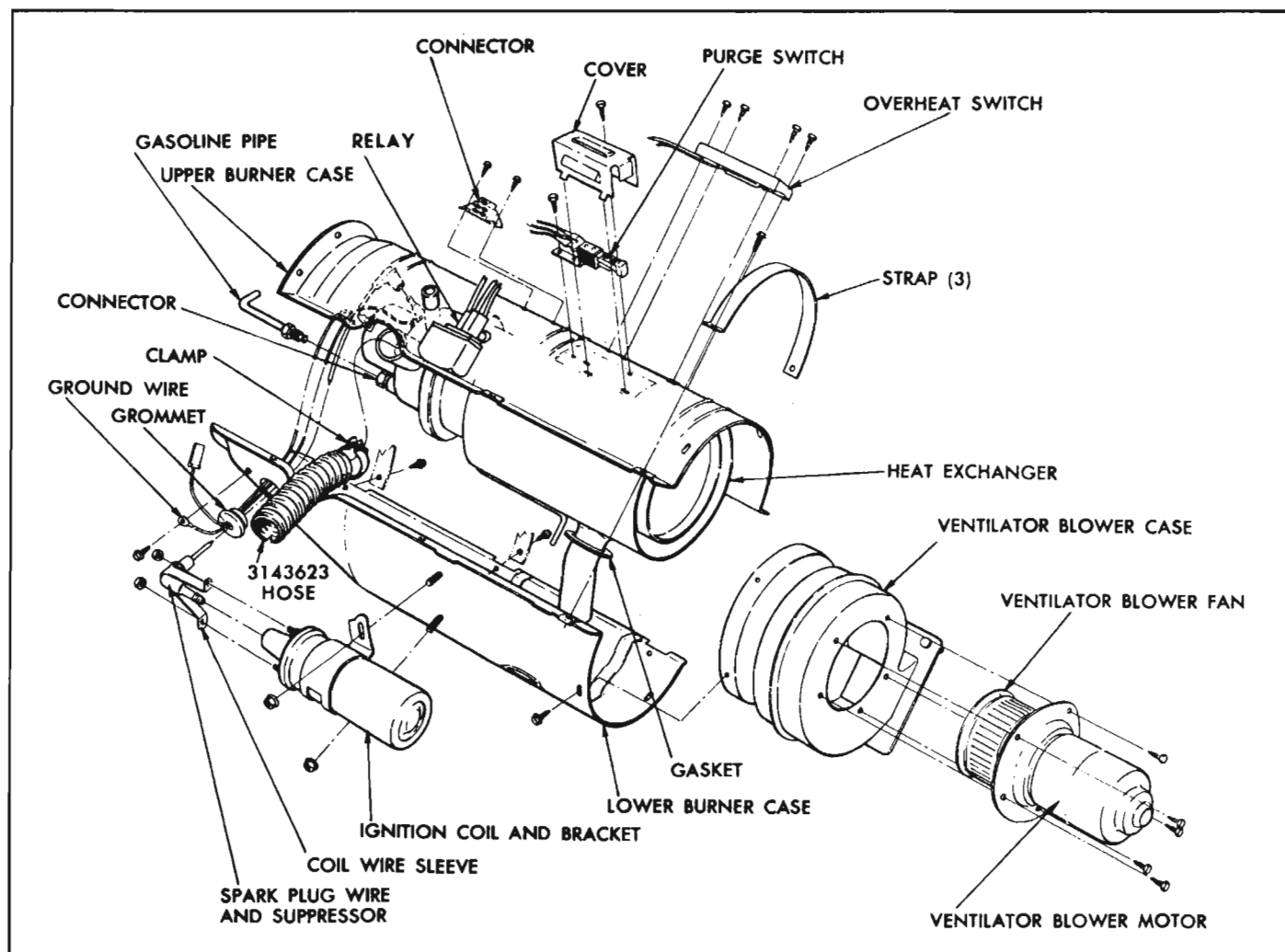


Fig. 11-20—Exploded View of Burner, Heat Exchanger and Attached Components

exchanger (fig. 11-19). Set case half in front compartment.

7. Loosen screw clamp holding combustion air hose and remove hose. Remove screw holding ground wire in place and pull ground wire and fuel solenoid wire through grommet.
8. Remove spark plug cable from spark plug.
9. Disconnect fuel line to burner housing inlet.
10. Loosen burner clamp holding burner to heat exchanger.
11. Remove burner and mixer cup assembly.
12. If necessary after inspection of the burner and mixer cup assembly, the mixer cup may be removed by removing three screws holding it to the burner housing.

Disassembly

1. Remove spark plug and sleeve (see *Spark Plug Replacement*).
2. Remove the three screws which fasten the solenoid cup to the housing.
3. Remove coil cup, seal, coil cup gasket, valve spring and valve assembly.
4. Remove fuel nozzle and spacer.
5. Remove valve seat retaining screw, valve seat, and valve seat gasket.
6. Remove fuel connector and fuel inlet filter (screen).
7. Use air pressure to clean all passages in burner housing.
8. Remove vent tube.
9. Retain coil cup, three fastening screws, fuel line

connector, valve seat retaining screw, and nozzle for re-use. All other parts will be replaced by new parts from the burner service kit.

Assembly

1. Install valve assembly, valve spring, coil cup gasket, seal and coil cup. Fasten with three screws. The solenoid wire to the coil should be positioned in line with the combustion air inlet in the housing.
2. Install valve seat gasket, valve seat, and valve seat retaining screw.
3. Install spacer and fuel nozzle.
4. Install fuel inlet filter screen and fuel connector. Spray pattern may be checked as described in *Item L* under *Diagnosis Guide*.
5. Install louver plate and mixer cup assembly and spark plug.
6. Install spark plug and reset spark gap as described in *Item G* under *Diagnosis Guide*.
7. Install vent tube.

Installation

1. If removed attach gasket to mixer cup and fasten mixer cup to burner housing with three screws.
2. Place burner assembly in heat exchanger and attach fuel line loosely. Align combustion air inlet on casting with notch in lower heater case.
3. Connect burner to heat exchanger with circular band clamp and screw. This clamp must be properly installed and must be tight, otherwise there may be a loud continuous noise when the burner

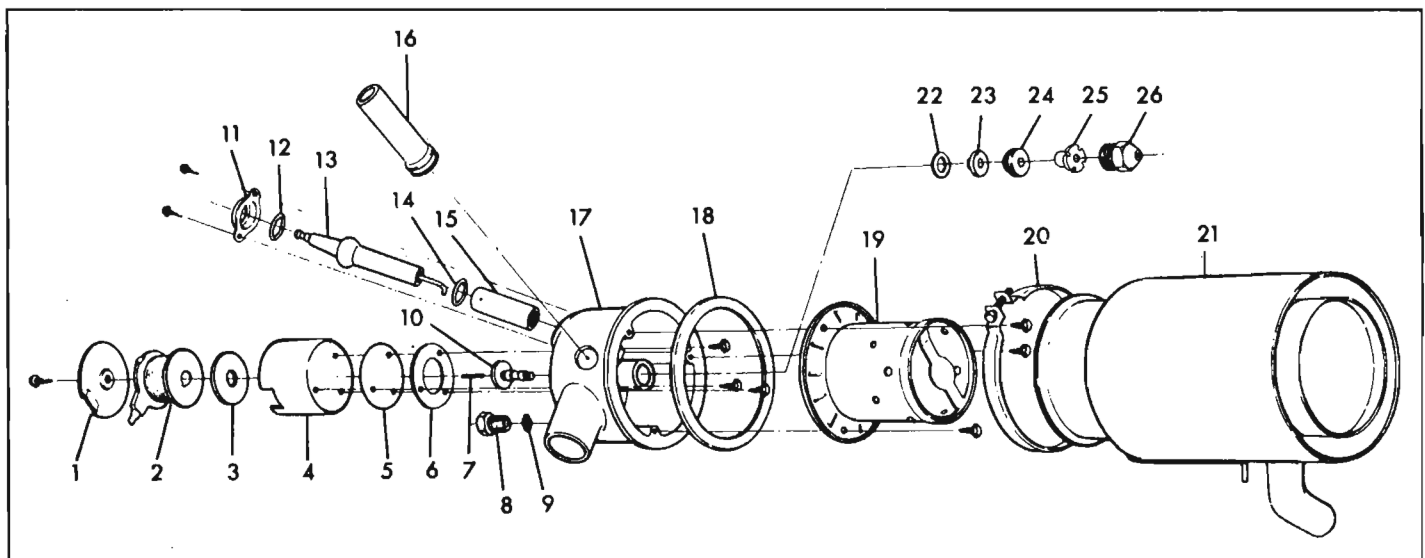


Fig. 11-21—Exploded View of Heat Exchanger, Burner and Fuel Solenoid

- | | | | | |
|-----------------------|-------------------------|-----------------------|--------------------|-----------------------|
| 1. Solenoid Cup Cover | 6. Solenoid Cup Gasket | 11. Retainer Cap | 16. Vent Tube | 21. Heat Exchanger |
| 2. Solenoid Coil | 7. Spring | 12. Spark Plug Washer | 17. Burner Housing | 22. Valve Seat Gasket |
| 3. Washer | 8. Connector | 13. Spark Plug | 18. Gasket | 23. Valve Seat |
| 4. Solenoid Cup | 9. Filter | 14. Spark Plug Washer | 19. Mixer Cup | 24. Valve Seat Screw |
| 5. Solenoid Cup Seal | 10. Burner (Fuel) Valve | 15. Spark Plug Sleeve | 20. Burner Clamp | 25. Spacer |
| | | | | 26. Burner Nozzle |

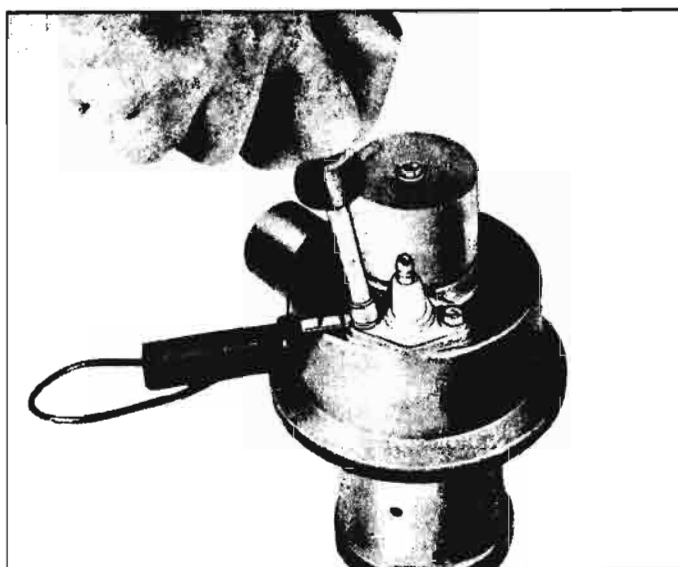


Fig. 11-22—Removing Spark Plug Retainer Cap Screws

- is in operation as well as odors of combustion in the car.
4. Tighten fuel line to burner housing inlet. Push ground wire and fuel solenoid wire through grommet and attach ground wire to heater case.
 5. Attach spark plug cable and combustion air hose.
 6. Install upper heater case on heater, making sure that rubber vent tube protrudes through upper heater case, and fasten three straps in place.
 7. Install screws holding heater case to ventilator blower and heater flange to fender.
 8. Attach five-way gang connector to upper heater case and secure with two screws.
 9. Connect green wire to 3-way connector at relay.
 10. Connect fuel solenoid, 3-way and five-way gang connectors.

SPARK PLUG REPLACEMENT

Refer to Figures 11-21, 11-22 and 11-23.

1. Remove burner from heater as indicated.

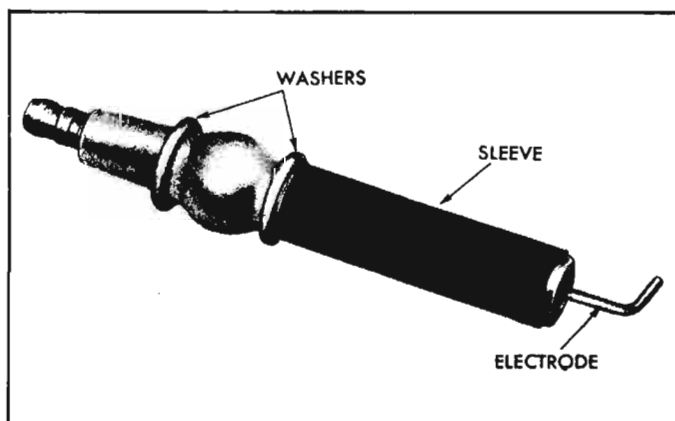


Fig. 11-23—Spark Plug and Related Parts

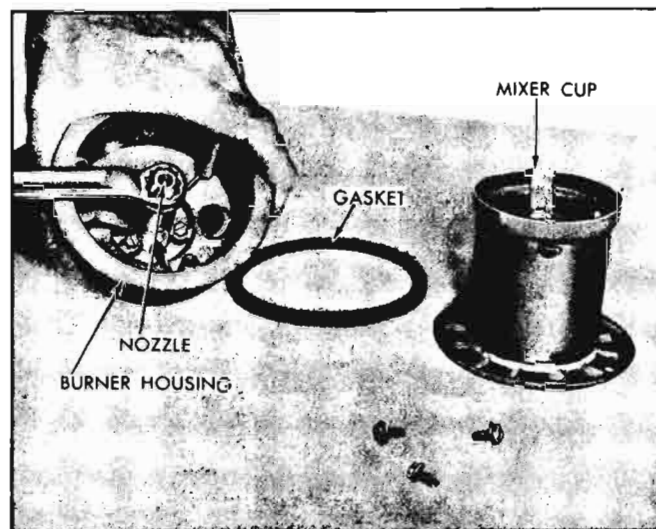


Fig. 11-24—Removing Burner Nozzle

2. Remove two screws holding the spark plug retainer cap in place and remove cap.
3. Remove spark plug and sleeve.
4. To install spark plug, assemble two washers and sleeve to plug and insert plug in housing. Spark plug and housing are notched so that the spark plug can only be installed in correct position.
5. Install retainer cap and secure with two screws.
6. Check gap between spark plug electrode and ground electrode as described in *Item G* under *Diagnosis Guide*.

NOZZLE REPLACEMENT

Refer to Figures 11-21 and 11-24.

1. Remove burner, louver plate and mixer cup assembly as outlined under *Burner Assembly*.
2. Remove fuel nozzle.
3. Install new fuel nozzle and tighten to 100 in. lbs. (approximately 8 ft. lbs.) torque.
4. Install louver plate and mixer cup assembly.

SOLENOID COIL REPLACEMENT

Refer to Figures 11-21 and 11-25.

1. Remove burner assembly as outlined under *Burner Assembly*.
2. Remove screw holding coil cover in place and remove cover.
3. Remove coil and washer.
4. Install new washer and coil.
5. Install coil cover and fasten with screw.

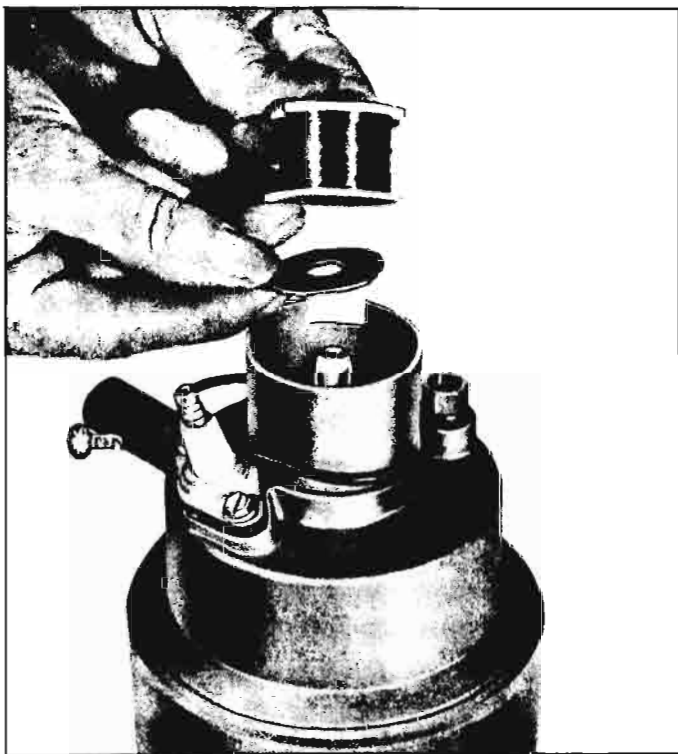


Fig. 11-25—Removing Fuel Solenoid Coil and Washer

HEAT EXCHANGER REPLACEMENT

Refer to Figure 11-20.

1. Remove burner assembly from heat exchanger (see *Burner Assembly*).
2. Remove screws securing exhaust pipe and fuel line shield and remove shield (see Figure 11-16).
3. Disconnect exhaust pipe and fuel line connections.
4. Remove two nuts holding ventilator blower case in place. These nuts are reached from the passenger compartment. One is located inside the air distributor and may be reached through the passenger compartment air distributor door and the other is located below the distributor on the dash panel.
5. Disconnect the drain hose from the heat exchanger drain pipe.
6. Tilt the lower heater case toward the front of the front compartment and remove the heat exchanger.
7. Place exhaust pipe gasket on new heat exchanger and install heat exchanger.
8. Attach two nuts holding blower case to dash panel.
9. Attach fuel line and exhaust pipe, being careful to obtain tight connections.
10. Attach drain hose to heat exchanger drain pipe.
11. Replace shield over exhaust pipe and fuel line.

12. Reassemble burner to heater case as outlined under *Burner Assembly*.

HEATER UNIT (COMPLETE)

The complete heater unit consists of the burner, heat exchanger, solenoid, case and fittings together with the ventilator blower assembly.

Removal and Installation

Refer to Figure 11-4.

1. Remove exhaust pipe shield.
2. Loosen exhaust pipe clamp.
3. Disconnect fuel line to heater assembly. Disconnect rubber hose leading to drain.
4. Disconnect combustion air hose from combustion blower and remove all clamps holding it against the body or holding black and white combustion blower wires to the hose.
5. Disconnect five-way gang connector on heater case and remove green wire from 3-way connector at relay.
6. Remove two screws holding upper heater case flange to fender sheet metal.
7. Remove two nuts holding ventilator blower case in place. These nuts are reached from the passenger compartment. One is located inside the distributor duct and may be reached through the passenger compartment distributor air valve (door) and the other is located below the distributor on the dash panel.
8. Lift heater unit and remove.
9. To install, reverse above procedure.

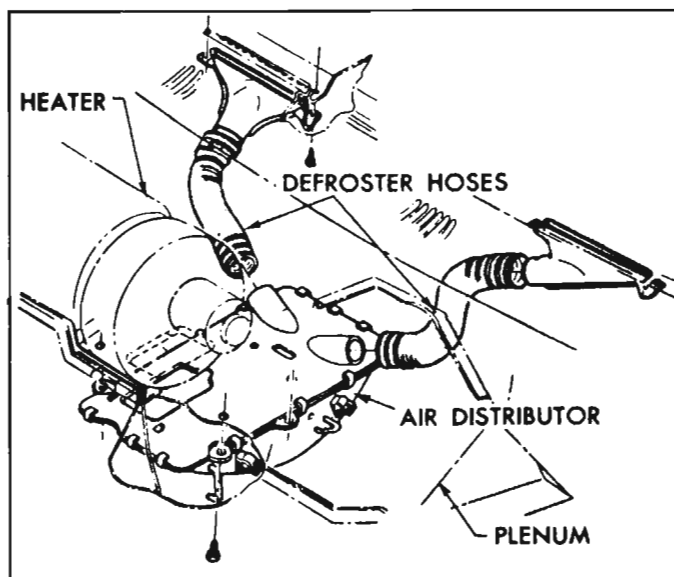


Fig. 11-26—Air Distributor Attachment

AIR DISTRIBUTOR CASE REPLACEMENT

Refer to Figures 11-26 and 11-27.

1. Disconnect control cables and conduits from air distributor.
2. Pull defroster hoses from nozzles on air distributor.
3. Remove air distributor mounting screws and lower the distributor away from dash panel.
4. Remove the thermostat and the heater control (fan) switch and install them on replacement air distributor case.
5. Align air distributor with mounting hole in dash panel and install mounting screws.
6. Slide defroster hoses onto nozzles on air distributor.
7. Connect control cables to levers, install clamp screws and adjust cables as outlined under *Control Adjustments* following.

CONTROLS

Refer to Figure 11-27.

Control Knob and Cable Replacement

1. Disconnect cable from lever at air distributor and remove conduit clamp screw at distributor.
2. Remove conduit clamp screw at control assembly and push knob and cable assembly out of the slot.
3. Insert knob in bottom of slot in control assembly and raise knob to top of slot.

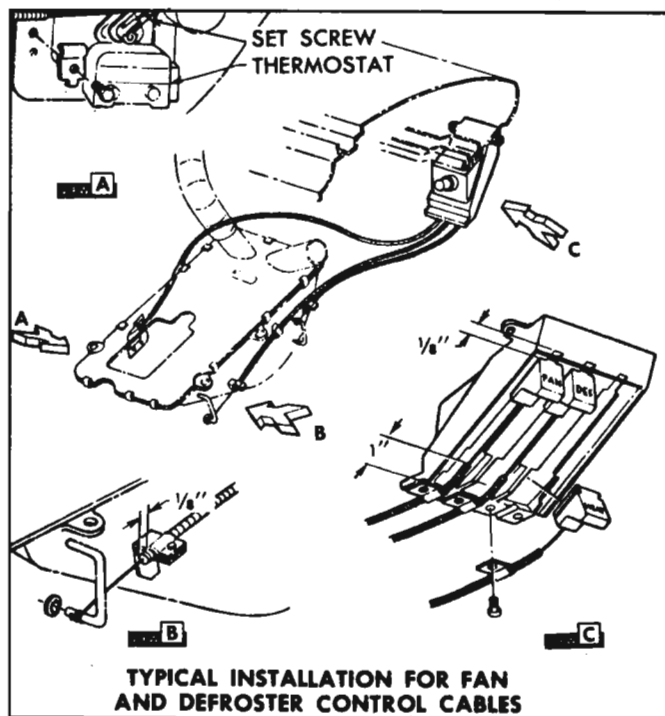


Fig. 11-27—Heater Controls

4. Install conduit clamp at bottom of control assembly and at air distributor, connect cable to lever and adjust as outlined under *Control Adjustments* following.

Control Assembly Replacement

Refer to Figures 11-27 and 11-28.

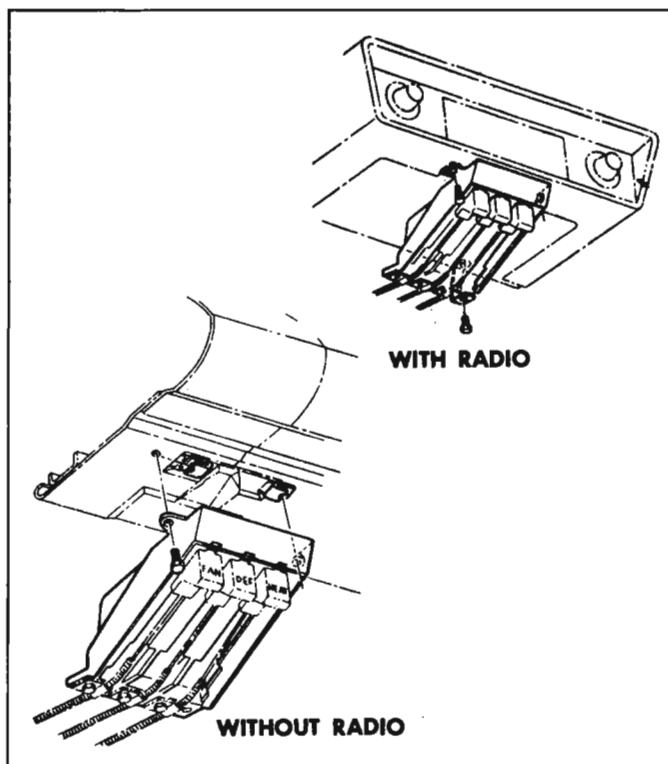


Fig. 11-28—Heater Control Assembly Attachment

1. Disconnect cables from levers at air distributor and remove conduit clamp screws at air distributor.
2. Remove light bulb.
3. Remove control assembly mounting screws at top of assembly and, where equipped with radio, the brace-to-conduit clamps screw at bottom of assembly, then pull the assembly rearward away from the brace.
4. Locate replacement assembly in mounting position and secure with screws.
5. Install light bulb.
6. Connect cables to levers, install conduit clamps at air distributor and adjust as outlined under *Control Adjustments* below.

Control Adjustments

- All bowden cables must be attached to proper control knobs.
- All bowden cable sheaths must be secured with clamps and screw at base of heater control assembly and at individual control points.

1. Move *Heat* control knob into *down* position within $\frac{1}{4}$ " of cable sheath. Control cable must be routed to thermostat. Cable must be attached to thermostat with thermostat lever in full clockwise direction. Cable may then be adjusted at heater control end to permit control knob to stop at extreme top of slot. Refer to Figures 11-27.
2. Move *Def* cable as required to reset *Def* control knob at top of control assembly when defrost diverter door in distribution duct is completely closed.
3. Move *Fan* cable as required to rest *Fan* control knob at top of control assembly when air distributor door to blower is completely closed.

SPECIFICATIONS

Refer to Section 12 for heater specifications.

SPECIAL TOOLS

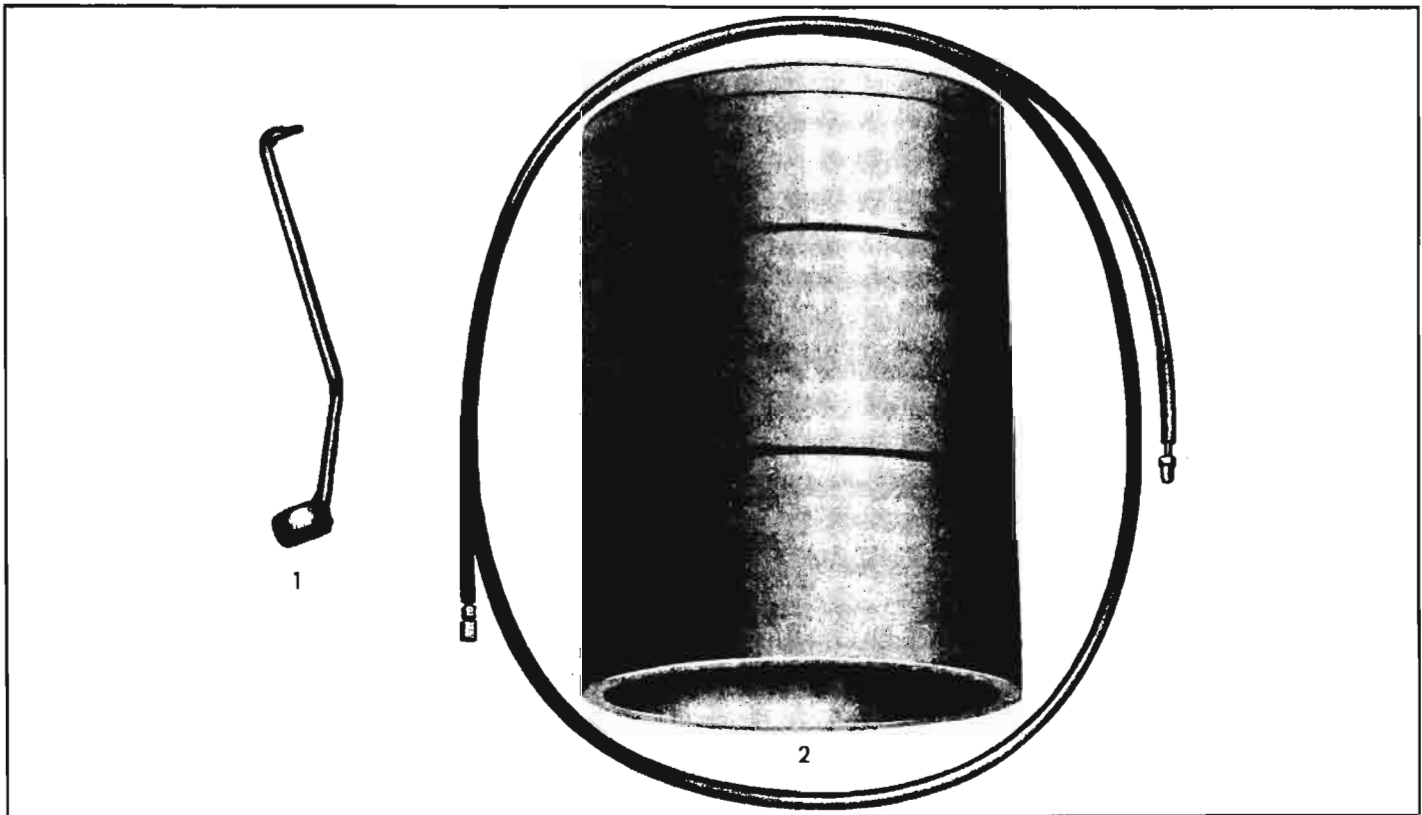


Fig. 11-29—Heater Special Tools

1. J-8368 Spark Plug Gauge

2. J-8367 Nozzle Spray Pattern Checking Gauge

GASOLINE HEATER—1200 SERIES

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GENERAL DESCRIPTION

In general theory and operation, the Corvair 95 gasoline heater is the same as that in the 500, 700 and 900 Corvair styles. Obvious design differences in the Corvair 95 make necessary an extremely compact heater unit. All heater components, mounted in the luggage compartment in the other styles, are contained

in a housing attached to the dash panel at the right hand side of the passenger compartment. The hot air distributor, attached to the bottom of the housing, routes air to the passenger compartment as well as to the defroster outlets. Figure 11-30 illustrates the general location of all components.

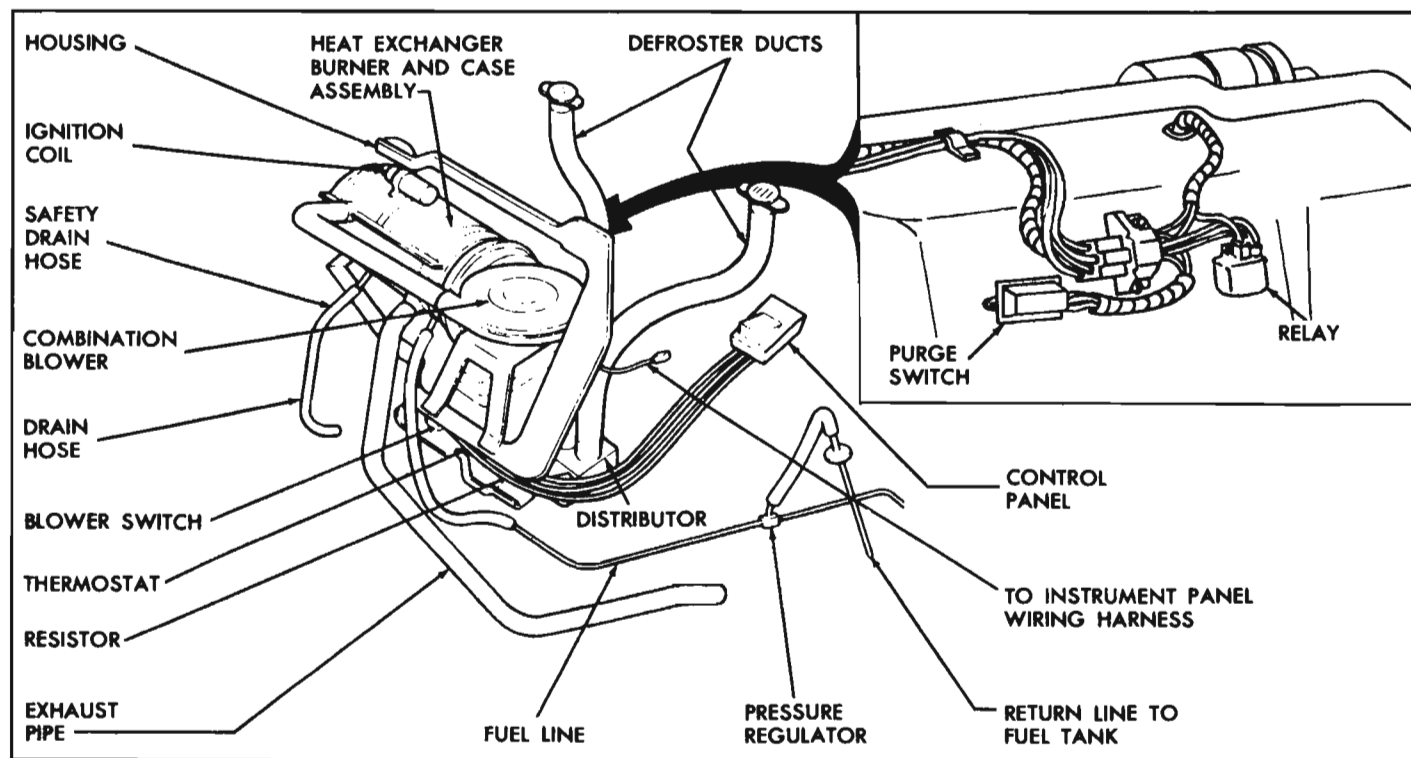


Fig. 11-30—Corvair 95 Gasoline Heater Components

SERVICE OPERATIONS

Service procedures for the various components of the Corvair 95 heater remain as previously outlined for

the Corvair heater. Therefore, only removal and disassembly procedures will be covered here.

HEATER, HOUSING AND DISTRIBUTOR ASSEMBLY

Removal (See Fig. 11-31 and 11-33)

1. Remove the cowl air inlet grille and the right headlamp assembly. (See Section 10—Body.)
2. Through the headlamp opening, disconnect the safety drain hose from the heater assembly.
3. Loosen the clip securing the fuel line to the heater assembly and remove the line.
4. Loosen the clamp attaching the exhaust pipe to the heater assembly and remove the exhaust pipe bracket screw at the right hand frame side member. Drop the exhaust pipe out of the way.
5. Remove the headlamp wiring harness from the clip on the combustion blower bracket. This harness may hang through the cowl air inlet opening until reinstalled.
6. Remove the glove box. (See Section 10—Body.)
7. Unplug the heater harness wires (dark green and dark blue) from the connector on the instrument panel harness.
8. Through the cowl air inlet opening, remove the four heater cover stud nuts from studs "A" in Figure 11-33.
9. Remove the heater control from the dash, the vent control knob and cable from housing and the defroster hoses from the distributor.
10. Remove the screws attaching the heater housing

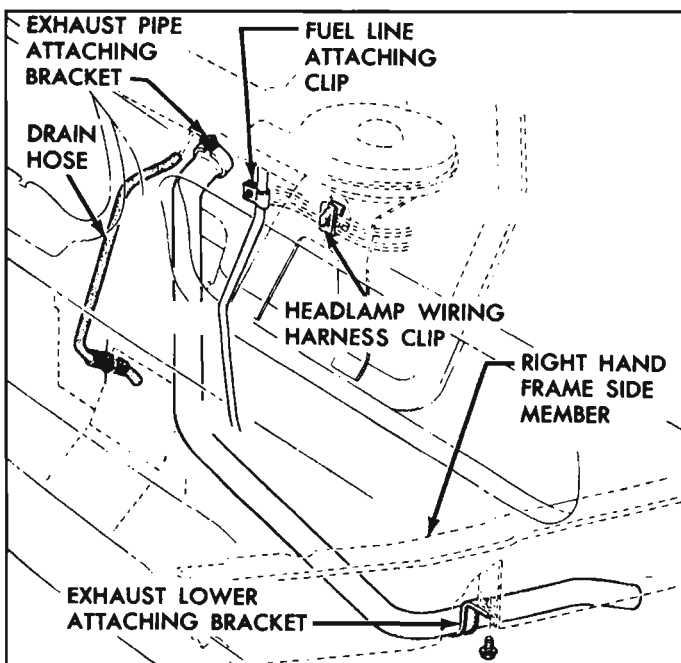


Fig. 11-31—Exhaust, Drain and Fuel Lines

- assembly to the passenger side of the dash panel.
11. Remove the entire unit from the vehicle.

Installation

1. Place unit in vehicle and install screws mounting housing to dash panel.
2. Reinstall four stud nuts through the cowl air inlet opening.
3. Install all wires, hoses and pipes.
4. Replace right hand headlamp assembly and cowl air inlet grille.

DISTRIBUTOR, THERMOSTAT, HEATER CONTROL SWITCH AND RESISTOR

1. Remove the heater control assembly from the instrument panel.
2. Remove the defroster hoses.
3. Remove the three screws (fig. 11-32) attaching the distributor to the housing.
4. The distributor and control unit may now be removed as a unit.
5. Remove control cables and wiring connectors as required.
6. The thermostat, heater control switch and resistor may now be removed and replaced as necessary.

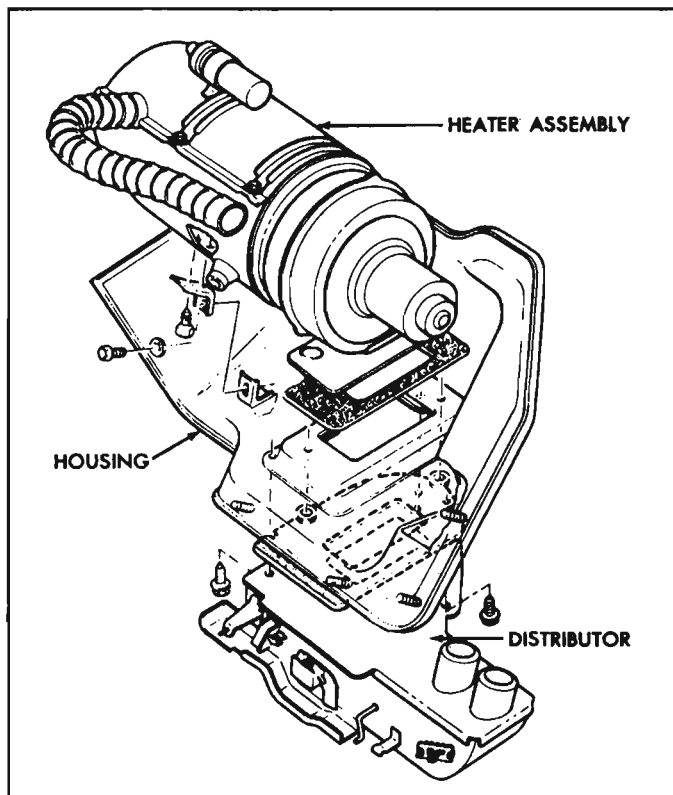


Fig. 11-32—Distributor and Heater Assembly Removal

Installation

1. Replace wiring connectors, control cables and defroster hoses.
2. Attach distributor to housing.
3. Replace heater control assembly.

HEATER ASSEMBLY

Removal (fig. 11-32)

With the housing assembly removed from the vehicle and the distributor removed from the housing, proceed as follows:

1. Disconnect all wiring connectors from the heater assembly.
2. Remove the nuts (exposed when the distributor is removed) from the heater blower studs and the screw from the heater support bracket.
3. Disconnect the hose from the combustion blower.
4. Lift the heater assembly from the housing and service assembly as previously recommended for 500, 700 and 900 style assembly.

Installation

1. Set assembly into position and replace stud nuts and support bracket screw.
2. Replace the combustion blower hose and all wiring connectors.

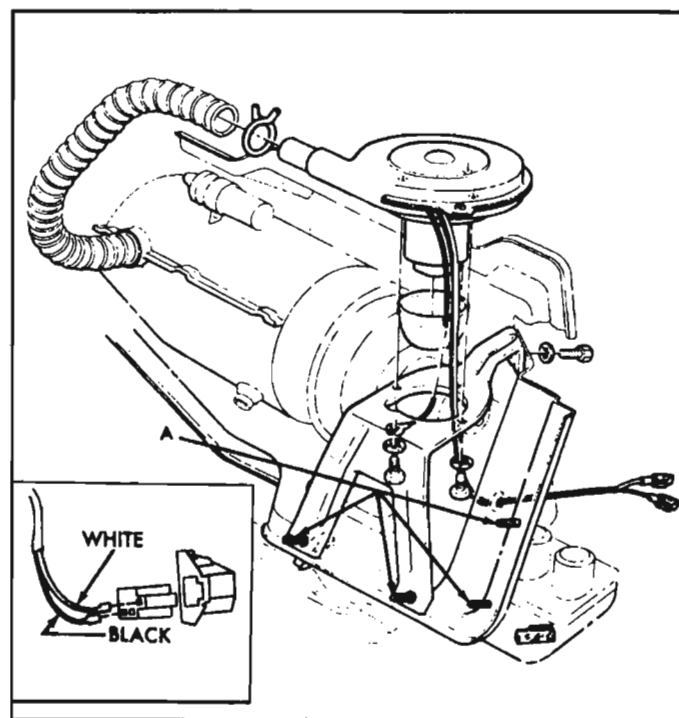


Fig. 11-33—Combustion Blower Removal

COMBUSTION BLOWER

Removal (fig. 11-33)

With the housing assembly removed from the vehicle, proceed as follows:

1. Remove black and white wires from the multiple connector mounted on the heater housing between the relay and the purge switch.

CAUTION: Take special note of the wire locations in the connector. They must be replaced in the same location when reinstalled.

2. If not previously removed, remove the hose at the combustion blower.
3. Remove the bolt attaching the upper end of the combustion blower bracket to the housing and remove the bracket and blower, pulling the black and white wires through the grommet in the housing.
4. Remove the four screws attaching the blower to the bracket.

Installation

1. Install the blower and ground wire to the bracket.
2. Set bracket into place over housing studs and replace the upper bracket to housing attaching screw.
3. Thread black and white wires through grommet in housing and reinstall in proper holes in connector. (See Figure 11-33.)

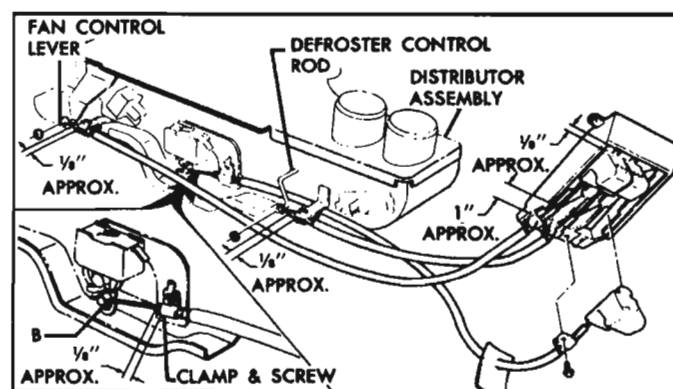


Fig. 11-34—Control Cable Adjustment

CONTROL CABLES

Adjust the control cables as shown in Figure 11-34. Defroster and fan control levers are adjusted by loosening the clamps and repositioning the cables. Adjust the thermostat control cable by means of the sleeve and set screw shown at B, Figure 11-34. Move the thermostat lever fully forward (with the control lever in OFF position) before tightening the set screw.

DIRECT AIR HEATER 500, 700 AND 900 SERIES

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GENERAL DESCRIPTION

The Direct Air Heater, utilizing the engine heat rejection principle, is a completely new heater for use in the 1961 Chevrolet Corvair. Extremely fast and even heating is provided through the four heat outlets spaced around the perimeter of the passenger compartment. The system also includes defroster outlets at the windshield. In operation, the system makes use of engine cooling air which would normally be ducted

out the rear of the engine after performing its cooling function. This air is instead routed through two flexible tubes and into the heater housing. The housing contains deflector doors necessary for temperature control and shutting off the air flow to the passenger compartment when desired. When the heated air reaches the housing, it is mixed with cooler air drawn from the upper engine shroud.

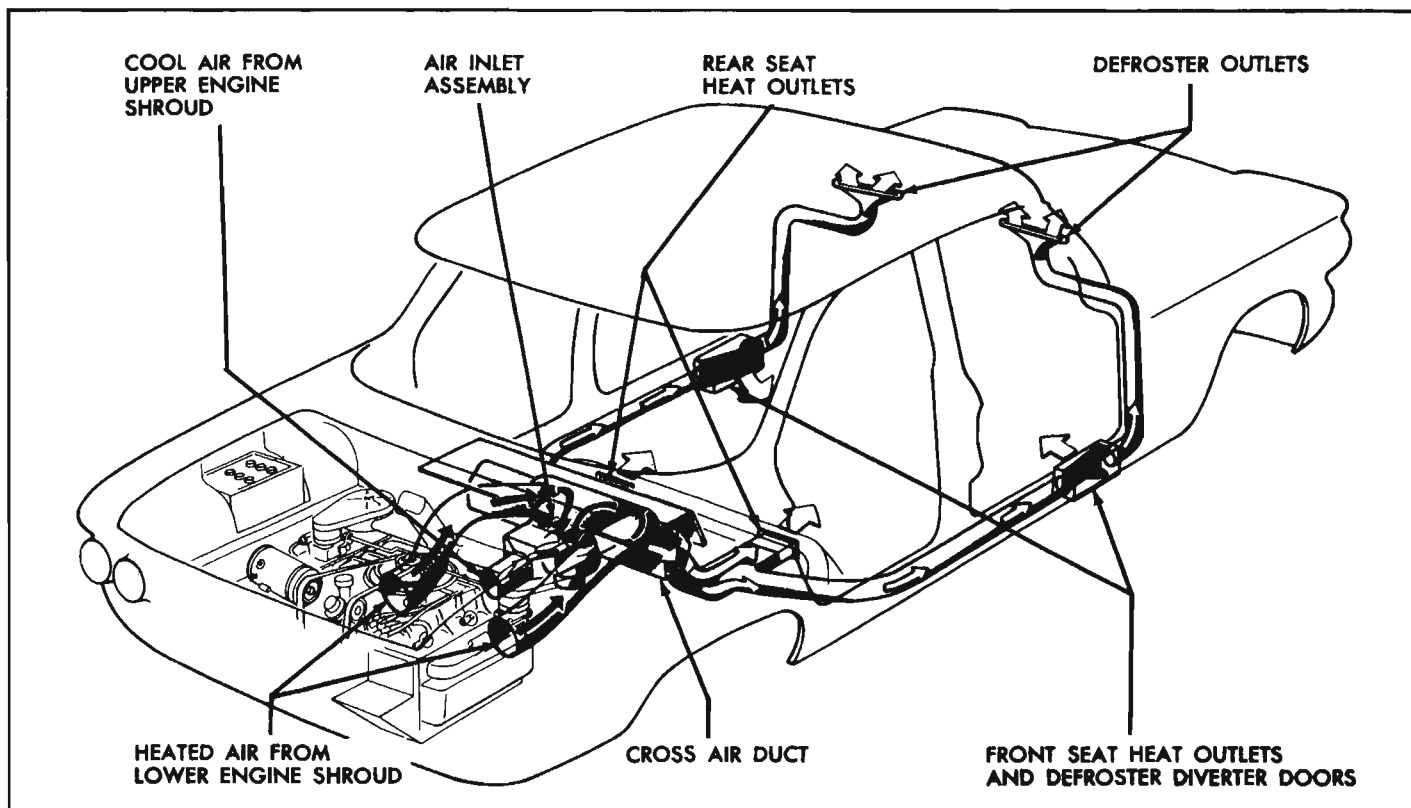


Fig. 11-35—Direct Air Heater Air Flow

NOTE: The cooler, tempering, air will maintain a temperature of about 110°F. during normal vehicle operation while the heated air entering the heater housing may reach 160°F.

The tempered air then flows through the cross air duct, into the rear seat air outlets and then through air ducts in the rocker panel to the front passenger compartment air outlets located in the side panels below the front doors. When defroster operation is necessary, diverter doors in the front seat air outlets divert the air flow to defroster outlets. Figure 11-35 illustrates the air flow through the various components.

HEATER ODORS

Because of the inherent characteristics of the heater, objectionable fumes in the engine compartment may be drawn into the passenger compartment and result in owner complaints. These complaints can be reduced in number by cautioning the owner on the importance

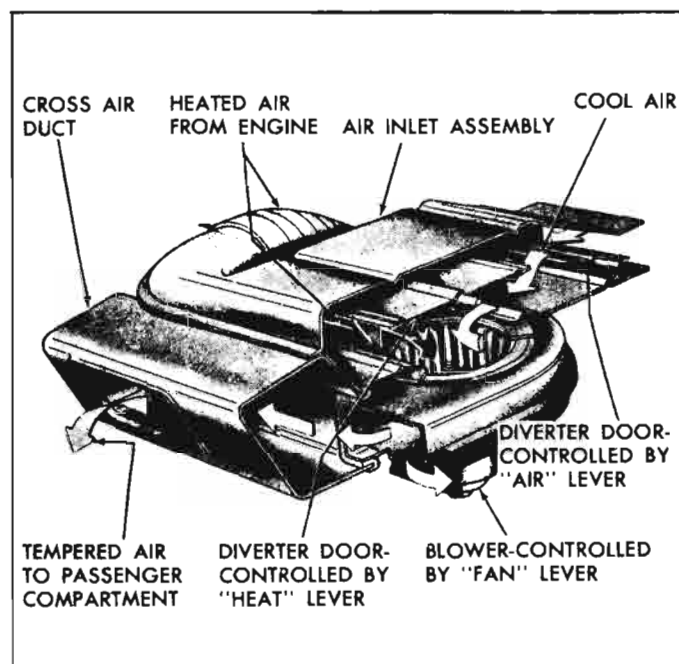


Fig. 11-36—Heater Housing and Cross Air Duct

of maintaining a clean engine. Oil spilled or dripped on the engine shrouding may result in some passenger discomfort, and care should be taken to see that such drips and spills are thoroughly cleaned up immediately. However, complaints of objectionable odors in the passenger compartment, whether the heater is on or off, should be traced immediately and promptly corrected. Procedures and possible locations to check for faulty engine gaskets or seals are covered under "Maintenance and Adjustments" of Section 6A.

CONTROLS

The Direct Air Heater is controlled by means of a four-lever control panel mounted beneath the dash and to the right of the steering column. These levers and their operations are as follows:

Fan—At the top of the control panel, the horizontally operating fan lever controls the three-speed blower motor.

Heat and Air—These levers control, through diverter doors in the inlet assembly, the proportion of heated and cooler air entering the mixing chamber of the inlet assembly. By operating these levers in conjunction, an unlimited number of settings is possible, allowing choice of 100% heated air, or any desired proportion and temperature of tempered air. During constant high speed driving, air flow through the heater may be reduced by turning off the blower and closing down the AIR and HEAT door to obtain the desired air flow.

Def—The defrost lever in its "up" position allows heated air to flow into the front passenger compartment. In the "down" position, deflector doors shut off the air flow to the passenger compartment and allow it to continue along the heater ductwork to the defroster nozzles. With this lever only partly "down," the air flow may be directed partially to the defrosters while the remainder of the air flow will continue to flow into the passenger compartment.

Air-Off Positions—When it is desired to completely turn off the Direct Air Heater, the FAN should be in the "off" position and the HEAT and AIR levers should be in the "up" position.

SERVICE OPERATIONS

BLOWER

Removal

1. With the car on a hoist, remove the blower motor wire at the connector.
2. Remove the blower mounting plate screws attaching the blower to the housing.
3. Work the motor and mounting plate down through

the rear suspension and the exhaust pipe assembly.

Installation

1. Remove the blower drum from the old blower motor and replace on the new blower.
2. Work the blower up into place in the housing and install the attaching screws.
3. Plug in the wiring connector.

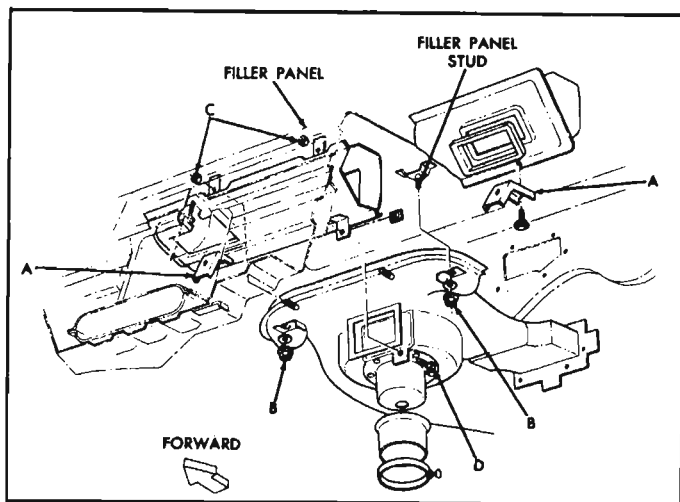


Fig. 11-37—Housing, Cross Air Duct and Blower Removal

HEATER HOUSING

Normally the only disassembly procedure necessary on the direct air heater will be replacement of a malfunctioning blower motor. Removal of the air inlet assembly should be unnecessary unless the diverter doors are bent or inoperative, resulting in warm air entering the passenger compartment even with the controls in the "OFF" position. This condition is unlikely to be encountered except in collision damage.

Removal

1. Remove engine as outlined in Section 8.
2. Remove four screws (fig. 11-38) attaching the cold air inlet assembly to the fire wall within the engine compartment.
3. Push the rubber adapter through the hole in the fire wall.
4. Disconnect the blower wire and control cables from heater housing (see fig. 11-39).
5. Remove two angle brackets (A, fig. 11-37) from the cross air duct and underbody.

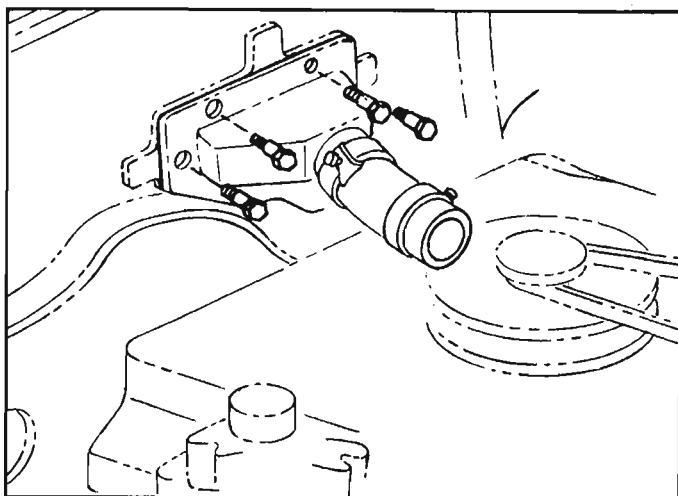


Fig. 11-38—Cold Air Inlet Assembly

6. Remove nuts (B, fig. 11-37) from studs on package shelf, one on either side of the blower motor.
7. Swing the rear of the heater housing down and work the cross air duct rearward over the rear suspension attachment pads.

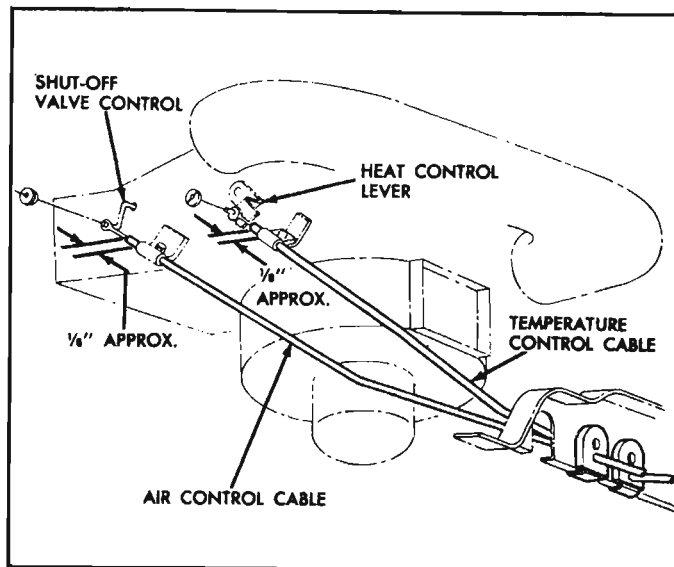


Fig. 11-39—Control Cable Attachment

Inspection

While the heater housing is removed from the vehicle, inspect the seals at the air entry ports into the passenger compartment. If the seals are damaged or excessively worn, they must be replaced.

If the diverter doors are damaged beyond repair, it will be necessary to install an entirely new housing assembly. When replacing the housing assembly, the blower may be removed from the old housing and installed on the new housing. If the cross air duct is undamaged, it may be removed from the old housing and installed on the new one.

Installation

1. Guide the housing and cross air duct over the rear suspension attachment pads being sure that the air ducts into the passenger compartment are properly positioned on the air openings on the cross air duct.
2. Loosely assemble nuts (B, fig. 11-37) on the studs on the package shelf to support the heater assembly.
3. Reinstall angle brackets (A, fig. 11-37) to the underbody and the cross air duct.
4. Tighten nuts (A) which were installed in step one.
5. Reinstall the four screws attaching the cold air inlet assembly to the fire wall within the engine compartment.
6. Install control cables and check their operation. With the cables properly adjusted, see Figure 11-39, a "cushion" will be felt at the end of the travel

of the AIR and HEAT levers on the heater control assembly.

AIR INLET ASSEMBLY

Replacement

1. With the heater housing removed from the vehicle, remove the two stud nuts (C, fig. 11-37) and single screw (D, fig. 11-37) attaching the cross air duct to the air inlet assembly.
2. Remove the hot air hoses and blower from the air inlet assembly and reinstall on the new air inlet assembly.
3. Reinstall the cross air duct on the new air inlet assembly.

4. Install the entire heater housing in the vehicle.

CONTROL CABLES

Control cables used on the Direct Air Heater are peculiar to this system only and should not be replaced with ordinary control cable such as used on hot water heaters and air conditioning systems.

The control cables adjustment procedures are the same as used on other Chevrolet Heaters as well as Air Conditioning Systems and air vent controls, and it is felt that servicemen are sufficiently versed in the adjustment that it will not be covered here. Figure 11-39 illustrates cable adjustments dimensions.

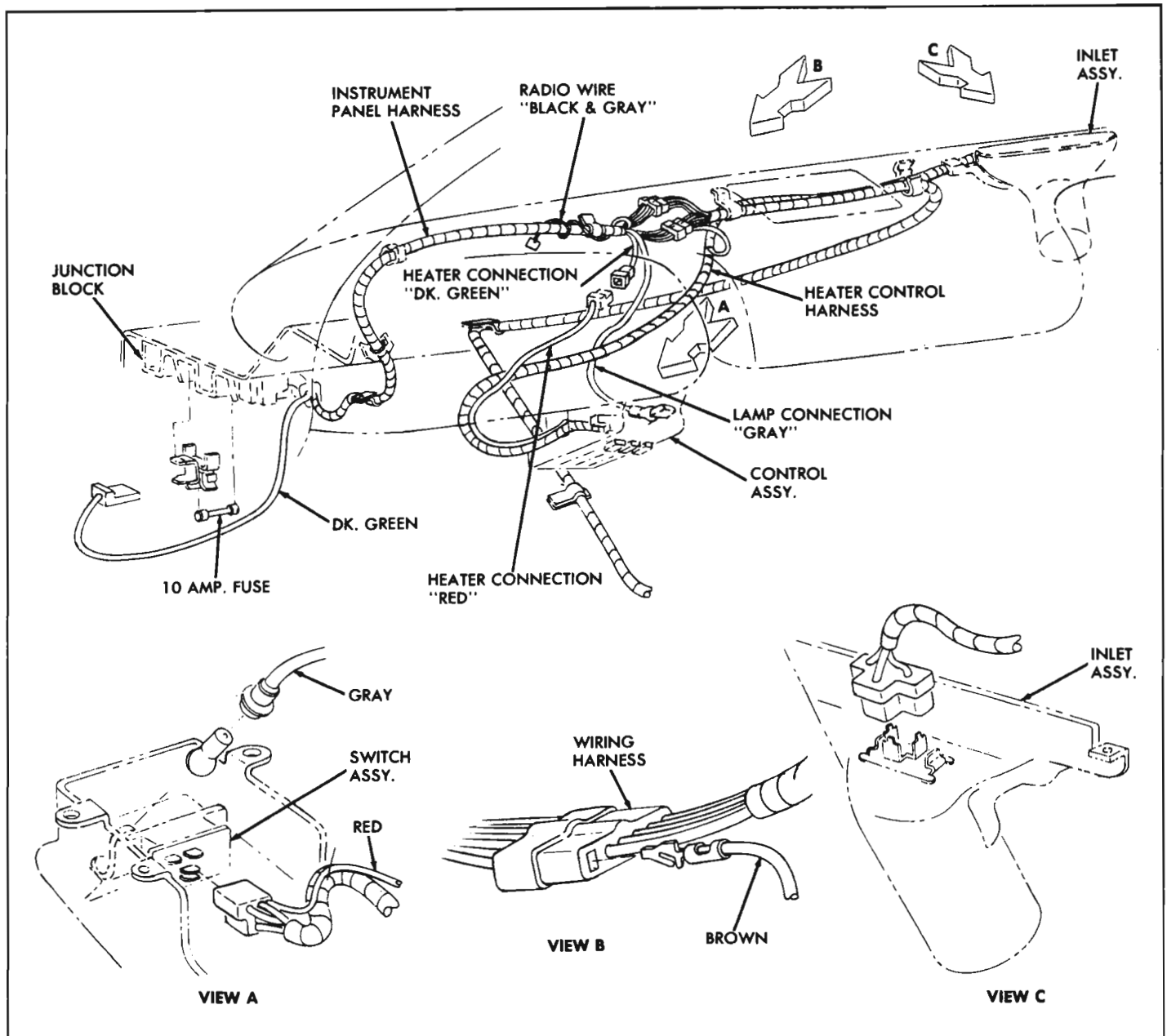


Fig. 11-40—Heater Wiring

DIRECT AIR HEATER—1200 SERIES

GENERAL DESCRIPTION

The Direct Air Heater as installed in the Corvair 95 is basically the same unit as previously described in the preceding service information on the Corvair Sedan styles. The main differences occur in the body air passages and in the procedure for removing the air inlet assembly. Figure 11-41 illustrates the components of the system including the single air passage from the rear of the vehicle to the front through which the heated air is routed. The single passage replaces the two ducts in the rocker panels in sedan styles. Figure 11-42 illustrates the removal procedure for the air inlet assembly. Notice that the cross air duct, which in the sedan styles is included as a part of the heater

housing, is installed in the Corvair 95 as part of the heater body duct. The air inlet assembly may be removed from within the vehicle without the necessity for first dropping the engine assembly. An access panel is provided above the heater for this purpose. Heated air enters the passenger compartment just below the rear seat, below the front seat, and through the defroster ducts. The same precautions are necessary pertaining to maintaining a clean engine as have previously been stated for the sedan styles. Any odor of objectionable fumes in the passenger compartment should be traced immediately and any defect corrected (see "Maintenance and Adjustments" in Section 6A).

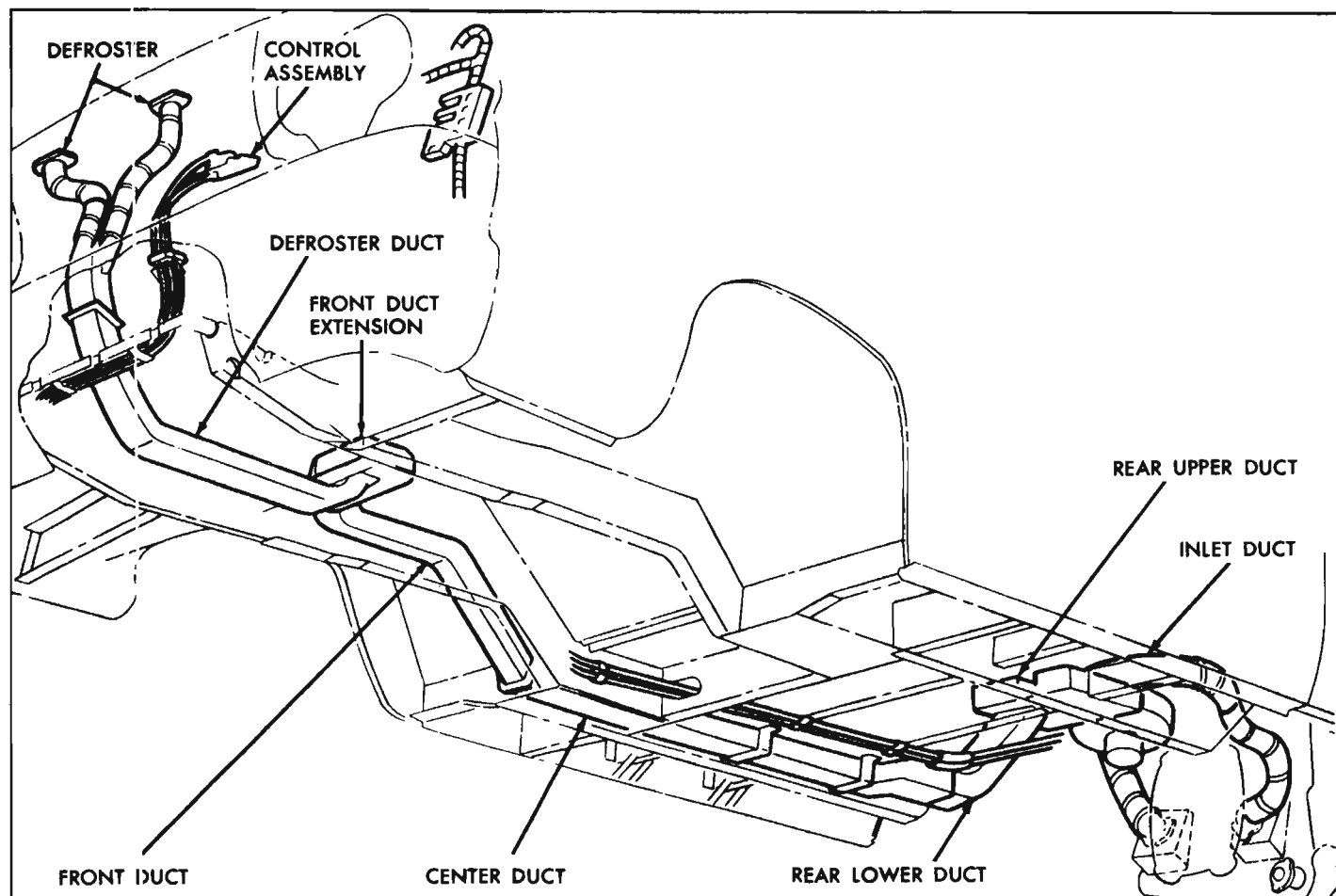


Fig. 11-41—Corvair 95 Direct Air Heater Components

SERVICE OPERATIONS

Service information previously given for sedan styles will apply as well to the heater components of the Corvair 95 style with the following exceptions.

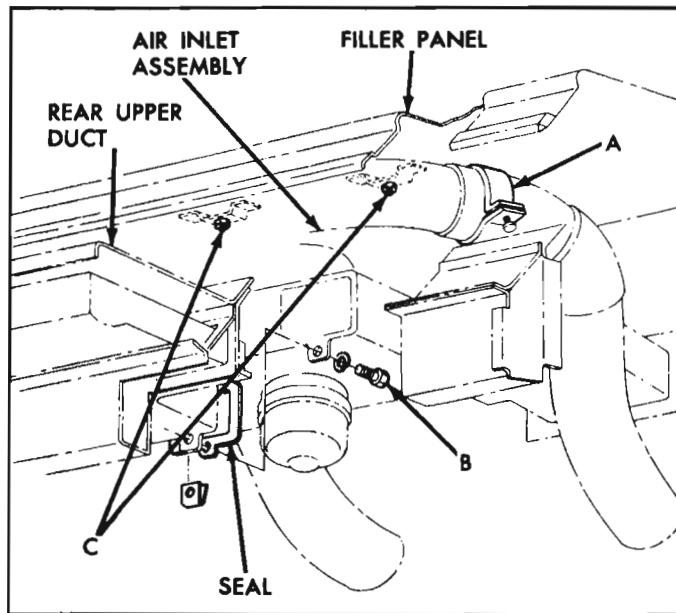


Fig. 11-42—Heater Housing Assembly Removal

HEATER HOUSING ASSEMBLY

Removal

1. Unplug the blower motor wiring connector and remove the control cables from the housing assembly.
2. Loosen the clamp (A, fig. 11-42) attaching the air hoses from the engine to the housing assembly and remove that end of the hoses from the assembly.
3. Remove screw B, Figure 11-42, attaching the housing assembly to the rear upper duct.
4. Remove the engine access panel.
5. Within the engine compartment, remove the four screws attaching the cold air inlet assembly to the fire wall and force the rubber boot through the opening in the fire wall.
6. From within the vehicle, remove the screws attaching the filler panel to the floor pan.
7. Carefully remove the filler assembly and housing assembly from the vehicle.
8. Place the entire unit on a covered bench and separate the inlet assembly from the filler panel by removing nuts C, Figures 11-42 and 11-43, from the filler panel studs.

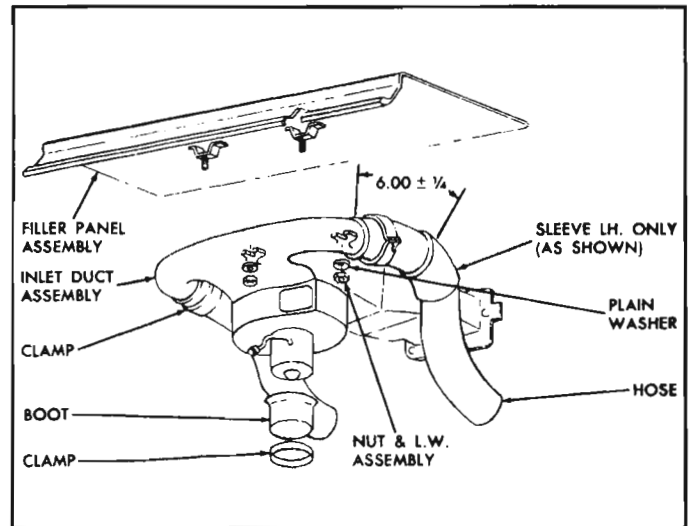


Fig. 11-43—Heater Housing—Filler Panel Attachment

Inspection

The air inlet assembly may be inspected for damage. The condition of the diverter doors is of special importance. If these doors are inoperative or bent out of shape, it will be necessary to replace the entire air inlet assembly.

The blower motor should be removed from the air inlet assembly being replaced and reinstalled on the new assembly.

Installation

1. With the filler panel lying on the protected bench, set the inlet assembly in place on the studs and loosely install the nuts and lock washers.
2. Carefully lower the filler panel and inlet assembly into place and install the filler panel attaching screws. Be sure the filler panel seal is properly positioned.
3. Force the rubber seal at the rear end of the air inlet assembly through the hole in the fire wall and reinstall the cool air inlet duct and four attaching screws.
4. At the front of the air inlet assembly, replace the inlet assembly to rear upper duct attaching screw B, Figure 11-42.
5. Tighten nuts C, Figures 11-42 and 11-43.
6. Replace the hot air hoses and tighten the attaching clamps.
7. Replace the control cables as shown in Figure 11-39 and plug in the blower wiring connector.

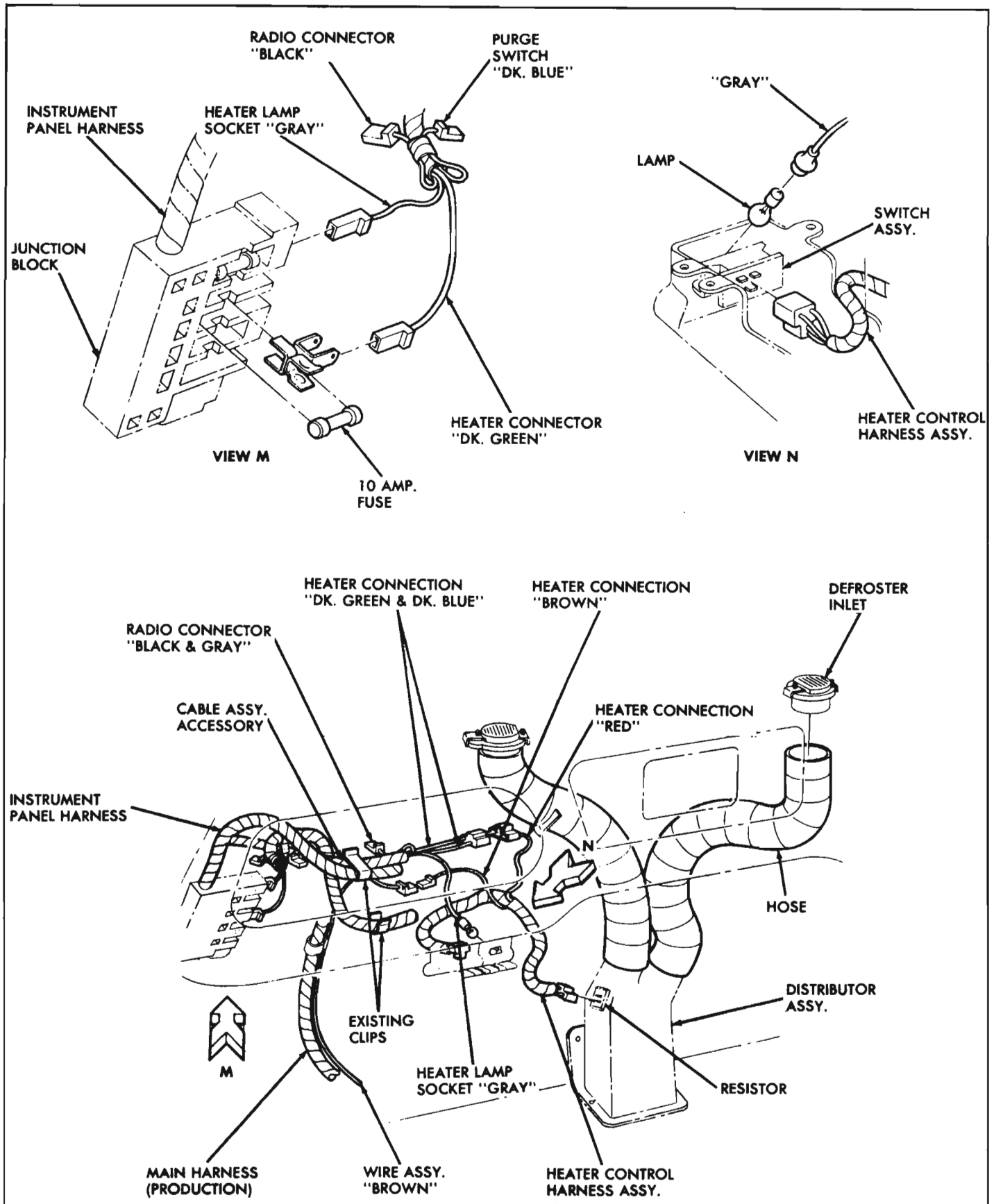


Fig. 11-44—Corvair 95 Direct Air Heater Wiring

INSTRUMENT PANEL COVER 500, 700 AND 900 SERIES

The instrument panel cover, or padded dash, is the same in all 500, 700 and 900 Series Corvairs. The following procedure covers removal and installation procedures for all component parts of the assembly.

INSTRUMENT PANEL COVER ASSEMBLY

Removal

1. Place protective coverings over front seat assembly.
2. Prior to removing instrument panel cover, remove the following hardware items:
 - a. Windshield lower side and center garnish mouldings.
 - b. Radio speaker opening finishing moulding.
 - c. Ash tray assembly.
 - d. Instrument center panel (at instrument cluster area.)
 - e. Instrument panel finishing moulding.
 - f. Instrument panel cover retainer moulding.
3. Carefully detach cemented areas of cover assembly shown in Figure 11-45 from instrument panel and remove cover.

CAUTION: The preformed, one piece instrument panel cover is subject to permanent damage if the following precautions are not observed.

- a. Handle with care. Bending or distortion causes permanent damage.
- b. Keep clean and free from cement.

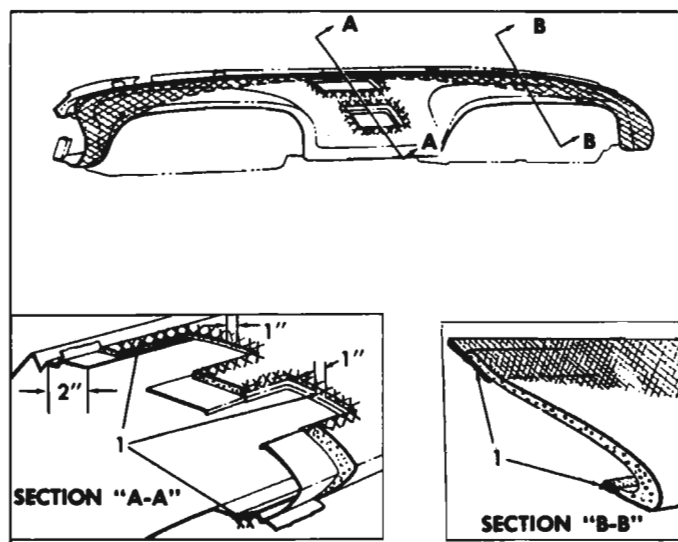


Fig. 11-45—Instrument Panel Cover

Installation

1. Clean off cementing surface of instrument panel.
2. Apply a thin coat of an approved neoprene-type weatherstrip adhesive to cementing surfaces of instrument panel cover, corresponding to areas indicated by "1" in Figure 11-45.

NOTE: The cementing area along forward edge of the cover increases from 2" at the forward edge of radio speaker grille opening at center-line of cover to 6" at outboard ends of cover. At radio speaker grille and ash tray cut-outs, a 1" wide area of cement is to be applied.

3. Apply a heavy coat of an approved neoprene-type weatherstrip adhesive to corresponding surfaces of instrument panel (See Figure 11-45).
4. Immediately following application of adhesive, carefully position cover along rear edge of instrument panel making certain cut-outs in cover line up with openings in instrument panel; then firmly and evenly press cover to instrument panel along rear edge of cover, around ash tray opening and along forward edge of cover.

CAUTION: This adhesive is fast drying, therefore, perform this operation quickly while the adhesive is still wet.

5. If necessary, trim cover at finishing and retaining mouldings.
6. Remove rubber seal from instrument center panel, if present; then install all previously removed parts and remove protective covering.

INSTRUMENT PANEL COVER RETAINER MOLDING

Removal and Installation

1. Remove screws securing moulding and remove moulding.
2. To install, reverse removal procedure.

INSTRUMENT PANEL RADIO SPEAKER OPENING FINISH MOLDING

Removal and Installation

1. From underside of instrument panel remove nuts securing moulding and remove moulding.
2. To install, reverse removal procedure.