GROUP 3

ENGINE FUEL AND EXHAUST SYSTEMS

SECTIONS IN GROUP 3

SECTION 3-A

SPECIFICATIONS AND GENERAL DESCRIPTION

CONTENTS OF SECTION 3-A

3-1 SPECIFICATIONS, FUEL AND EXHAUST SYSTEMS

a. General Specifications

Gasoline, Grade Required (with Standard Le Sabre Engine)	Regular
Gasoline, Grade Required (Other Engines)	Premium
Gasoline Tank Capacity (gal.)	20
Gasoline Gauge, Make and Type	A.C., Electric
Fuel Pump—Make and Type	A.C., HE
Drive	Eccentric at Camshaft Sprocket
Fuel Pump Pressure—	
At Pump Outlet, pounds	5 1/4 to 7
At Carburetor Inlet, pounds	4 3/4 to 6 1/2
Fuel Filter, Near Carburetor Inlet	A.C., Glass Bowl
Fuel Filter, In Gas Tank	Woven Plastic
Carburetor, Make	Carter or Rochester
Type	Downdraft
Barrels	2 and 4
Air Cleaner, Make and Type	A.C., Plastic Foam Element
Intake Manifold Heat Control	Valve and Thermostat
Heat Source	Exhaust Gas
Thermostat Wind-Up @ 70 Degrees F., Valve Closed	1/2 Turn
Idle Speed, in Neutral or Park	
Regular	525 RPM
Air Conditioned	575 RPM

b. Carter Carburetor Calibrations

IMPORTANT: Calibrations are governed by the CODE number.

Items	Series 4400-4600-4800
Model Designation	AFB
Number of Barrels	4
Code Number, for Following Calibrations	3279S
Bore Diameter, Primary	1 9/16"
Large Venturi Diameter, Primary	1 3/16"
Bore Diameter, Secondary	1 11/16"
Large Venturi Diameter, Secondary	1 9/16"
Float Level Adjustment	7/32"
Float Drop Adjustment	3/4"
Float Needle Seat	#38
Low Speed Jet	#66
Idle Discharge Port	.200" x .030"
Lower Idle Port	#52
Metering Jet, Primary	120-256
Metering Jet, Secondary	
Production	120-158
High Altitude	120-194
Metering Rod	
Production	16-167
High Altitude	16-189
NOTE: Use High Altitude Kit Above 3500 Feet	
Use Kit Consisting of Secondary Jets, Primary Rods and Springs.	
Throttle Bore Vents	#42
Anti-Percolator or Main Bleed Hole	#64
Pump Setting at Closed Throttle	7/16"
Pump Discharge Jet	#70
Vacuum Spark Control Port	.130" x .040"
Choke Coil Housing Number	170AC478S
Choke Thermostat Setting	Index
Choke Suction Hole	#40
Choke Piston Setting (with .026" Wire)	.101"
Closing Shoe Clearance	.020"
F. I. Cam Setting, Choke Closed	Index
Unloader Opening at Choke Valve Edge	3/16"
Initial Idle Speed	3/4 Turn In
Initial Idle Mixture	3/4 Turn Out
Fast Idle Speed (Hot, on Low Step)	625 RPM
Slow Idle Speed (Hot)	525 RPM
Slow Idle Speed (Hot, with Air Conditioning)	575 RPM

c. Rochester Carburetor Calibrations

IMPORTANT: Calibrations are governed by the CODE number on the attached code tag.

Items	Series 4400 Standard Engine		Series 4600-4800 4400 Power Pack	
Model Designation	2GC		4GC	
Number of Barrels	2		4	
Code Number, for Following Calibrations	7020046	Primary	7020040	Secondary
Throttle Bore	1 11/16"	1 9/16"		1 11/16"
Small Venturi	1/8"	1/4"		1/4"
Large Venturi	1 1/4"	1 1/8"		1 15/32"
Main Metering Jets				
Production	.060"-60°	.052"-60°		.074"-60°
High Altitude	.058"-60°	.048"-60°		.073"-60°
NOTE: Use High Altitude Kit Above 3500 Feet.				
Idle Tube Restriction	#69	#70		#69
Idle Needle Hole	#71		#60	
1st Idle Hole	#66		2-#67	
2nd Idle Hole	2-#65		#66	
3rd Idle Hole			#66	

c. Rochester Carburetor Calibrations (Continued)

Items		
Spark Hole	2-#55	#46
Pump Discharge Hole	#67	#71
Choke Restriction	#44	#46
Choke Setting	Index	Index
Choke Coil Number	12	32
Float Level Adjustment	11/16" to seam	.140"
Float Drop Adjustment	1 29/32"	1 7/16"
Secondary Float Level Adjustment		1 3/8"
Secondary Float Toe Adjustment		3/8"
Secondary Float Drop Adjustment		1 5/16"
Pump Rod Adjustment (Center Hole)	29/32"	1 1/64"
Choke Rod Adjustment	#41 (.095")	#55 (.052")
Choke Piston Setting, Choke Closed	0 to 1/32"	0 to 1/32"
Choke Unloader Adjustment	1/4" (.250")	#30 (.129")
Secondary Contour Adjustment		.030"
Secondary Lockout Adjustment		.015"
Initial Idle Speed	1 Turn In	1 Turn In
Initial Idle Mixture	1 1/2 Turns Out	1 1/2 Turns Out
Fast Idle Speed (Hot, on Low Step)		625 RPM
Slow Idle Speed (Hot)	525 RPM	525 RPM
Slow Idle Speed (Hot, with Air Conditioning)	575 RPM	575 RPM

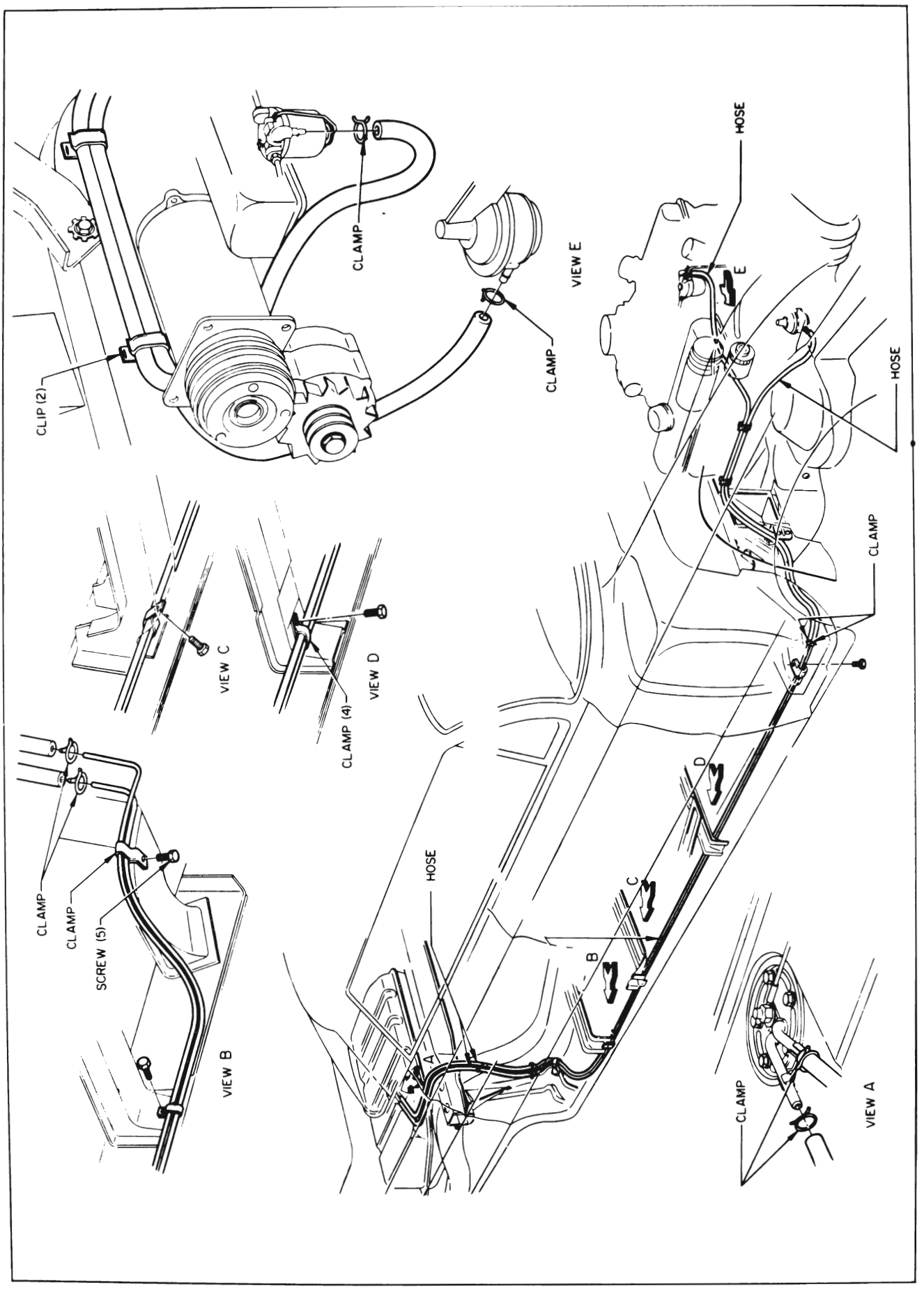

Figure 3-1—Fuel and Vapor By-Pass Systems

3-2 DESCRIPTION OF FUEL SYSTEM

a. Gasoline Tank, Feed Pipe and Filter

The gasoline tank is attached to the underbody in the kick-up area over the rear axle assembly (all except estate wagons). The tank is attached directly by two bolts through the rear flange and two nuts at the front flange.

The lower section of the gas tank filler is soldered into an opening at the left upper center of the tank. A separate upper section of the tank filler is fastened to the body by four bolts. The upper and lower sections of the filler are joined with a short hose and two clamps. The tank is vented at a special pipe rather than at the filler cap. This breather pipe extends from the upper left top of the tank and has a rubber hose extending from it to an inverted U-shaped pipe fastened into the body. A positive sealing filler cap is used. If the cap is replaced, it is important that this type of cap be used.

The tank outlet is located at the top right center of the tank. It consists of a combination fuel pick-up, filter, and gas gauge tank unit. The tank unit can be removed without lowering the gas tank by removing a special access hole cover in the trunk compartment (all except estate wagons).

The fuel line is weld - steel tubing with a terne coat outside and a tin coat inside. Connections from the tank to the line and from the line to the fuel pump are made with synthetic rubber hose attached with spring clamps.

A glass bowl fuel filter is located in the line between the fuel pump and the carburetor where it can easily be visually inspected or cleaned.

In all air conditioner equipped cars, a vapor by-pass system is installed. These cars have a special fuel filter which has a metering outlet in the top. Any vapor which forms is bled off and returned to the gas tank through a separate line alongside the fuel supply line. This system greatly reduces any possibility of vapor lock. See Figure 3-1.

b. Fuel Pump, Carburetor, and Automatic Choke

The fuel pump is mounted on the lower right side of the timing chain cover. It is actuated by a hardened, chrome-plated, stamped steel eccentric mounted on the front side of the crankshaft sprocket. The pump is inverted, thereby placing it in a lower, cooler location. It has a built in air dome with a diaphragm to dampen out pulsations in fuel pressure. The construction and operation of the pump are described in Section 3-D.

c. Air Cleaner and Intake Silencer

All series engines are equipped with oil wetted polyurethane foam element air cleaners combined with intake silencers. The air cleaner removes abrasive dust and dirt from the air before it enters the engine through the carburetor. The intake silencer reduces to a very low level the roaring noise made by the air as it is drawn through the intake system. The cleaner and silencer also functions as a flame arrester in event of "backfire" through the intake system.

There are two air cleaner and silencer assemblies: Series 4400 standard two barrel carburetor cars, and four barrel carburetor cars. See Figure 3-2.

Figure 3-2—Air Cleaner and Silencer Assemblies

All four barrel carburetor air cleaners have two locating tabs which engage two projections on the carburetor air horn to locate the large air inlet tube firmly in position about 15° to the right of the center line of the engine.

Two barrel carburetor air cleaners have neither a support bracket nor locating tabs. Therefore it is important to securely tighten the wing nut by hand after locating the air cleaner on the carburetor to make sure the air cleaner remains stationary. Proper location is with the intake pointed about 45^{0} to left of the center line of the engine and with the word "FRONT" on the air cleaner forward. On power steering cars, the intake will be located about one inch to the rear of the power steering pump.

The air cleaner is of the washable plastic foam type. It consists of a cylinder of polyurethane foam over a perforated sheet metal supporting screen. This screen also acts as a flame arrester in case of a backfire.

d. Carburetor Throttle Control Linkage

The carburetor throttle control linkage is designed to provide positive control of the throttle valves through their entire range without being affected by movement of the engine on its rubber mountings. See Figure 3-10.

The accelerator pedal is mounted on two ball studs which are screwed into weld nuts in the floor pan. Depressing the accelerator pedal causes the pedal to make a sliding contact with the rear end of the throttle operating lever, forcing the lower part of the lever to pivot forward and down. The lever pivots in a bearing mounted on the body cowl. See Figure 3-10.

As the lower part of the throttle operating lever is pushed forward by the accelerator pedal, the upper part of the lever is pulled rearward. This pulls the throttle rod rearward, causing the carburetor throttle lever to open the throttle valves.

The return spring returns the throttle linkage to idle position whenever pressure is released from the accelerator pedal. See Figure 3-10.

On all cars, a dash pot is mounted in position to be contacted by an arm of the carburetor throttle lever as the throttle is closed. The dash pot cushions the closing of the throttle valves to prevent engine stalling when the accelerator pedal is suddenly released.

When the throttle valves are opened near the wide open position, the throttle linkage actuates stator linkage which in turn operates a stator control valve in the transmission. As the throttle valves are opened to a certain point, the throttle lever contacts a stator lever on the carburetor, causing it to move forward. The upper stator rod pulls the upper end of the stator idler lever forward, causing the lower end of the idler to pivot rearward. This moves the lower stator rod rearward to actuate the stator lever on the transmission. See Figure 3-10.

3-3 DESCRIPTION OF INTAKE AND EXHAUST SYSTEMS

a. Intake Manifold and Heat Control

A low-restriction, dual (2 section) intake manifold is bolted to the inner edges of both cylinder heads, where it connects with all inlet ports. The end branches of each section run at 90 degrees to the connecting middle branch, thereby forming a T-junction at the dividing point which assures a uniform division and distribution of fuel to all cylinder inlets. Each manifold section feeds four cylinders—two in each bank. See Figure 3-3.

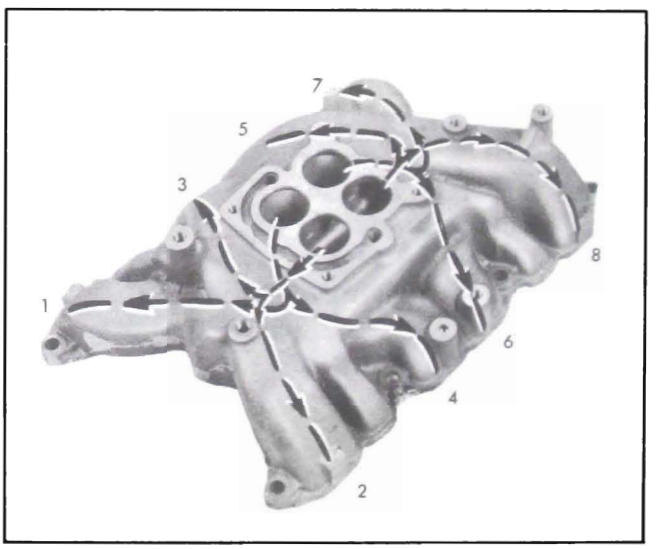

Figure 3-3—Intake Manifold Distribution

The 2-barrel carburetor feeds one barrel into each section of its 2-port manifold. The 4-barrel carburetor feeds one primary and one secondary barrel into each section of its 4-port manifold.

The intake manifold is heated and hot spots are provided at the T-junction dividing points by crossover chambers cast along the outer walls of each end branch. These chambers connect to the two middle exhaust passages in each cylinder head. See Figure 3-4. Hot spots

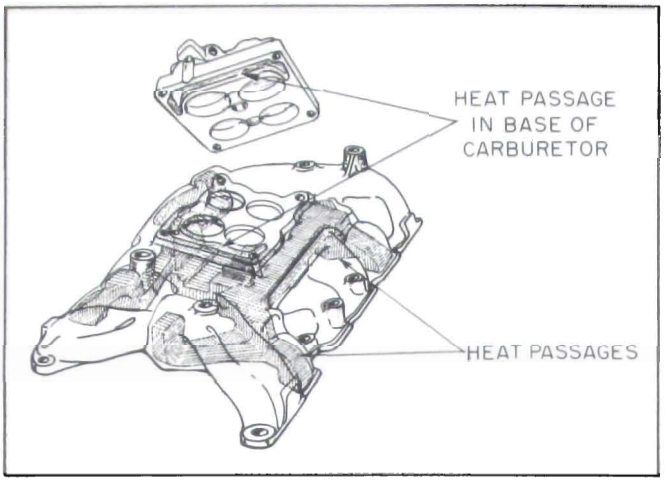

Figure 3-4—Intake Manifold Heat Chambers

located at the dividing junctions aid in vaporizing the heavier particles of fuel which are swept against the outer walls due to their greater momentum. The heated intake manifold also aids in obtaining a uniform fuel distribution.

The intake manifold is heated by exhaust gas cross-over passages cast under the center section of the manifold. These passages connect to the two middle exhaust passages in each cylinder head. See Figure 3-4. Exhaust heat is supplied directly to the carburetor mounting surface by two holes drilled from the mounting surface into the cross-over passages. The carburetors are designed to conduct this heat around the throttle valve area to reduce engine stalling due to carburetor icing.

A heat control valve with a bi-metal thermostat is located in the right exhaust manifold. See Figure 3-8. When the engine is cold and the thermostat closes the valve, the resulting back pressure in the manifold forces exhaust gas through the crossover passages in the intake manifold to the left exhaust manifold. As the engine warms up and the thermostat releases the valve, the flow of hot gas through the crossover chamber is reduced.

Restricted openings in the metal intake manifold gaskets meter the flow of exhaust gases through the intake manifold when the engine is cold and the heat valve is closed.

All cars built for sale in California have a positive crankcase ventilating system to help reduce air pollution. The regular crankcase ventilating system has a vent pipe which projects down into the slip-stream under the car to draw fumes from the crankcase. The positive crankcase ventilating system replaces the vent pipe with a hose which connects to a fitting in the carburetor throttle body. This causes crankcase fumes to be drawn into the intake manifold to be burned in the engine. See Figure 3-4A.

When air flow through the carburetor is high, added air from the positive ventilating system has no noticeable effect on engine operation; however, at idle speed, air flow through the carburetor is so low that any large amount added by the ventilating system would upset the air-fuel mixture, causing rough idle. For this reason, a spring-loaded check valve is used which restricts the ventilating system flow whenever intake manifold vacuum is high.

b. Exhaust Manifolds, Pipes, and Mufflers

Each cylinder exhausts through an individual port into a separate branch of the exhaust manifold. This manifold, referred to as the double "Y" type, is designed to provide a separation of 270 degrees crankshaft rotation between any two exhaust impulses in one branch of the manifold. This elimination of overlap within any given branch of the manifold permits valve timing that improves engine efficiency, minimizes exhaust valve burning, and effects more complete scavanging of exhaust gas from the cylinder.

The right manifold contains the valve which controls the supply of exhaust heat to the intake manifold, as described above (subpar. a). It also contains the carburetor choke heat stove which consists of an alloy steel heating tube mounted in two drilled holes in the manifold. Heated air is drawn from the heat stove through an insulated pipe into the automatic choke housing. Cool clean air is supplied to the heat stove from the carburetor air horn.

All front and center exhaust pipe assemblies are made up of two layers (inner and outer) of welded pipe. Rear exhaust pipes and tail pipes use single layer pipe. The double layer pipe is used to muffle pipe "ring" which is set-up by the firing impulses of the individual cylinders; the life of the pipe is also greatly increased.

Most of the connections are of the ball joint type. These ball joints make for easy disconnection, connection, and alignment of the exhaust system without damage to the parts. No gaskets are used in the entire exhaust system. Connection of the tail pipe to the muffler is made with a U-bolt and clamp.

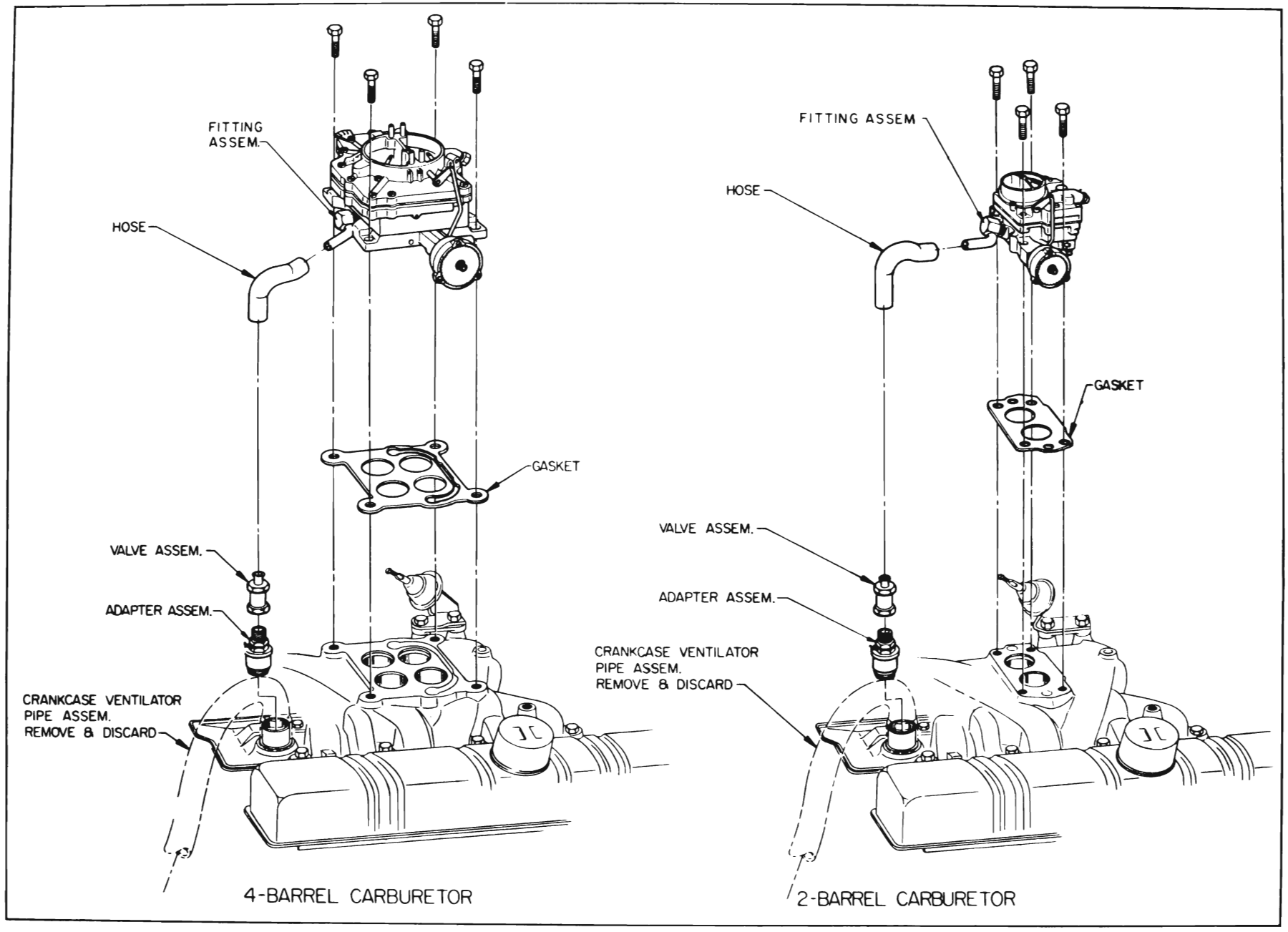

Figure 3-4A—Positive Crankcase Ventilating System (Factory Installed)

The muffler is of the oval-shaped, dynamic flow type having very low back pressure. It is double wrapped of heavy gauge galvanized steel with a layer of asbestos placed between wrappings to aid in reduction of noise transfer and to prevent any "oil-canning" effect. The exhaust system is supported by free hanging rubber-fabric mountings which permit free movement of the system but do not permit transfer of noise and vibration into the passenger compartment.

c. Dual Exhaust System

The dual exhaust system is optional on all cars except estate wagons. Because of the different location of the gas tank on the estate wagons, dual exhaust cannot be installed on these models. See Figure 3-7.

A single muffler is placed cross-wise at the rear of the car. See Figure 3-5. The muffler has an inlet and an outlet on each end. Each side of the dual exhaust system has a front exhaust pipe assembly having an integral resonator at the rear end. Each resonator is attached to a center exhaust pipe by a U-bolt and clamp. Each center exhaust pipe is in turn connected by a ball joint to a short rear exhaust pipe just forward of the rear spring cross-member. Each rear exhaust pipe is attached to the muffler inlet by a ball joint. A tail pipe is attached to each of the muffler outlets by a U-bolt and clamp. Three hangers are used on each side of the dual exhaust system, one located near the rear end of the center exhaust pipe, another located near the muffler end of the rear exhaust pipe, and the third near the rear end of the tail pipe. The muffler is supported by the rear exhaust pipe and tail pipe hangers. See Figure 3-5. Longer front and center exhaust pipes are used on the Series 4800 because of their longer wheel base. Also longer tail pipes are required on Series 4800 because of their longer rear overhang.

The exhaust gases from each bank of cylinders pass through individual resonating chambers in the muffler and then enter one common chamber. This common mixing of gases increases muffler silencing ability and eliminates the "cold side" muffler. The "cold side" of previously used dual exhaust systems was the side in which the engine thermostatic heat control valve was located.

d. Single Exhaust System

The single exhaust system has the same construction features as the dual exhaust system. A smaller cross-wise muffler is used which has the inlet located on the right end and the outlet on the left end. See Figures 3-6 and 7.

The single exhaust system has a front exhaust pipe assembly consisting of a branch pipe from each exhaust manifold welded together. A long center exhaust pipe extends along the right side of the frame back to the rear exhaust pipe. The rear exhaust pipe extends up over the rear axle along the outside of the frame, then crosses over the side rail and goes down to the right end of the muffler. A short tail pipe extends back from the left end of the muffler. All connections are ball joints except the tail pipe to muffler connection which is the U-bolt and clamp type. See Figures 3-6 and 7.

A total of four hangers is used on the single exhaust system, the first located near the rear end of the center exhaust pipe, the second located near the muffler end of the rear exhaust pipe, the third at the muffler end of the tail pipe, and the last near the rear end of the tail pipe.

None of the parts are interchangeable between the single and dual exhaust systems except for some of the hangers. However, both right and left exhaust manifolds are the same for single or dual exhaust cars.

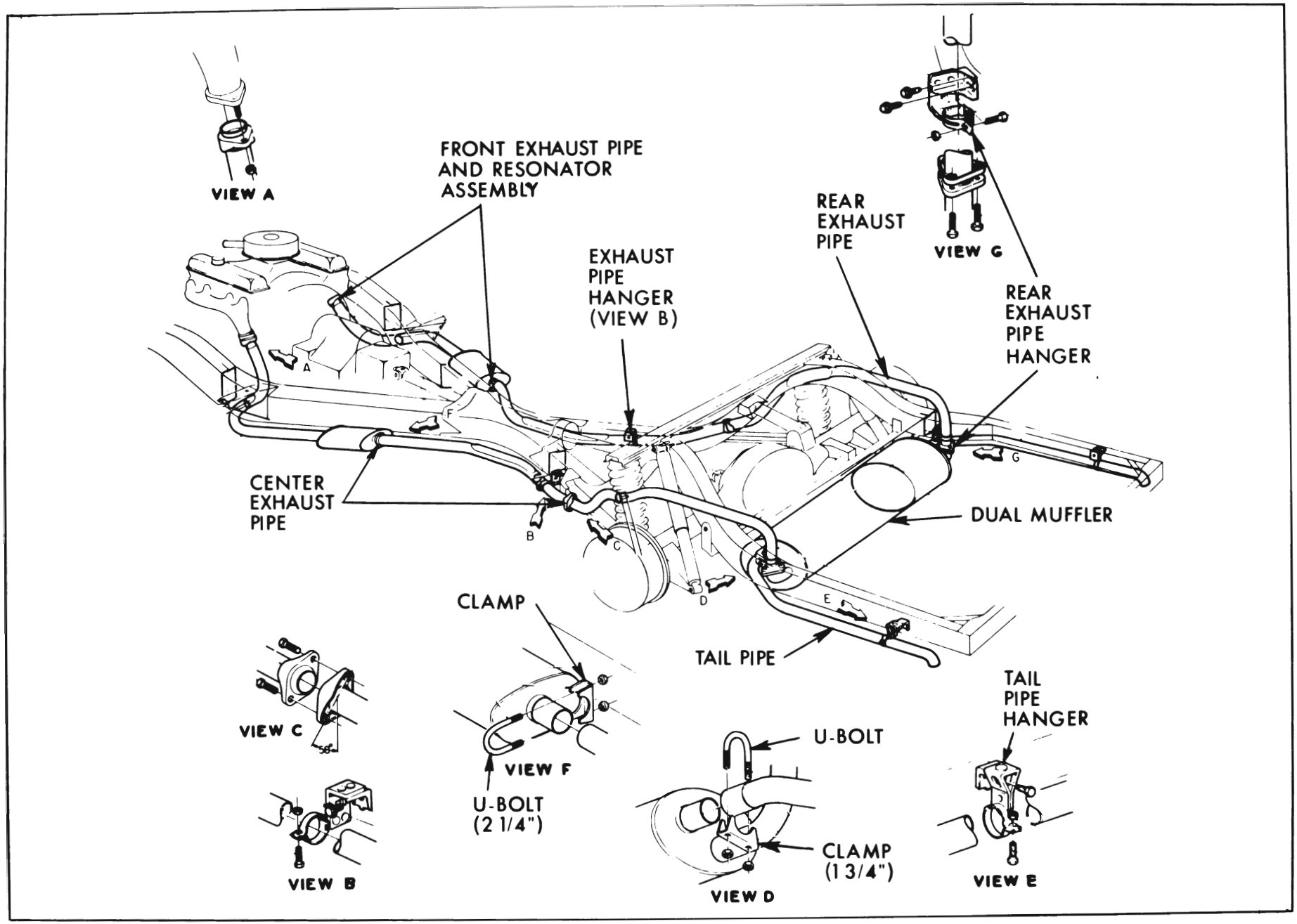

Figure 3-5—Dual Exhaust System

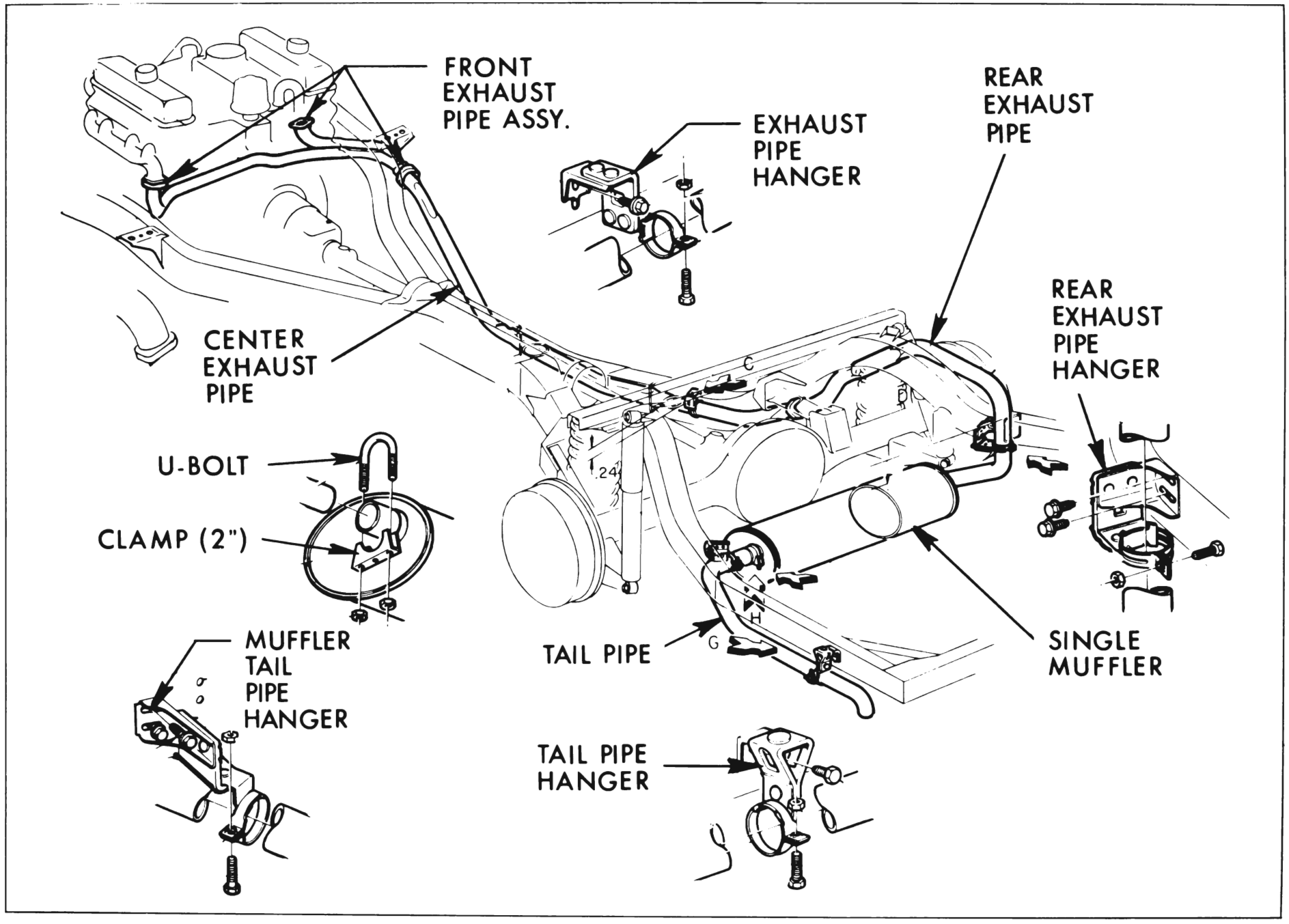

Figure 3-6—Single Exhaust System (Except Estate Wagons)

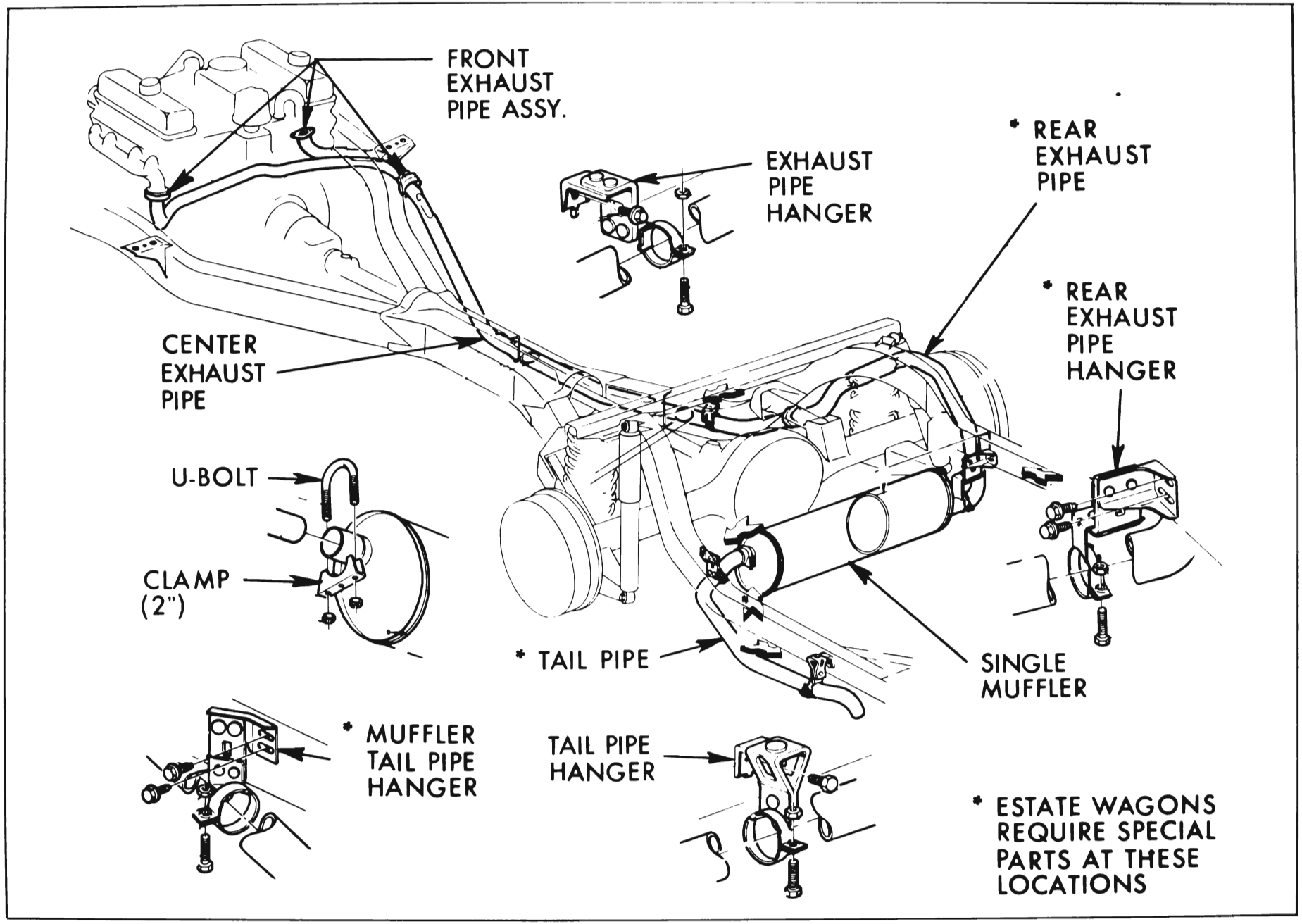

Figure 3-7—Single Exhaust System (Estate Wagons)