

2004 Cadillac CTS**2004 STEERING Power Steering System - CTS****2004 STEERING****Power Steering System - CTS****SPECIFICATIONS****FASTENER TIGHTENING SPECIFICATIONS****Fastener Tightening Specifications**

Application	Specification	
	Metric	English
Intermediate Steering Shaft to Steering Gear Pinch Bolt	50 N.m	37 lb ft
Power Steering Cooler Screws	5.4 N.m	48 lb in
Power Steering Cooler to Frame	9 N.m	80 lb in
Power Steering lines to Power Steering Gear	30 N.m	22 lb ft
Power Steering Pressure Line to Power Steering Pump	40 N.m	30 lb ft
Power Steering Pressure Hose to Frame	9 N.m	80 lb in
Power Steering Pressure Hose to Power Steering Gear Retaining Bolt	9 N.m	80 lb in
Power Steering Pump Bracket to Engine Bolts LY7	50 N.m	37 lb ft
Power Steering Pump Mounting Bolts LA3/LY9	35 N.m	26 lb ft
Power Steering Pump Mounting Bolts LY7	22 N.m	17 lb ft
Power Steering Reservoir Lower Bolt	25 N.m	18 lb ft
Power Steering Reservoir Upper Bolt	9 N.m	80 lb in
Power Steering Return and Pressure Hoses to Power Steering Gear Retaining Nuts	8 N.m	71 lb in
Steering Gear Mounting Bolts	95 N.m	70 lb ft
Tie Rod to Knuckle Nut	70 N.m	52 lb ft

POWER STEERING PUMP SPECIFICATIONS**Power Steering Pump Specifications**

Engine Code	Engine Size	High Flow		Pressure Relief	
		LPM	GPM	kPa	PSI
LY9	2.6L	7.1/8.1	1.87/2.13	9650/10400	1400/1500
LA3	3.2L				

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LY7 LCT	3.6L 5.7L	7.1/8.1	1.87/2.13	11300/12000	1640/1740
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DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - POWER STEERING SYSTEM (W/O ELECTRO-HYDRA HYDRAULIC STEERING)

Begin the system diagnosis by reviewing the system Description and Operation. Reviewing the Description and Operation information will help you determine the correct symptom diagnostic procedure when a malfunction exists. Reviewing the Description and Operation information will also help you determine if the condition described by the customer is normal operation. Refer to **Symptoms - Power Steering System** in order to identify the correct procedure for diagnosing the system and where the procedure is located.

SYMPTOMS - POWER STEERING SYSTEM

IMPORTANT: Review the system description and operation in order to familiarize yourself with the system functions. Refer to **Power Steering System Description and Operation (w/o Electro-Hydraulic Steering)**.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the power steering system.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect the power steering reservoir for the proper power steering fluid level and condition.

Symptoms List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- **Power Steering Fluid Leaks**
- **Rattle, Clunk, or Shudder Noise from the Power Steering System**
- **Whine or Growl Noise from the Power Steering System**
- **Steering Effort Hard in One or Both Directions**
- **Steering Effort Too Easy in One or Both Directions**

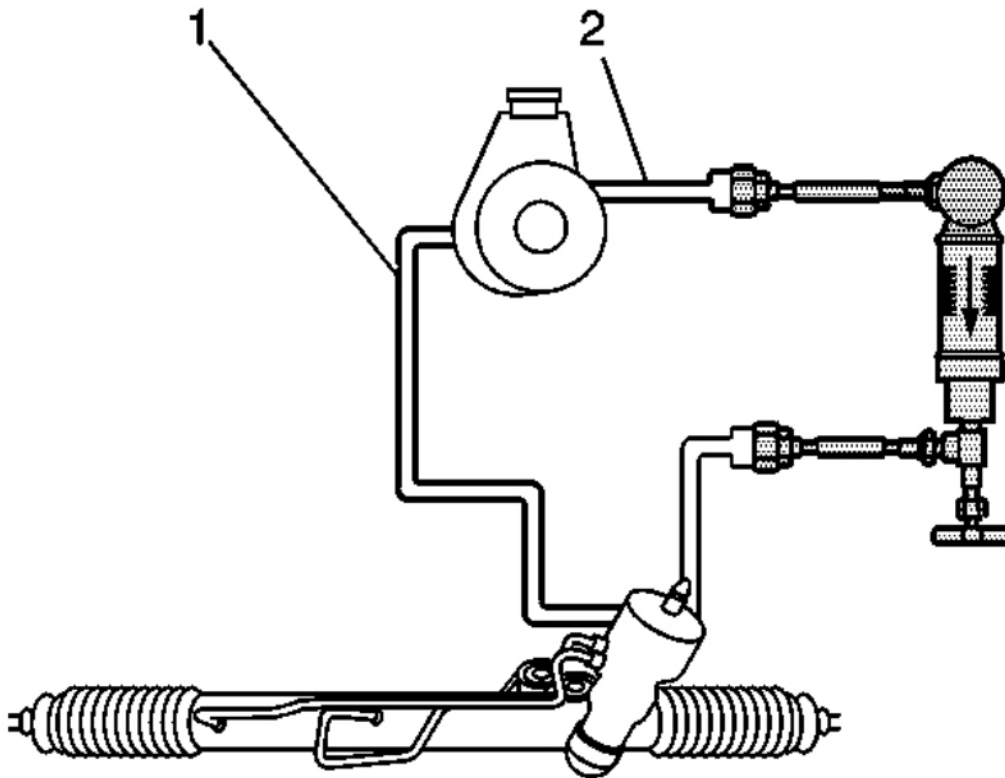
POWER STEERING SYSTEM TEST PROCEDURE

Fig. 1: Testing Rack and Pinion System Pressures
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 1

Callout	Component Name
1	Power Steering Return Hose
2	Power Steering Pressure Hose

Test Description

The numbers below refer to the step numbers on the diagnostic table.

5: This step tests the system for restrictions.

7: This step tests the following components for the following conditions:

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- The pump for internal leaks
- The power steering pipes for kinks

8: This step tests the ability of the pump to regulate flow at maximum pressure.

10: This step tests the ability of the pump to regulate flow under normal operating conditions.

12: This step tests the internal components of the pump and the gear.

Power Steering System Test Procedure

Step	Action	Value(s)	Yes	No
DEFINITION: The Power Steering System Test Procedure will perform the following functions: • Test the operation of the hydraulic power steering system. • Test the operation of the power steering pump and power steering gear. • Identify restrictions in the system.				
1	Inspect the power steering fluid for the following indications of contamination: • Milky fluid - water • Brown fluid - burnt • Debris in fluid - plastic or dirt Is the fluid free of contamination?	-	Go to Step 3	Go to Step 2
2	Flush the power steering system. Refer to <u>Flushing the Power Steering System.</u> Did you complete the procedure?	-	Go to Step 3	-
3	IMPORTANT: In order to accurately diagnose the system, the malfunction must be present during the test procedure. Attempt to duplicate the condition. Is the condition present?	-	Go to Step 4	System OK
	1. Turn the ignition switch to the OFF position. 2. Place a drain pan under the vehicle in			

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4	order to catch any power steering fluid. 3. Disconnect the power steering pressure pipe/hose from the power steering pump or the power steering gear as necessary. 4. Install the J 44721 Power Steering System Analyzer. See <u>Special Tools and Equipment</u>. 5. Fill the power steering system. Refer to <u>Checking and Adding Power Steering Fluid</u>. Did you complete the installation?	-	Go to Step 5	-
5	1. Fully open the J 44721 valve. See <u>Special Tools and Equipment</u>. 2. Start the engine. NOTE: Refer to <u>Steering Wheel in the Full Turn Position Notice</u> in Cautions and Notices. 3. Turn the steering wheel and BRIEFLY hold the steering wheel against the steering stop in order to release any trapped air from the system. 4. Inspect and ensure that all of the power steering pipe/hose connections are not leaking. 5. Making sure the steering wheel is OFF the steering stop, observe the pressure reading. Is the pressure reading greater than the specified value?	1379 kPa (200 psi)	Go to Step 6	Go to Step 7
	IMPORTANT: A restriction may be present in the power			

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6	steering system. Turn off the engine IMMEDIATELY. Locate and repair the restriction. Did you complete the repair?	-	Go to Step 15	-
7	- Allow the engine to run until the engine reaches full operating temperature. - Record the pressure reading and flow reading. - Partially close the J 44721 valve until the system pressure reaches the specified value, then record the FLOW reading. See <u>Special Tools and Equipment</u>. - Subtract second flow reading from the first flow reading. Is the flow DECREASE greater than 3.8 L (1 gal) per minute?	4827 kPa (700 psi)	Go to Step 11	Go to Step 8
8	IMPORTANT: Do not leave the valve closed for more than 5 seconds, or internal pump damage could accrue. Fully close then open the J 44721 valve 3 times. See <u>Special Tools and Equipment</u>. Record all of the high pressure readings. Refer to <u>Power Steering Pump Specifications</u> for power steering system pressure relief specifications. Are the three high pressure readings within specifications?	-	Go to Step 9	Go to Step 13
9	Are the three high pressure readings within 245 kPa (50 psi) of each other?	-	Go to Step 10	Go to Step 13
	- Increase the engine speed to approximately 1500 RPM. - Record the flow reading. Refer to			

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10	<u>Power Steering Pump Specifications</u> for power steering system pressure specifications. Is the actual flow reading within specifications?	-	Go to Step 11	Go to Step 13
11	Is the difference between the actual flow reading and the maximum flow specification more than 3.8 L (1 gal) per minute?	-	Go to Step 13	Go to Step 12
12	NOTE: Refer to <u>Steering Wheel in the Full Turn Position Notice</u> in Cautions and Notices. Turn the steering wheel from steering stop to steering stop and record the FLOW readings at each stop. Is the flow LOWER than 3.8 L (1 gal) per minute?	-	Go to Step 15	Go to Step 14
13	Replace the power steering pump. Refer to <u>Power Steering Pump Replacement (LY7)</u>, <u>Power Steering Pump Replacement (LA3/LY9)</u> or <u>Power Steering Pump Replacement (5.7L)</u>. Did you complete the replacement?	-	Go to Step 15	-
14	The power steering gear is leaking across the piston or bypassing the valve circuit. Replace the power steering gear. Refer to <u>Power Steering Gear Replacement (LHD)</u> or <u>Power Steering Gear Replacement (RHD)</u>. Did you complete the replacement?	-	Go to Step 15	-
15	Test the power steering system for the original condition. Does the original condition still exist?	-	Go to Step 5	Go to Step 16
	1. Disconnect and remove the J 44721 from the vehicle. See <u>Special Tools and Equipment</u>. 2. Connect the vehicle power steering			

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16	pipes/hoses. 3. Fill the power steering system. Refer to <u>Checking and Adding Power Steering Fluid</u>.	-		
	Did you complete the procedure?		System OK	-

POWER STEERING FLUID LEAKS

Power Steering Fluid Leaks

Step	Action	Yes	No
1	Did you review the Power Steering System General Description and perform the necessary inspections?	Go to Step 2	Go to <u>Symptoms - Power Steering System</u>
2	Verify that power steering fluid leaks are present. Is the power steering system leaking?	Go to Step 3	System OK
3	Inspect the power steering system fittings. Are the fittings leaking?	Go to Step 8	Go to Step 4
4	Inspect the power steering hoses. Are the hoses leaking?	Go to Step 11	Go to Step 5
5	Inspect the power steering pump and the reservoir for leaks. Is the power steering pump or reservoir leaking?	Go to Step 10	Go to Step 6
6	Inspect the power steering gear for leaks. Is the power steering gear leaking?	Go to Step 11	Go to Step 7
7	Inspect the power steering cooler for leaks. Is the power steering cooler leaking?	Go to Step 12	Go to Step 3
8	NOTE: Refer to <u>Fastener Notice</u> in Cautions and Notices. Tighten the fittings. Refer to <u>Fastener Tightening Specifications</u>. Did you complete the repair?	Go to Step 13	-
	Replace the power steering hoses. Refer to the appropriate procedures: • <u>Power Steering Reservoir Outlet</u>		

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9	<u>Pipe/Hose Replacement (LY7), Power Steering Reservoir Outlet Pipe/Hose Replacement (LY9) or Power Steering Reservoir Outlet Pipe/Hose Replacement (LS6)</u> • <u>Power Steering Pressure Pipe/Hose Replacement (LHD), Power Steering Pressure Pipe/Hose Replacement (RHD) or Power Steering Pressure Pipe/Hose Replacement (5.7L)</u> • <u>Power Steering Return Hose Replacement (LHD), Power Steering Return Hose Replacement (RHD) or Power Steering Return Hose Replacement (LS6)</u>		
	Did you complete the repair?	Go to Step 13	-
10	Replace the power steering pump or reservoir. Refer to <u>Power Steering Pump Replacement (LY7), Power Steering Pump Replacement (LA3/LY9), Power Steering Pump Replacement (5.7L) or Remote Power Steering Fluid Reservoir Replacement (LY7), Remote Power Steering Fluid Reservoir Replacement (LA3/LY9) or Remote Power Steering Fluid Reservoir Replacement (5.7L).</u>		
	Did you complete the repair?	Go to Step 13	-
11	Replace the power steering gear. Refer to <u>Power Steering Gear Replacement (LHD) or Power Steering Gear Replacement (RHD).</u>		
	Did you complete the repair?	Go to Step 13	-
12	Replace the power steering cooler. Refer to <u>Power Steering Cooler Replacement (FE3), Power Steering Cooler Replacement (FE1) or Power Steering Cooler Replacement (FE4).</u>		

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	Did you complete the repair?	Go to Step 13	-
13	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

RATTLE, CLUNK, OR SHUDDER NOISE FROM THE POWER STEERING SYSTEM

Rattle, Clunk, or Shudder Noise from the Power Steering System

Step	Action	Yes	No
1	Did you review the Power Steering System General Description and perform the necessary inspections?	Go to Step 2	Go to Symptoms - Power Steering System
2	Verify that a rattle, clunk or shudder noise is present. Is a rattle, clunk or shudder noise present?	Go to Step 3	System OK
3	Inspect the power steering hoses for proper routing and clearance. Is the routing or clearance of the power steering hoses incorrect?	Go to Step 10	Go to Step 4
4	Inspect the engine drive belt for cracking or excessive wear. Refer to Symptoms - Engine Mechanical in Engine Mechanical - 2.6L and 3.2L. Is the drive belt cracked or excessively worn?	Go to Step 11	Go to Step 5
5	Inspect the power steering pump pulley for damage. Is the power steering pump pulley damaged?	Go to Step 12	Go to Step 6
6	Inspect the power steering pump for the proper installation. Refer to Power Steering Pump Replacement (LY7) , Power Steering Pump Replacement (LA3/LY9) or Power Steering Pump Replacement (5.7L) . Is the power steering pump installation incorrect?	Go to Step 13	Go to Step 7
7	Inspect the power steering gear for the proper installation. Refer to Power Steering Gear Replacement (LHD) or Power Steering Gear Replacement (RHD) . Is the power steering gear installation incorrect?	Go to Step 14	Go to Step 8

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8	Inspect the suspension. Is the suspension worn?	Go to Step 15	Go to Step 9
9	Inspect the intermediate shaft. Is the intermediate shaft worn?	Go to Step 16	Go to Step 3
10	Adjust or replace the hoses. Refer to the appropriate procedures: • <u>Power Steering Reservoir Outlet Pipe/Hose Replacement (LY7), Power Steering Reservoir Outlet Pipe/Hose Replacement (LY9) or Power Steering Reservoir Outlet Pipe/Hose Replacement (LS6)</u> • <u>Power Steering Pressure Pipe/Hose Replacement (LHD), Power Steering Pressure Pipe/Hose Replacement (RHD) or Power Steering Pressure Pipe/Hose Replacement (5.7L)</u> • <u>Power Steering Return Hose Replacement (LHD), Power Steering Return Hose Replacement (RHD) or Power Steering Return Hose Replacement (LS6)</u> Did you complete the repair?	Go to Step 17	-
11	Replace the engine drive belt. Refer to <u>Drive Belt Replacement</u> in Engine Mechanical - 2.6L and 3.2L. Did you complete the repair?	Go to Step 17	-
12	Replace the power steering pump pulley. Refer to <u>Power Steering Pulley Replacement</u> . Did you complete the repair?	Go to Step 17	-
13	Install the power steering pump correctly. Refer to <u>Power Steering Pump Replacement (LY7), Power Steering Pump Replacement (LA3/LY9) or Power Steering Pump Replacement (5.7L)</u> .		

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	Did you complete the repair?	Go to Step 17	-
14	Install the power steering gear correctly. Refer to <u>Power Steering Gear Replacement (LHD)</u> or <u>Power Steering Gear Replacement (RHD)</u> . Did you complete the repair?	Go to Step 17	-
15	Replace the worn suspension components. Refer to <u>Diagnostic Starting Point - Suspension General Diagnosis</u> in Suspension General Diagnosis. Did you complete the repair?	Go to Step 17	-
16	Replace the intermediate shaft. Refer to <u>Intermediate Steering Shaft Replacement - Upper</u> or <u>Intermediate Steering Shaft Replacement - Lower</u> . Did you complete the repair?	Go to Step 17	-
17	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

WHINE OR GROWL NOISE FROM THE POWER STEERING SYSTEM

Whine or Growl Noise from the Power Steering System

Step	Action	Yes	No
1	Did you review the Power Steering System Description and perform the necessary inspections?	Go to Step 2	Go to <u>Symptoms - Power Steering System</u>
2	Verify that a whine or growl noise is present. Is a whine or growl noise present?	Go to Step 3	System OK
3	Perform the power steering test procedure in order to diagnose a hydraulic condition and repair or replace a component. Refer to <u>Power Steering System Test Procedure</u> . Did you repair or replace a power steering system component?	Go to Step 10	Go to Step 4
4	Using the J 39570 Chassis Ear, inspect the power steering gear for a whine or growl noise. Is the noise present at the power steering gear?	Go to Step 7	Go to Step 5
	Using the J 39570 , inspect the power steering		

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5	pump for a whine or growl noise. Is the noise present at the power steering pump?	Go to Step 8	Go to Step 6
6	Using the J 39570 , inspect the power steering hoses for a whine or growl noise. Is the noise present at the power steering hoses?	Go to Step 9	Go to Step 2
7	Replace the power steering gear. Refer to <u>Power Steering Gear Replacement (LHD)</u> or <u>Power Steering Gear Replacement (RHD)</u> . Did you complete the repair?	Go to Step 10	-
8	Replace the power steering pump. Refer to <u>Power Steering Pump Replacement (LY7)</u> , <u>Power Steering Pump Replacement (LA3/LY9)</u> or <u>Power Steering Pump Replacement (5.7L)</u> . Did you complete the repair?	Go to Step 10	-
9	Adjust the routing of the power steering hoses. Did you complete the repair?	Go to Step 10	-
10	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

STEERING EFFORT HARD IN ONE OR BOTH DIRECTIONS

Steering Effort Hard in One or Both Directions

Step	Action	Yes	No
1	Did you review the Power Steering System General Description and perform the necessary inspections?	Go to Step 2	Go to <u>Symptoms - Power Steering System</u>
2	Verify that the steering effort is hard in one or both directions. Does the system operate normally?	System OK	Go to Step 3
3	Perform the power steering test procedure. Refer to <u>Power Steering System Test Procedure</u> . Did you complete the procedure?	Go to Step 4	-
4	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

STEERING EFFORT TOO EASY IN ONE OR BOTH DIRECTIONS

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Steering Effort Too Easy in One or Both Directions

Step	Action	Yes	No
1	Did you review the Power Steering System Description and perform the necessary inspections?	Go to Step 2	Go to Symptoms - Power Steering System
2	Verify that the steering effort is too easy in one or both directions. Does the system operate normally?	System OK	Go to Step 3
3	Perform the power steering test procedure. Refer to <u>Power Steering System Test Procedure</u> . Did you complete the procedure?	Go to Step 4	-
4	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

REPAIR INSTRUCTIONS

BLEEDING THE POWER STEERING SYSTEM

Tools Required

- **J 35555** Metal Mityvac. See **Special Tools and Equipment**.
- **J 43485** Power Steering Bleeder Adapter. See **Special Tools and Equipment**.

IMPORTANT: Hoses touching the frame, body, or engine may cause system noise.

1. Verify that the hoses do not touch any other part of the vehicle.

IMPORTANT: Loose connections may not leak, but could allow air into the steering system.

2. Verify that all hose connections are tight.

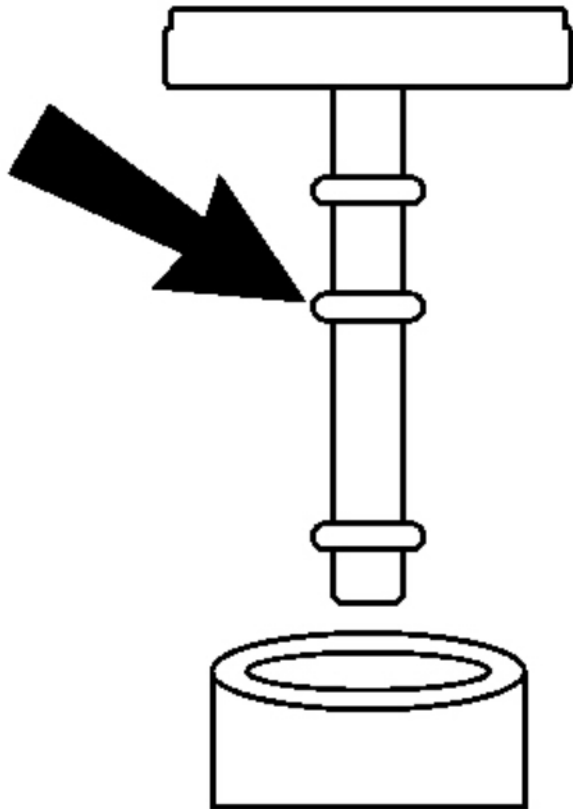


Fig. 2: Identifying FULL COLD Level On Reservoir Cap
Courtesy of GENERAL MOTORS CORP.

NOTE: If the power steering system has been serviced, an accurate fluid level reading cannot be obtained unless air is bled from the steering system. The air in the fluid may cause pump cavitation noise and may cause pump damage over a period of time.

IMPORTANT: Maintain the fluid level throughout the bleed procedure.

3. Remove the pump reservoir cap.

IMPORTANT: Use clean, new power steering fluid only.

4. Fill the pump reservoir with fluid to the FULL COLD level.

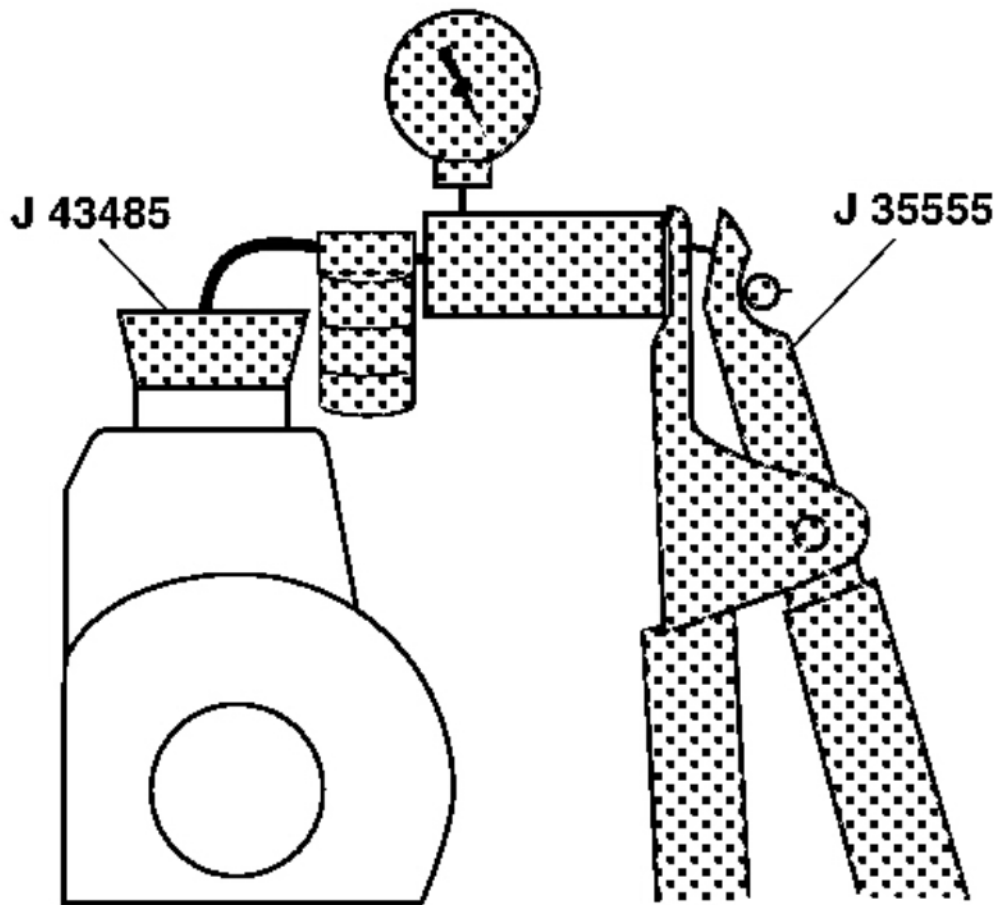


Fig. 3: Bleeding Power Steering System Using J 43485 & J 35555
Courtesy of GENERAL MOTORS CORP.

5. Attach the **J 43485** to the **J 35555** or equivalent. See Special Tools and Equipment.
6. Place the **J 43485** on or in the pump reservoir filler neck. See Special Tools and Equipment.
7. Apply a vacuum of 68 kPa (20 in Hg) maximum.

8. Wait 5 minutes.

Typical vacuum drop is 7-10 kPa (2-3 in Hg). If the vacuum does not remain steady, refer to Excessive Vacuum Drop Diagnosis at the end of this procedure.

9. Remove the **J 43485** and the **J 35555** . See **Special Tools and Equipment**.
10. Reinstall the pump reservoir cap.
11. Start the engine. Allow the engine to idle.
12. Turn off the engine.
13. Verify the fluid level. Repeat steps 11-13 until the fluid stabilizes.

IMPORTANT: Do not turn steering wheel to lock.

14. Start the engine. Allow the engine to idle.
15. Turn the steering wheel 180-360 degrees in both directions 5 times.
16. Switch the ignition off.

NOTE: **When adding fluid or making a complete fluid change, always use the proper power steering fluid. Failure to use the proper fluid will cause hose and seal damage and fluid leaks.**

17. Verify the fluid level.

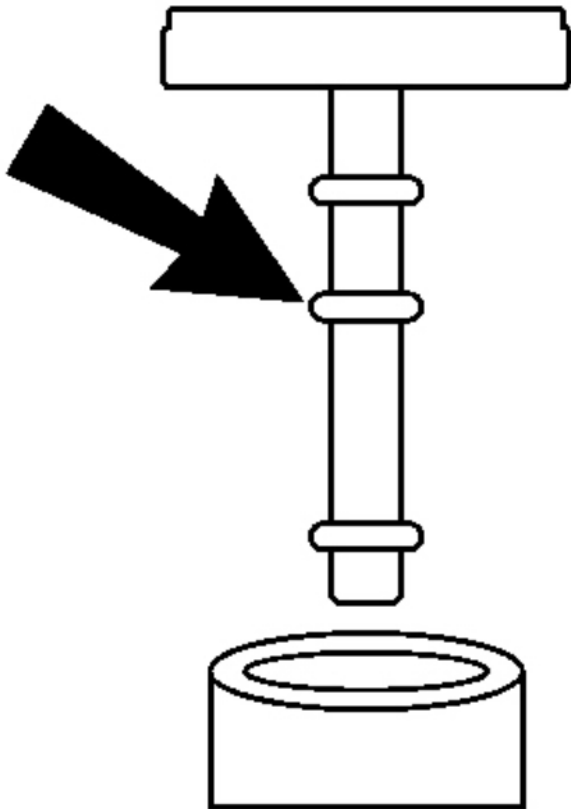


Fig. 4: Identifying FULL COLD Level On Reservoir Cap
Courtesy of GENERAL MOTORS CORP.

18. Remove the pump reservoir cap.

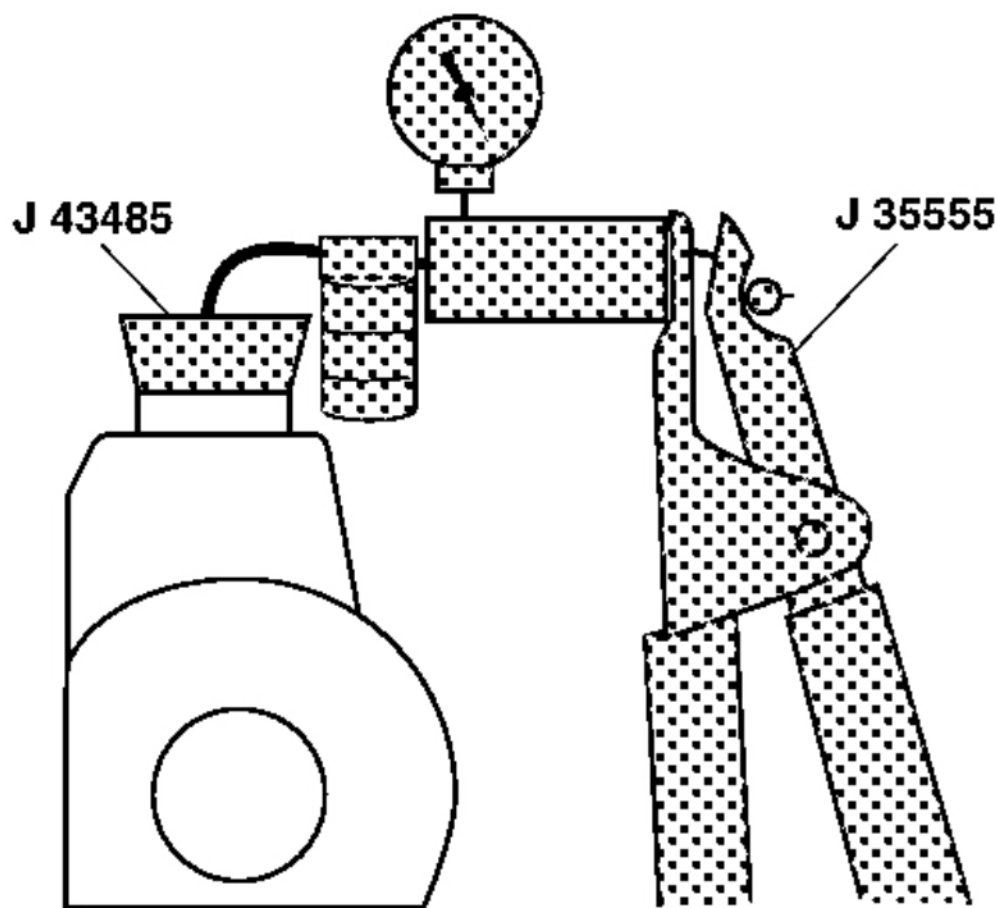


Fig. 5: Bleeding Power Steering System Using J 43485 & J 35555
Courtesy of GENERAL MOTORS CORP.

19. Attach the **J 43485** to the **J 35555** or equivalent. See **Special Tools and Equipment**.
20. Place the **J 43485** on or in the pump reservoir filler neck. See **Special Tools and Equipment**.
21. Apply a vacuum of 68 kPa (20 in Hg) maximum.
22. Wait 5 minutes.
23. Remove the **J 43485** and the **J 35555** . See **Special Tools and Equipment**.
24. Verify the fluid level.

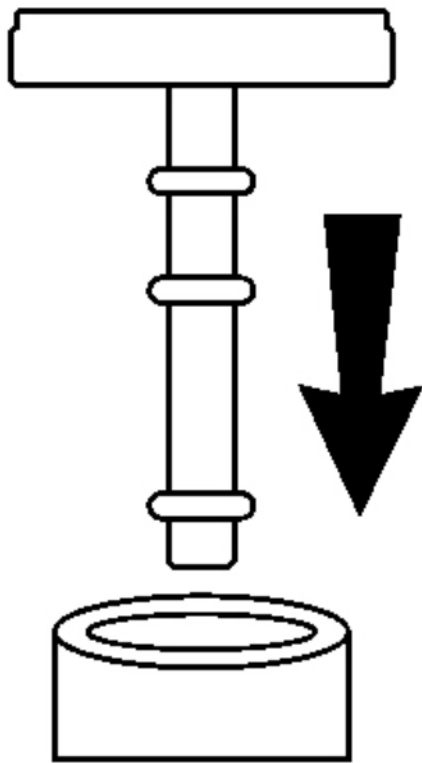


Fig. 6: View Of Pump Reservoir Cap
Courtesy of GENERAL MOTORS CORP.

25. Reinstall the pump reservoir cap.

Excessive Vacuum Drop Diagnosis

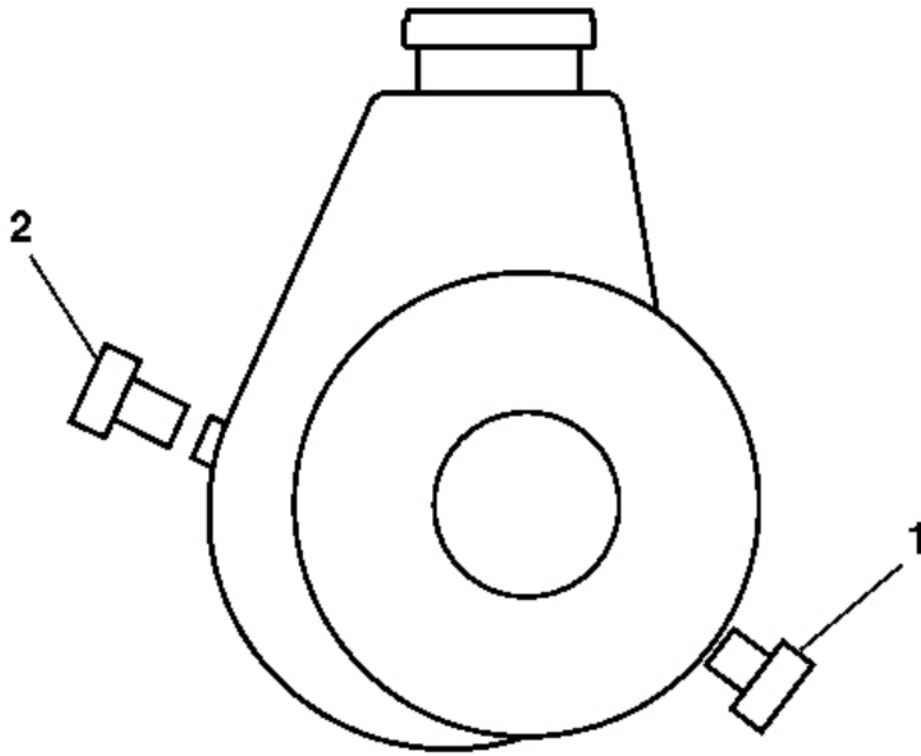


Fig. 7: Installing Plugs Into Power Steering Pump Pressure & Return Ports
Courtesy of GENERAL MOTORS CORP.

1. If the vacuum continues to drop, remove the pressure and return hose from the pump.
2. Install the plugs (1,2) supplied with the **J 43485** into the pressure and return port. See **Special Tools and Equipment**.

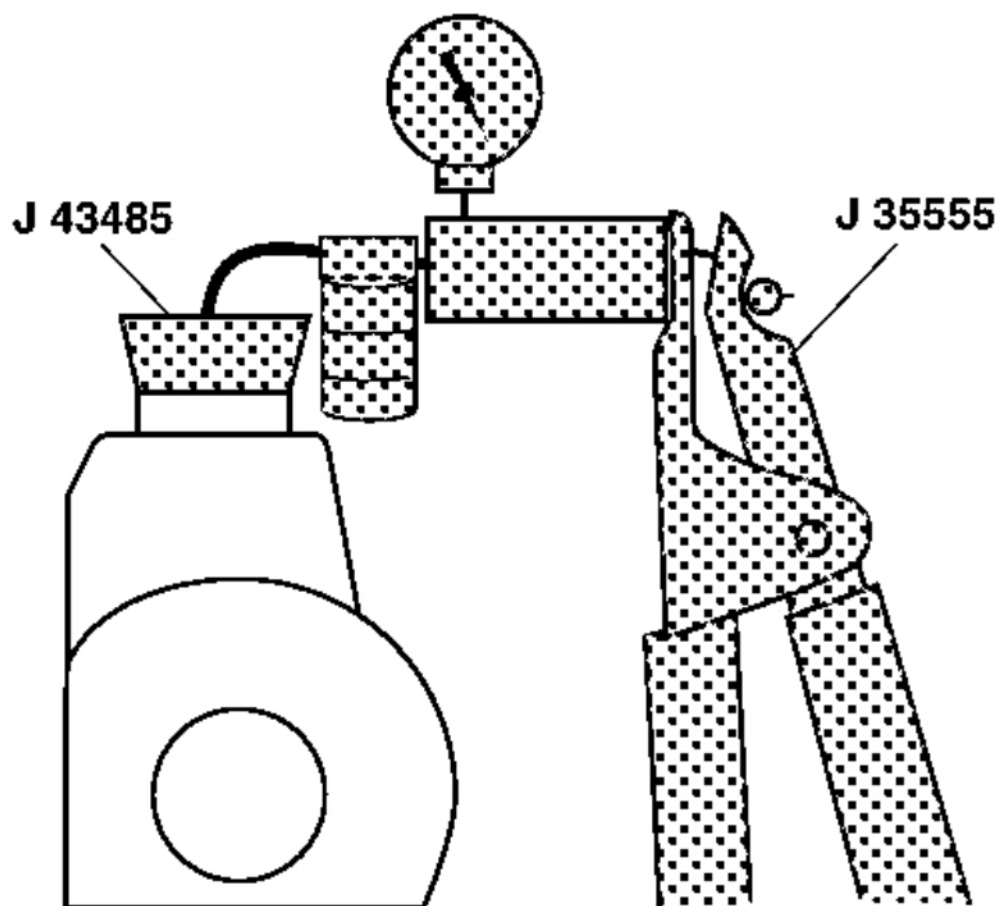


Fig. 8: Bleeding Power Steering System Using J 43485 & J 35555
Courtesy of GENERAL MOTORS CORP.

3. Attach the **J 43485** to the **J 35555** or equivalent. See **Special Tools and Equipment**.
4. Place the **J 43485** on or in the pump reservoir filler neck. See **Special Tools and Equipment**.
5. Apply a vacuum of 68 kPa (20 in Hg) maximum.
6. If the vacuum drops again, repair or replace the pump. If the vacuum holds steady, continue to check the other parts of the steering system.

IMPORTANT: Fluid must be free from bubbles and foam. Be aware of

periodic bubbles that indicate a loose connection or leaking O-ring seal in the return hose or the pressure hose. Fluid must be free from discoloration.

7. Observe the fluid.
8. If condition persists, replace the following parts:
 - The return hose clamps
 - The return hose O-rings
 - The pressure hose O-rings
 - The gear cylinder line O-rings
 - The reservoir to pump O-ring
9. Repeat the bleed procedure from the beginning.
10. Drive the vehicle approximately 16 km (10 mi) in order to warm the system to operating temperature. Evaluate vehicle on a smooth flat surface.
11. Verify the following conditions:
 - There is smooth power assist.
 - The vehicle operates quietly.
 - The pump maintains the proper fluid level.
 - There is not any leaking in the steering system.
 - The fluid is free of foam or discoloration.

CHECKING AND ADDING POWER STEERING FLUID

NOTE: When adding fluid or making a complete fluid change, always use the proper power steering fluid. Failure to use the proper fluid will cause hose and seal damage and fluid leaks.

1. Clean the area surrounding the reservoir cap.
2. Remove the reservoir cap.
3. Inspect the power steering pump fluid level at regular intervals. Use the appropriate procedure below.

Add fluid when required. Refer to **Fluid and Lubricant Recommendations** in Maintenance and Lubrication.

Fluid Is Hot

1. Run the engine until the fluid reaches about 80°C (170°F).
2. Turn the engine OFF.
3. Remove the reservoir cap.
4. Inspect the fluid level on the capstick.
5. Ensure that the fluid level is at the HOT/FULL mark on the capstick.
4. If the fluid level is low, add power steering fluid to the proper level.
5. Install the reservoir cap.
6. When checking the fluid level after servicing the steering system, bleed the air from the system. Refer to **Bleeding the Power Steering System**.

FLUSHING THE POWER STEERING SYSTEM

IMPORTANT: Do not reuse any drained power steering fluid regardless of appearance or condition.

1. Turn off the engine.
2. Raise the front end of the vehicle off the ground until the tires and wheels turn freely. Refer to **Lifting and Jacking the Vehicle** in General Information.
3. Place a large container under the fluid return hose in order to collect the draining fluid.
4. Remove the fluid return hose at the power steering pump reservoir inlet connection.
5. Plug the reservoir return hose inlet connection on the power steering pump.

IMPORTANT:

- This step may require 4 L (4 qt) of power steering fluid until the draining fluid appears clear.
- Do not run the engine without the power steering fluid level at FULL COLD.

6. Run the engine at idle while an assistant maintains the fluid level at FULL COLD in the reservoir using new approved power steering fluid.
7. Turn off the engine.
8. Turn the steering wheel fully to the left and to the right.
9. Remove the plug from the pump reservoir inlet connection.
10. Install the fluid return hose to the pump reservoir.
11. Maintain the fluid level at FULL COLD.
12. Operate the engine at idle for approximately 15 minutes.

13. Repeat steps 3-5.
14. Inspect the power steering fluid for the following indications of contamination:
 - Milky fluid - water
 - Brown fluid - burnt
 - Plastic debris or dirt chunks
15. If the fluid is contaminated, repeat steps 6-12 in order to complete a third flush.
16. Remove the plug from the pump reservoir inlet connection.
17. Install the fluid return hose to the pump reservoir.
18. Clean any spilled fluid.
19. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.

REMOTE POWER STEERING FLUID RESERVOIR REPLACEMENT (LY7)

Removal Procedure

1. Remove the air cleaner intake duct. Refer to **Air Cleaner Intake Duct Replacement** in Engine Controls - 3.6 L (LY7).
2. Remove the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.
3. Place a drain pan under the vehicle.
4. Disconnect the power steering cooler hose from the power steering reservoir.

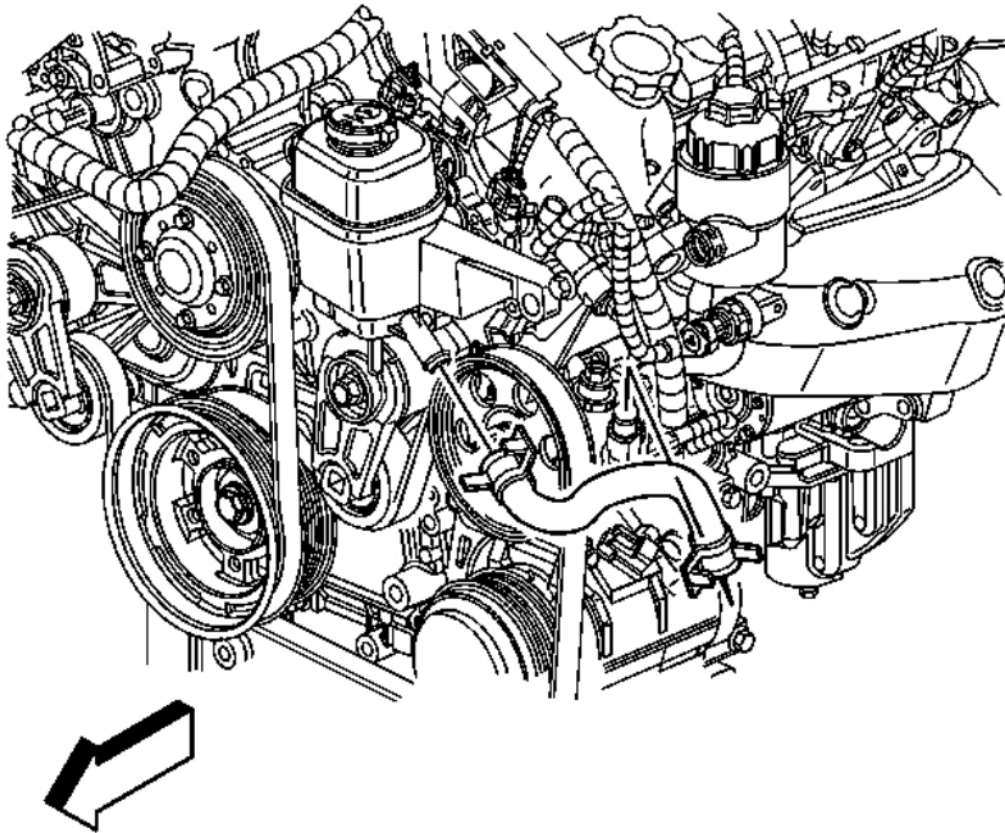


Fig. 9: Disconnecting Power Steering Reservoir Outlet Hose
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the power steering reservoir outlet hose from the power steering reservoir.

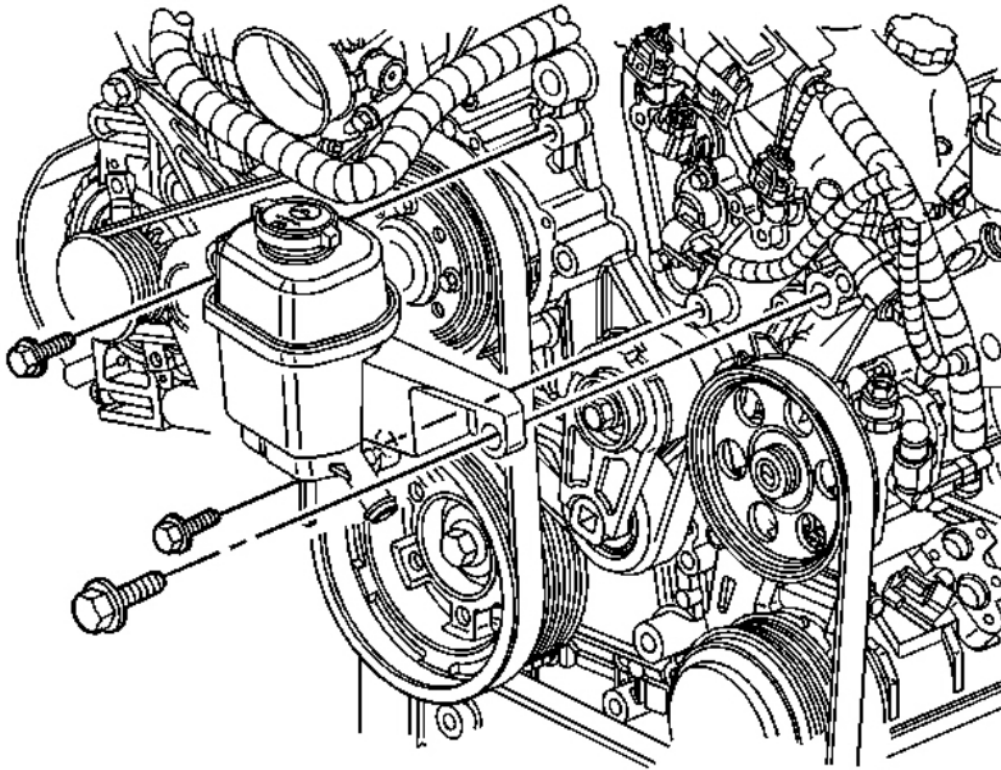


Fig. 10: Removing Power Steering Reservoir Retaining Bolts
Courtesy of GENERAL MOTORS CORP.

6. Remove the power steering reservoir retaining bolts.
7. Remove the power steering reservoir from the vehicle.

Installation Procedure

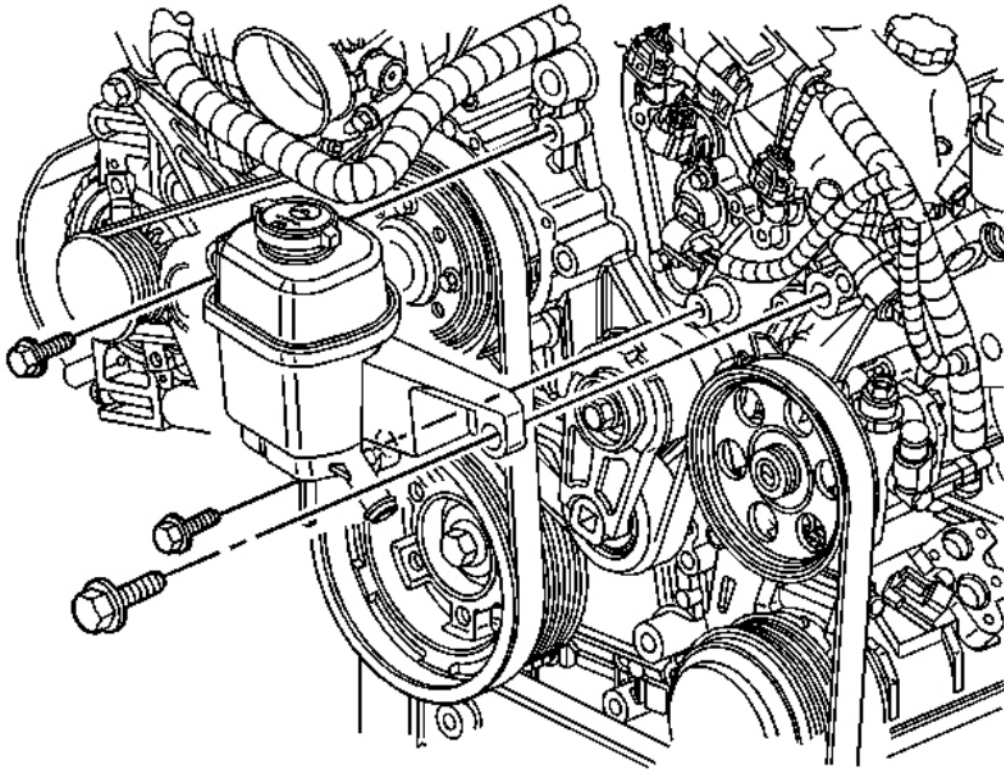


Fig. 11: Installing Power Steering Reservoir To Vehicle
Courtesy of GENERAL MOTORS CORP.

1. Install the power steering reservoir to the vehicle.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the power steering reservoir retaining bolts.

Tighten:

- Tighten the two upper bolts to 9 N.m (80 lb in).
- Tighten the lower bolt to 25 N.m (19 lb ft).

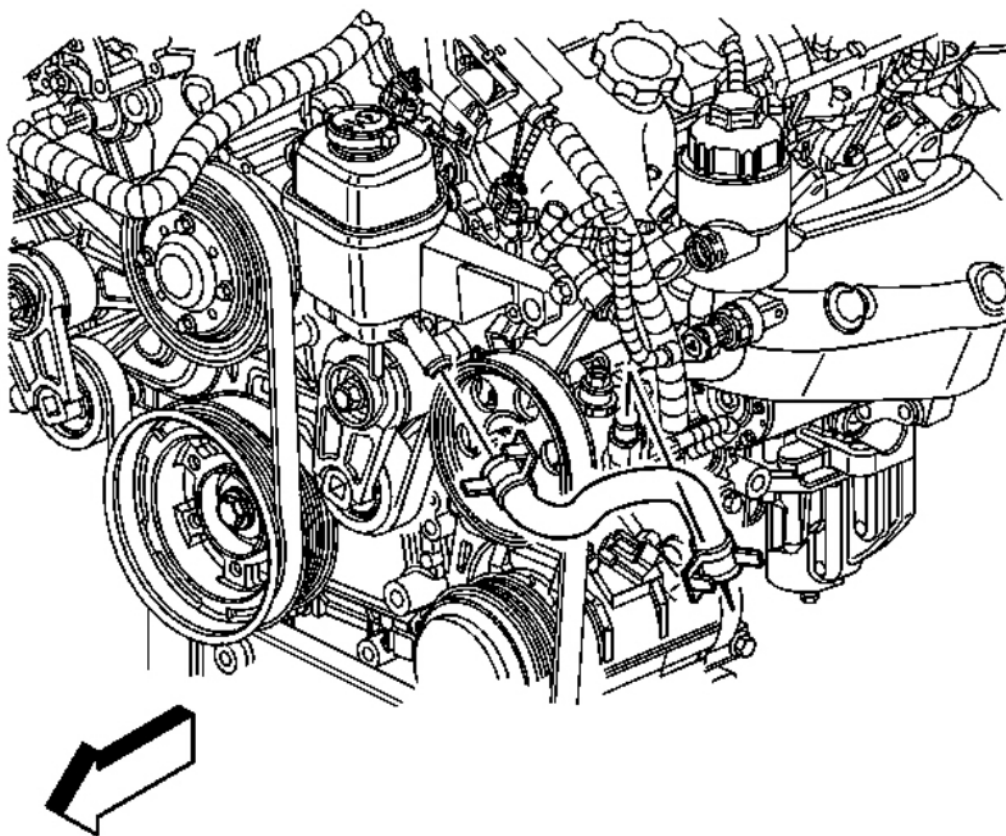


Fig. 12: Connecting Power Steering Reservoir Outlet Hose
Courtesy of GENERAL MOTORS CORP.

3. Connect the power steering reservoir outlet hose to the power steering reservoir.
4. Connect the power steering cooler hose to the power steering reservoir.
5. Remove the drain pan from under the vehicle.
6. Install the air cleaner intake duct. Refer to **Air Cleaner Intake Duct Replacement** in Engine Controls - 3.6 L (LY7).
7. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.
8. Install the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.

Removal Procedure

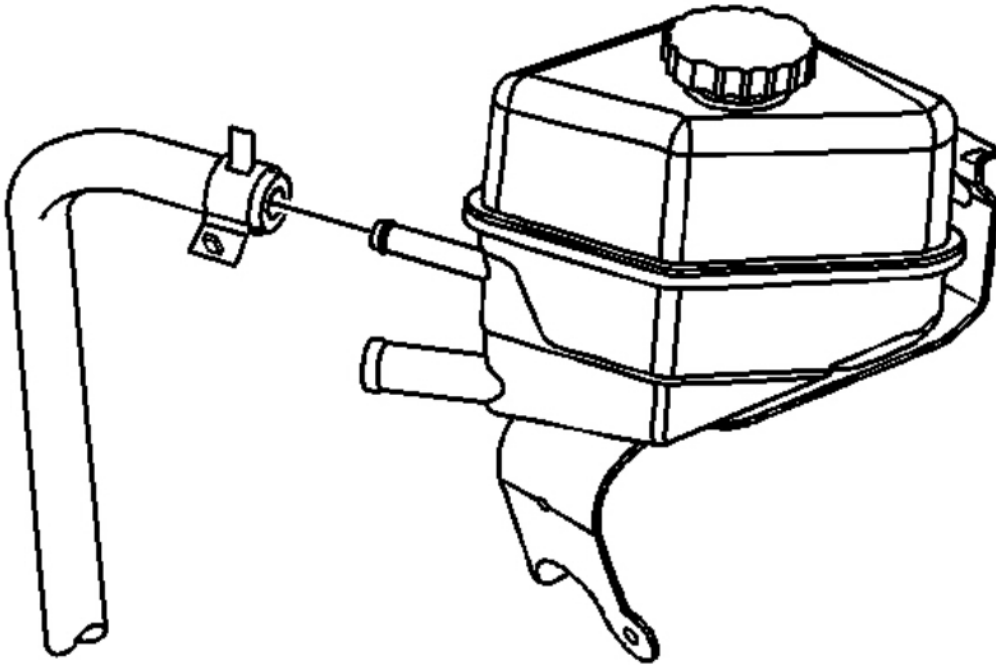


Fig. 13: Disconnecting Power Steering Return Hose From Power Steering Reservoir
Courtesy of GENERAL MOTORS CORP.

1. Place a drain pan under the vehicle.
2. Disconnect the power steering return hose from the power steering reservoir.

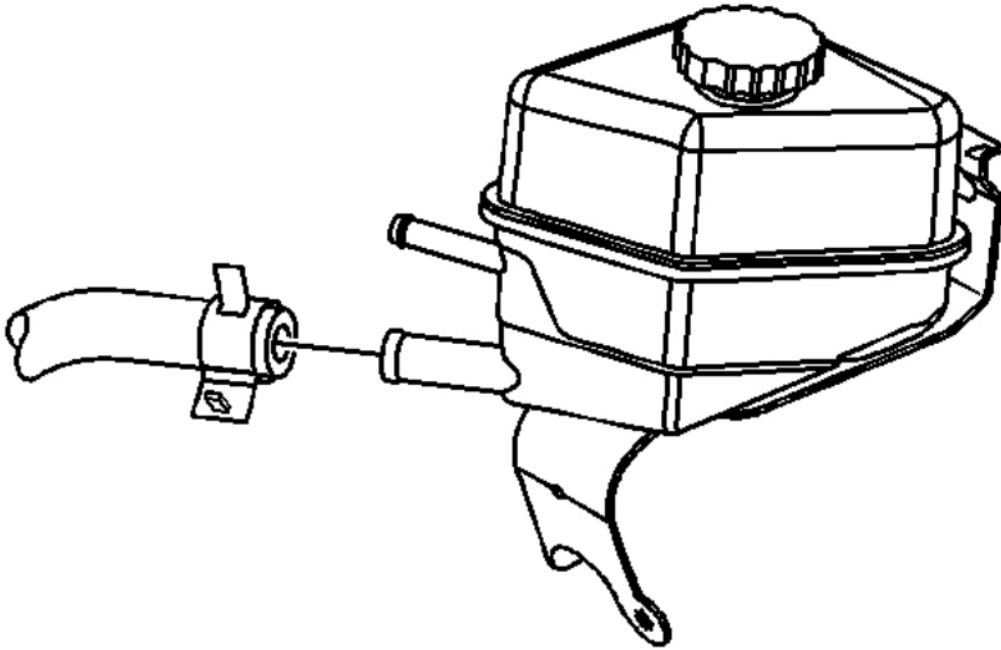


Fig. 14: Disconnecting Power Steering Reservoir Outlet Hose
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the power steering reservoir outlet hose from the power steering reservoir.
4. Disconnect the brake vacuum hose from the power steering reservoir.

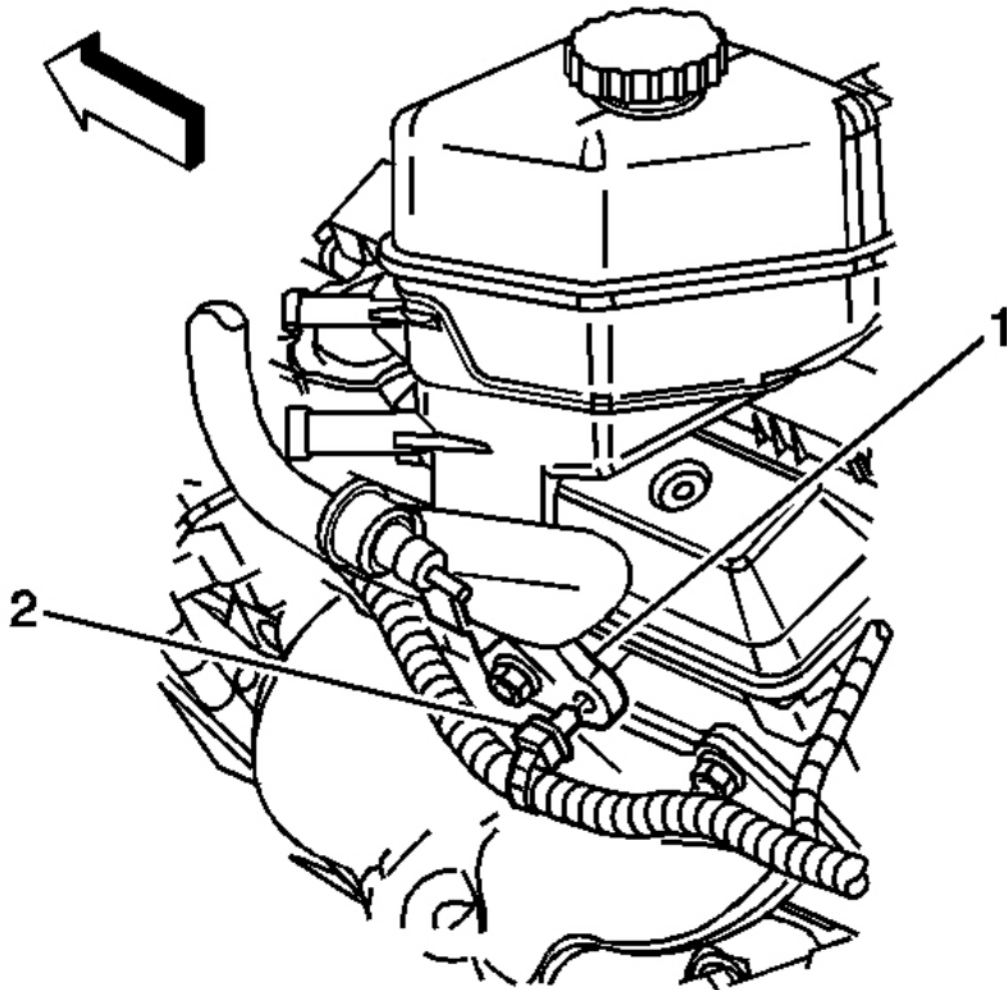


Fig. 15: Disconnecting Wiring Harness From Power Steering Reservoir
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the wiring harness (2) from the power steering reservoir (1).

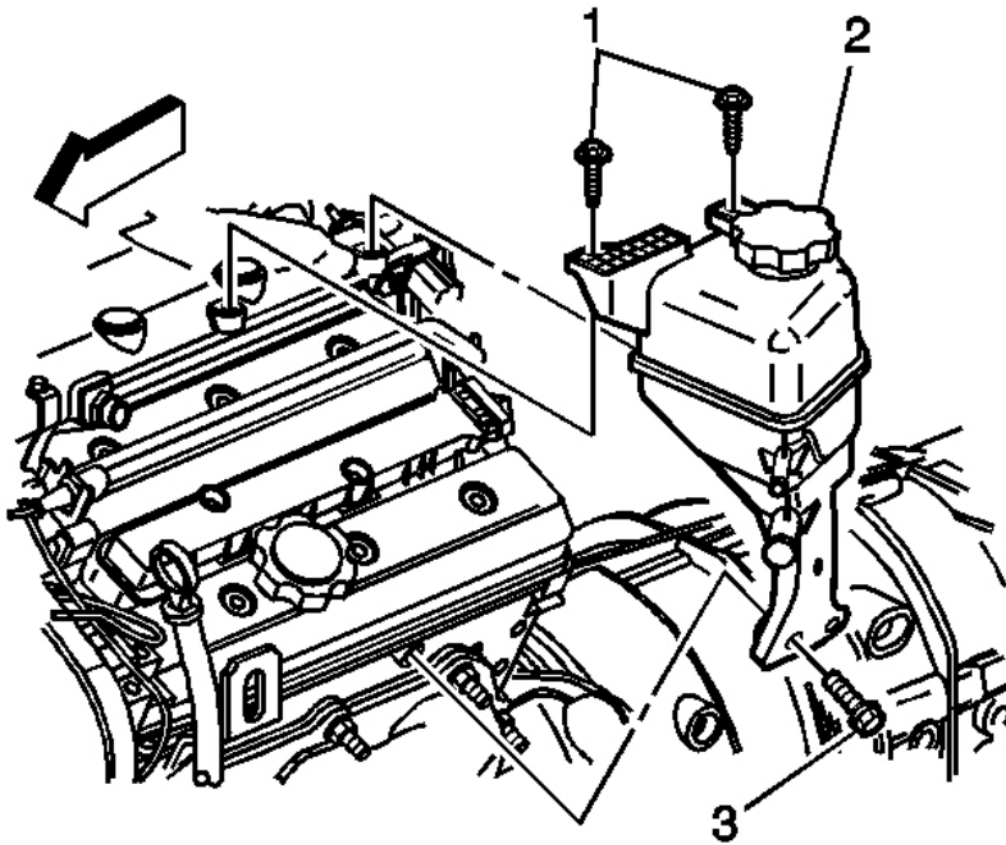


Fig. 16: Locating Remote Power Steering Fluid Reservoir Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

6. Remove the power steering reservoir mounting bolts (1 and 3).
7. Remove the power steering reservoir (2).

Installation Procedure

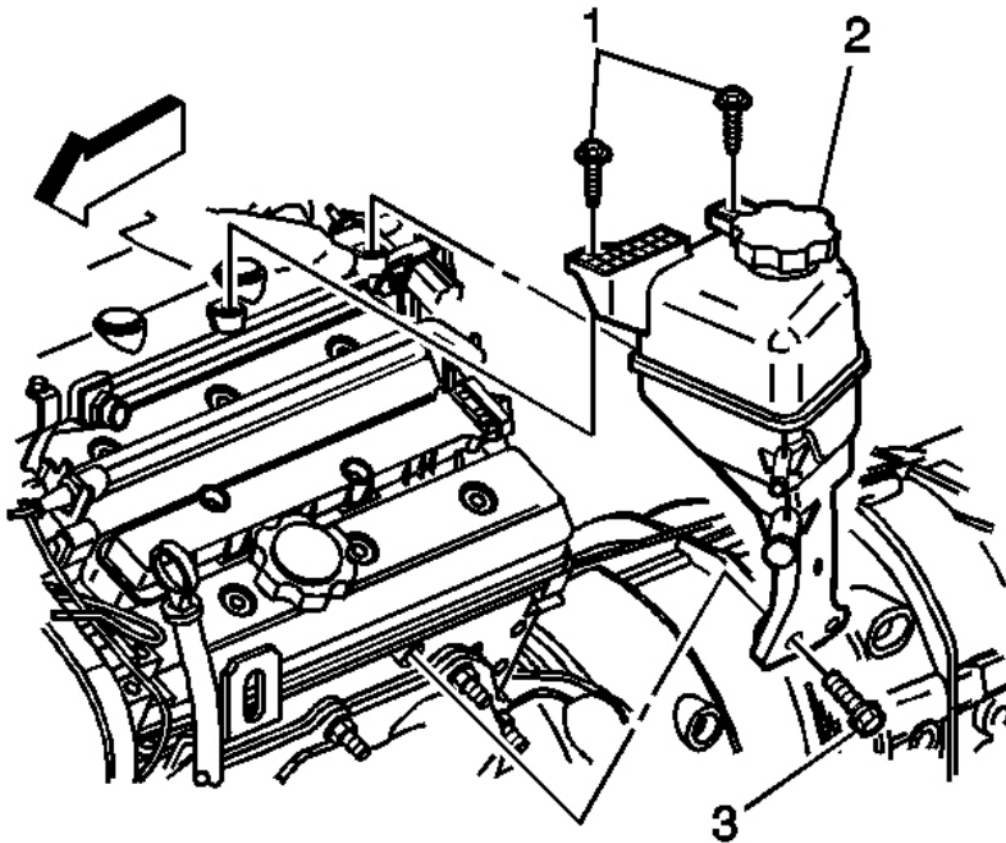


Fig. 17: Locating Remote Power Steering Fluid Reservoir Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install the power steering reservoir.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the power steering reservoir mounting bolts (1 and 3).

Tighten:

- Tighten the bolts (1) to 9 N.m (80 lb in).
- Tighten the bolt (3) to 25 N.m (18 lb ft).

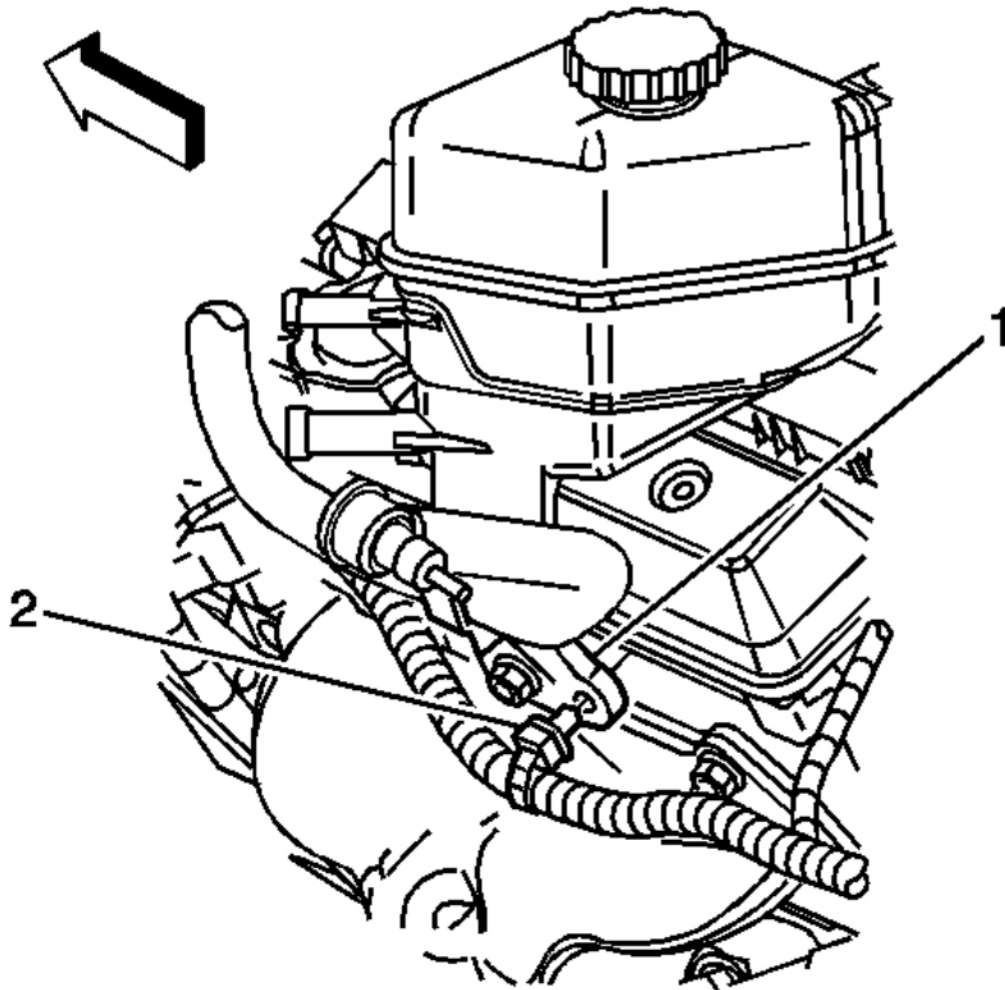


Fig. 18: Connecting Wiring Harness To Power Steering Reservoir
Courtesy of GENERAL MOTORS CORP.

3. Connect the wiring harness (2) to the power steering reservoir (1).
4. Connect the brake vacuum hose to the power steering reservoir.

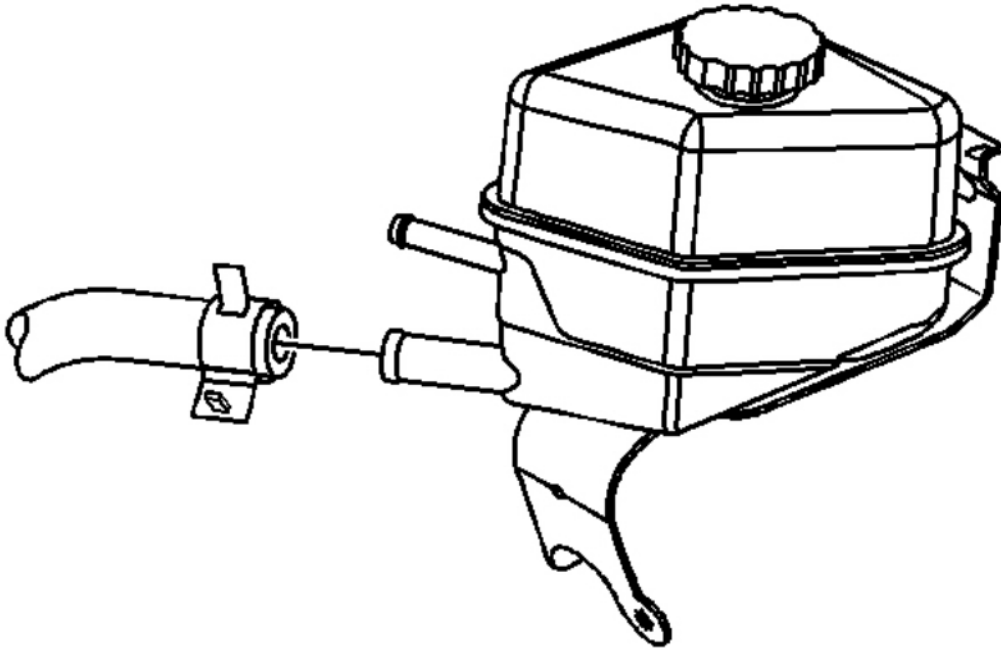


Fig. 19: Connecting Power Steering Reservoir Outlet Hose
Courtesy of GENERAL MOTORS CORP.

5. Connect the power steering reservoir outlet hose to the power steering reservoir.

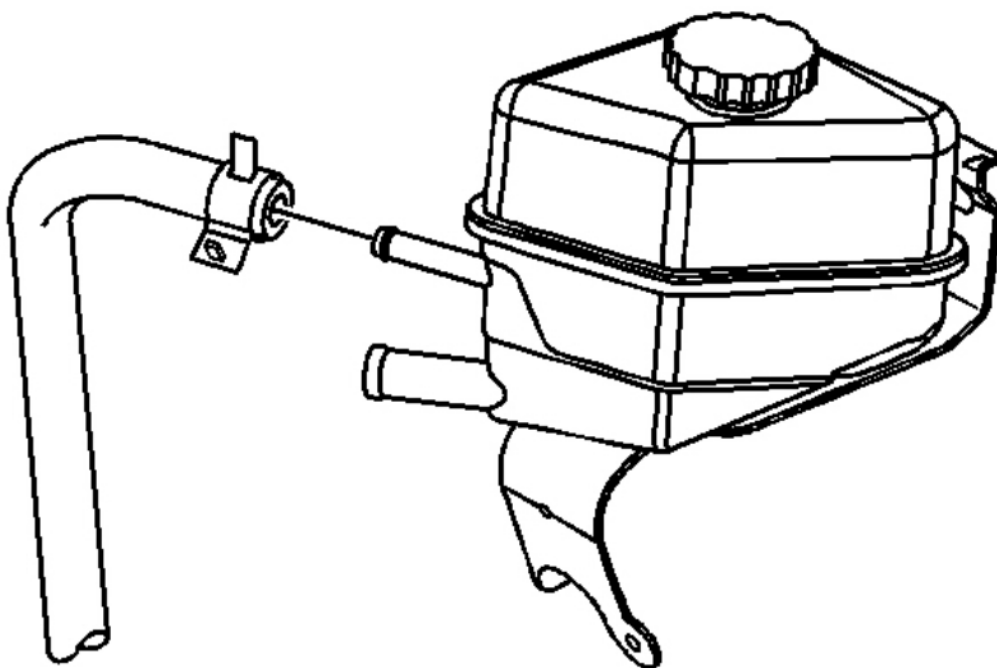


Fig. 20: Connecting Power Steering Return Hose To Power Steering Reservoir
Courtesy of GENERAL MOTORS CORP.

6. Connect the power steering return hose to the power steering reservoir.
7. Remove the drain pan from under the vehicle.
8. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.

REMOTE POWER STEERING FLUID RESERVOIR REPLACEMENT (5.7L)

Removal Procedure

1. Remove the fuel injector sight shield. Refer to **Fuel Injector Sight Shield Replacement** in Engine Mechanical - 5.7L.
2. Remove the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.
3. Place a drain pan under the vehicle.

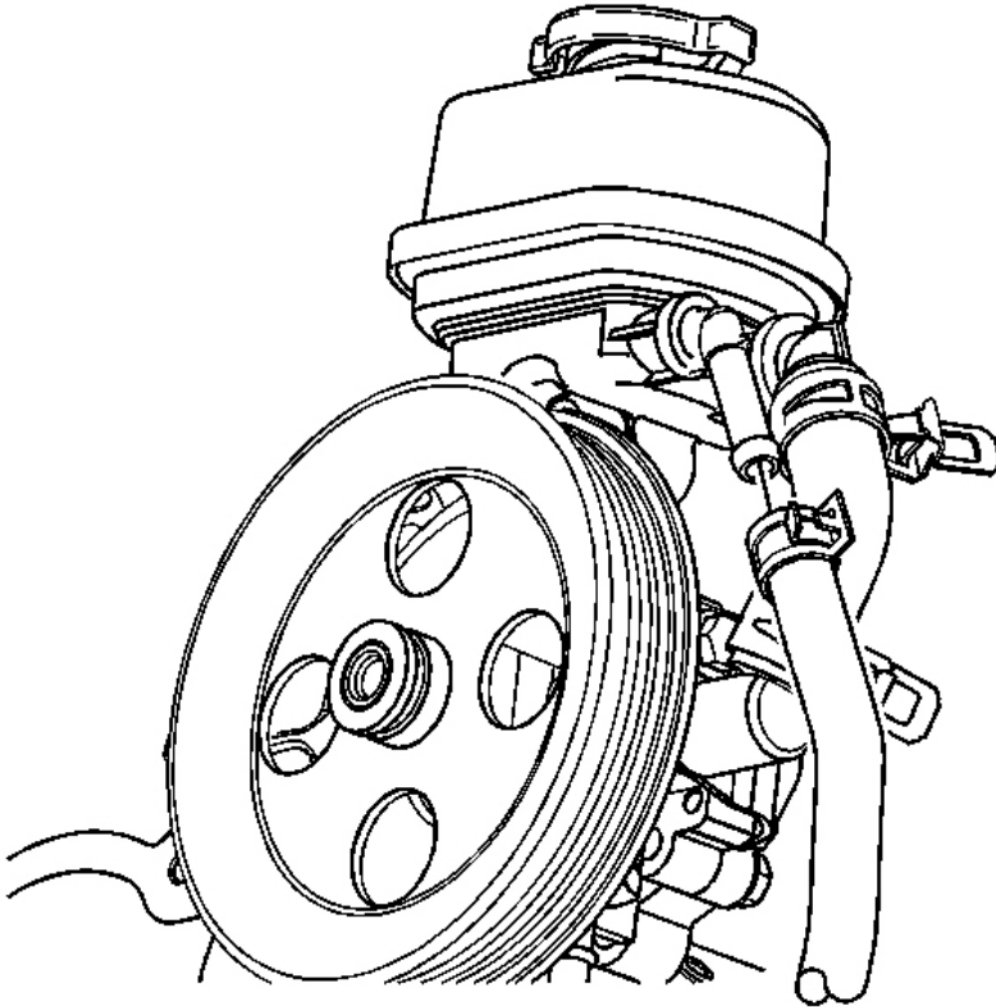


Fig. 21: Disconnecting Power Steering Cooler Hose
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the power steering cooler hose from the power steering reservoir.

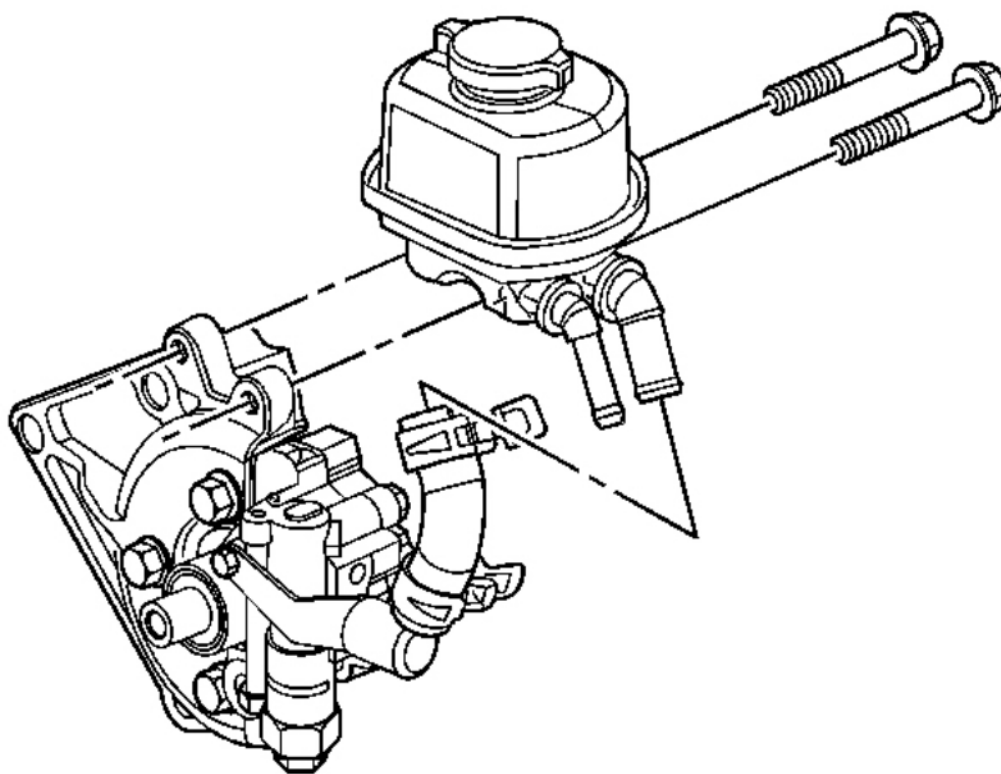


Fig. 22: Removing Power Steering Reservoir Retaining Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the power steering reservoir retaining bolts.

IMPORTANT: When removing the power steering reservoir, squeeze the clamp and pull the power steering reservoir from the power steering reservoir outlet hose.

6. Remove the power steering reservoir from the vehicle.

Installation Procedure

IMPORTANT: When installing the power steering reservoir, squeeze the clamp on the hose and install the reservoir in the reservoir outlet hose.

1. Install the power steering reservoir to the vehicle.

NOTE: Refer to Fastener Notice in Cautions and Notices.

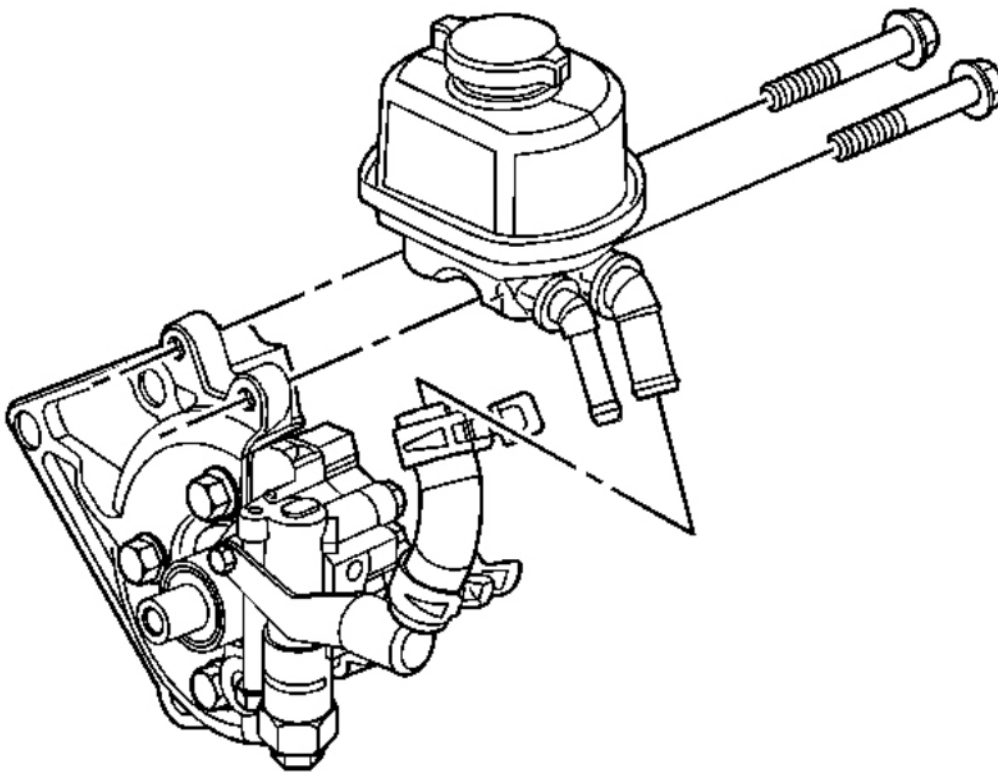


Fig. 23: Installing Power Steering Reservoir Retaining Bolts
Courtesy of GENERAL MOTORS CORP.

2. Install the power steering reservoir retaining bolts.

Tighten: Tighten the bolts to 25 N.m (18 lb ft).

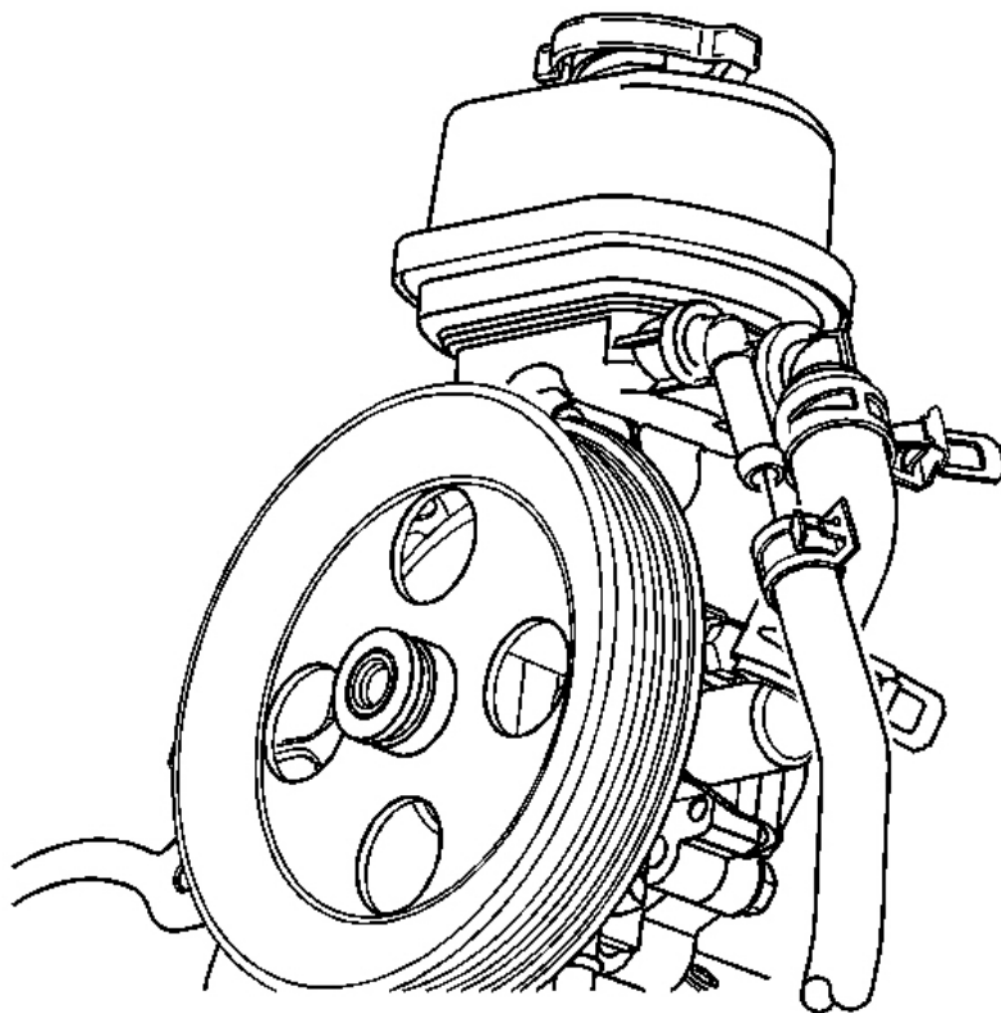


Fig. 24: Connecting Power Steering Cooler Hose To Power Steering Reservoir
Courtesy of GENERAL MOTORS CORP.

3. Connect the power steering cooler hose to the power steering reservoir.
4. Remove the drain pan from under the vehicle.
5. Install the fuel injection sight shield. Refer to **Fuel Injector Sight Shield Replacement** in Engine Mechanical - 5.7L.
6. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.
7. Install the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front

End.

POWER STEERING PULLEY REPLACEMENT

Tools Required

- J 25033-C Pulley Installer
- J 25034-C Pulley Remover

Removal Procedure

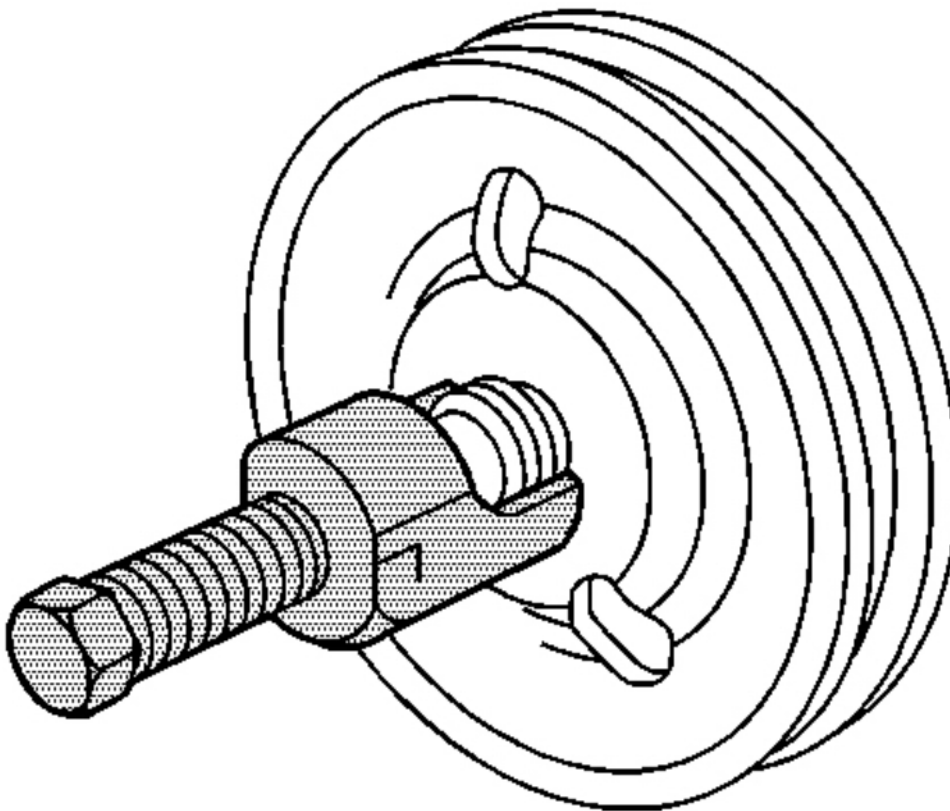


Fig. 25: View Of Power Steering Pump Pulley Remover
Courtesy of GENERAL MOTORS CORP.

1. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls-2.6L and 3.2L.
2. Remove the drive belt. Refer to **Drive Belt Replacement** in Engine Mechanical -2.6L and 3.2L.
3. Using **J 25034-C** remove the power steering pump pulley from the power steering pump.

Installation Procedure

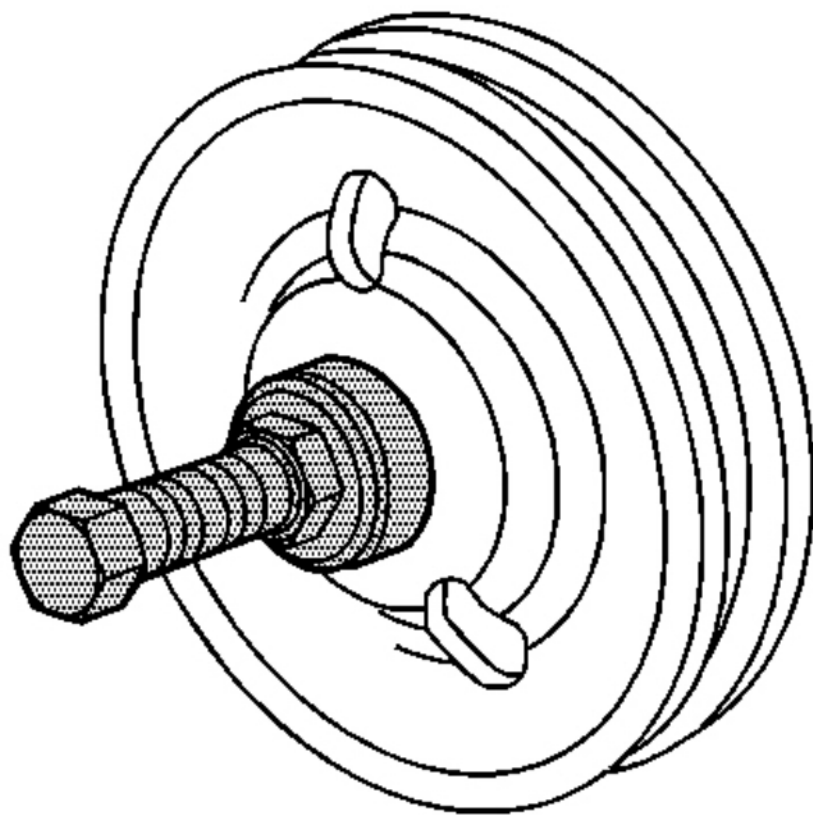


Fig. 26: View Of Power Steering Pump Pulley Installer
Courtesy of GENERAL MOTORS CORP.

1. Using **J 25033-C** install the power steering pump pulley to the power steering pump.

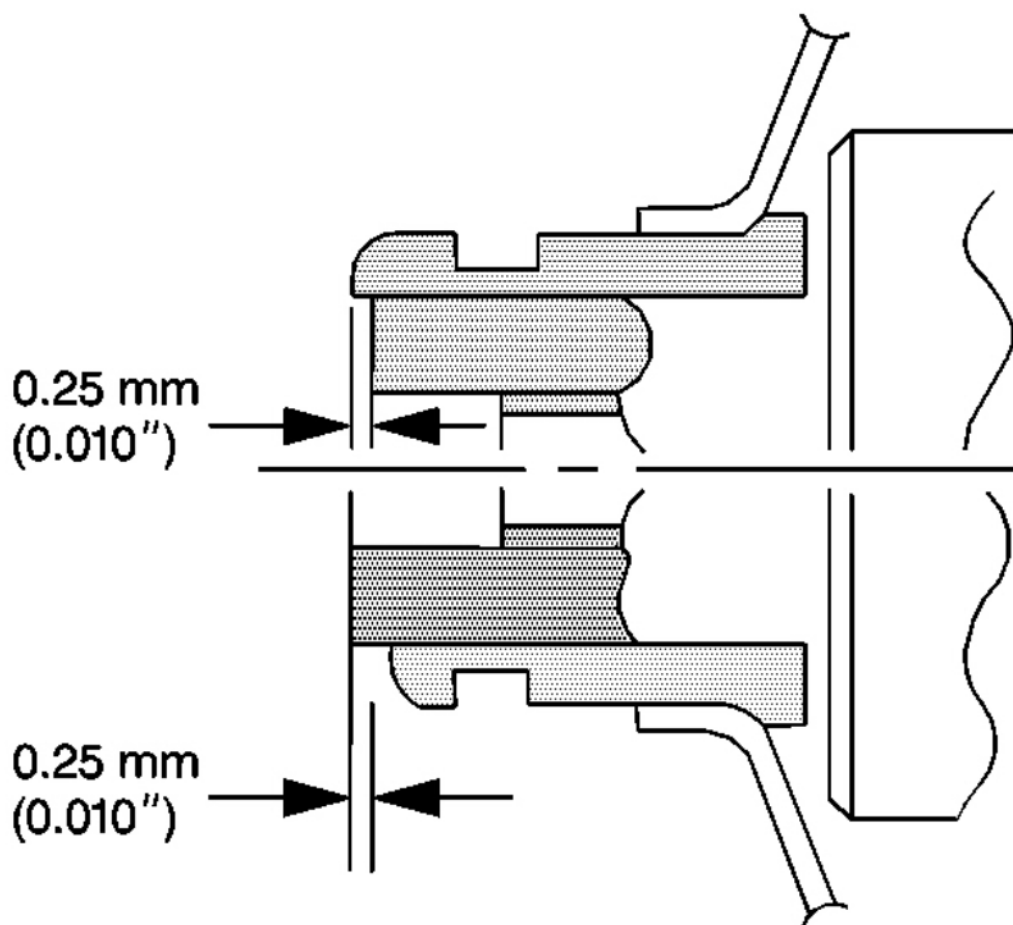


Fig. 27: Measuring Axial Tolerance Of Power Steering Pulley On Pump
Courtesy of GENERAL MOTORS CORP.

2. Ensure that the axial tolerance of the power steering pulley on the power steering pump is within 0.25 mm (0.010 in).
3. Install the drive belt. Refer to **Drive Belt Replacement** in Engine Mechanical -2.6L and 3.2L.
4. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls-2.6L and 3.2L.

Removal Procedure

1. Place a drain pan under the vehicle.
2. Remove the power steering pulley. Refer to **Power Steering Pulley Replacement**.

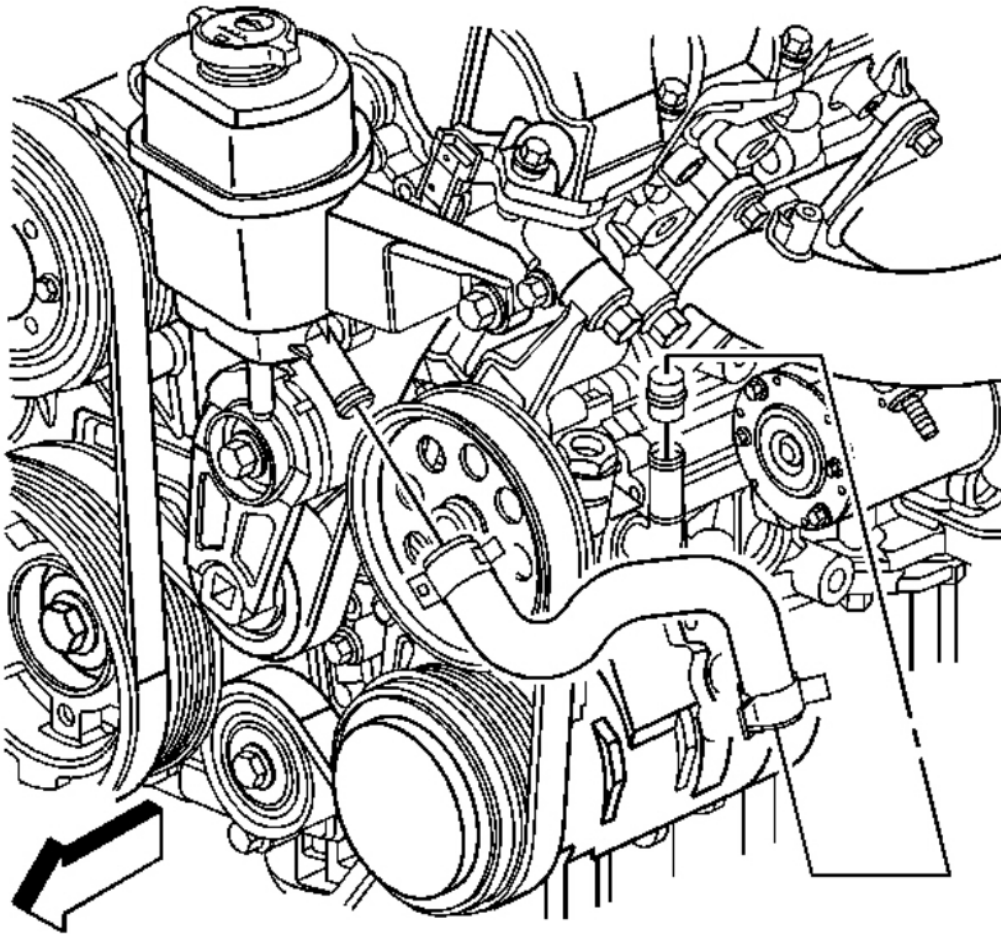


Fig. 28: Disconnecting Power Steering Reservoir Outlet Hose From Power Steering Pump

Courtesy of GENERAL MOTORS CORP.

3. Disconnect the power steering reservoir outlet hose from the power steering pump.

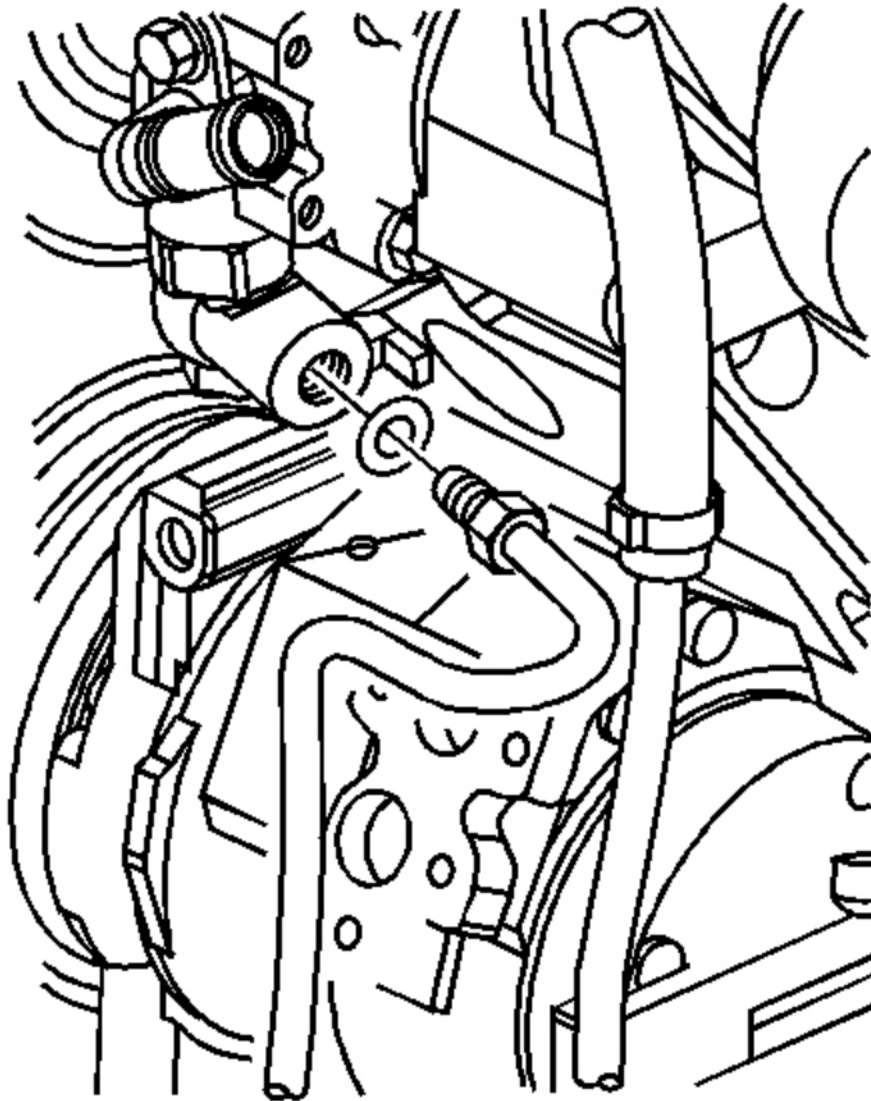


Fig. 29: Disconnecting Power Steering Pressure Hose From Power Steering Pump
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the power steering pressure hose from the power steering pump.

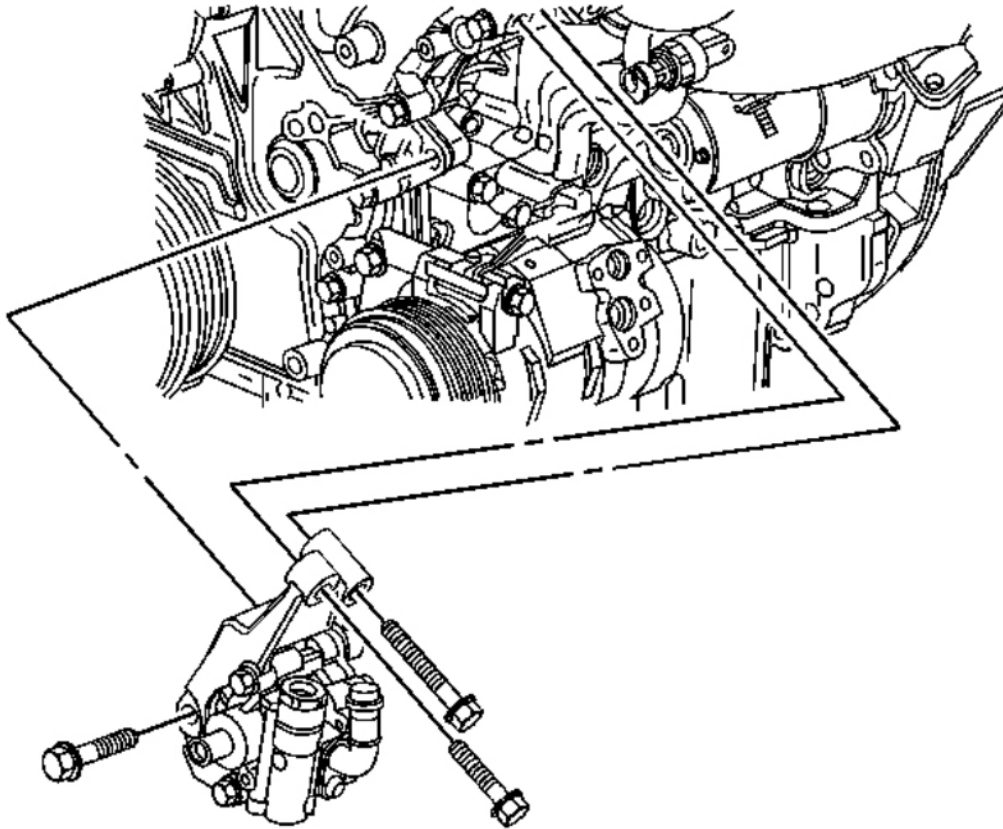


Fig. 30: Removing Power Steering Pump Bracket To Engine Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the power steering pump bracket to engine mounting bolts.
6. Remove the power steering pump bracket assembly.

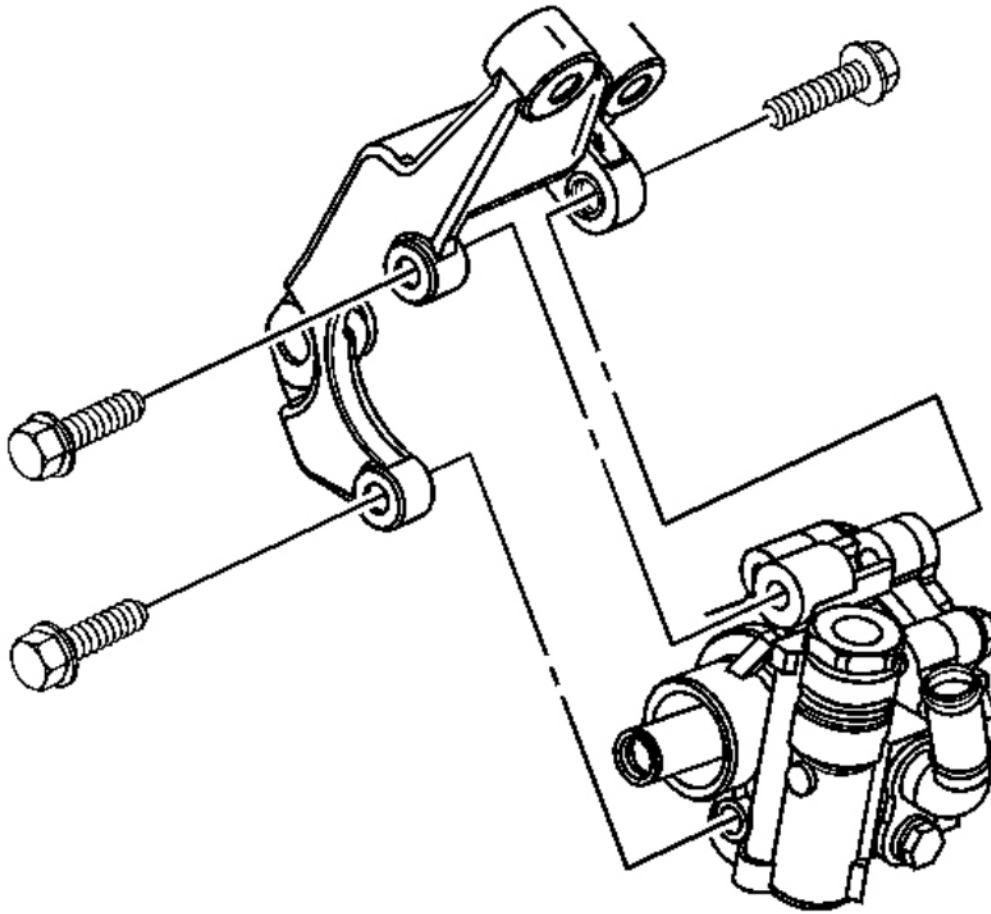


Fig. 31: Removing Power Steering Pump To Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

7. Remove the power steering pump to bracket bolts.
8. Remove the pump from the bracket.

Installation Procedure

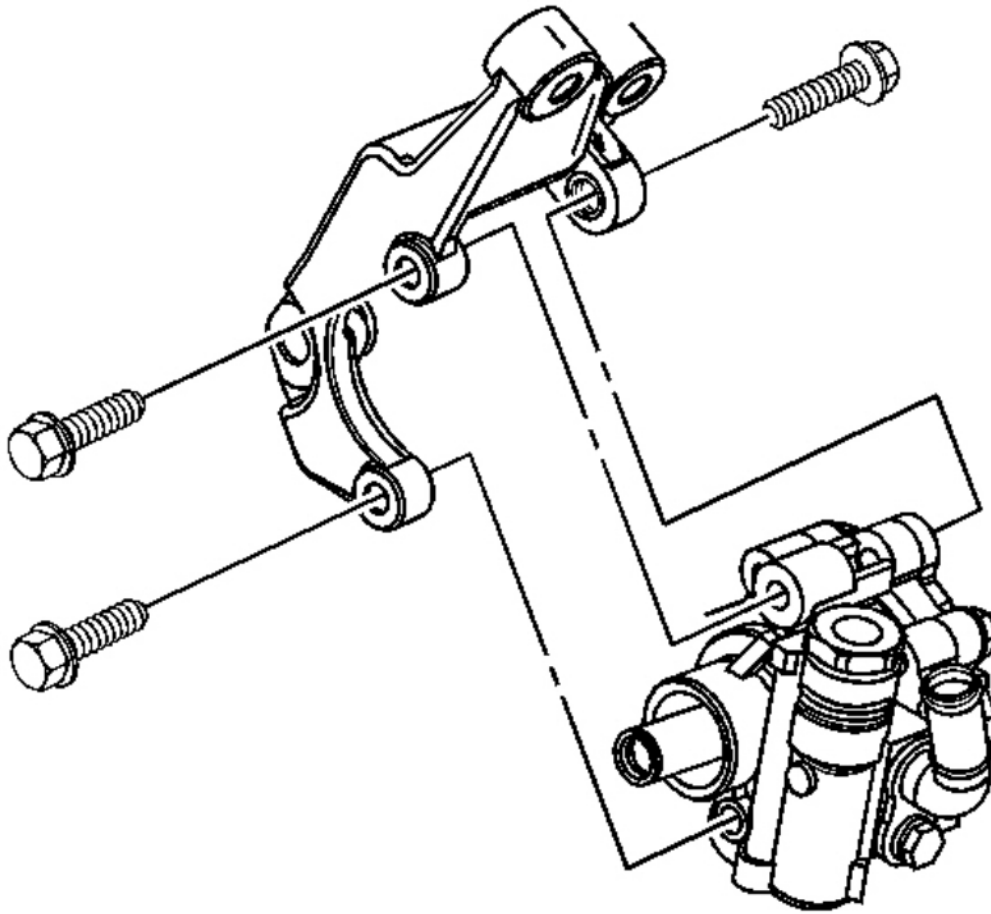


Fig. 32: Installing Pump From Bracket
Courtesy of GENERAL MOTORS CORP.

1. Install the pump from the bracket.

NOTE: Refer to **Fastener Notice** in Cautions and Notices.

2. Install the power steering pump to bracket bolts.

Tighten: Tighten the bolts to 22 N.m (17 lb ft).

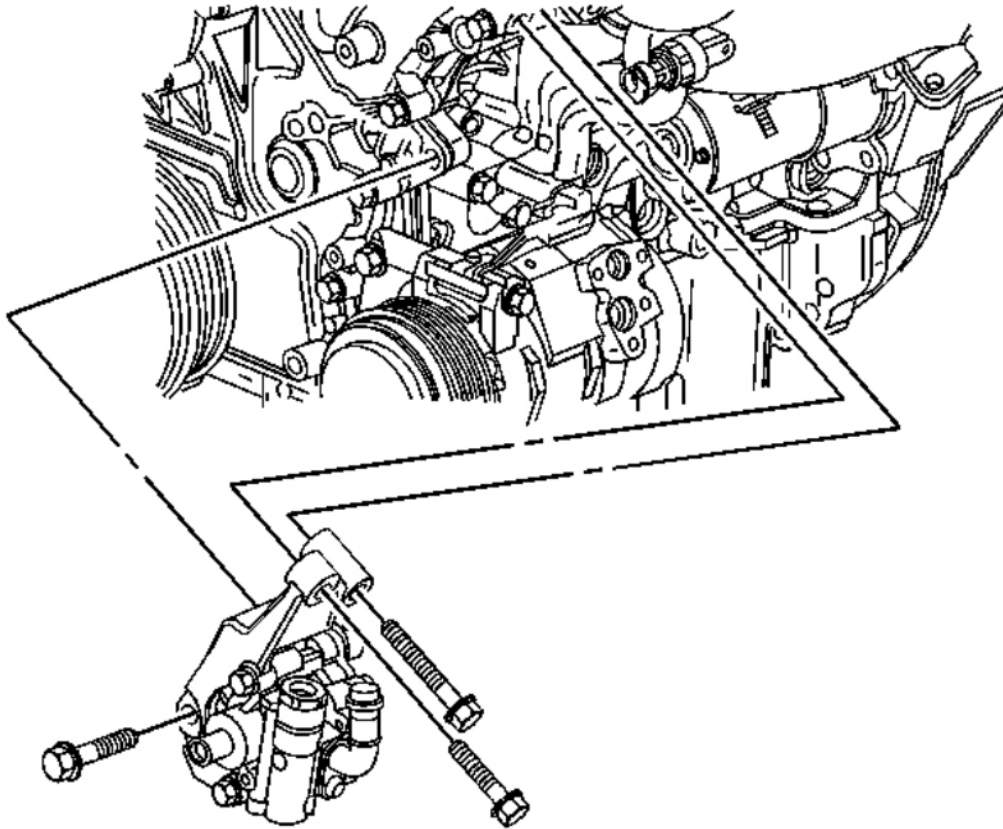


Fig. 33: Installing Power Steering Pump Bracket Assembly
Courtesy of GENERAL MOTORS CORP.

3. Install the power steering pump bracket assembly to the engine.
4. Install the power steering pump bracket to engine mounting bolts.

Tighten: Tighten the bolts to 50 N.m (37 lb ft).

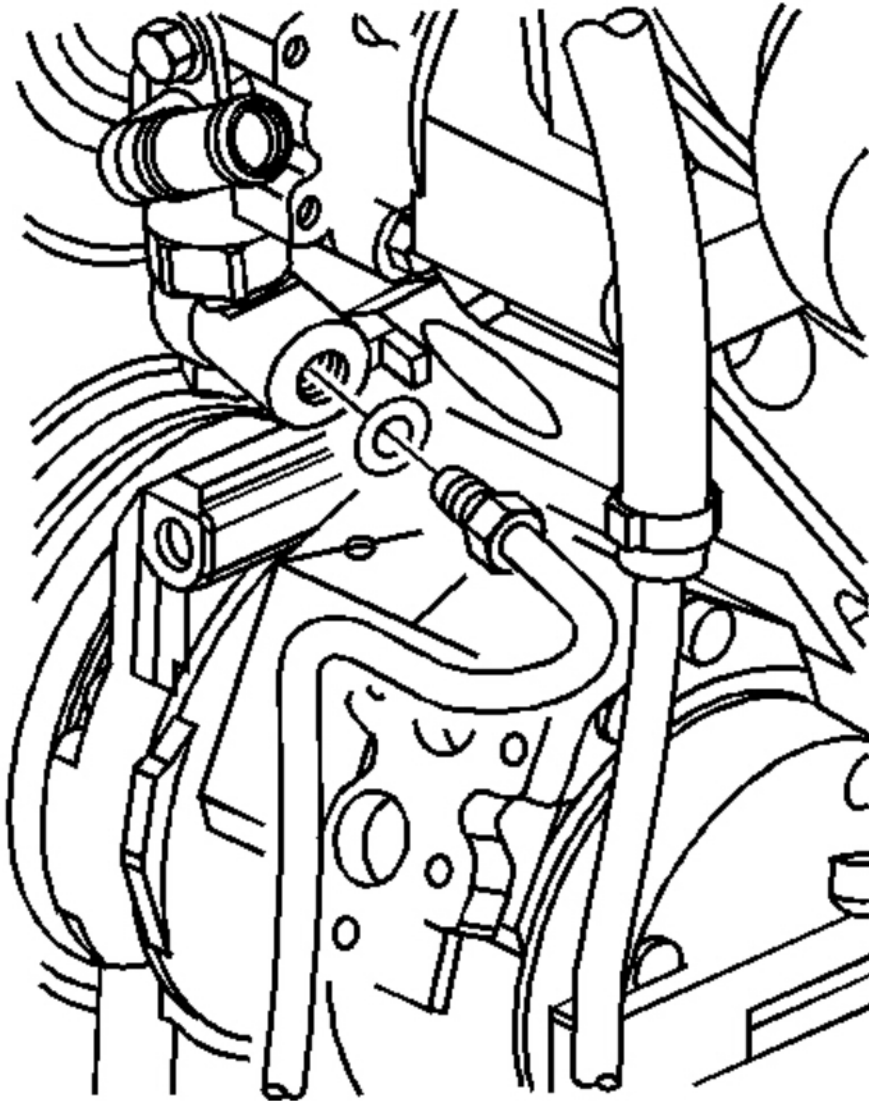


Fig. 34: Connecting Power Steering Pressure Hose To Power Steering Pump
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Clean the material from the power steering pressure hose and install a new seal.

5. Connect the power steering pressure hose to the power steering pump.

Tighten: Tighten the hose to 40 N.m (30 lb ft).

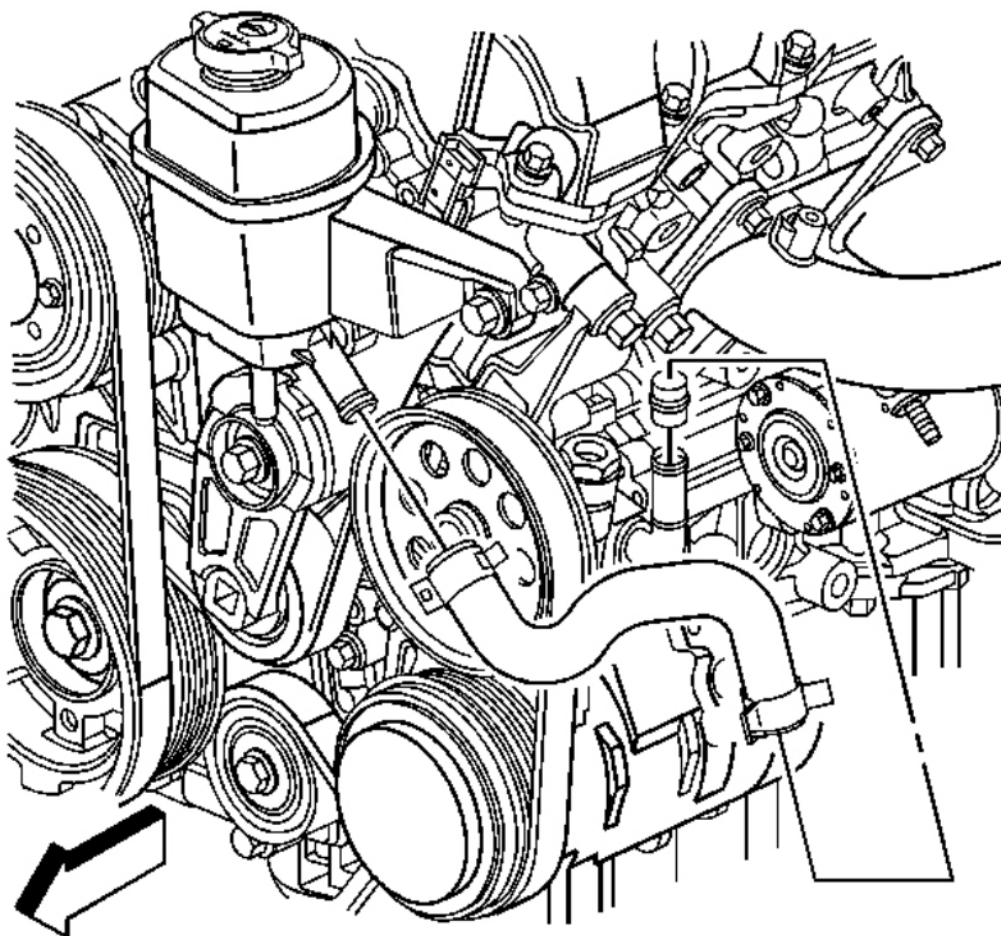


Fig. 35: Connecting Power Steering Reservoir Outlet Hose To Power Steering Pump
Courtesy of GENERAL MOTORS CORP.

6. Connect the power steering reservoir outlet hose to the power steering pump.
7. Install the power steering pulley. Refer to **Power Steering Pulley Replacement**.
8. Remove the drain pan from under the vehicle.
9. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.

Removal Procedure

1. Place a drain pan under the vehicle.
2. Remove the power steering pulley. Refer to Power Steering Pulley Replacement.

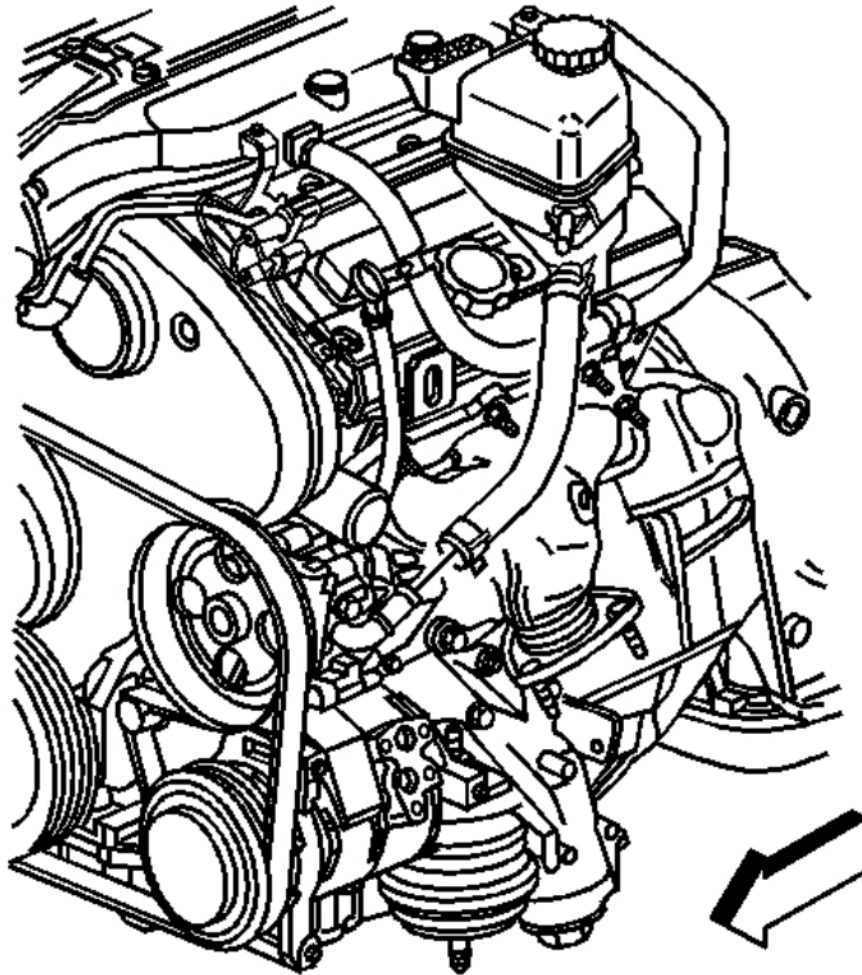


Fig. 36: Disconnecting Power Steering Reservoir Outlet Hose From Power Steering Pump

Courtesy of GENERAL MOTORS CORP.

3. Disconnect the power steering reservoir outlet hose from the power steering pump.

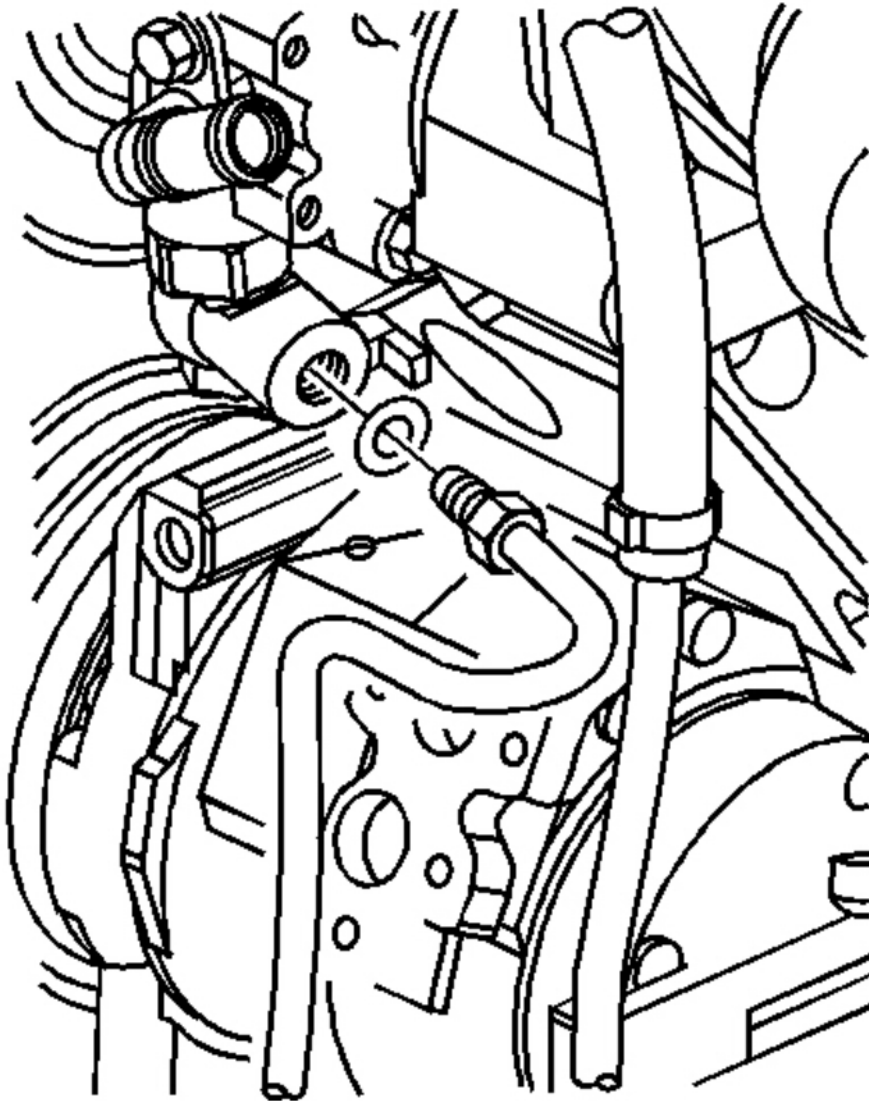


Fig. 37: Disconnecting Power Steering Pressure Hose From Power Steering Pump
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the power steering pressure hose from the power steering pump.

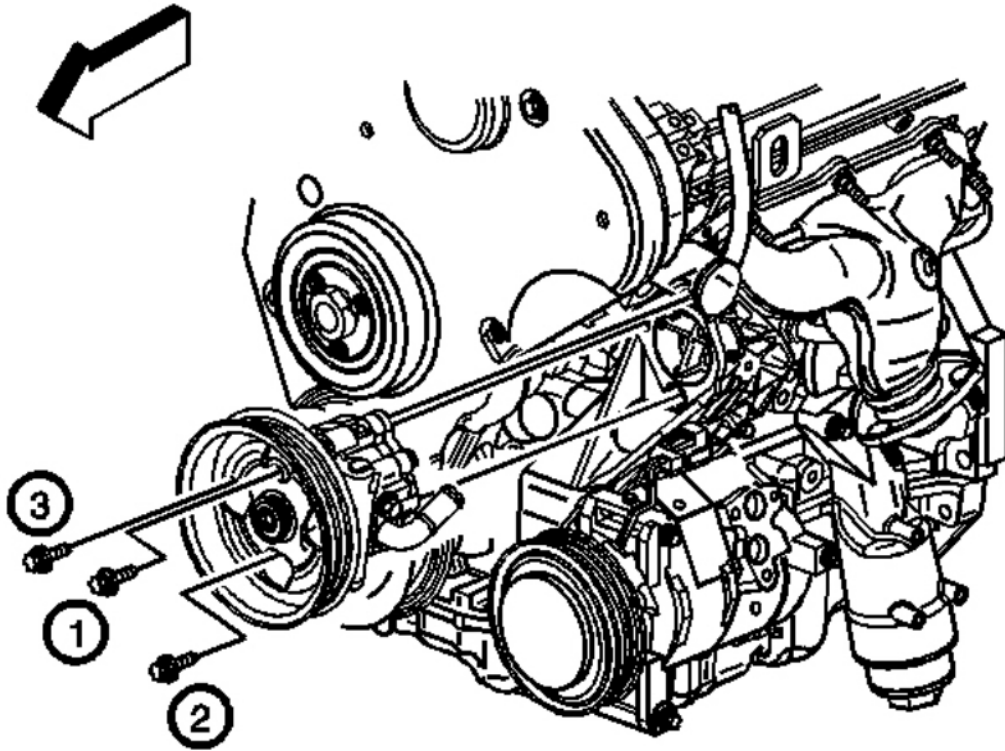


Fig. 38: Removing Power Steering Pump Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the power steering pump mounting bolts (1, 2, and 3).
6. Remove the power steering pump.

Installation Procedure

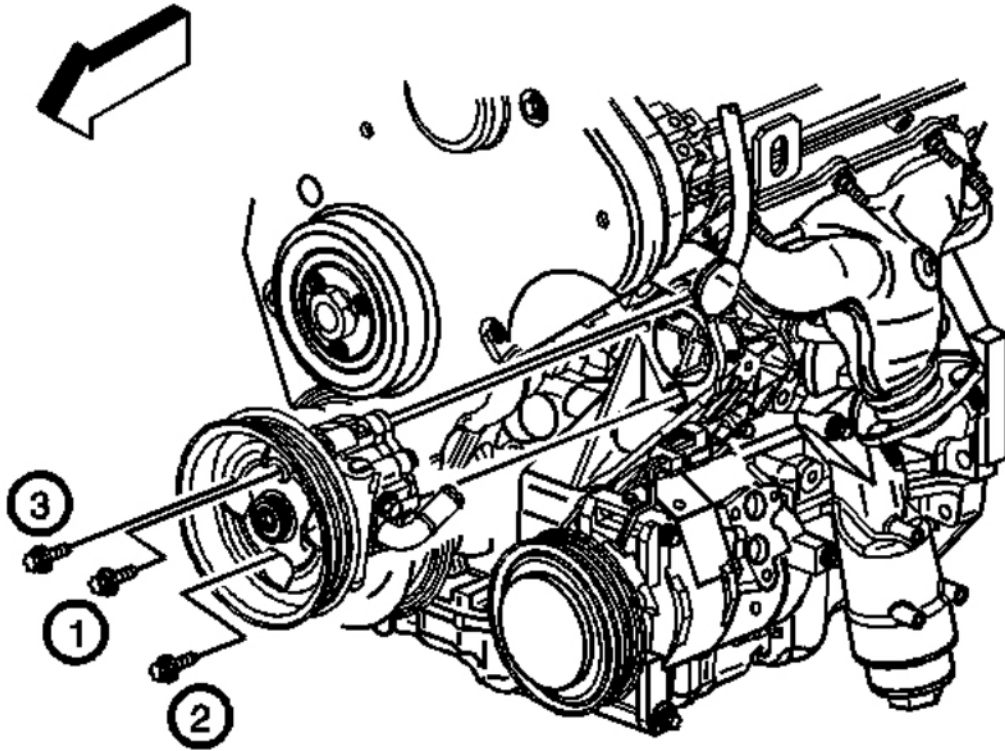


Fig. 39: Installing Power Steering Pump
Courtesy of GENERAL MOTORS CORP.

1. Install the power steering pump.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the power steering pump mounting bolts and tighten in sequence (1, 2 and 3).

Tighten: Tighten the bolts to 35 N.m (26 lb ft).

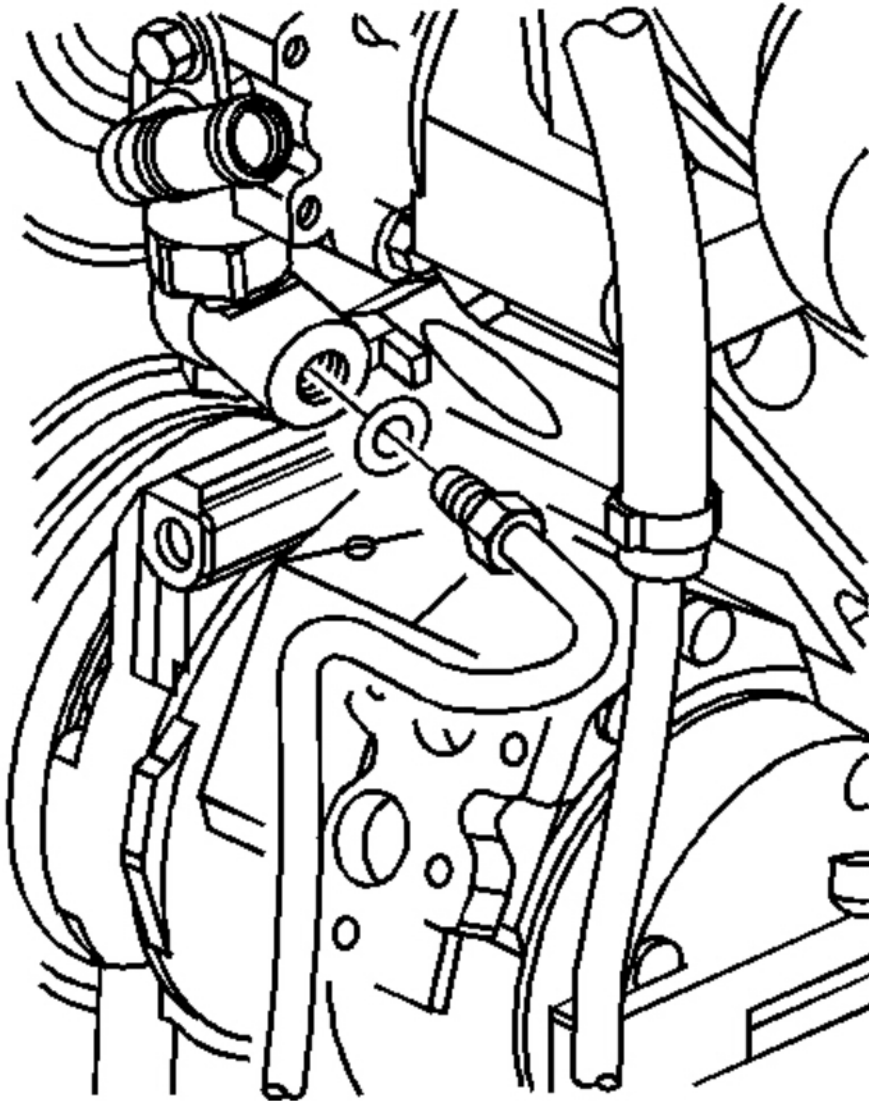


Fig. 40: Connecting Power Steering Pressure Hose To Power Steering Pump
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Clean the material from the power steering pressure hose and install a new seal.

3. Connect the power steering pressure hose to the power steering pump.

Tighten: Tighten the hose to 40 N.m (30 lb ft).

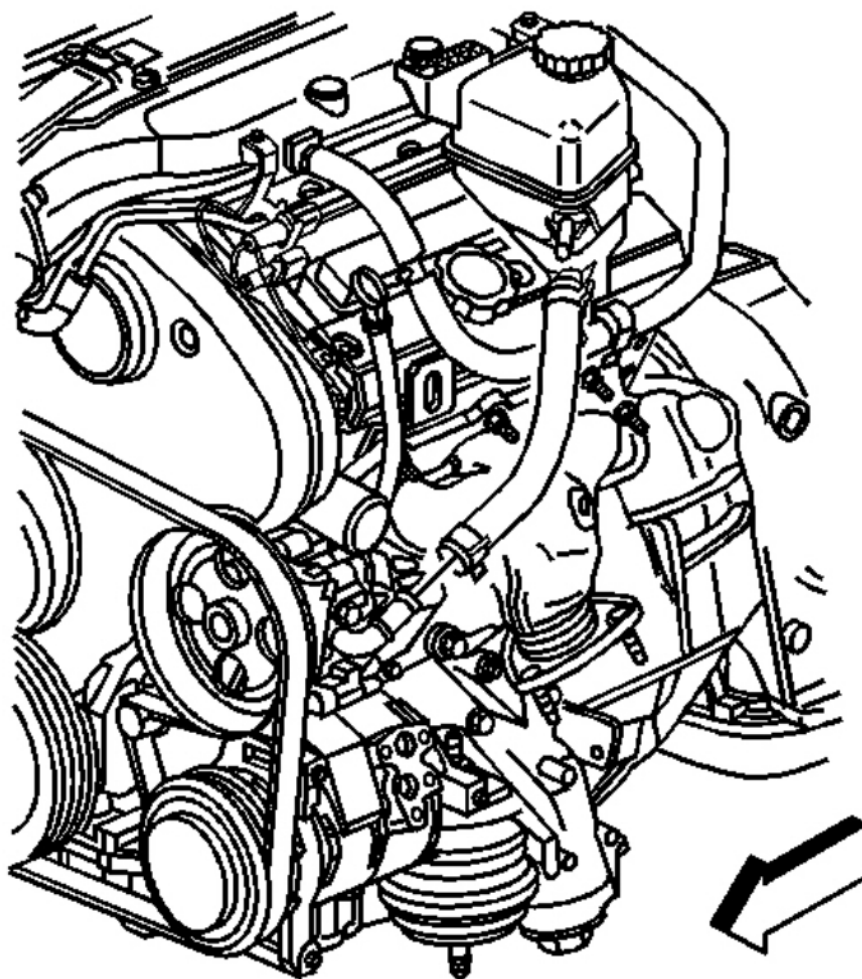


Fig. 41: Connecting Power Steering Reservoir Outlet Hose
Courtesy of GENERAL MOTORS CORP.

4. Connect the power steering reservoir outlet hose to the power steering pump.
5. Install the power steering pulley. Refer to **Power Steering Pulley Replacement**.
6. Remove the drain pan from under the vehicle.
7. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.

POWER STEERING PUMP REPLACEMENT (5.7L)

Removal Procedure

1. Remove the front air deflector. Refer to [Air Deflector Replacement - Front](#) in Body Front End.
2. Place a drain pan under the vehicle.
3. Remove the power steering pulley. Refer to [Power Steering Pulley Replacement](#).

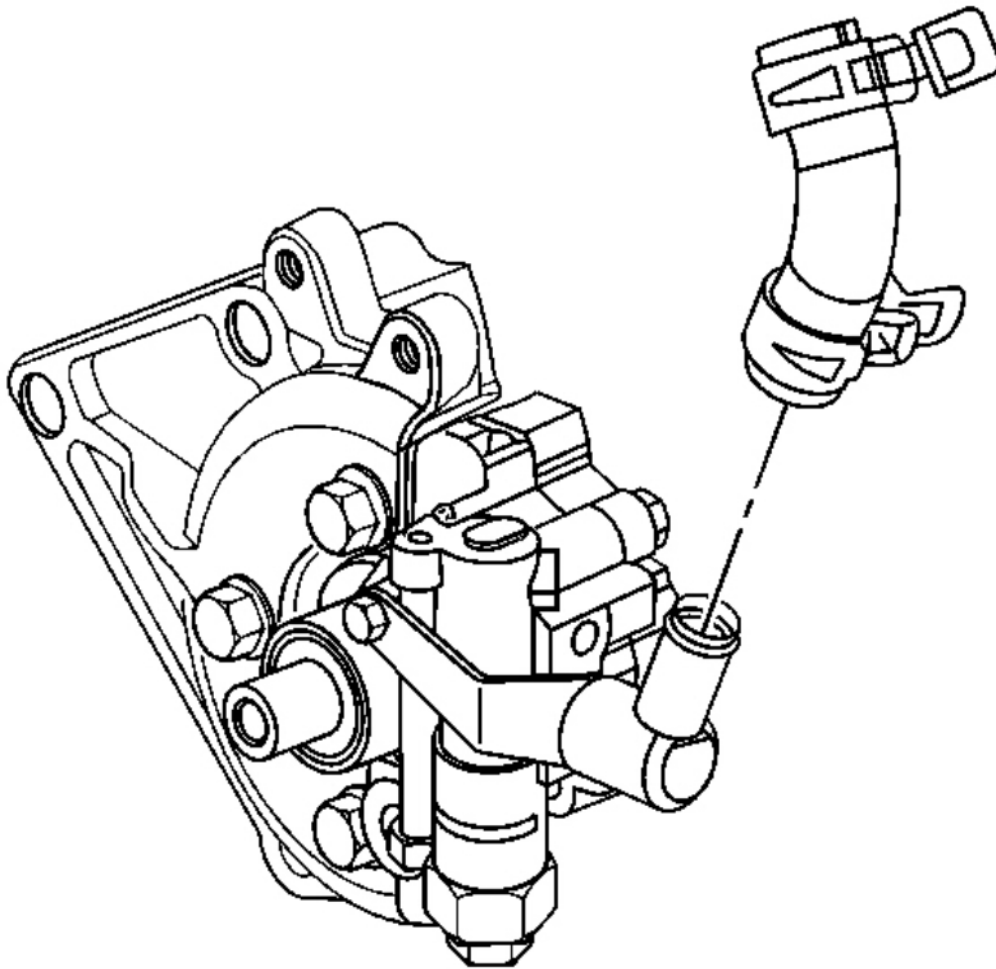


Fig. 42: Disconnecting Power Steering Reservoir Outlet Hose From Power Steering Pump

Courtesy of GENERAL MOTORS CORP.

4. Disconnect the power steering reservoir outlet hose from the power steering pump.

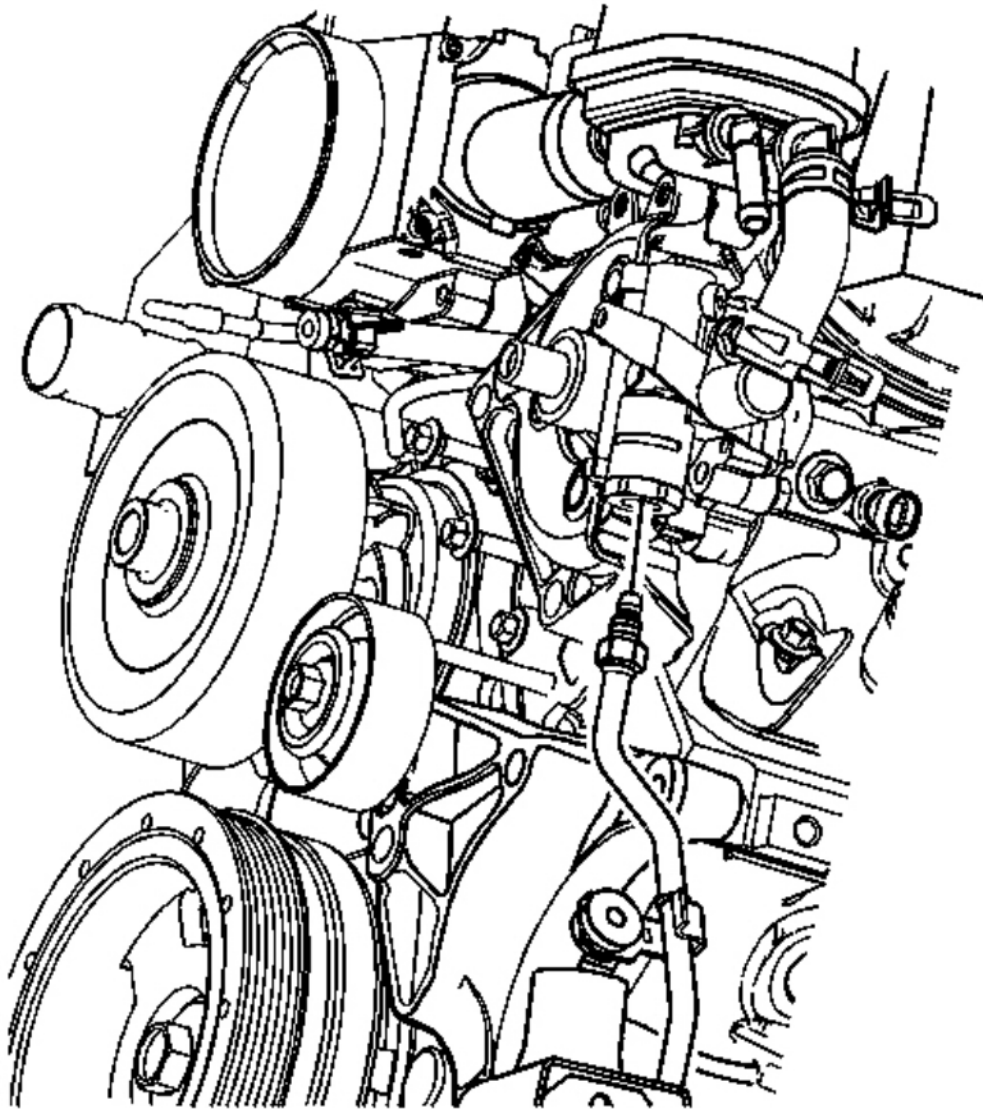


Fig. 43: Disconnecting Power Steering Pressure Hose From Power Steering Pump
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the power steering pressure hose from the power steering pump.

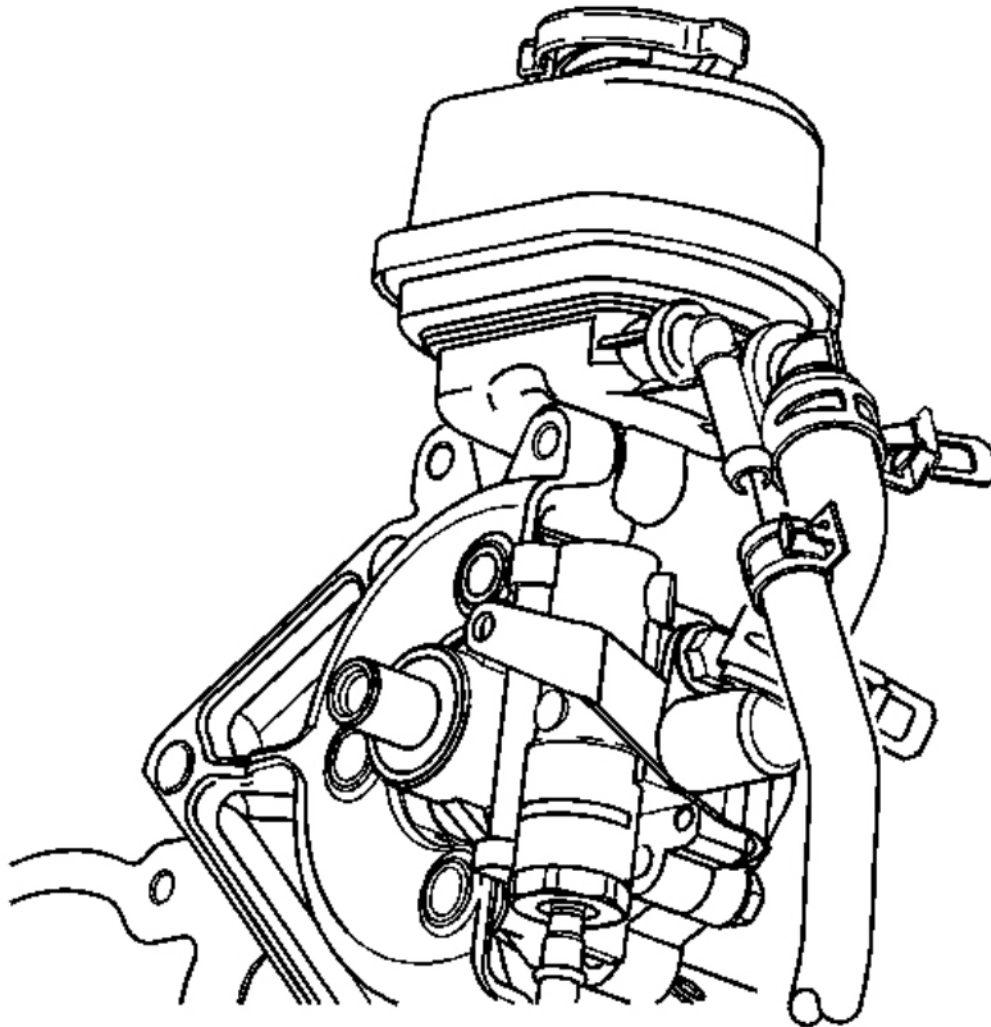


Fig. 44: Disconnecting Power Steering Cooler Outlet Hose From Power Steering Reservoir

Courtesy of GENERAL MOTORS CORP.

6. Disconnect the power steering cooler outlet hose from the power steering reservoir.

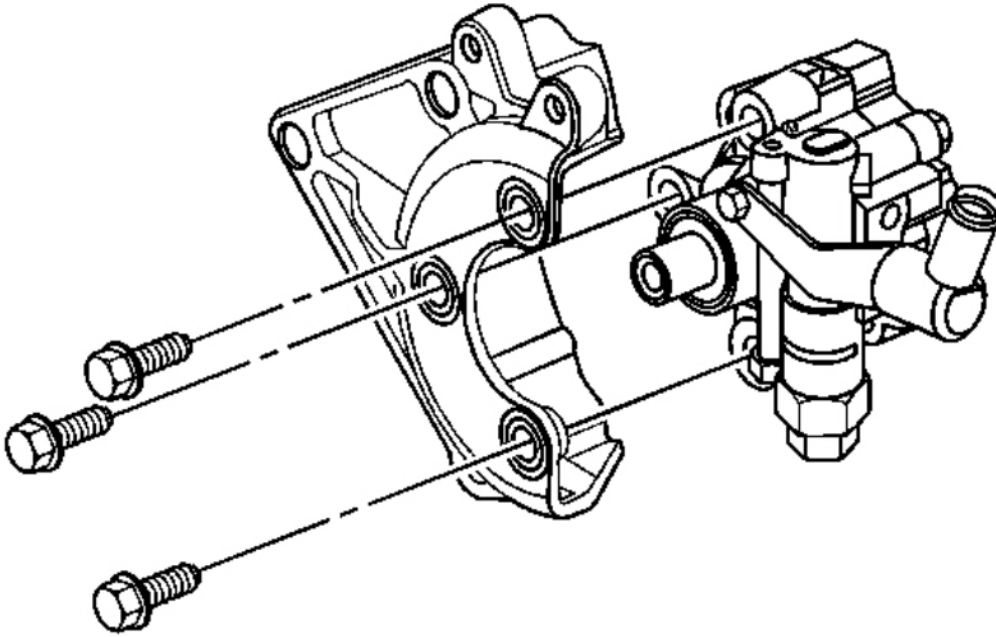


Fig. 45: Removing Power Steering Pump To Power Steering Pump Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

7. Remove the power steering pump to power steering pump bracket bolts.
8. Remove the power steering pump from the power steering pump bracket.

Installation Procedure

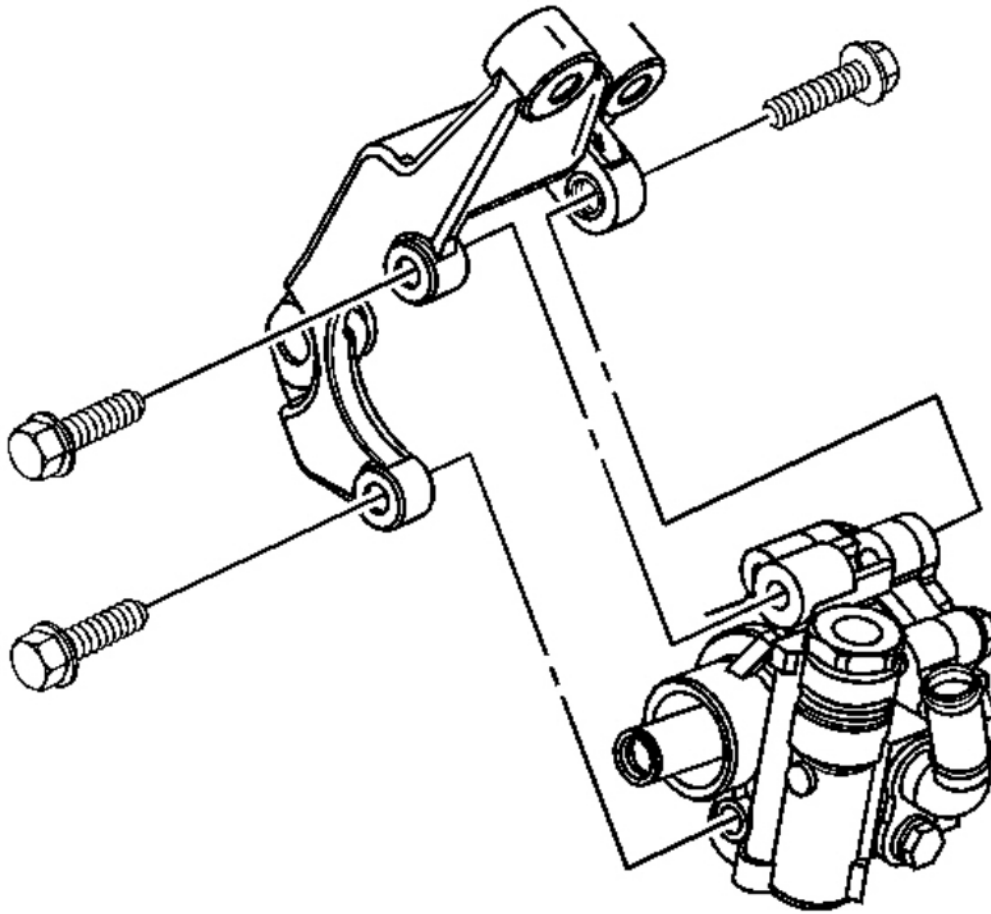


Fig. 46: Installing Power Steering Pump To Power Steering Pump Bracket
Courtesy of GENERAL MOTORS CORP.

1. Install the power steering pump to the power steering pump bracket.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the power steering pump to the power steering pump bracket bolts.

Tighten: Tighten the bolts to 25 N.m (18 lb ft).

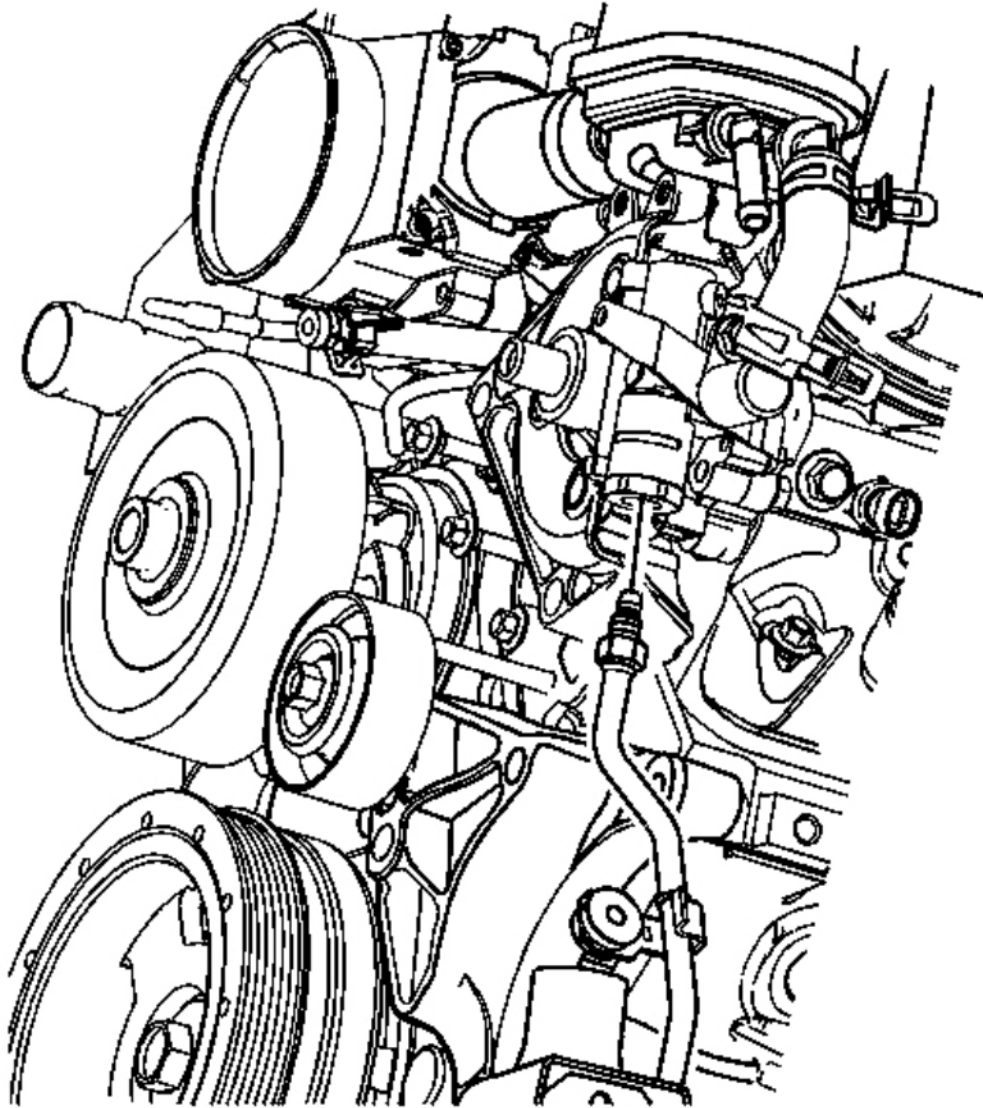


Fig. 47: Connecting Power Steering Pressure Hose To Power Steering Pump
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Clean the material from the power steering pressure hose and install a new seal.

3. Connect the power steering pressure hose to the power steering pump.

Tighten: Tighten the hose to 40 N.m (30 lb ft).

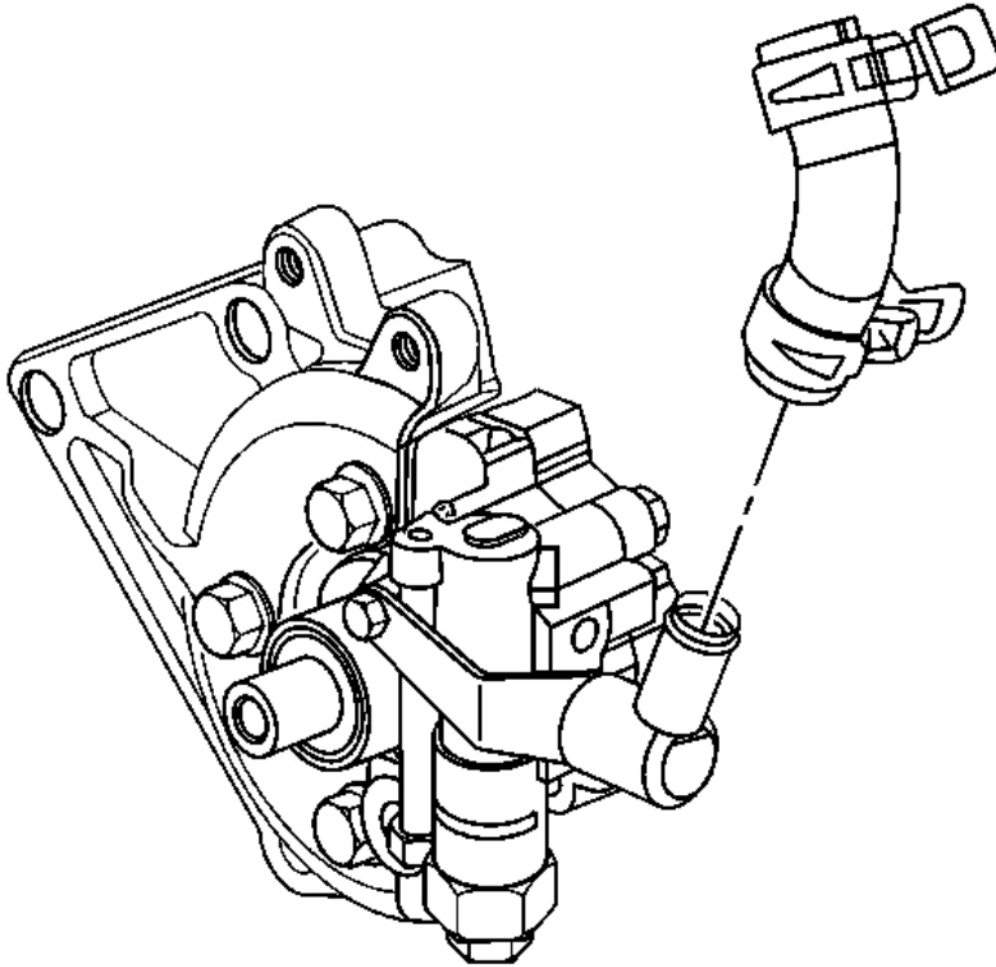


Fig. 48: Connecting Power Steering Reservoir Outlet Hose To Power Steering Pump
Courtesy of GENERAL MOTORS CORP.

4. Connect the power steering reservoir outlet hose to the power steering pump.

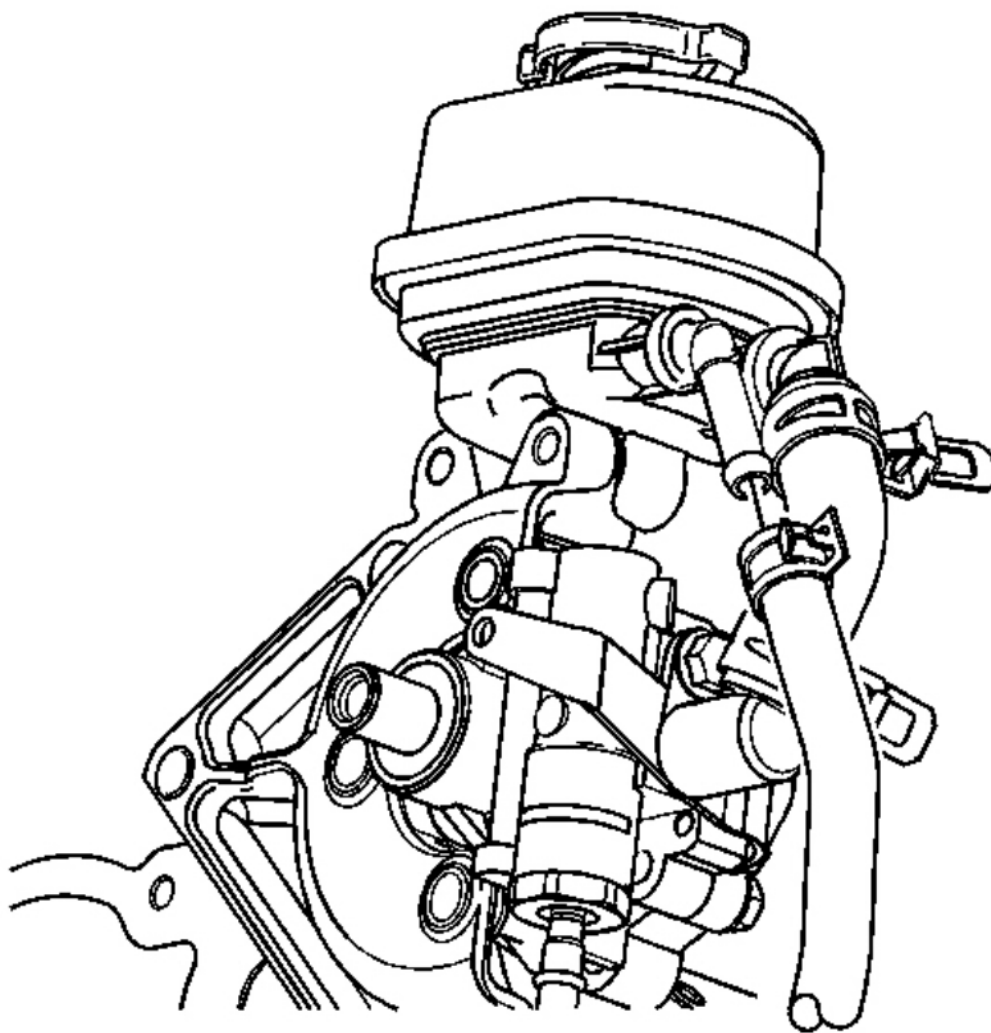


Fig. 49: Connecting Power Steering Cooler Outlet Hose
Courtesy of GENERAL MOTORS CORP.

5. Connect the power steering cooler outlet hose to the power steering reservoir.
6. Install the power steering pulley. Refer to **Power Steering Pulley Replacement**.
7. Remove the drain pan from under the vehicle.
8. Install the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.

9. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.

TIE ROD REPLACEMENT - INNER - ON VEHICLE

Removal Procedure

1. Raise and support vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the front tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Remove outer tie rods. Refer to **Rack and Pinion Outer Tie Rod End Replacement**.

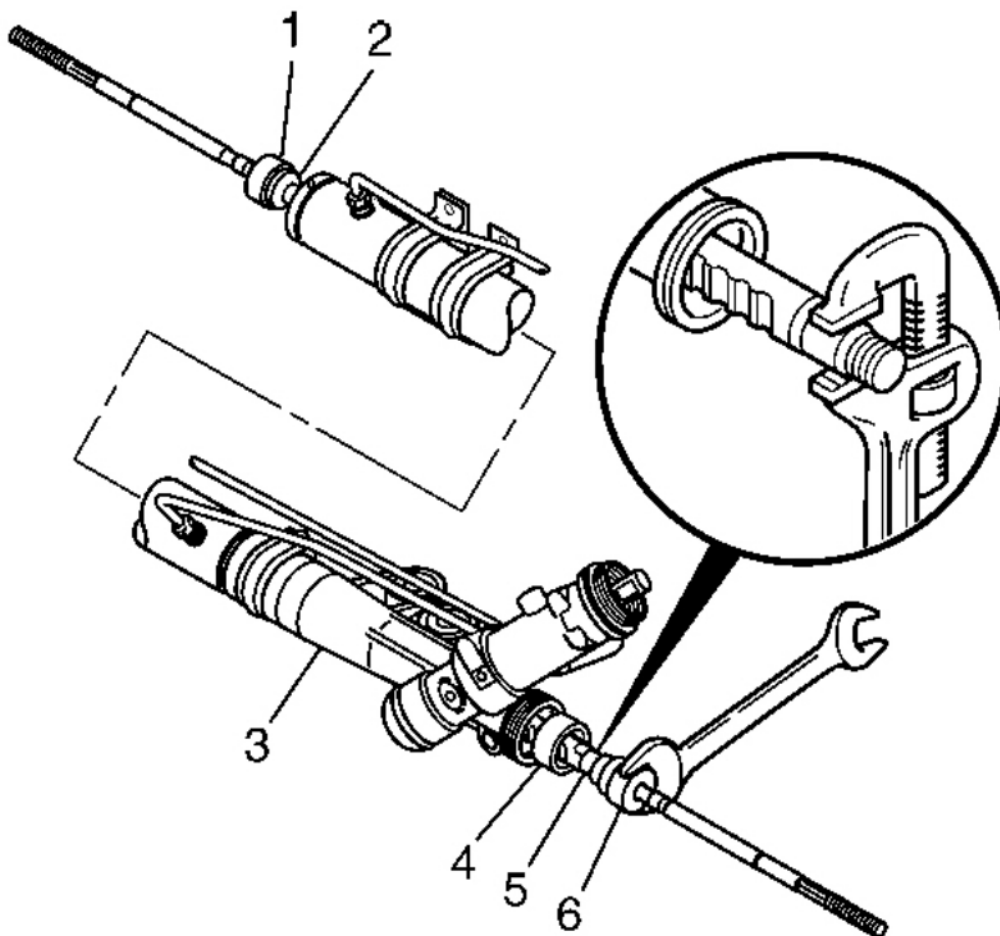


Fig. 50: Identifying Inner Tie Rod Components
Courtesy of GENERAL MOTORS CORP.

4. Remove the rack and pinion boot. Refer to **Rack and Pinion Boot Replacement - On Vehicle**.

NOTE: **Refer to Pipe Wrench Positioning Notice in Cautions and Notices.**

5. Place a pipe wrench on the rack (5) next to the inner tie rod housing (6).
6. Place a wrench on the flats of the inner tie rod housing (6).
7. Rotate the inner tie rod housing (6) counterclockwise, while holding the rack stationary, until the inner tie rod separates from the rack (5).

Assembly Procedure

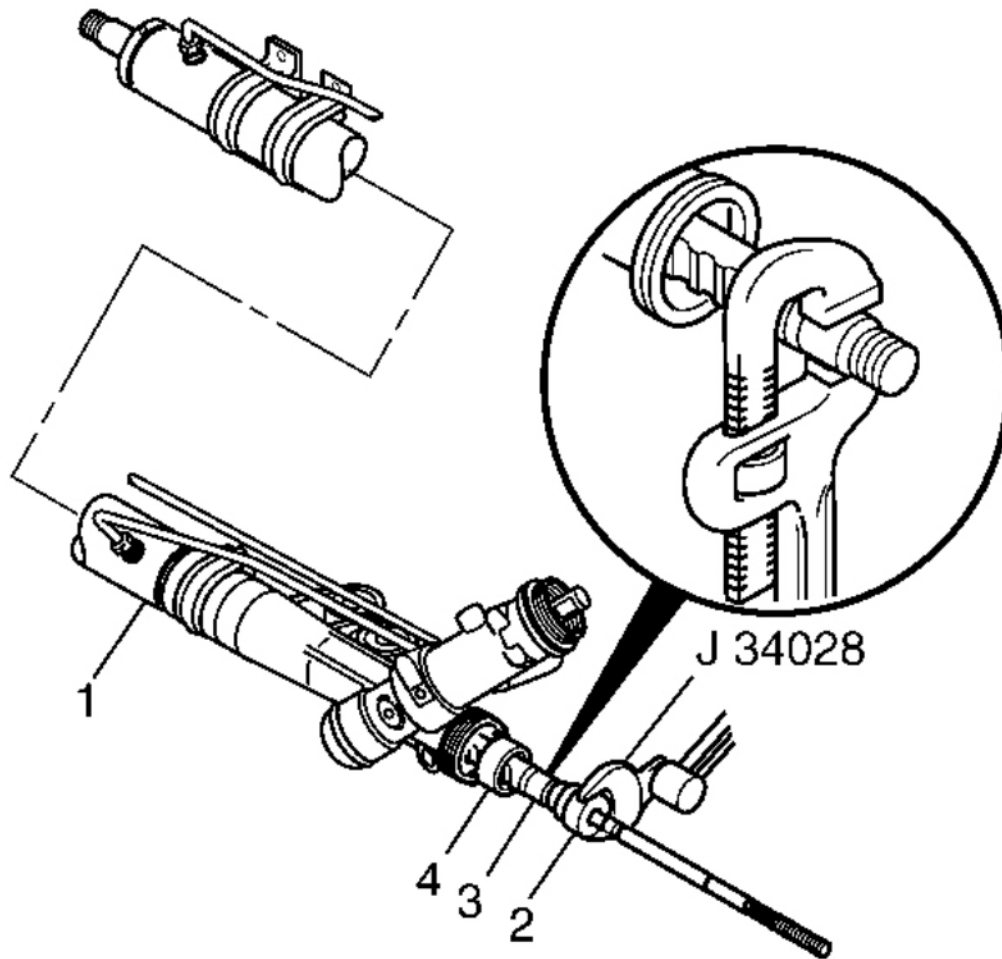


Fig. 51: Connecting Inner Tie Rod To Rack
Courtesy of GENERAL MOTORS CORP.

1. Attach the inner tie rod onto the rack (3).

NOTE: Refer to **Pipe Wrench Positioning Notice** in **Cautions and Notices**.

2. Place a pipe wrench on the rack (3) next to the inner tie rod housing (2).

NOTE: Refer to **Fastener Notice** **Cautions and Notices**.

3. Place a torque wrench and J 34028 on the flats of the inner tie rod housing (2).

Tighten: Tighten the inner tie rod to 100 N.m (74 lb ft).

4. Install the rack and pinion boot. Refer to **Rack and Pinion Boot Replacement - On Vehicle**.
5. Install outer tie rods. Refer to **Rack and Pinion Outer Tie Rod End Replacement**.
6. Install the front tire and wheels. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
7. Lower the vehicle.

RACK AND PINION OUTER TIE ROD END REPLACEMENT

Tools Required

J 24319-B Steering Linkage and Tie Rod Puller

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.

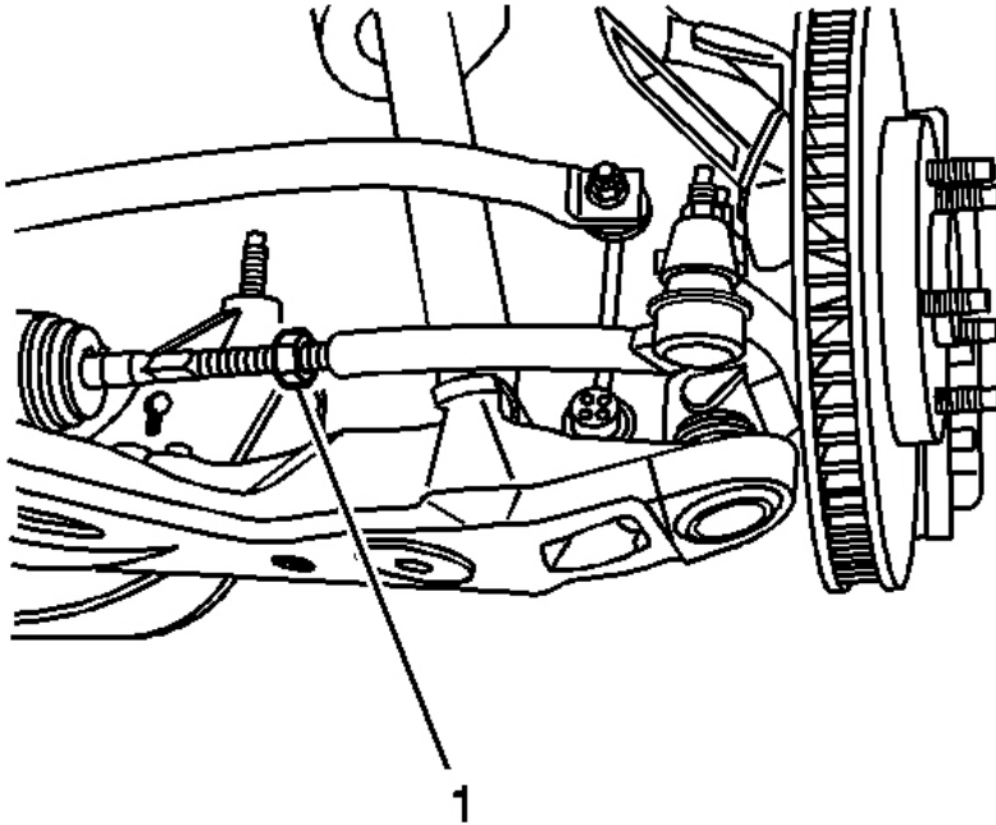


Fig. 52: Loosening Outer Tie Rod Jam Nut
Courtesy of GENERAL MOTORS CORP.

3. Loosen the outer tie rod jam nut (1).

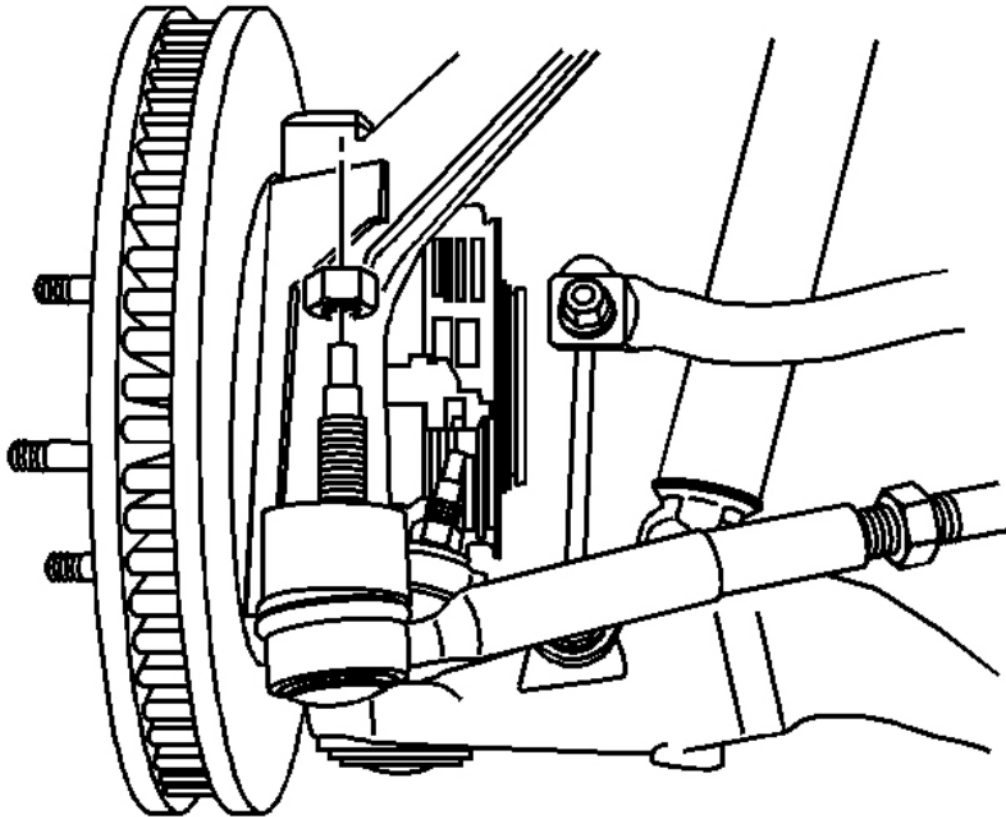


Fig. 53: View Of Outer Tie Rod-To-Steering Knuckle And Retaining Nut
Courtesy of GENERAL MOTORS CORP.

4. Remove the outer tie rod retaining nut.

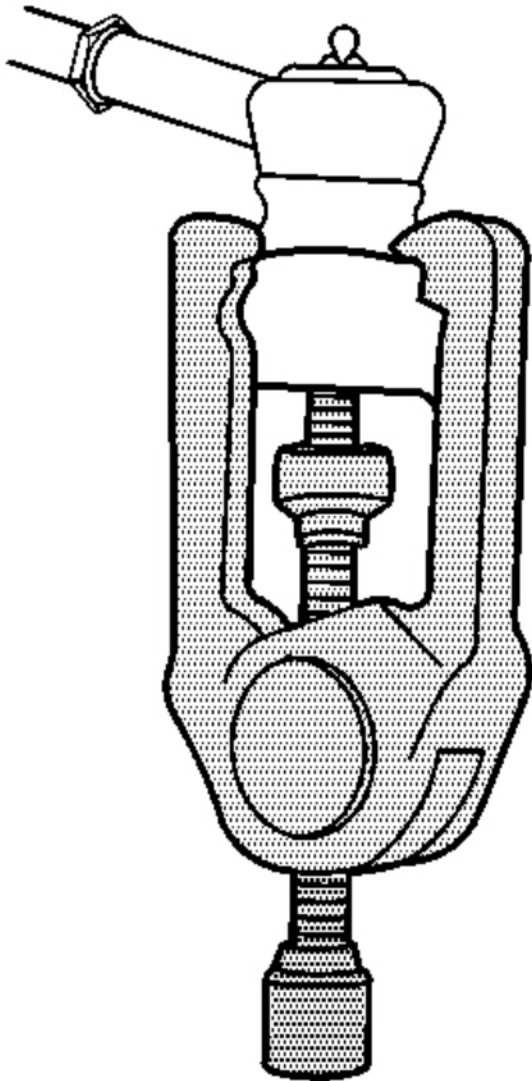


Fig. 54: Removing Outer Tie Rod Assembly From Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

5. Using **J 24319-B** disconnect the outer tie rod from the steering knuckle.

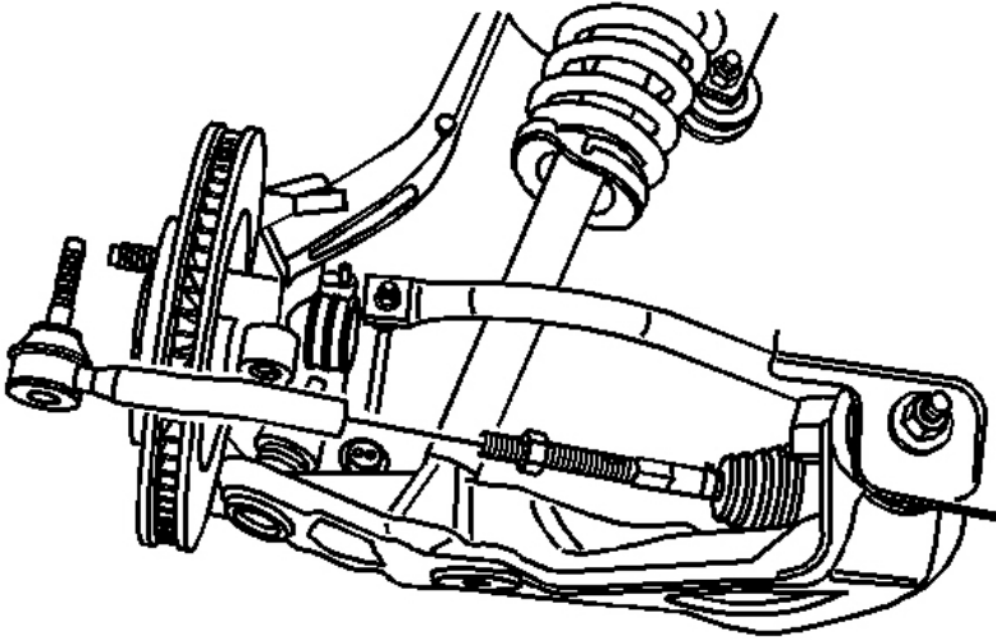


Fig. 55: Removing Outer Tie Rod From Inner Tie Rod
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Note the number of turns during removal for installation.

6. Remove the outer tie rod from the inner tie rod.

Installation Procedure

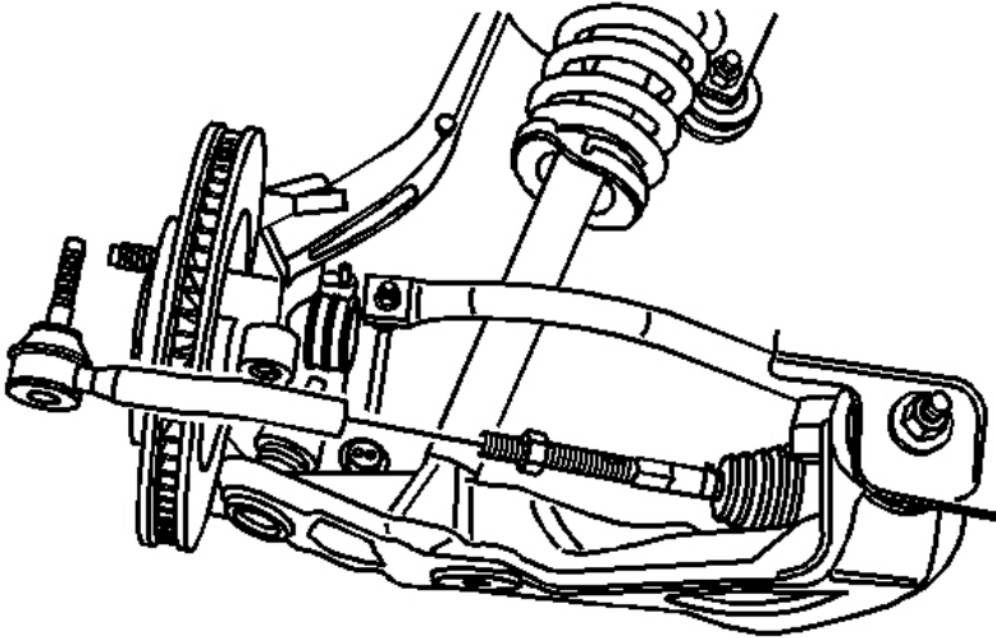


Fig. 56: Installing Outer Tie Rod To Inner Tie Rod
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Use the same number of turns that was used during removal.

1. Install the outer tie rod to the inner tie rod. Do not tighten the jam nut at this time.

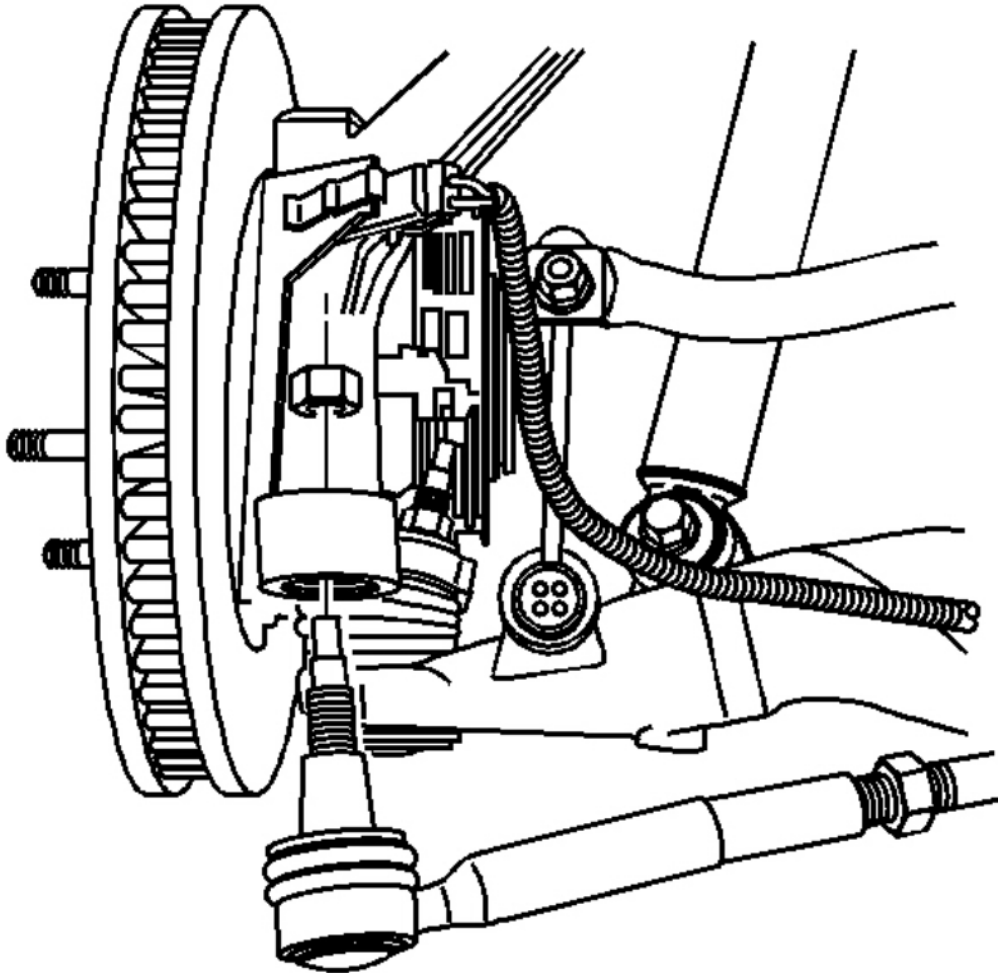


Fig. 57: Connecting Outer Tie Rod To Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Connect the outer tie rod to the steering knuckle.

Install the outer tie rod retaining nut.

Tighten: Tighten the nut to 70 N.m (52 lb ft).

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3. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
4. Lower the vehicle.
5. Adjust the front toe. Refer to **Front Toe Adjustment** in Wheel Alignment.

RACK AND PINION BOOT REPLACEMENT - ON VEHICLE

Tools Required

- **J 22610** Keystone Clamp Plier
- **J 42640** Steering Column Anti-Rotation Pin

Removal Procedure

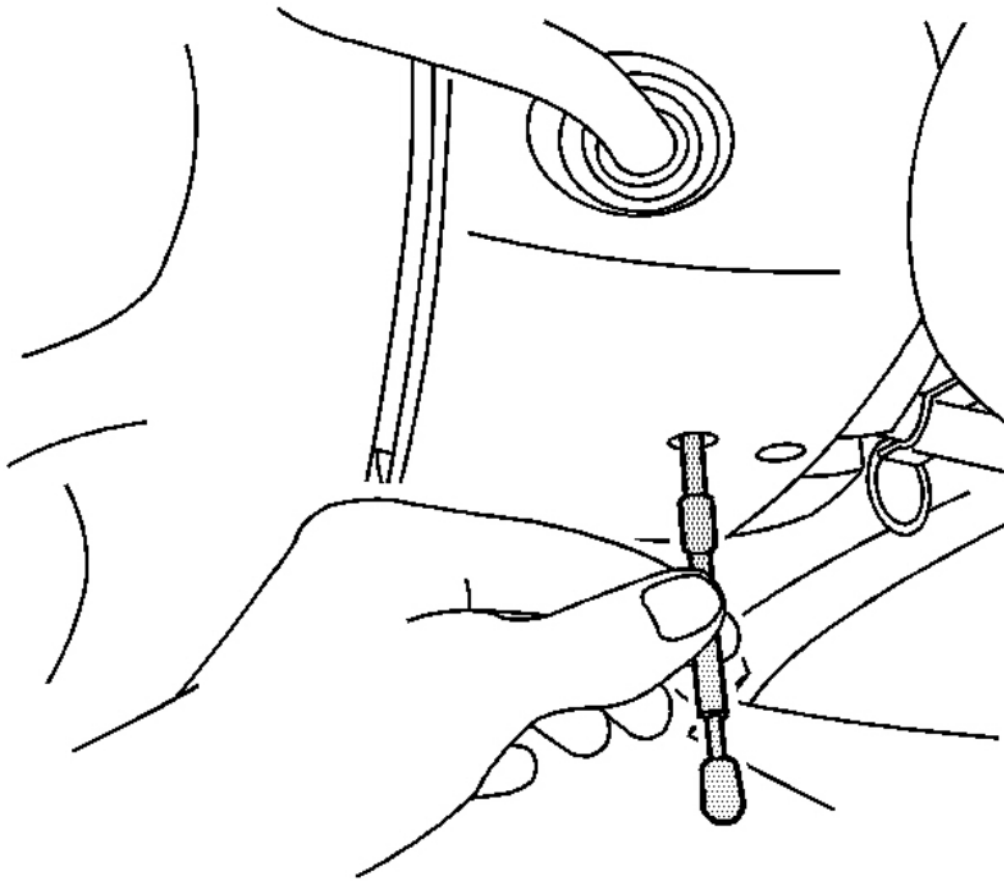


Fig. 58: Identifying J 42640

Courtesy of GENERAL MOTORS CORP.

1. Install **J 42640** to the steering column.
2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
3. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.

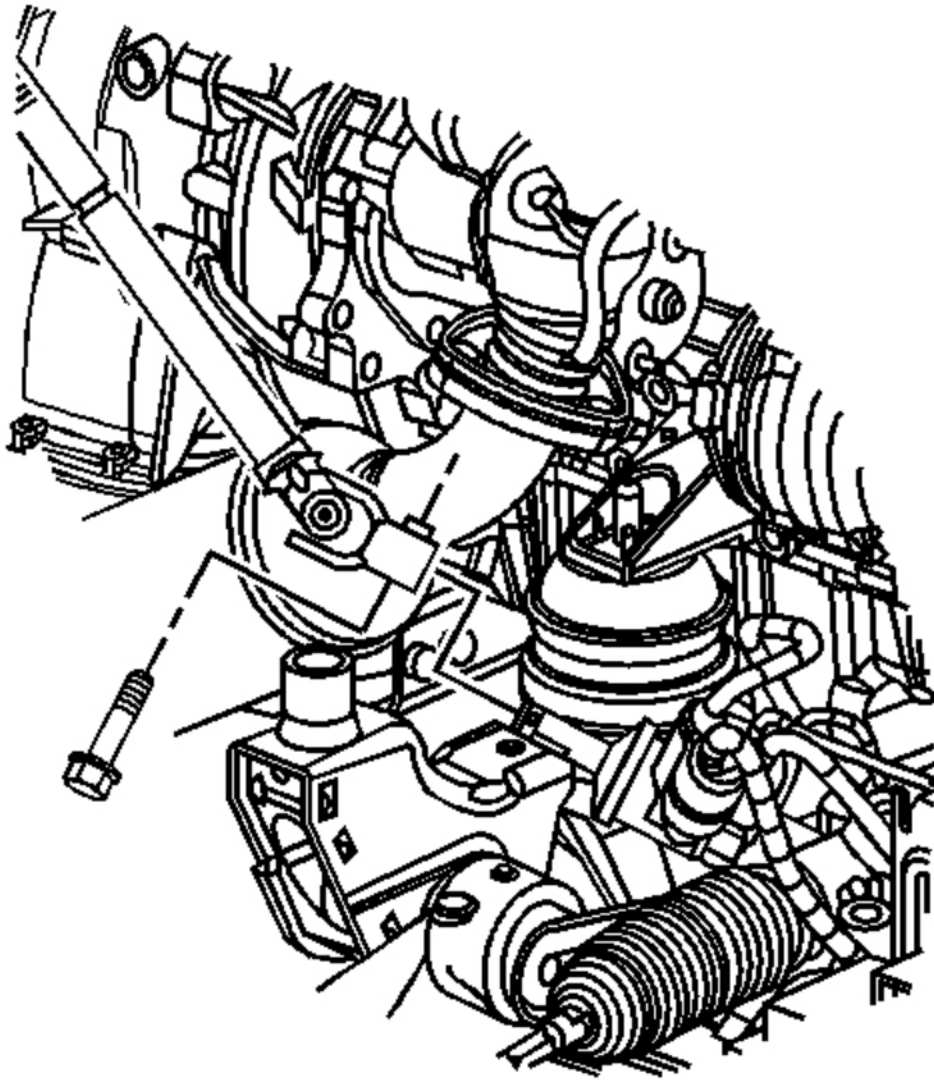


Fig. 59: Removing Intermediate Shaft Lower Pinch Bolt
Courtesy of GENERAL MOTORS CORP.

CAUTION: Failure to disconnect the intermediate shaft from the rack and pinion stub shaft can result in damage to the steering gear and/or intermediate shaft. This damage can cause loss of steering control which could result in personal

injury.

NOTE: The wheels of the vehicle must be straight ahead and the steering column in the LOCK position before disconnecting the steering column or intermediate shaft from the steering gear. Failure to do so will cause the coil assembly in the steering column to become uncentered which will cause damage to the coil assembly.

4. Remove the intermediate shaft lower pinch bolt.
5. Disconnect the intermediate shaft from the power steering gear.
6. Remove the outer tie rod. Refer to **Rack and Pinion Outer Tie Rod End Replacement.**

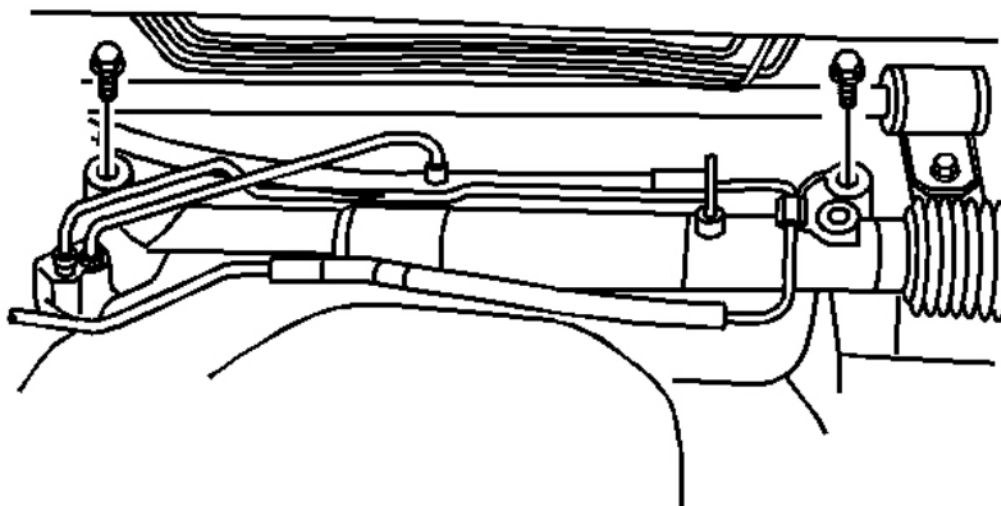


Fig. 60: Removing Power Steering Gear Retaining Bolts
Courtesy of GENERAL MOTORS CORP.

7. Remove the power steering gear retaining bolts.
8. Carefully position the power steering gear for access to the power steering gear dust boot.

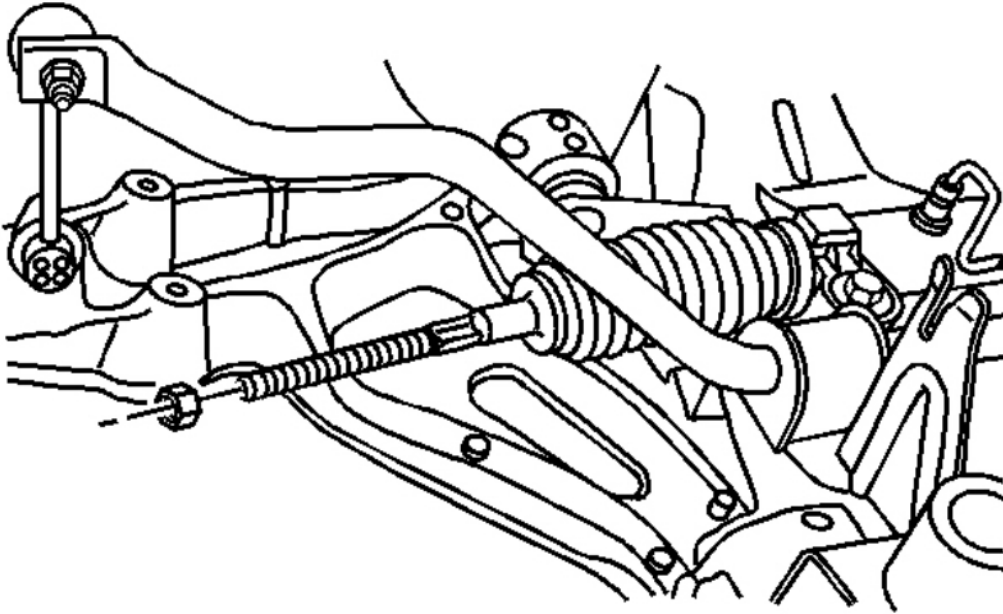


Fig. 61: Removing Jam Nut From Inner Tie Rod
Courtesy of GENERAL MOTORS CORP.

9. Remove the jam nut from the inner tie rod.

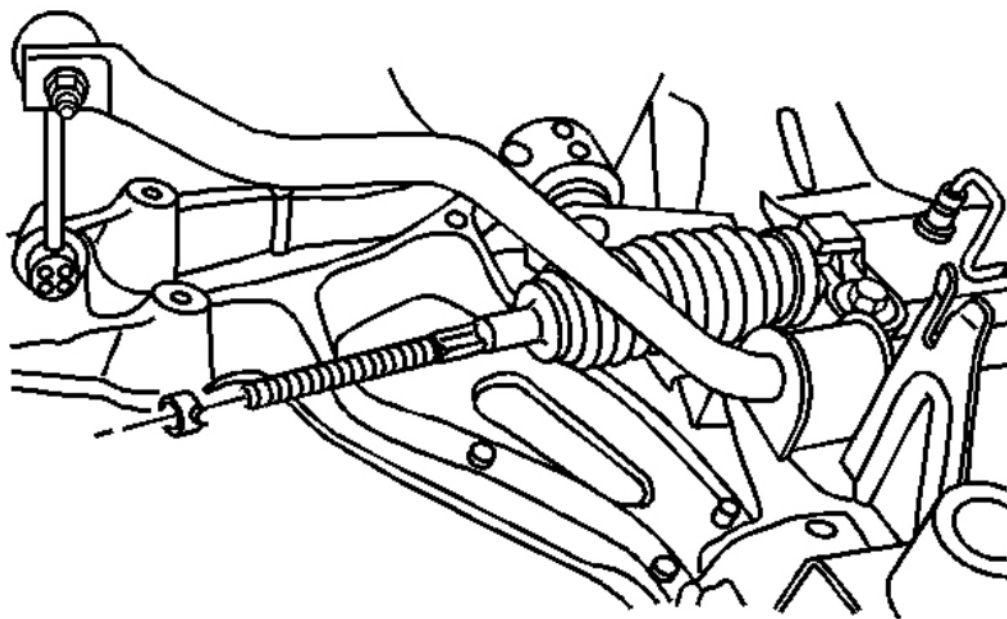


Fig. 62: Removing Rack And Pinion Boot Outer Clamp
Courtesy of GENERAL MOTORS CORP.

10. Remove the rack and pinion boot outer clamp.

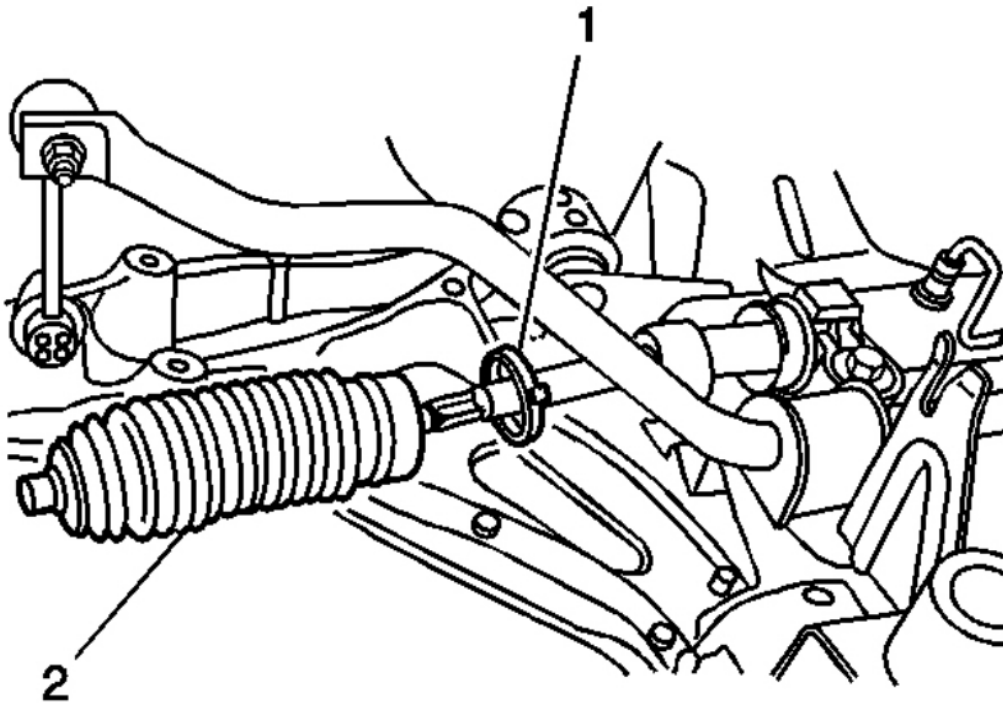


Fig. 63: Removing Rack And Pinion Boot Inner Clamp
Courtesy of GENERAL MOTORS CORP.

11. Remove the rack and pinion boot inner clamp.
12. Remove the rack and pinion boot (2).

Installation Procedure

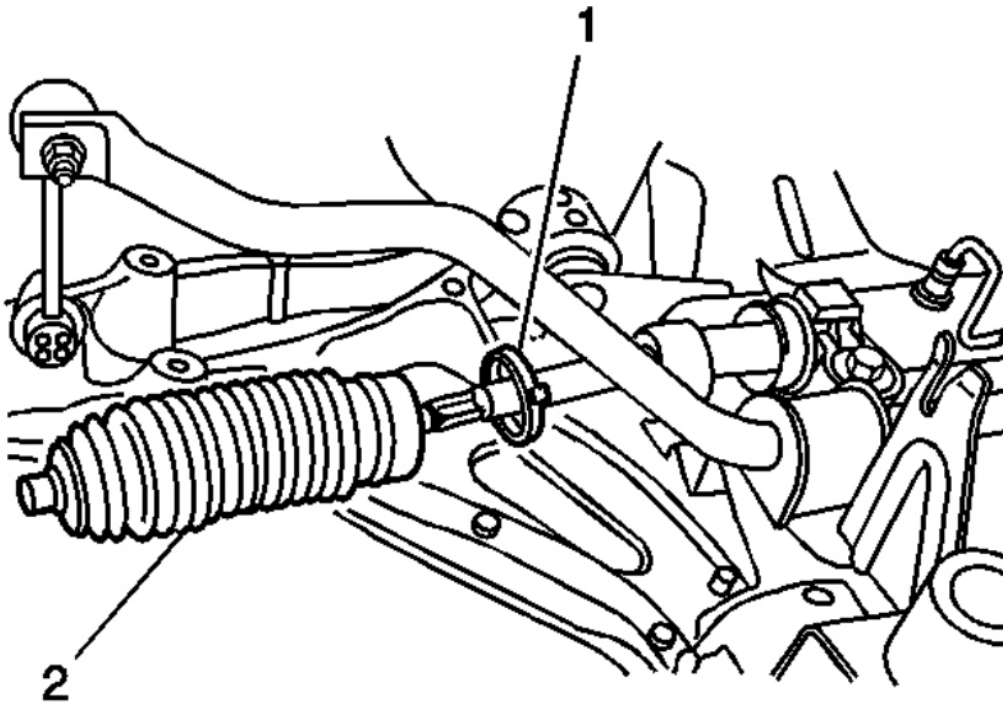


Fig. 64: Installing Rack And Pinion Boot
Courtesy of GENERAL MOTORS CORP.

1. Install the rack and pinion boot (2).
2. Install a new rack and pinion boot inner clamp (1).
3. Using **J 22610** crimp the rack and pinion boot clamp.

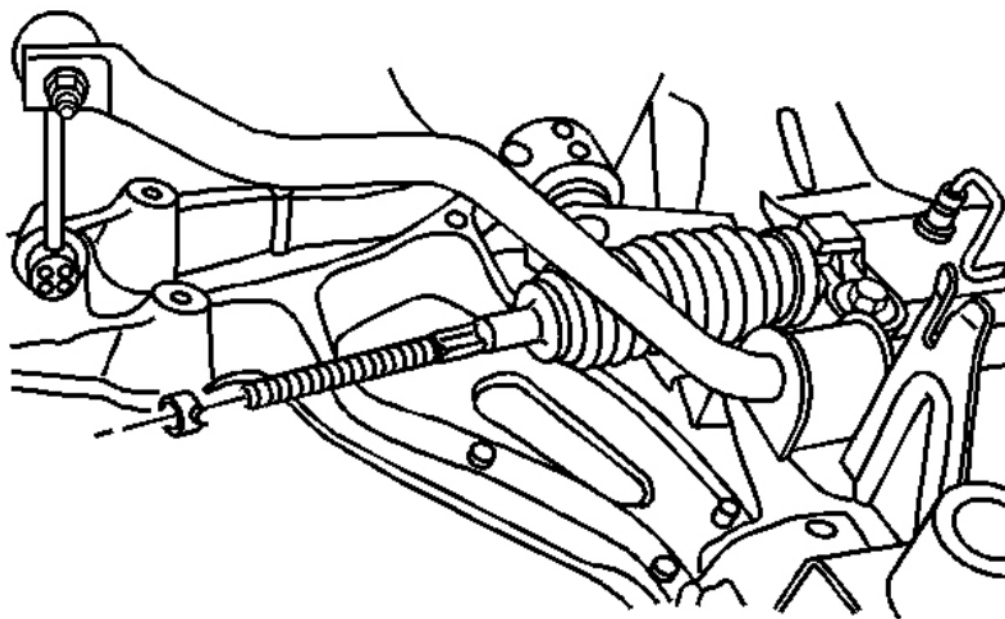


Fig. 65: Installing Rack And Pinion Boot Outer Clamp
Courtesy of GENERAL MOTORS CORP.

4. Install the rack and pinion boot outer clamp.

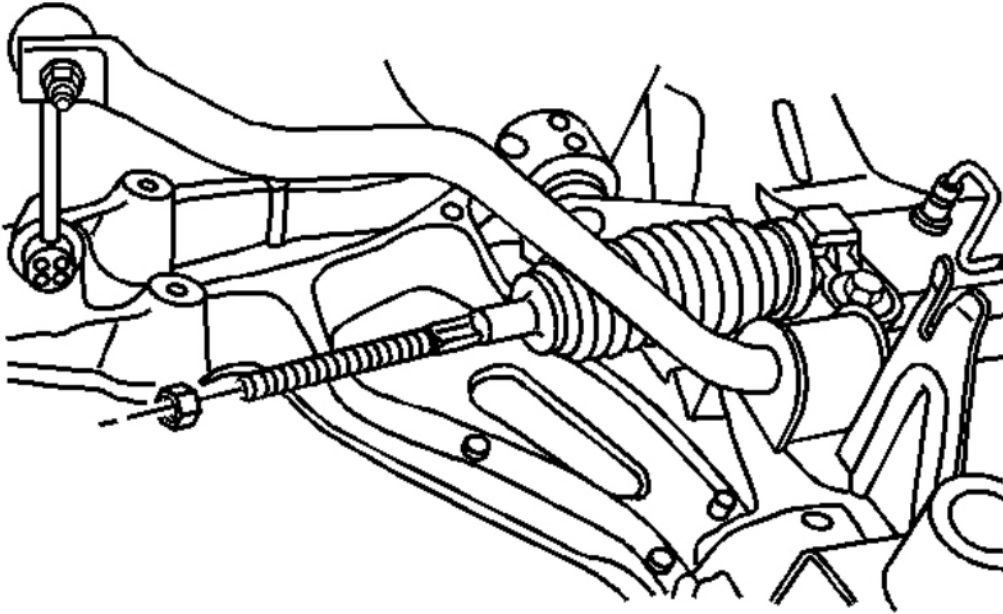


Fig. 66: Installing Jam Nut To Inner Tie Rod
Courtesy of GENERAL MOTORS CORP.

5. Install the jam nut to the inner tie rod.

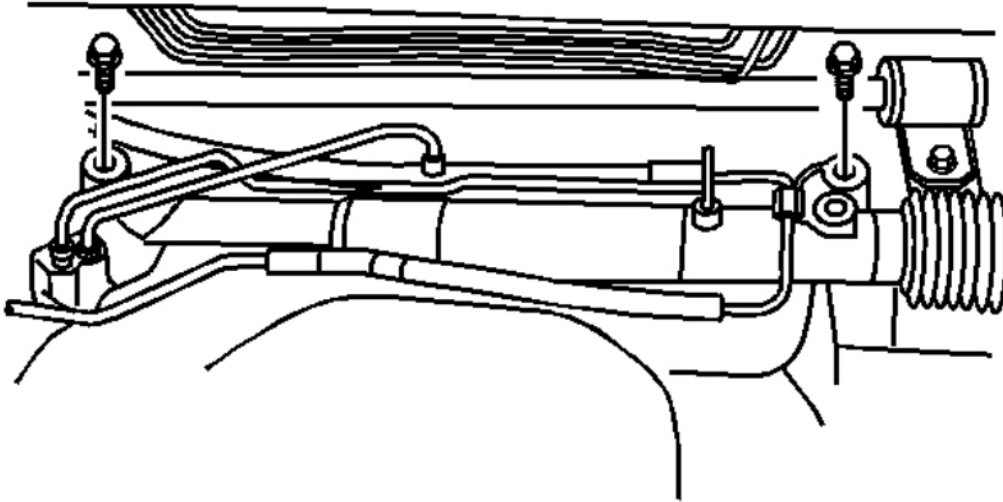


Fig. 67: Positioning Power Steering Gear
Courtesy of GENERAL MOTORS CORP.

6. Position the power steering gear.

NOTE: Refer to **Fastener Notice** in Cautions and Notices.

7. Install the power steering gear retaining bolts.

Tighten: Tighten the bolts to 95 N.m (70 lb ft).

8. Install the outer tie rod. Refer to **Rack and Pinion Outer Tie Rod End Replacement**.

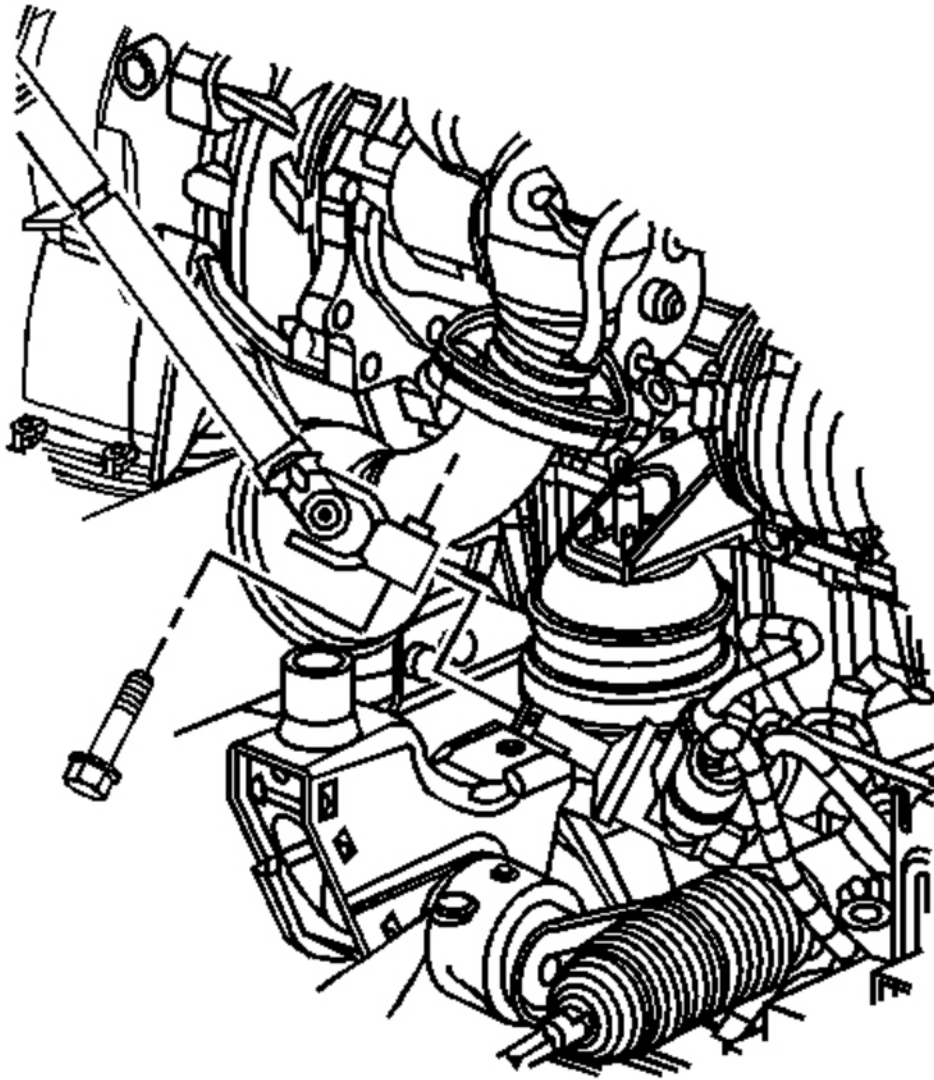


Fig. 68: Connecting Intermediate Shaft To Power Steering Gear
Courtesy of GENERAL MOTORS CORP.

9. Connect the intermediate shaft to the power steering gear.
10. Install the intermediate shaft lower pinch bolt.

Tighten: Tighten the bolt to 50 N.m (37 lb ft).

11. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
12. Lower the vehicle.

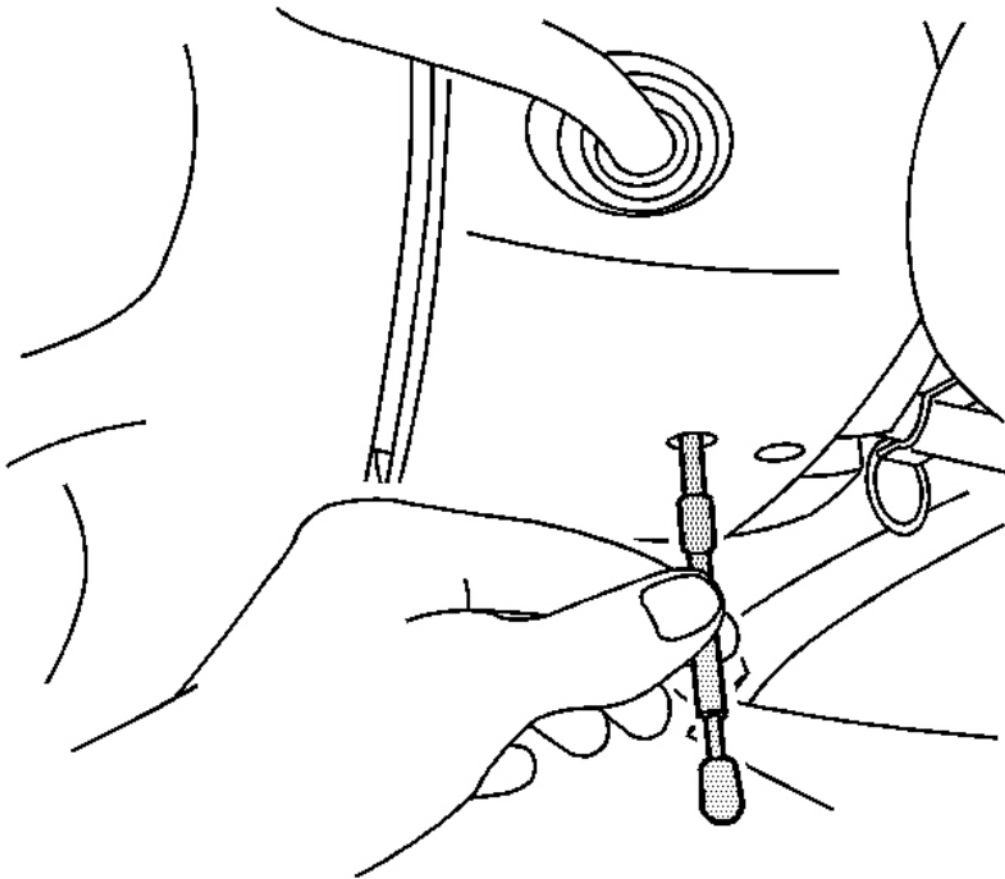


Fig. 69: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

13. Remove the **J 42640** from the steering column.
14. Adjust the front toe. Refer to **Front Toe Adjustment** in Wheel Alignment.

POWER STEERING COOLER PIPE/HOSE REPLACEMENT (LCT)

Removal Procedure

1. Place a drain pan under the vehicle.
2. Remove the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.

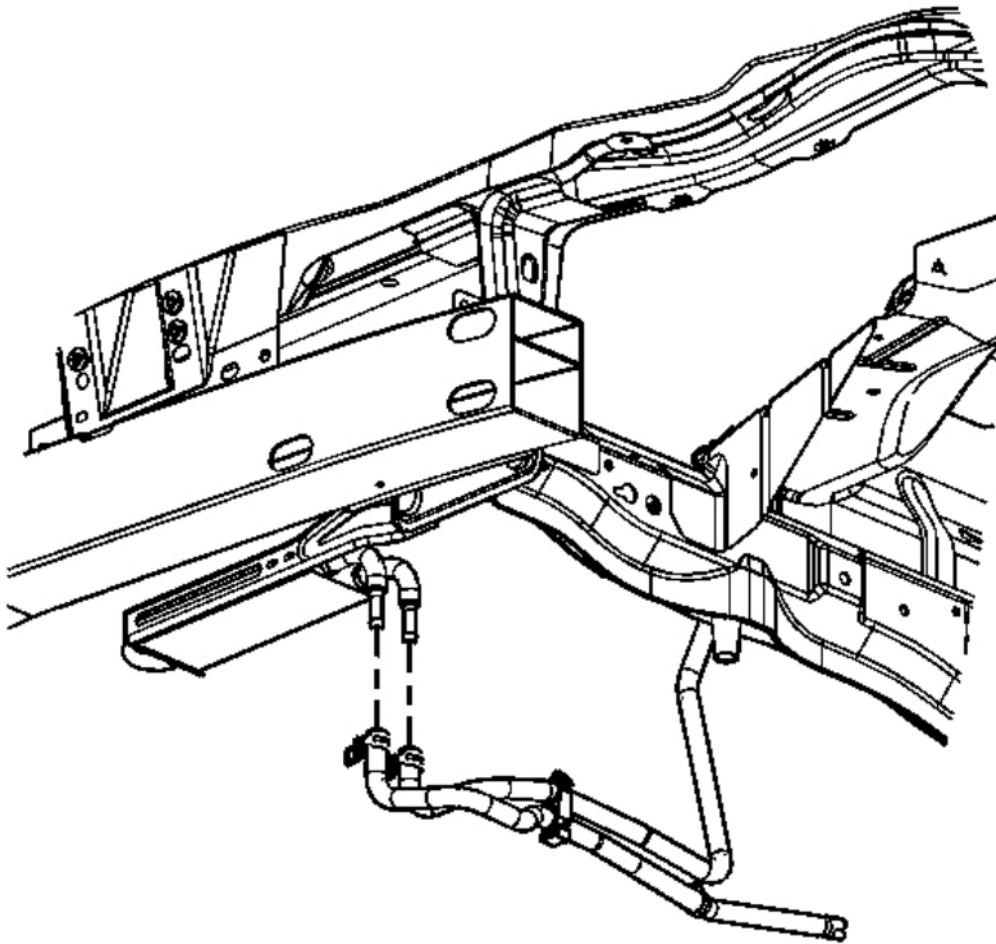


Fig. 70: Disconnecting Power Steering Cooler Line
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the power steering cooler line from the power steering cooler.

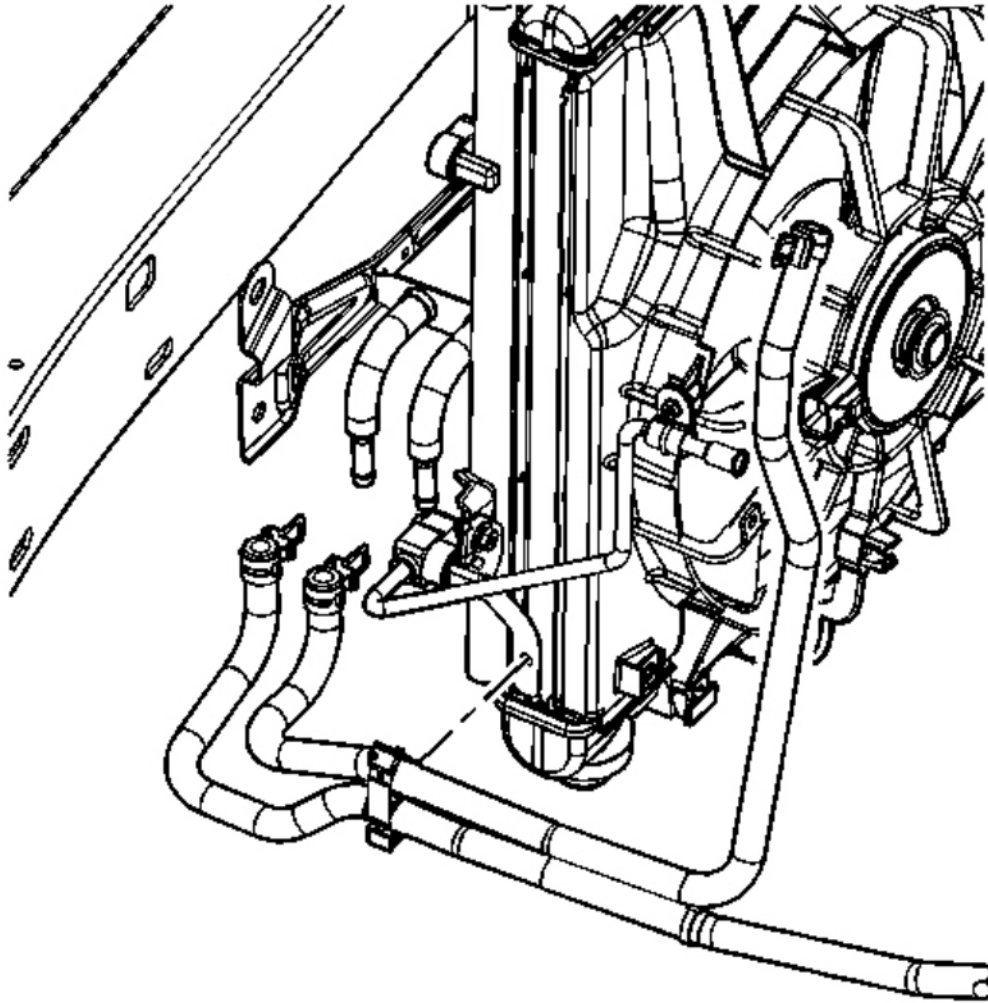


Fig. 71: Disconnecting Power Steering Cooler Pipe/Hose From Power Steering Reservoir

Courtesy of GENERAL MOTORS CORP.

4. Disconnect the power steering cooler pipe/hose from the power steering reservoir.
5. Remove the power steering cooler pipe/hose from the clip at the radiator
6. Remove the power steering cooler pipe/hose from the vehicle.

1. Install the power steering cooler pipe/hose to the vehicle.

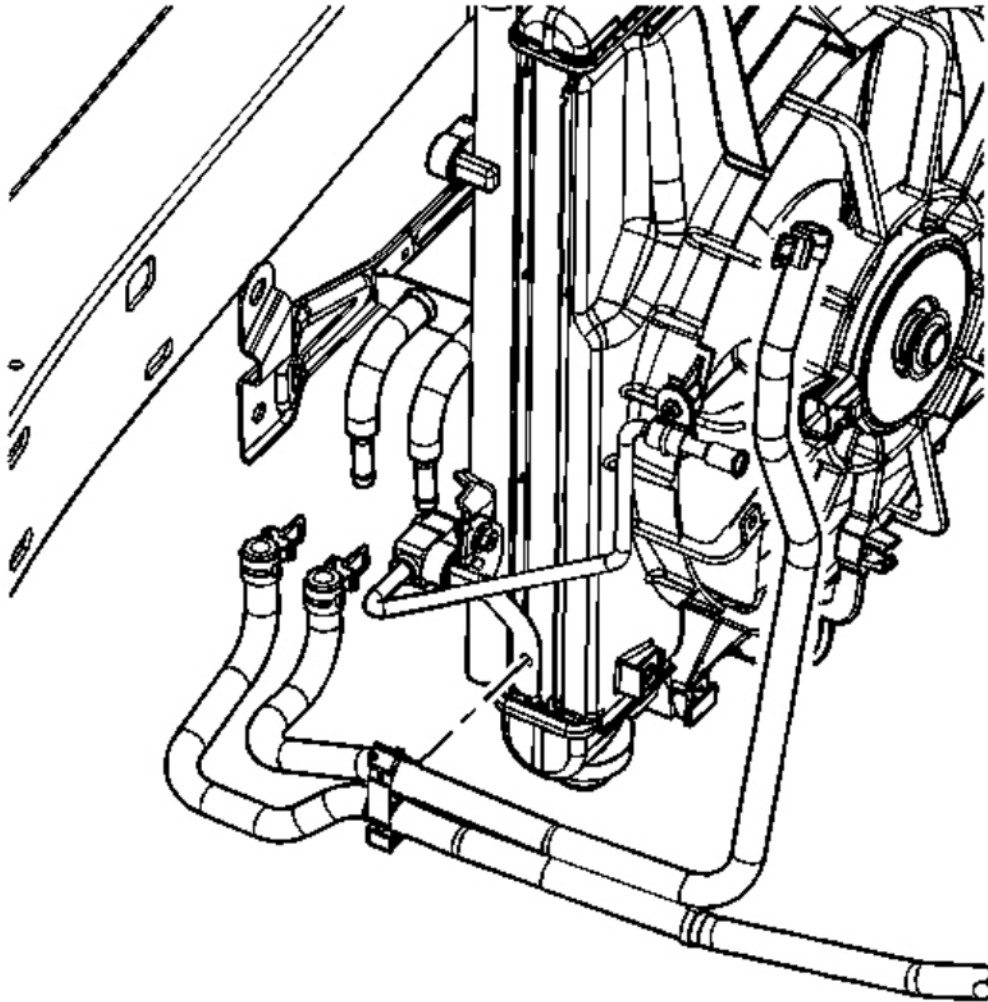


Fig. 72: Connecting Power Steering Cooler Pipe/Hose
Courtesy of GENERAL MOTORS CORP.

2. Connect the power steering cooler pipe/hose to the power steering reservoir.
3. Connect the power steering cooler pipe/hose to the clip at the radiator.

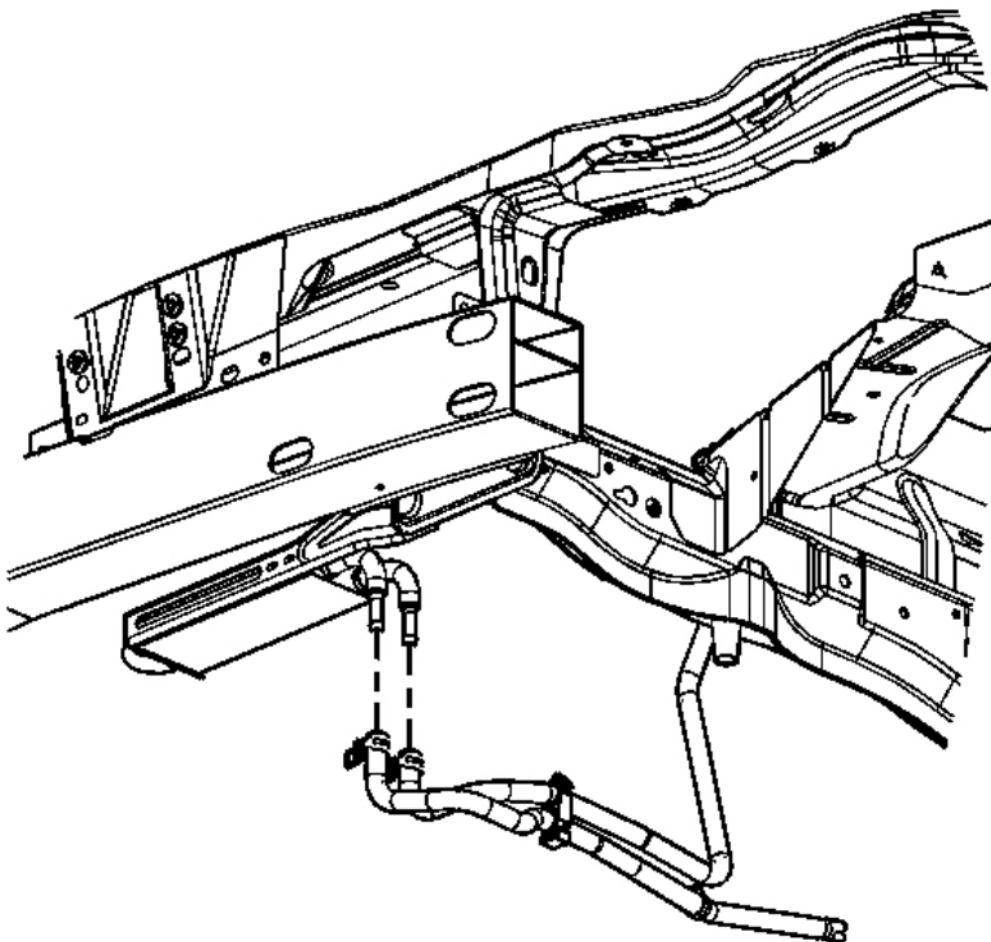


Fig. 73: Connecting Power Steering Cooler Pipe/Hose
Courtesy of GENERAL MOTORS CORP.

4. Connect the power steering cooler pipe/hose to the power steering cooler.
5. Install the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.
6. Remove the drain pan from under the vehicle.
7. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.

Removal Procedure

1. Remove the radiator. Refer to **Radiator Replacement (LA3, LY9)** , **Radiator Replacement (LY7)** or **Radiator Replacement (LS6)** in Engine Cooling.
2. Remove the hoses from the power steering cooler.

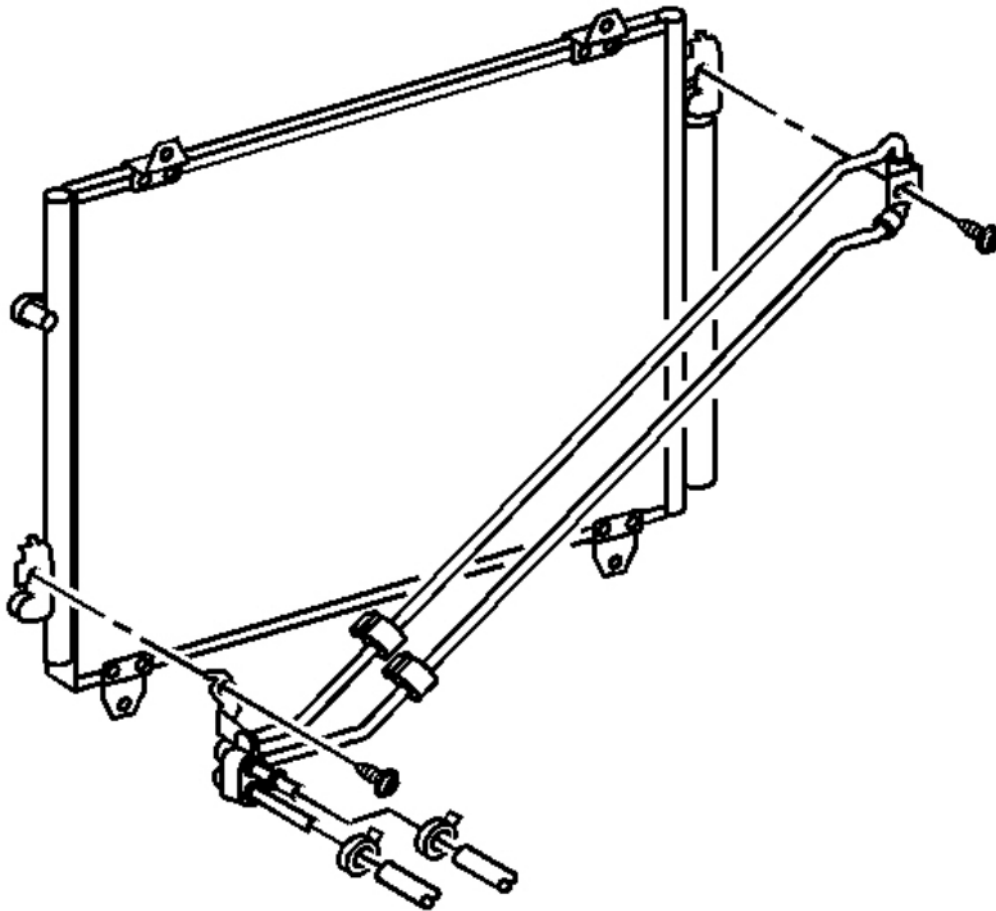


Fig. 74: Removing Power Steering Cooler Retaining Screws
Courtesy of GENERAL MOTORS CORP.

3. Remove the power steering cooler retaining screws.
4. Remove the power steering cooler.

Installation Procedure

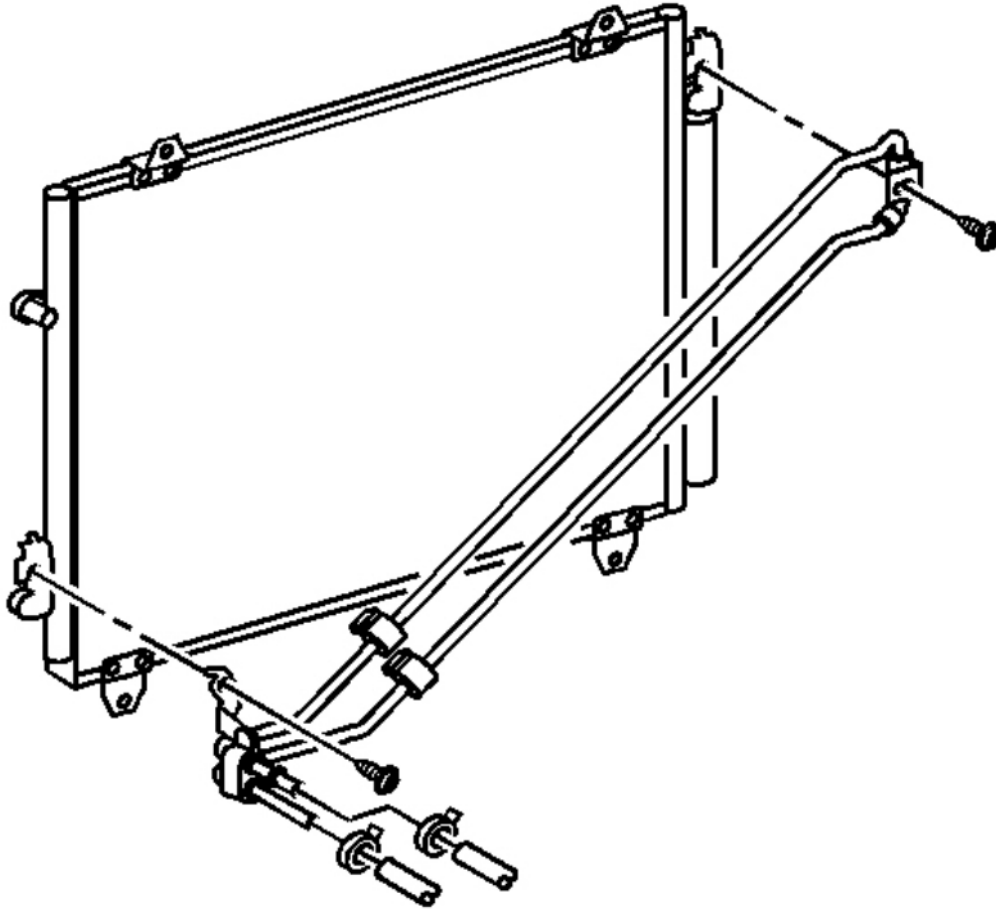


Fig. 75: Installing Power Steering Cooler
Courtesy of GENERAL MOTORS CORP.

1. Install the power steering cooler.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the power steering cooler retaining screws.

Tighten: Tighten the screws to 5.4 N.m (48 lb in).

3. Install the hoses to the power steering cooler.
4. Install the radiator. Refer to **Radiator Replacement (LA3, LY9)** , **Radiator Replacement (LY7)** or **Radiator Replacement (LS6)** in Engine Cooling.
5. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.

POWER STEERING COOLER REPLACEMENT (FE1)

Removal Procedure

1. Remove the intake air resonator. Refer to **Intake Air Resonator Replacement** in Engine Controls 2.6 L and 3.2 L.

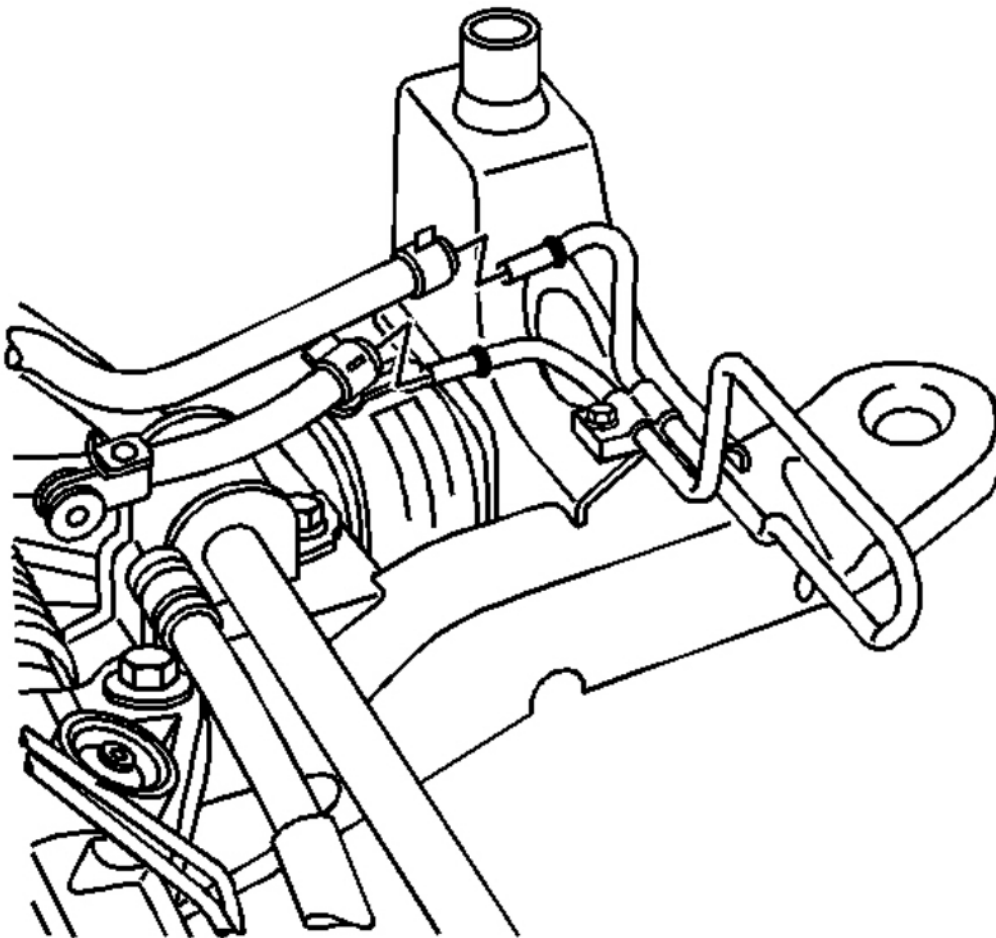


Fig. 76: Disconnecting Power Steering Cooler Hoses
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the power steering cooler hoses.

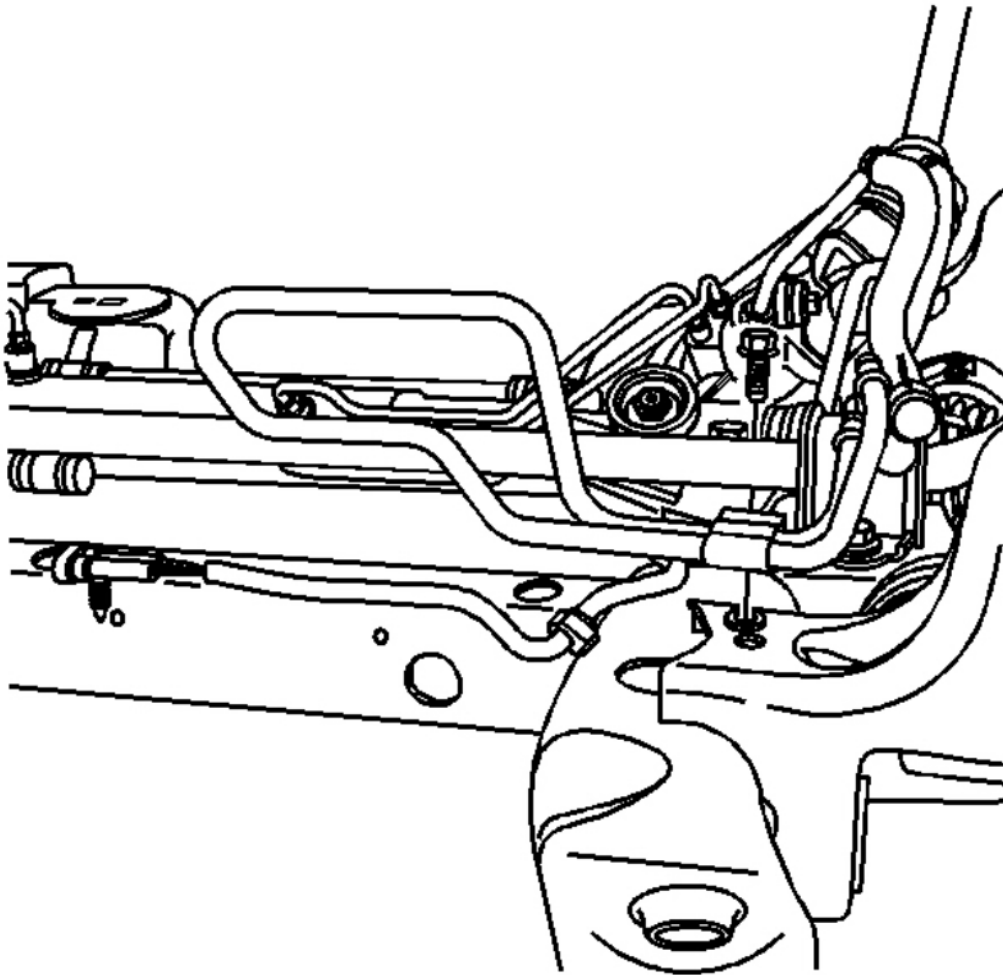


Fig. 77: Removing Power Steering Cooler Retaining Bolt
Courtesy of GENERAL MOTORS CORP.

3. Remove the power steering cooler retaining bolt.
4. Remove the power steering cooler from the vehicle.

Installation Procedure

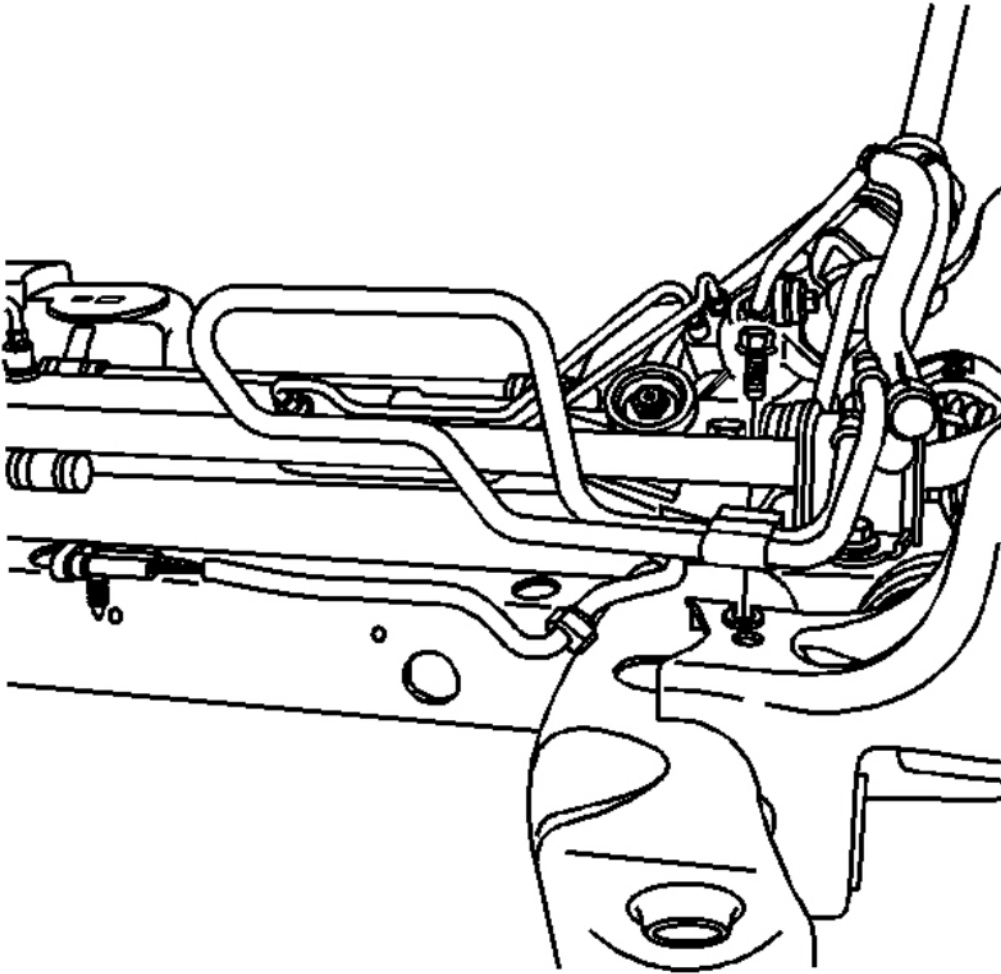


Fig. 78: Installing Power Steering Cooler To Vehicle
Courtesy of GENERAL MOTORS CORP.

1. Install the power steering cooler to the vehicle.

NOTE: Refer to **Fastener Notice** in Cautions and Notices.

2. Install the power steering cooler retaining bolt.

Tighten: Tighten the bolt to 9 N.m (80 lb in).

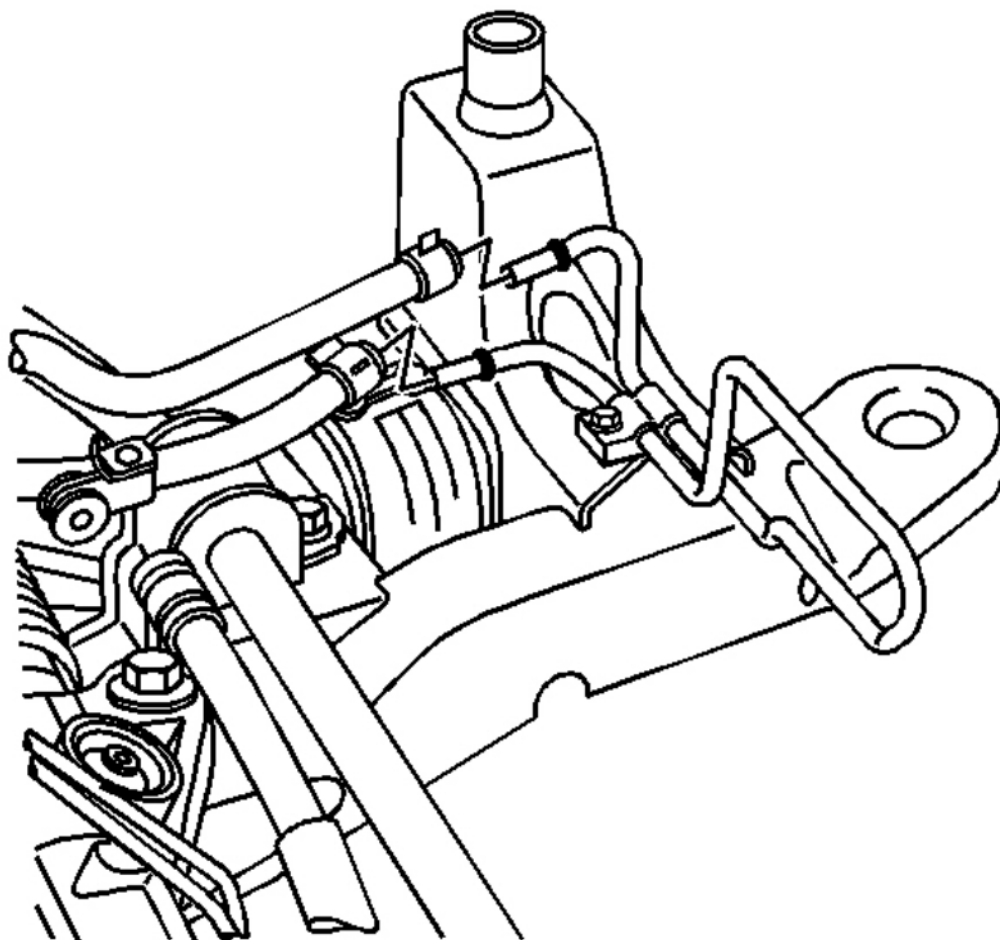


Fig. 79: Installing Power Steering Cooler Hoses
Courtesy of GENERAL MOTORS CORP.

3. Install the power steering cooler hoses.
4. Install the intake air resonator. Refer to **Intake Air Resonator Replacement** in Engine Controls 2.6 L and 3.2 L.
5. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.

Removal Procedure

1. Remove the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.
2. Place a drain pan under the vehicle.

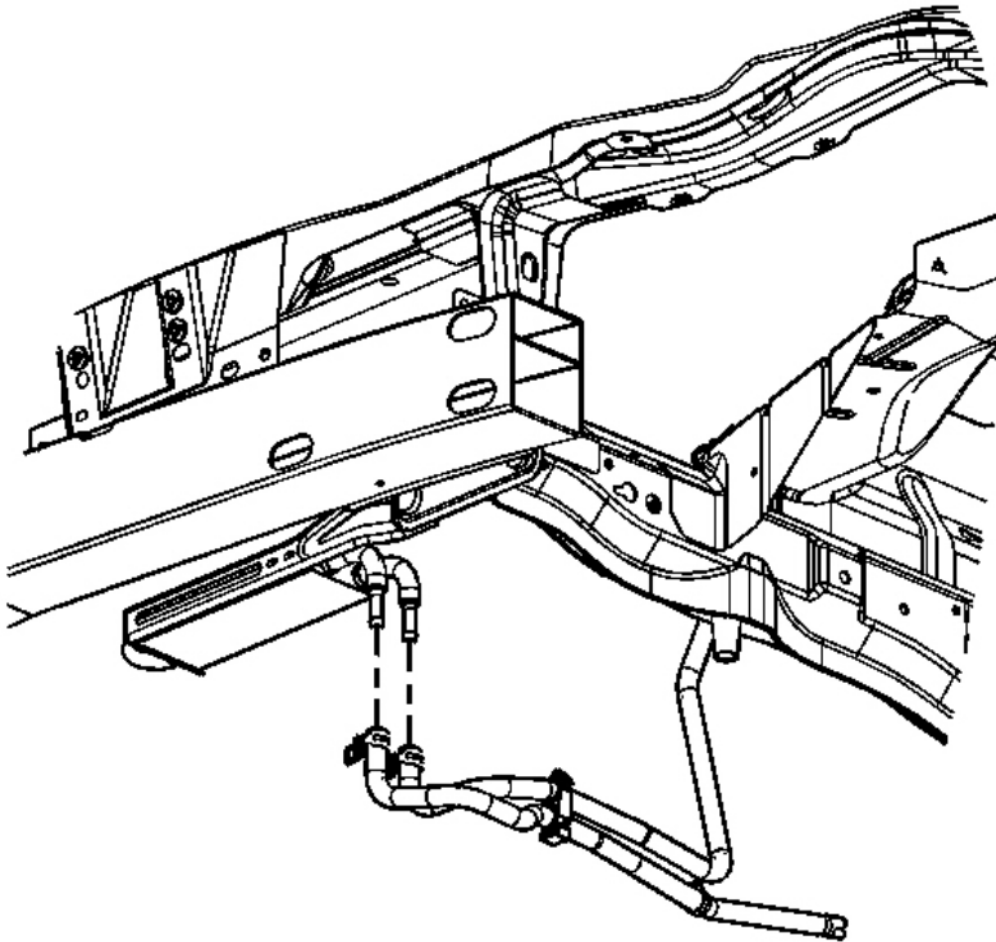


Fig. 80: Removing Power Steering Hoses From Power Steering Cooler
Courtesy of GENERAL MOTORS CORP.

3. Remove the power steering hoses from the power steering cooler.

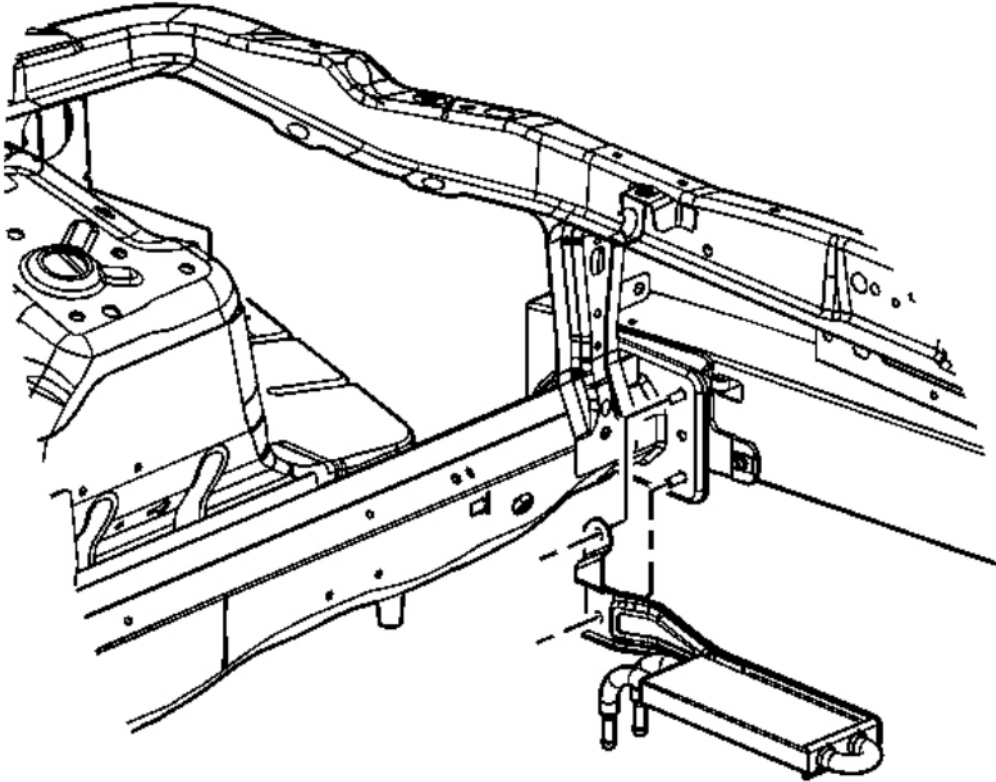


Fig. 81: Removing Power Steering Hoses From Power Steering Cooler
Courtesy of GENERAL MOTORS CORP.

4. Remove the power steering cooler retaining nuts.
5. Remove the power steering cooler.

Installation Procedure

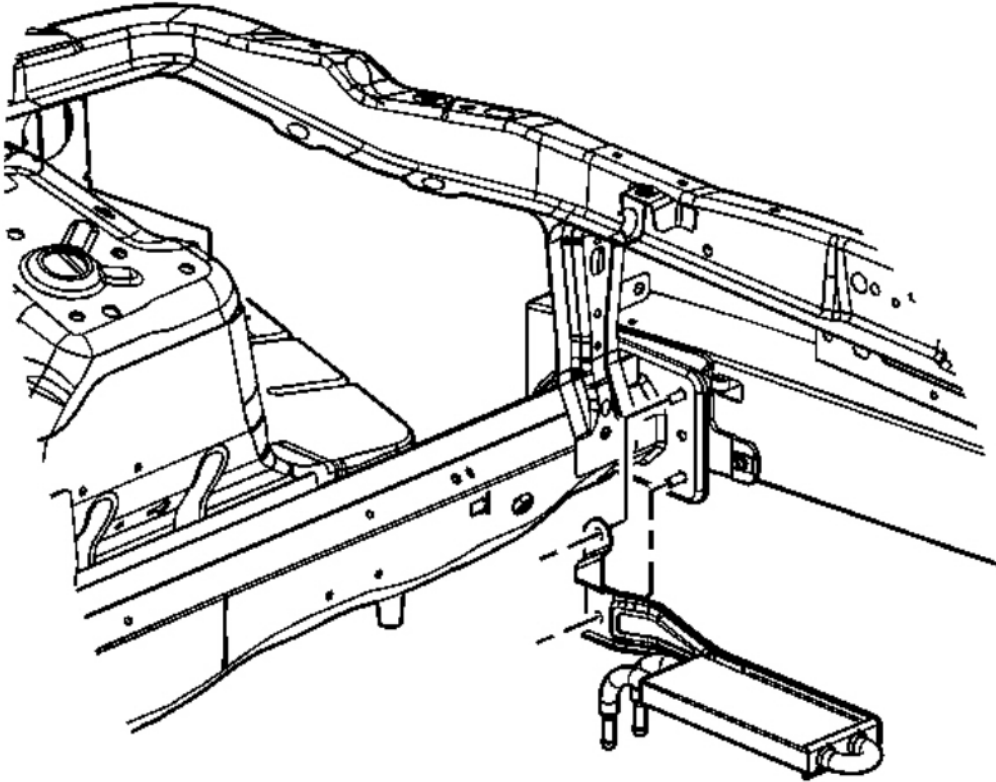


Fig. 82: Installing Power Steering Cooler
Courtesy of GENERAL MOTORS CORP.

1. Install the power steering cooler.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the power steering cooler retaining nuts.

Tighten: Tighten the nuts to 25 N.m (18 lb ft).

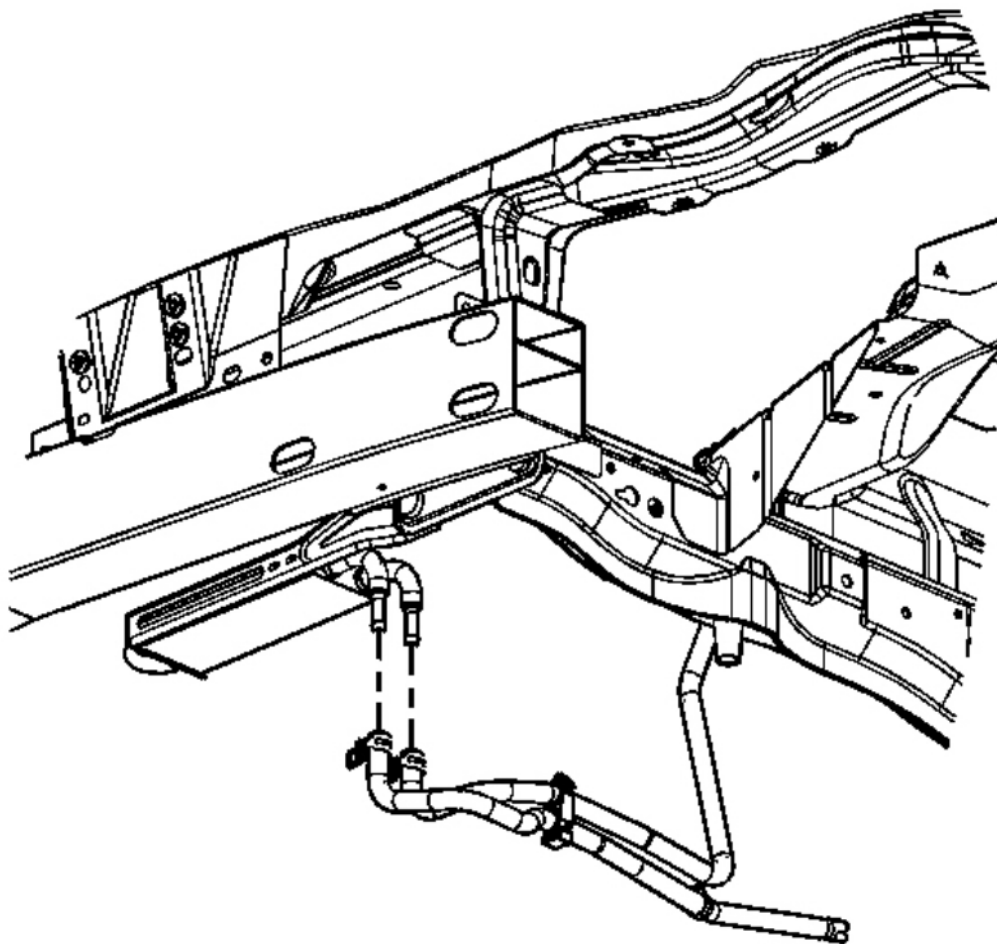


Fig. 83: Installing Power Steering Hoses To Power Steering Cooler
Courtesy of GENERAL MOTORS CORP.

3. Install the power steering hoses to the power steering cooler.
4. Install the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.
5. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.

POWER STEERING RESERVOIR OUTLET PIPE/HOSE REPLACEMENT (LY7)

Removal Procedure

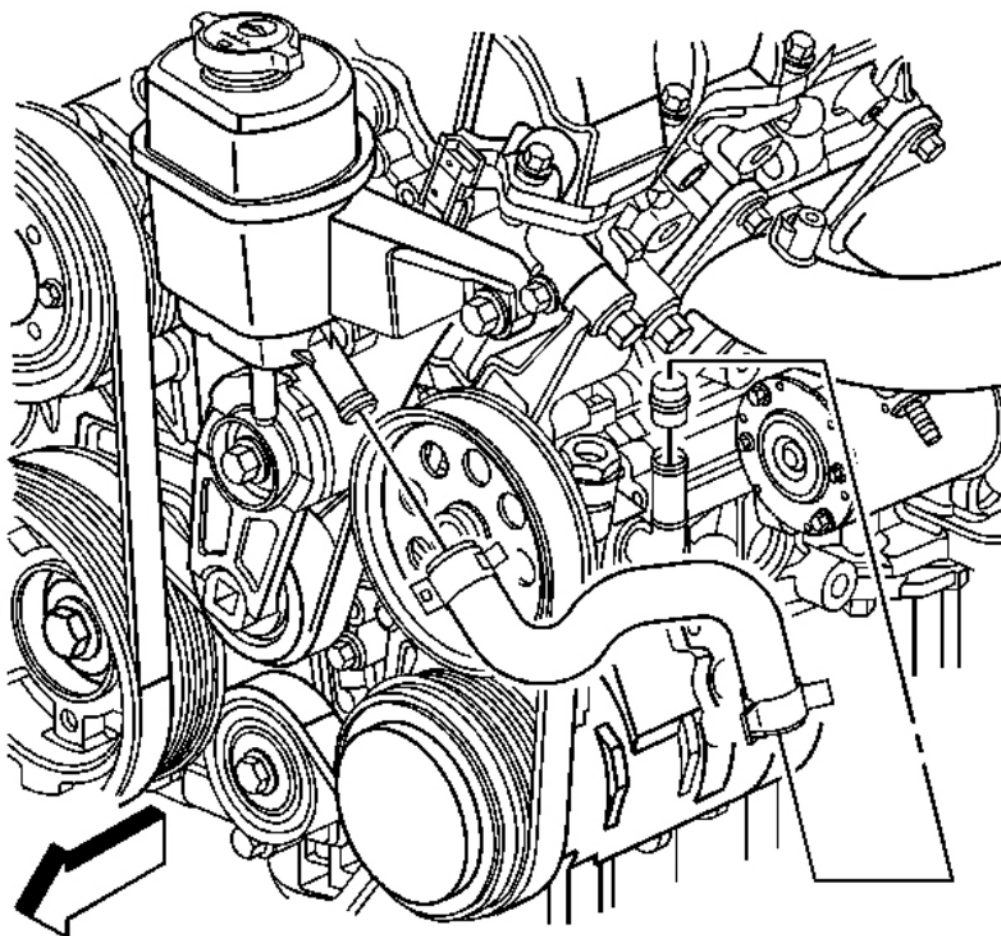


Fig. 84: Disconnecting Power Steering Reservoir Outlet Hose From Power Steering Pump

Courtesy of GENERAL MOTORS CORP.

1. Place a drain pan under the vehicle.
2. Disconnect the power steering reservoir outlet hose from the power steering pump.
3. Disconnect the power steering reservoir outlet hose from the power steering reservoir.
4. Remove the power steering reservoir outlet hose.

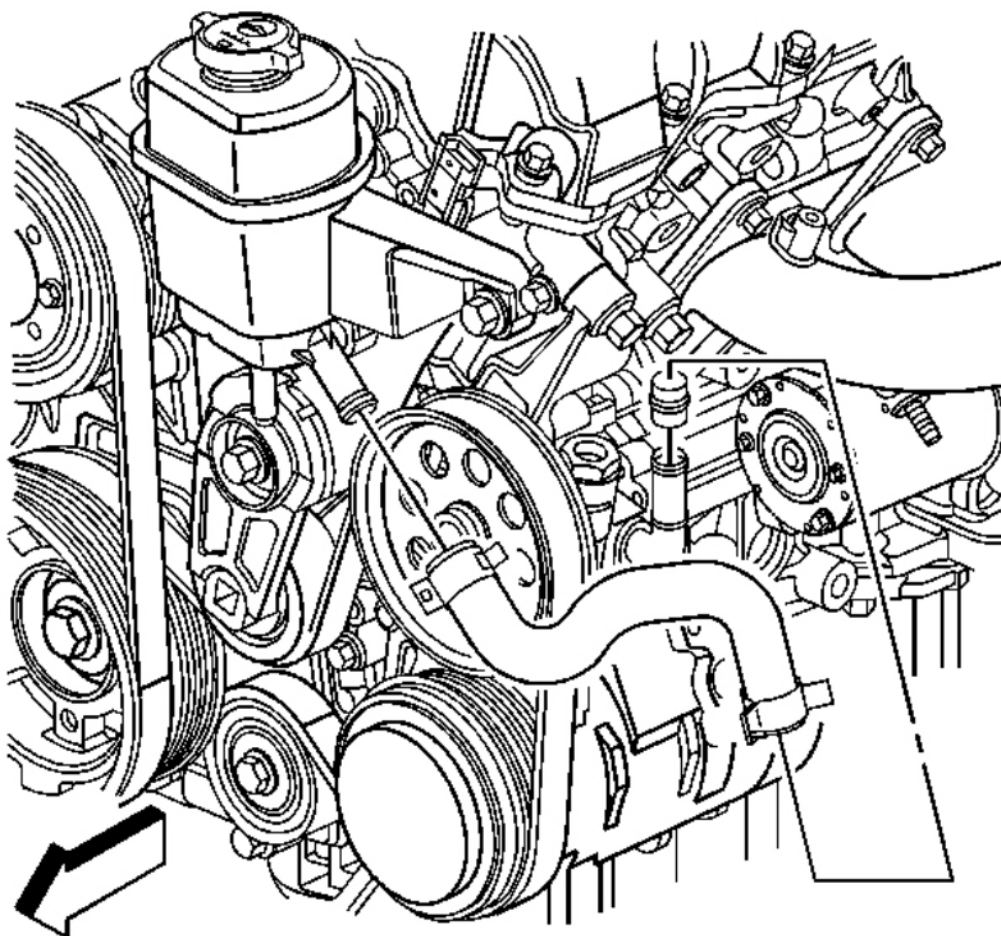


Fig. 85: Connecting Power Steering Reservoir Outlet Hose
Courtesy of GENERAL MOTORS CORP.

1. Connect the power steering reservoir outlet hose to the power steering reservoir.
2. Connect the power steering reservoir outlet hose to the power steering reservoir.
3. Remove the drain pan from under the vehicle.
4. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.

POWER STEERING RESERVOIR OUTLET PIPE/HOSE REPLACEMENT (LY9)

Removal Procedure

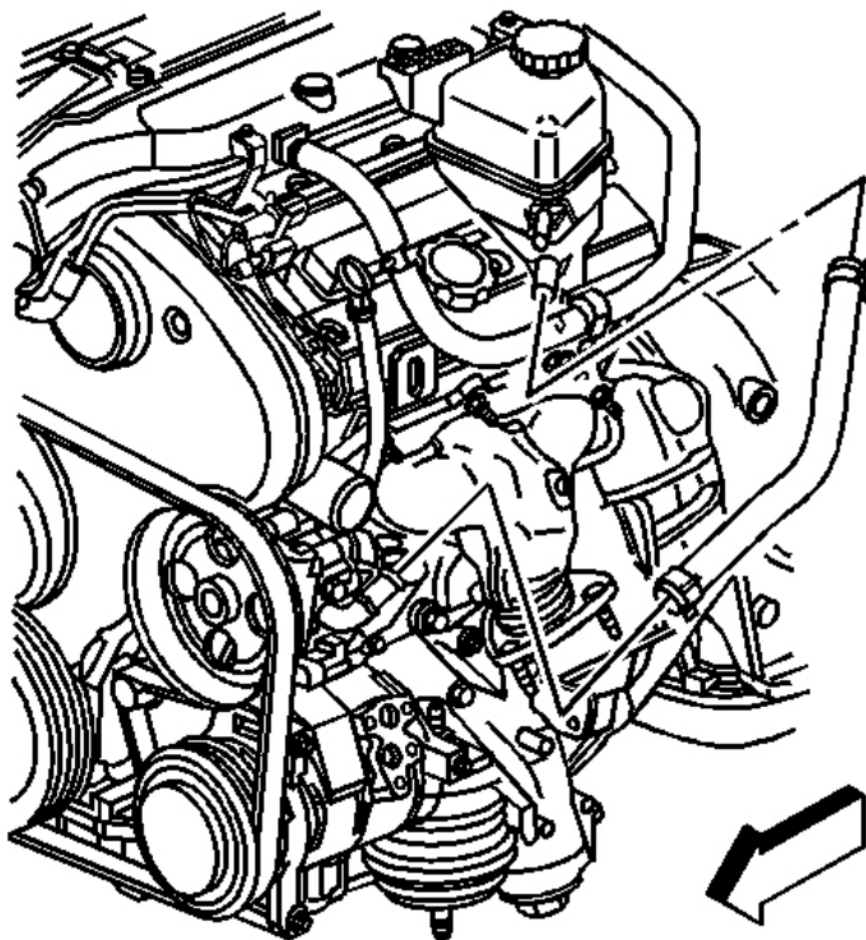


Fig. 86: Disconnecting Power Steering Reservoir Outlet Hose From Power Steering Pump

Courtesy of GENERAL MOTORS CORP.

1. Place a drain pan under the vehicle.
2. Disconnect the power steering reservoir outlet hose from the power steering pump.
3. Disconnect the power steering reservoir outlet hose from the power steering reservoir.
4. Remove the power steering reservoir outlet hose.

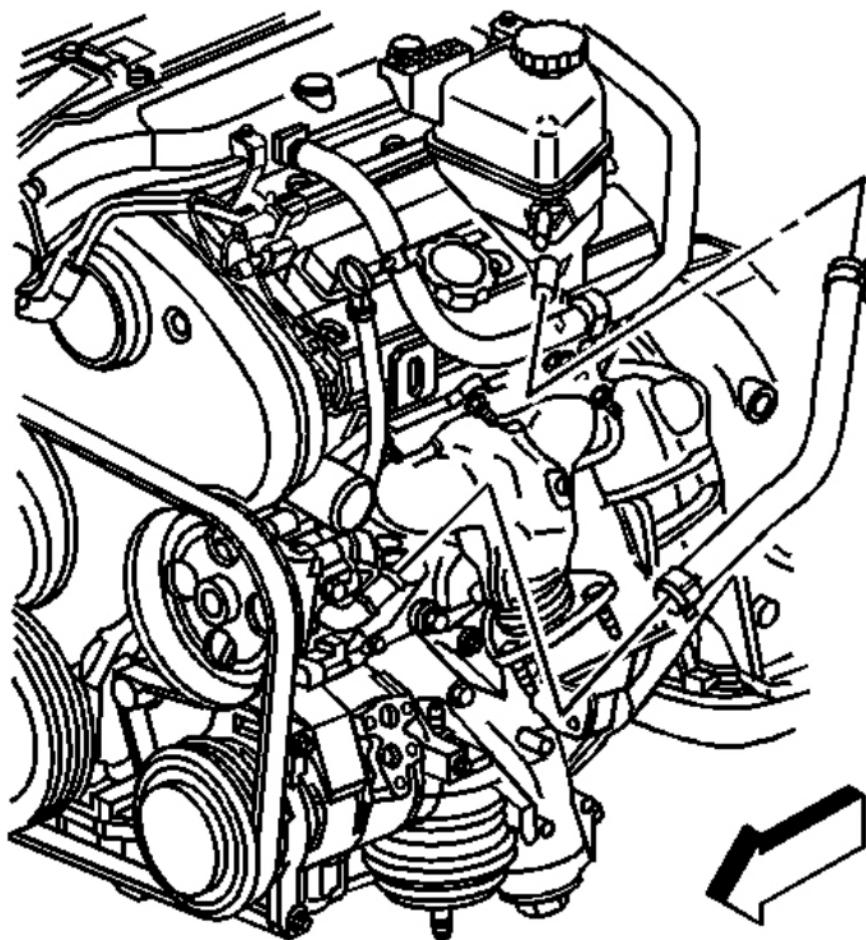


Fig. 87: Connecting Power Steering Reservoir Outlet Hose To Power Steering Reservoir

Courtesy of GENERAL MOTORS CORP.

1. Connect the power steering reservoir outlet hose to the power steering reservoir.
2. Connect the power steering reservoir outlet hose to the power steering reservoir.
3. Remove the drain pan from under the vehicle.
4. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.

Removal Procedure

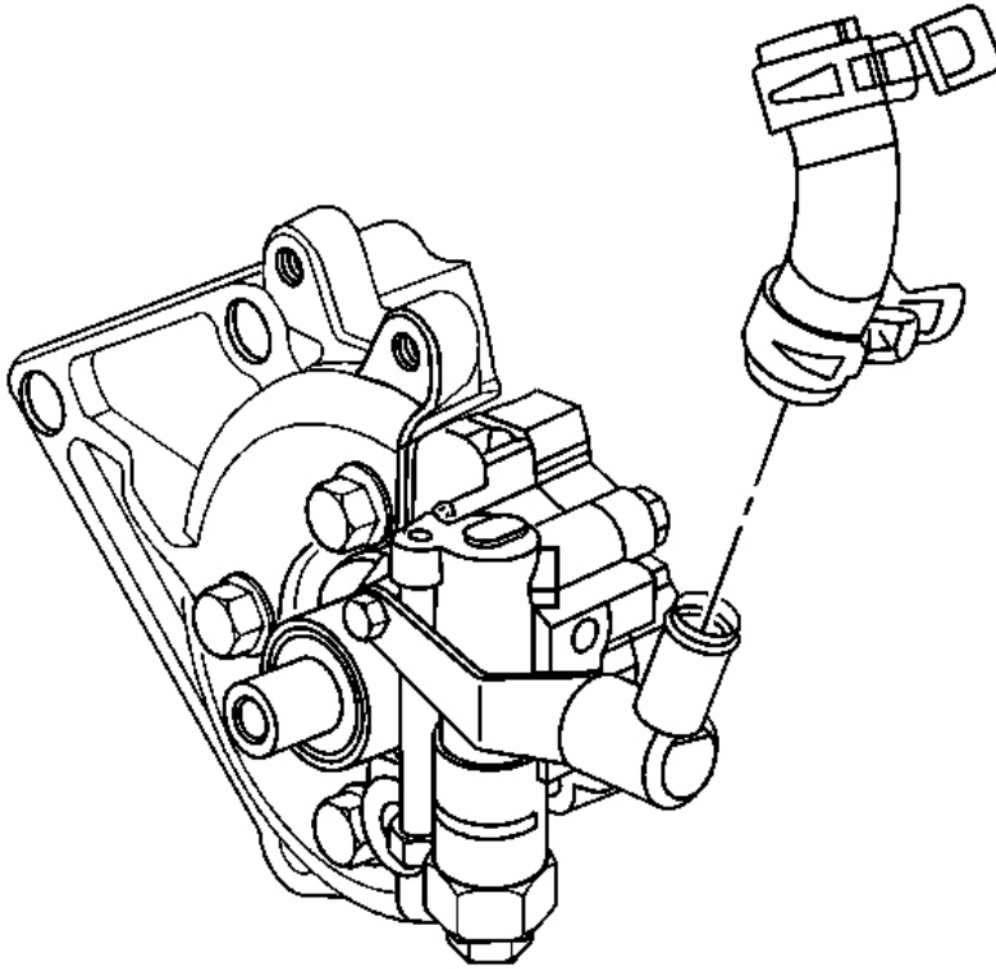


Fig. 88: Disconnecting Power Steering Reservoir Outlet Hose
Courtesy of GENERAL MOTORS CORP.

1. Remove the power steering reservoir. Refer to **Remote Power Steering Fluid Reservoir Replacement (LY7)**, **Remote Power Steering Fluid Reservoir Replacement (LA3/LY9)** and **Remote Power Steering Fluid Reservoir Replacement (5.7L)**.
2. Disconnect the power steering reservoir outlet hose from the power steering pump.

Installation Procedure

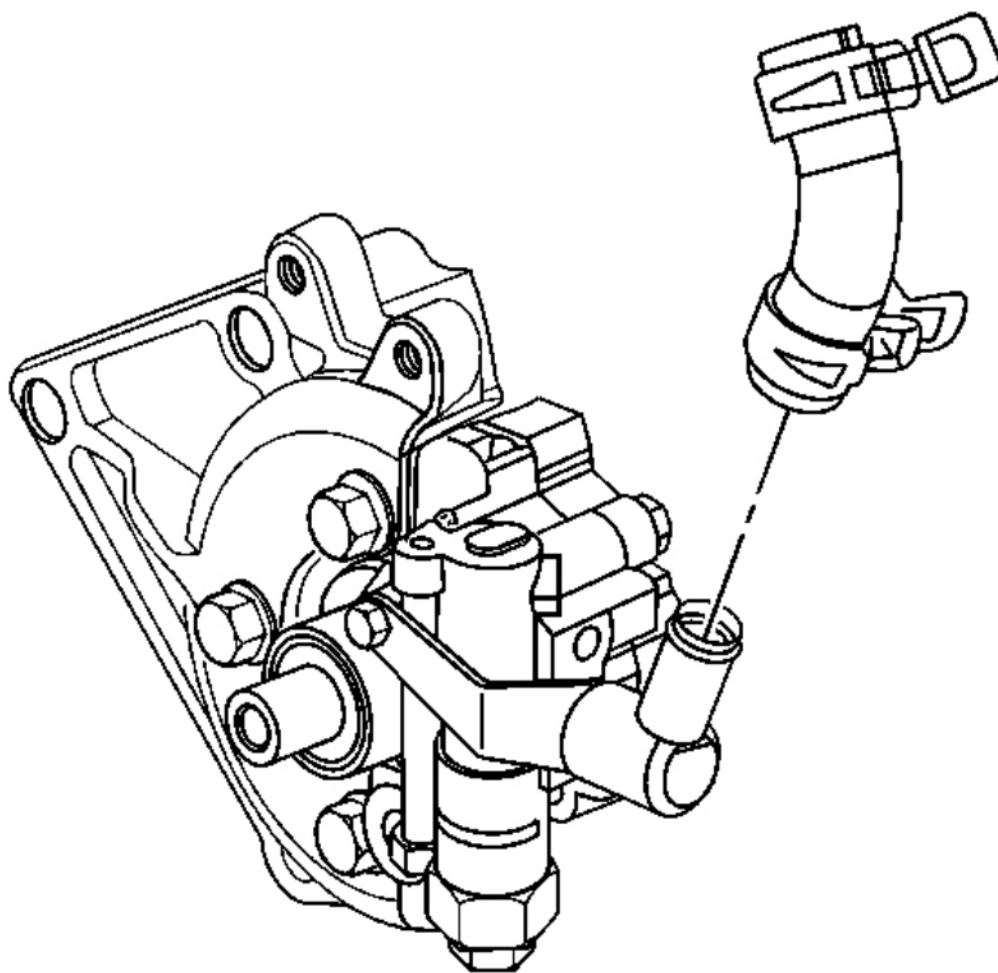


Fig. 89: Connecting Power Steering Reservoir Outlet Hose
Courtesy of GENERAL MOTORS CORP.

1. Connect the power steering reservoir outlet hose to the power steering pump.
2. Install the power steering reservoir. Refer to **Remote Power Steering Fluid Reservoir Replacement (LY7)**, **Remote Power Steering Fluid Reservoir Replacement (LA3/LY9)** and **Remote Power Steering Fluid Reservoir Replacement (5.7L)**.
3. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.

Removal Procedure

1. Place a drain pan under the vehicle.
2. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls - 2.6L and 3.2L.
3. Remove the intake air resonator. Refer to **Intake Air Resonator Replacement** in Engine Controls - 2.6L and 3.2L.
4. Remove the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.

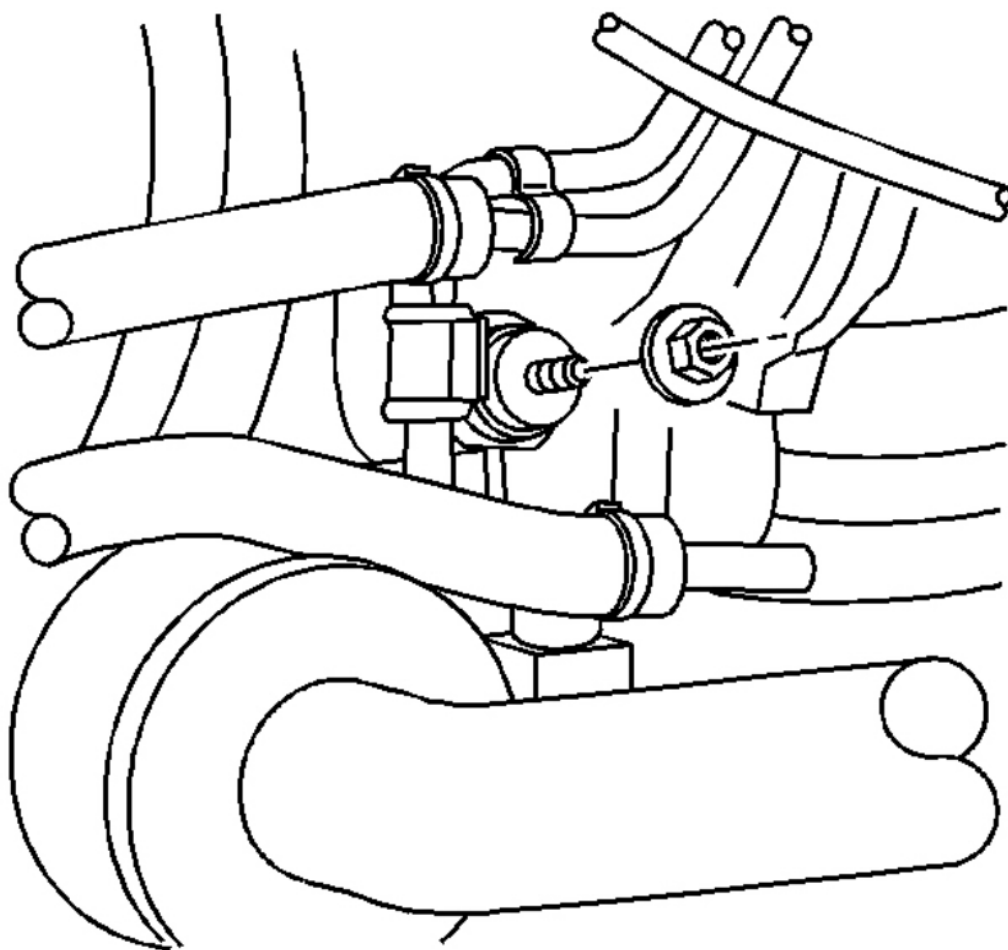


Fig. 90: Removing Power Steering Pressure Hose Retaining Nut

Courtesy of GENERAL MOTORS CORP.

5. Remove the power steering pressure hose retaining nut from the air conditioning compressor.

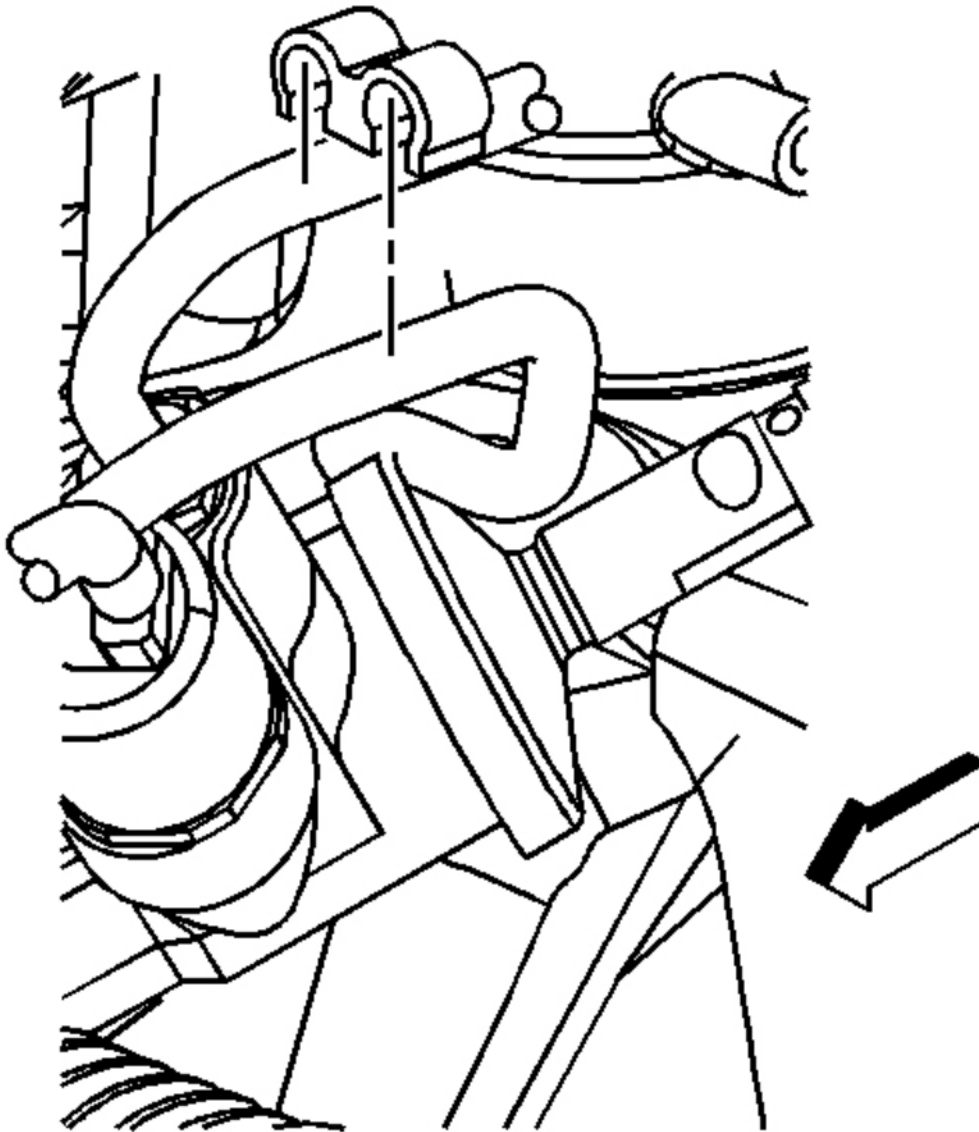


Fig. 91: Removing Clip From Power Steering Pressure Hose

Courtesy of GENERAL MOTORS CORP.

6. Remove the clip from the power steering pressure hose.

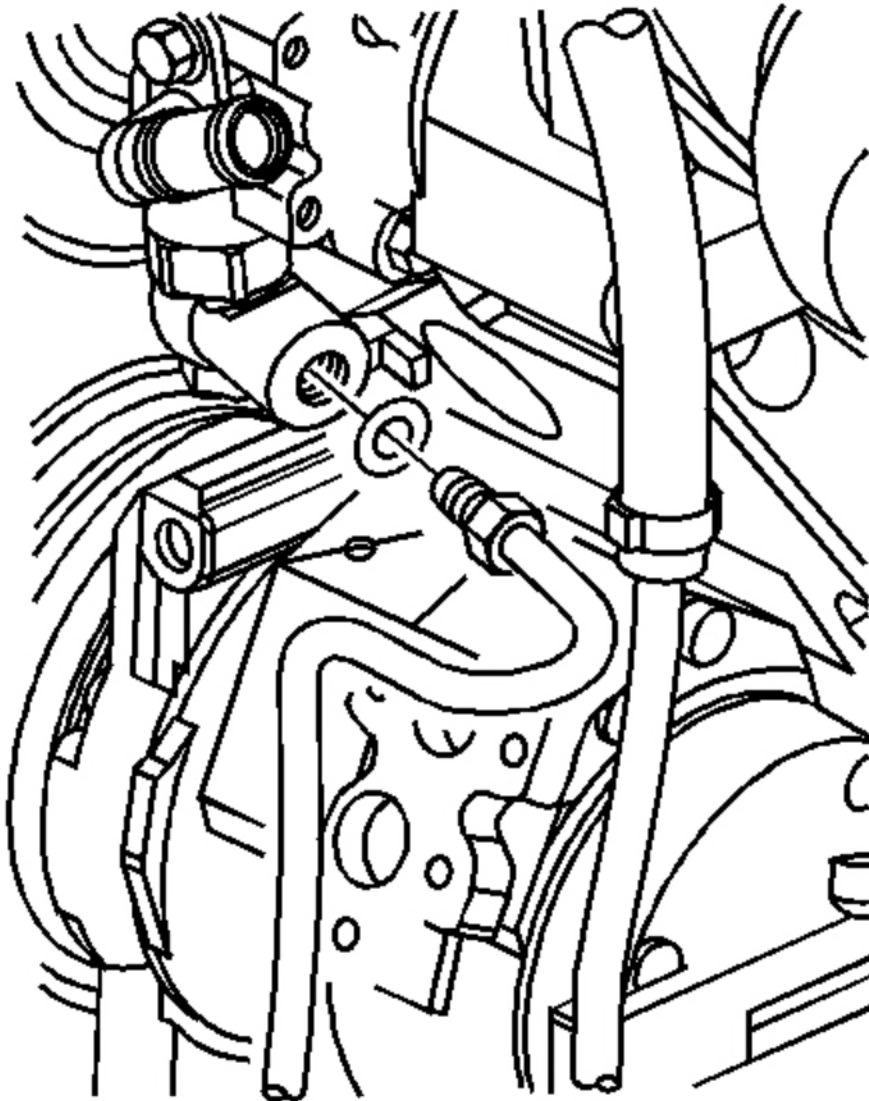


Fig. 92: Disconnecting Power Steering Pressure Hose
Courtesy of GENERAL MOTORS CORP.

7. Disconnect the power steering pressure hose from the power steering pump.

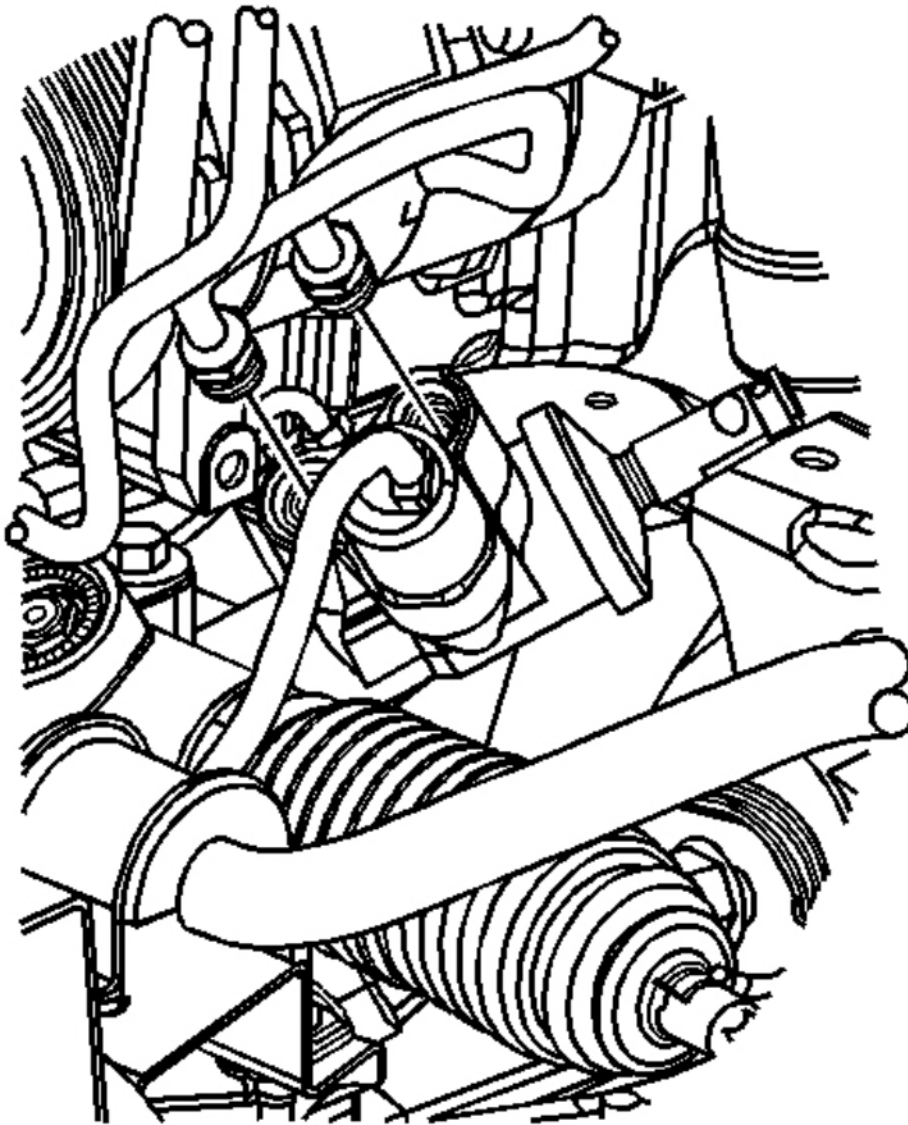


Fig. 93: Disconnecting Power Steering Pressure Hose From Power Steering Gear
Courtesy of GENERAL MOTORS CORP.

8. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General

Information.

9. Disconnect the power steering pressure hose from the power steering gear.

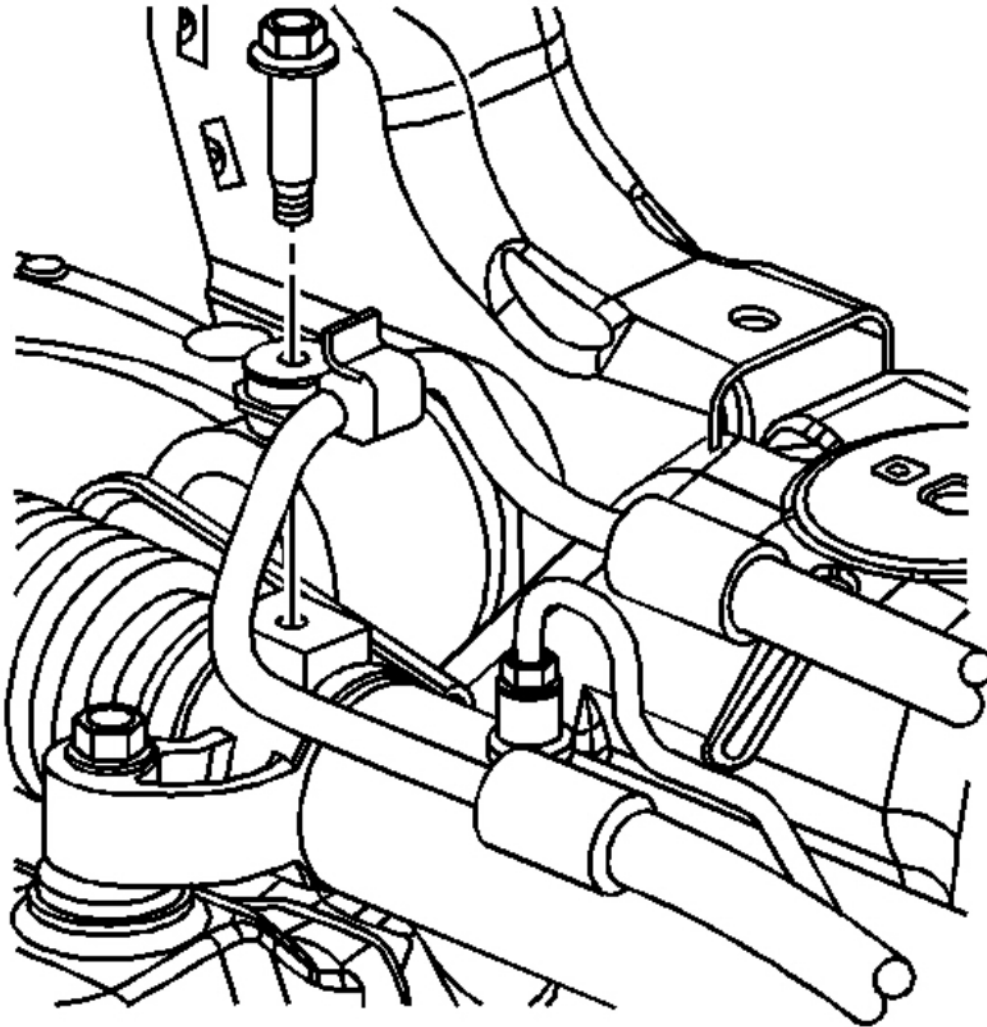


Fig. 94: Removing Power Steering Pressure Hose Mounting Bolt
Courtesy of GENERAL MOTORS CORP.

10. Remove the power steering pressure hose mounting bolt.
11. Remove the power steering pressure hose from the vehicle.

Installation Procedure

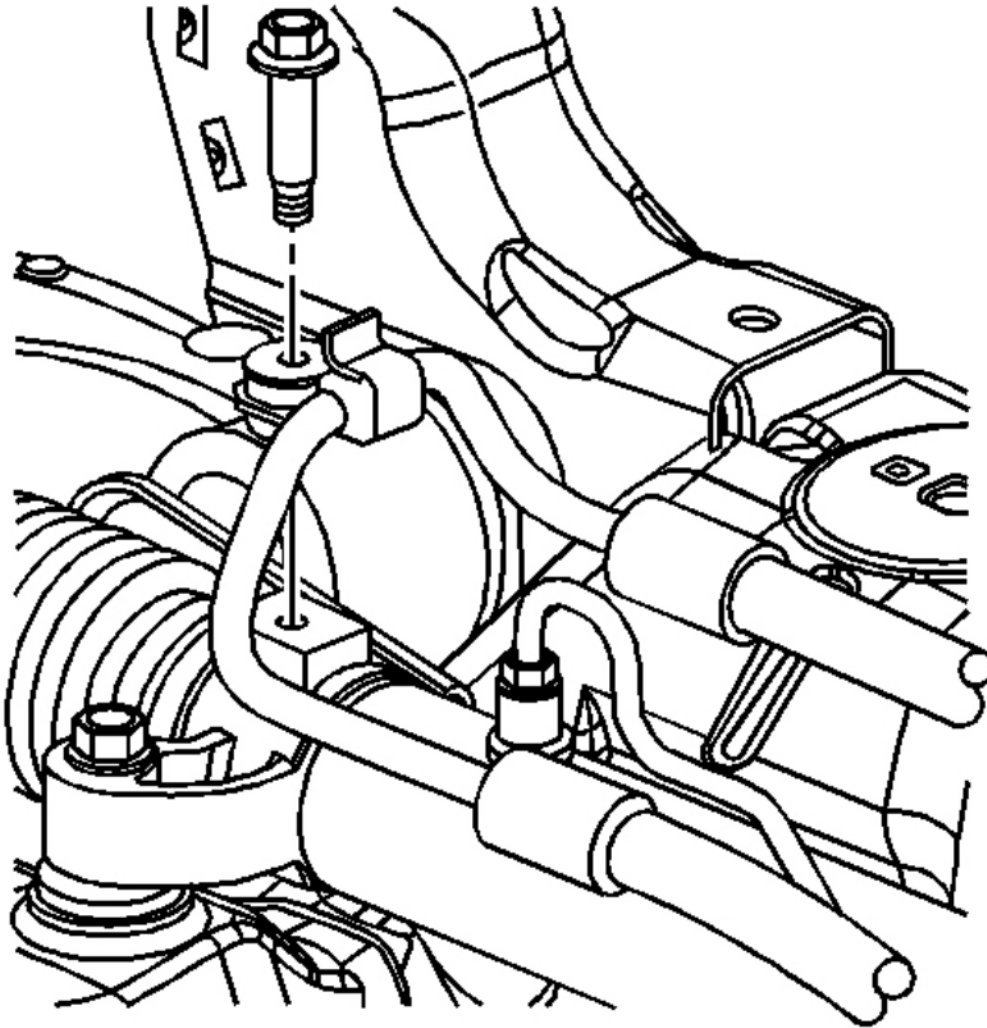


Fig. 95: Installing Power Steering Pressure Hose
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Loosely install the pressure hose and retainers before tightening.

1. Install the power steering pressure hose.

2. Install the power steering pressure hose retaining bolt.

Tighten: Tighten the power steering pressure hose retaining bolt to 9 N.m (80 lb in).

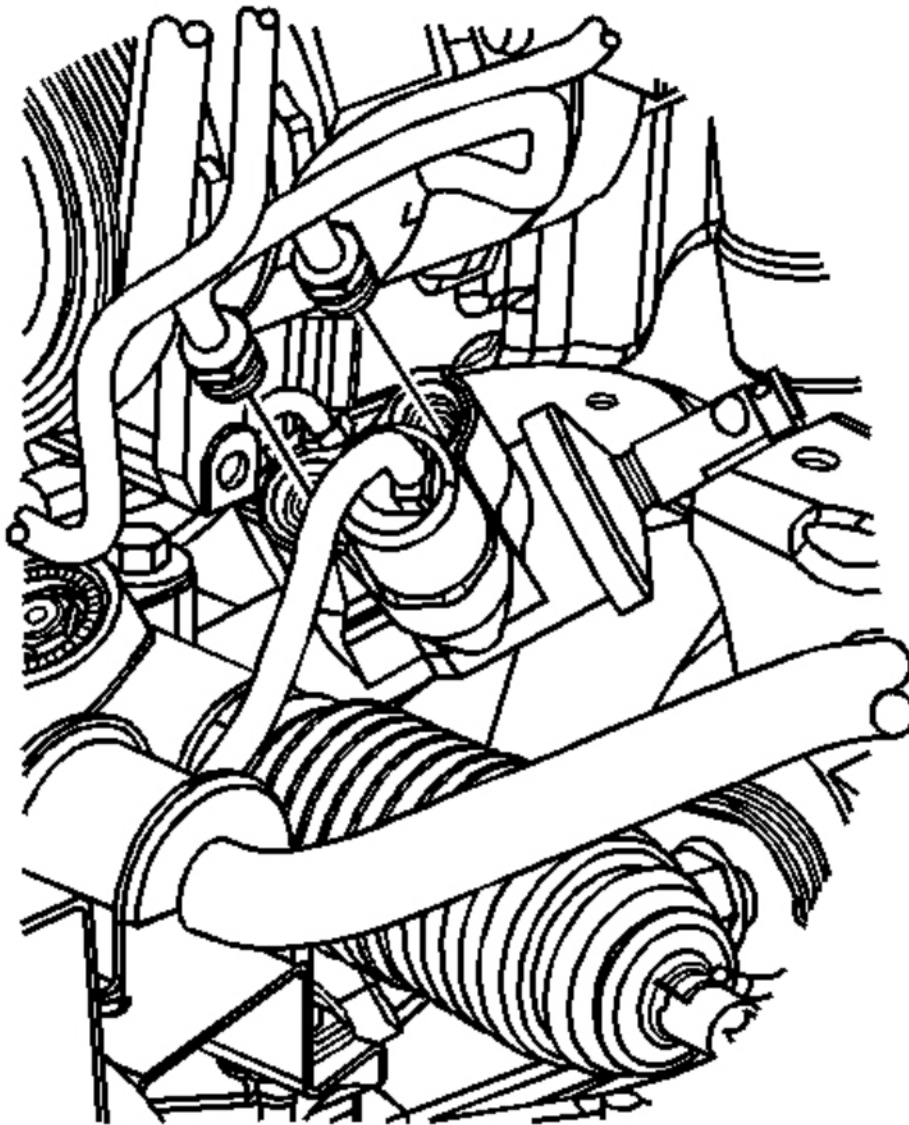


Fig. 96: Connecting Power Steering Pressure Hose To The Power Steering Gear
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Install a new seal on the power steering pressure hose before installing to the power steering gear.

3. Connect the power steering pressure hose to the power steering gear.

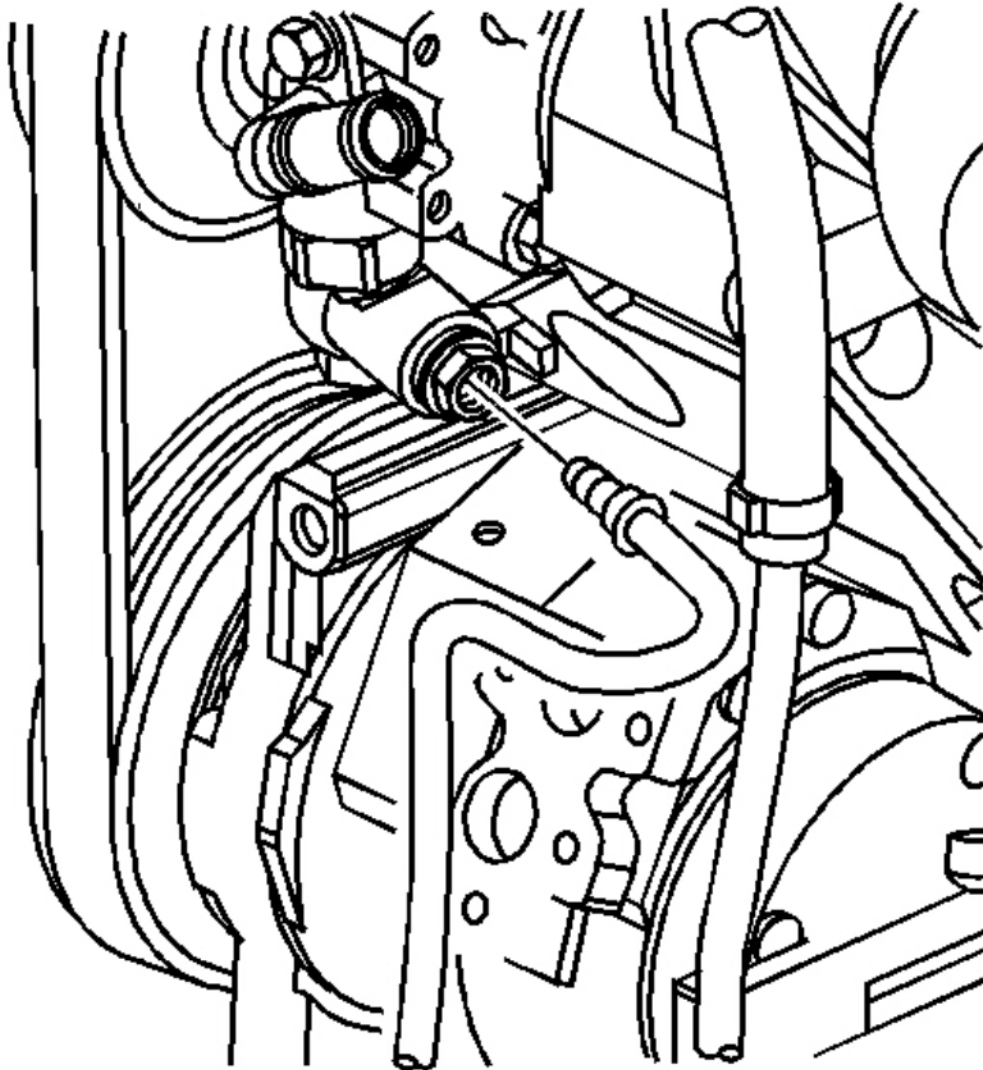


Fig. 97: Installing Power Steering Pressure Hose Fitting
Courtesy of GENERAL MOTORS CORP.

4. Lower the vehicle.

NOTE: Refer to Fastener Notice in Cautions and Notices.

5. Install the power steering pressure hose fitting to the power steering pump.

Tighten: Tighten the hose to pump fitting to 40 N.m (30 lb ft).

IMPORTANT: When installing the power steering pressure hose into the power steering pump a distinct click should be heard when the hose is fully seated.

6. Connect the power steering pressure hose to the power steering pump.

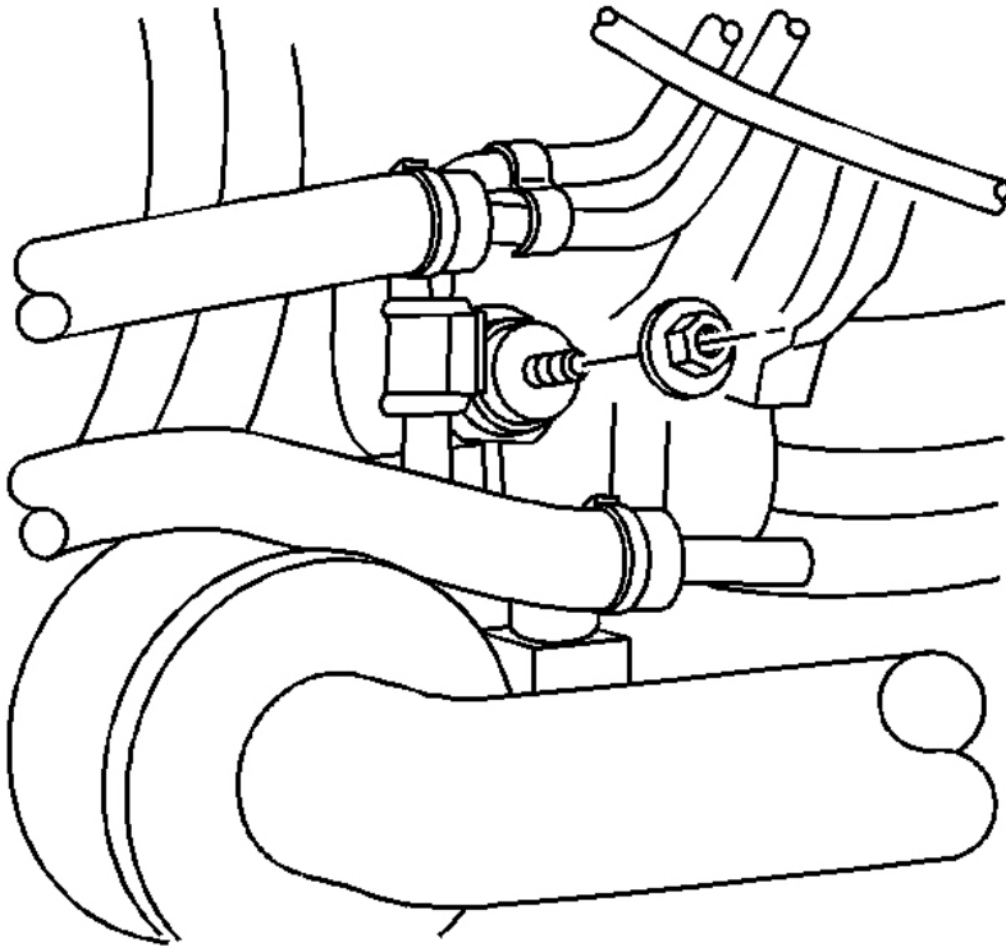


Fig. 98: Installing Power Steering Pressure Hose Retaining Nut
Courtesy of GENERAL MOTORS CORP.

7. Install the power steering pressure hose retaining nut to the air conditioning compressor.

Tighten:

- Tighten the hose to air compressor retaining nut to 8 N.m (71 lb in).
- Tighten the hose to the gear retaining bolts to 9 N.m (80 lb in).
- Tighten the hose to gear fittings to 30 N.m (22 lb ft).

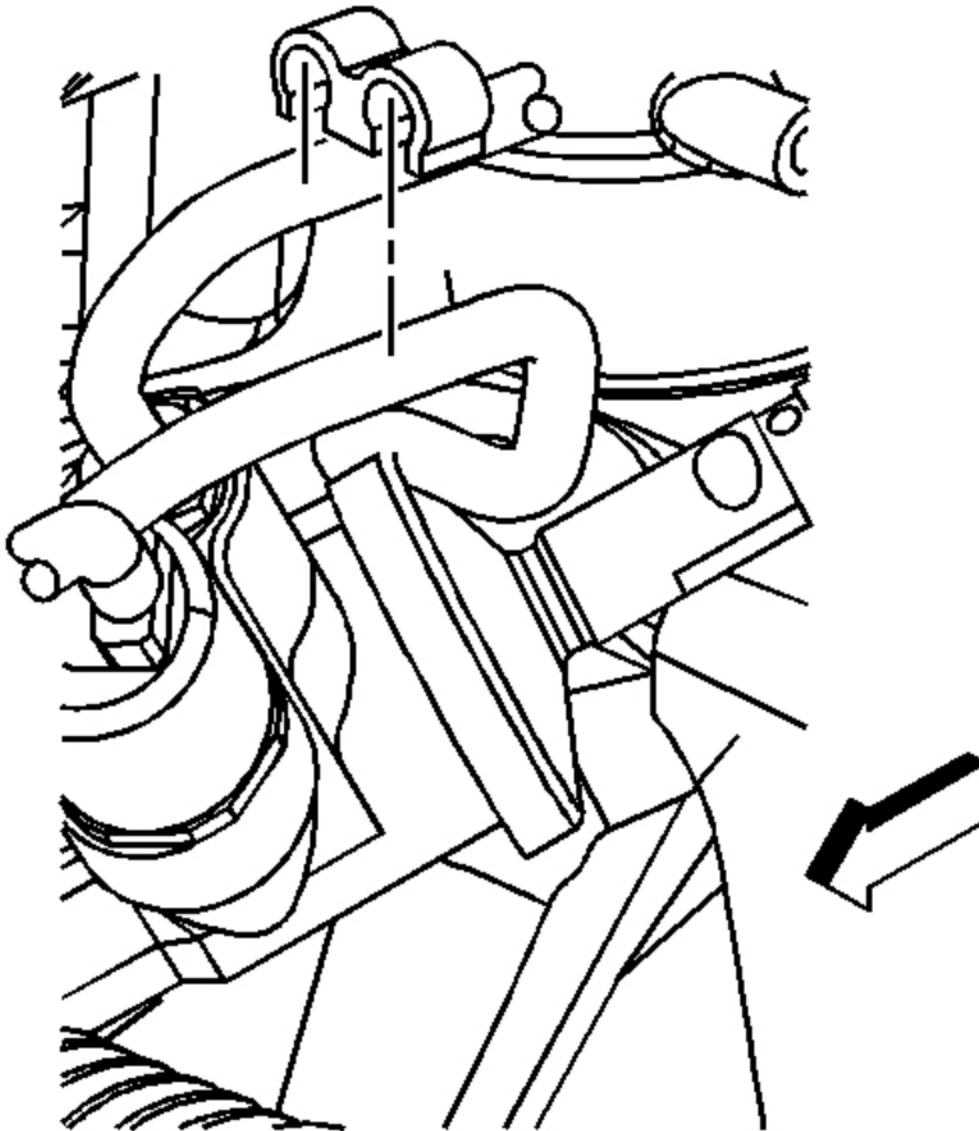


Fig. 99: Installing Clip To Power Steering Pressure Hose
Courtesy of GENERAL MOTORS CORP.

8. Install the clip to the power steering pressure hose.
9. Install the intake air resonator. Refer to **Intake Air Resonator Replacement** in Engine Controls - 2.6L and 3.2L.

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10. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls - 2.6L and 3.2L.
11. Remove the drain pan from under the vehicle.
12. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.
13. Install the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.

POWER STEERING PRESSURE PIPE/HOSE REPLACEMENT (RHD)

Removal Procedure

1. Place a drain pan under the vehicle.
2. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls - 2.6L and 3.2L.
3. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
4. Remove the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.

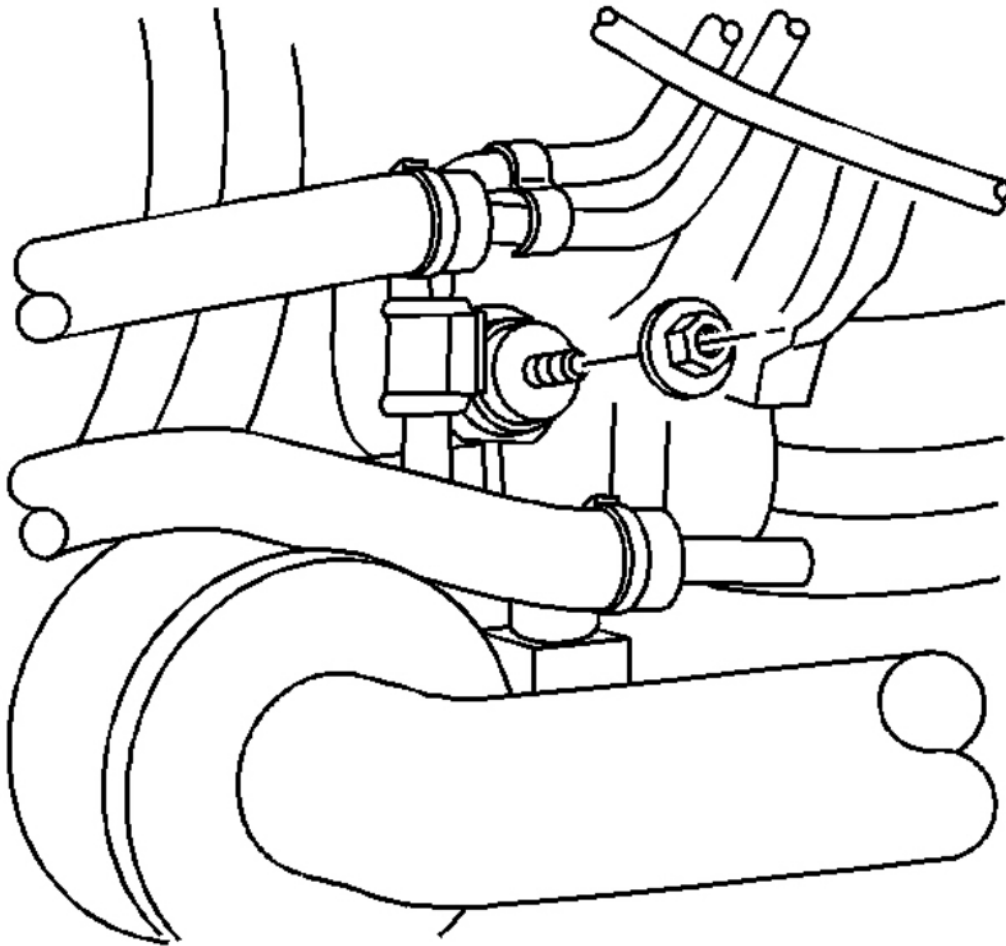


Fig. 100: Removing Power Steering Pressure Hose Retaining Nut
Courtesy of GENERAL MOTORS CORP.

5. Remove the power steering pressure hose retaining nut from the air conditioning compressor.
6. Lower the vehicle.

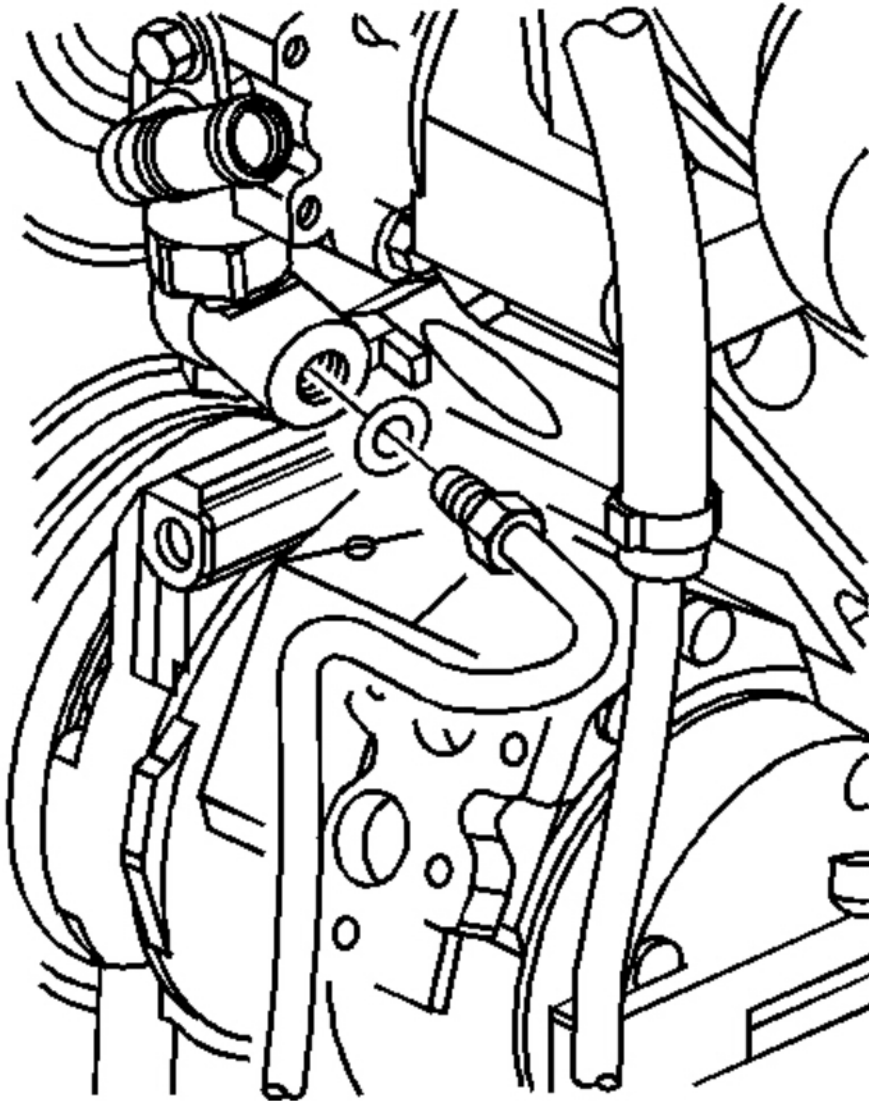


Fig. 101: Disconnecting Power Steering Pressure Hose
Courtesy of GENERAL MOTORS CORP.

7. Disconnect the power steering pressure hose from the power steering pump.
8. Raise the vehicle.

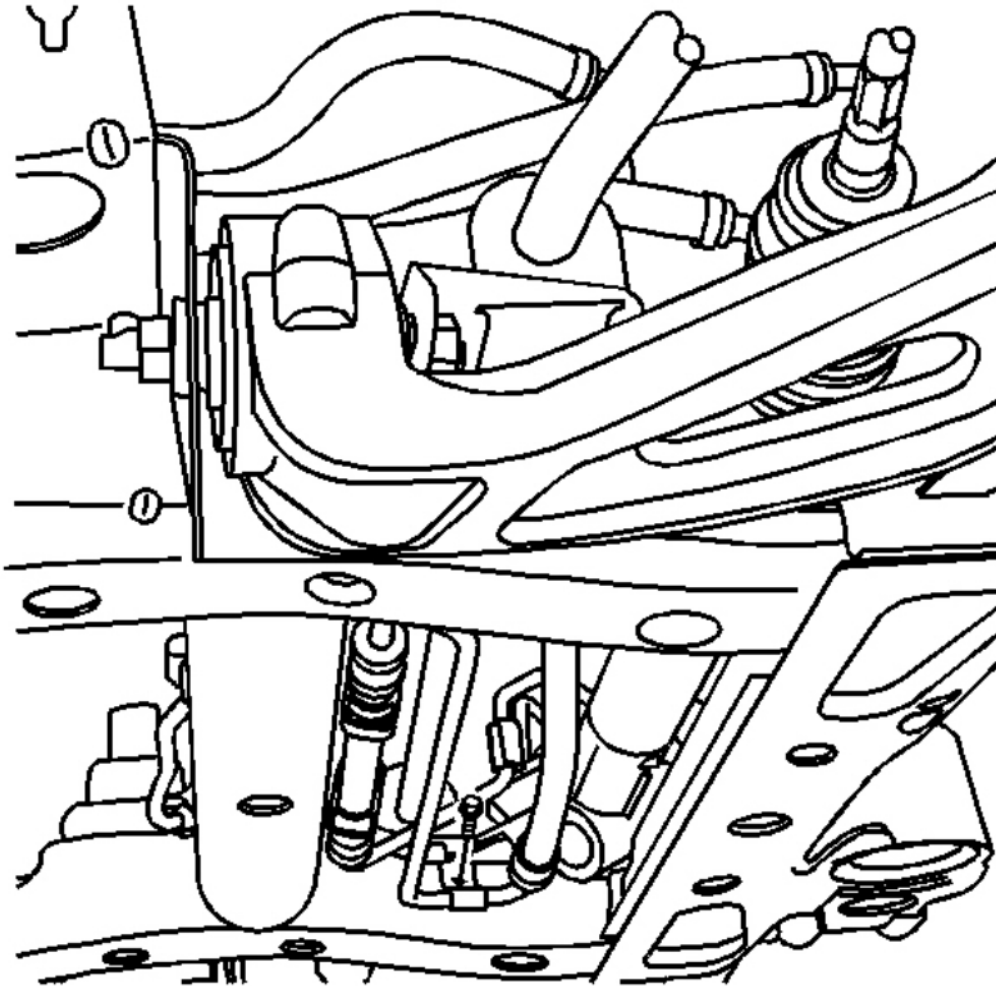


Fig. 102: Removing Power Steering Pressure Hose To Cradle Mounting Bolt
Courtesy of GENERAL MOTORS CORP.

9. Remove the power steering pressure hose to cradle mounting bolt.

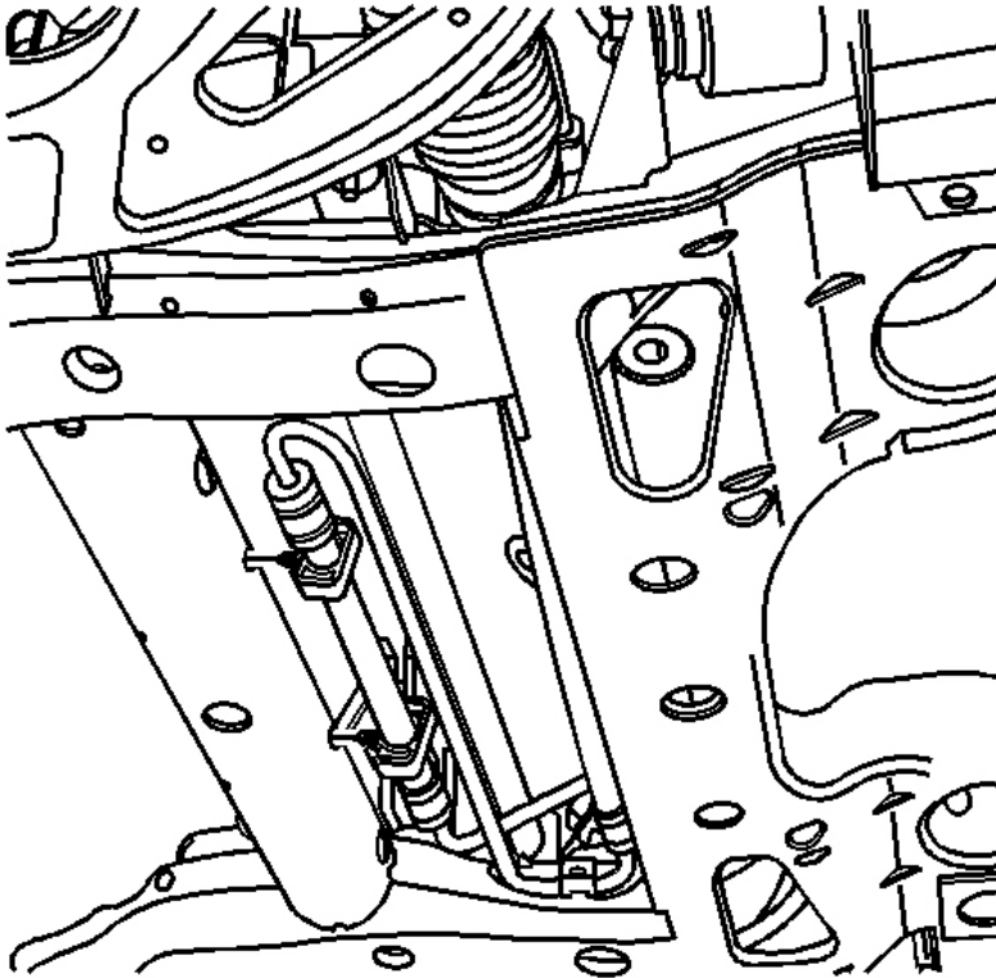


Fig. 103: Removing Power Steering Pressure Hose Retaining Clips From Cradle
Courtesy of GENERAL MOTORS CORP.

10. Remove the power steering pressure hose retaining clips from the cradle.

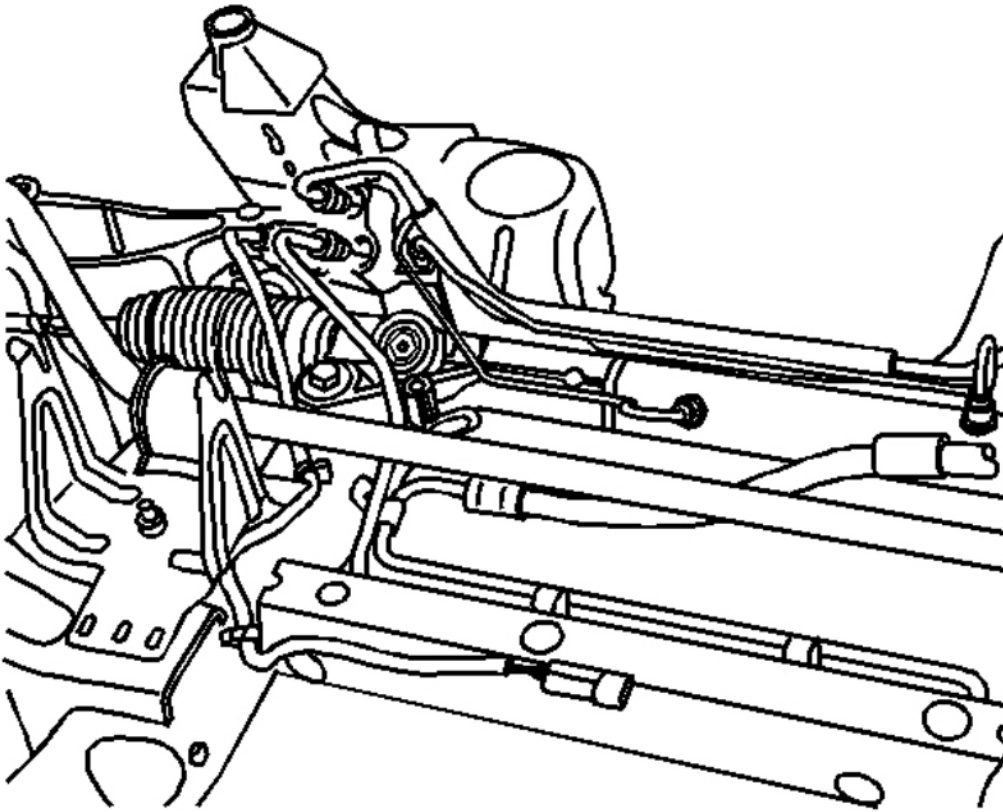


Fig. 104: Disconnecting Power Steering Pressure Hose From The Power Steering Gear

Courtesy of GENERAL MOTORS CORP.

11. Disconnect the power steering pressure hose from the power steering gear.
12. Remove the power steering pressure hose from the vehicle.

Installation Procedure

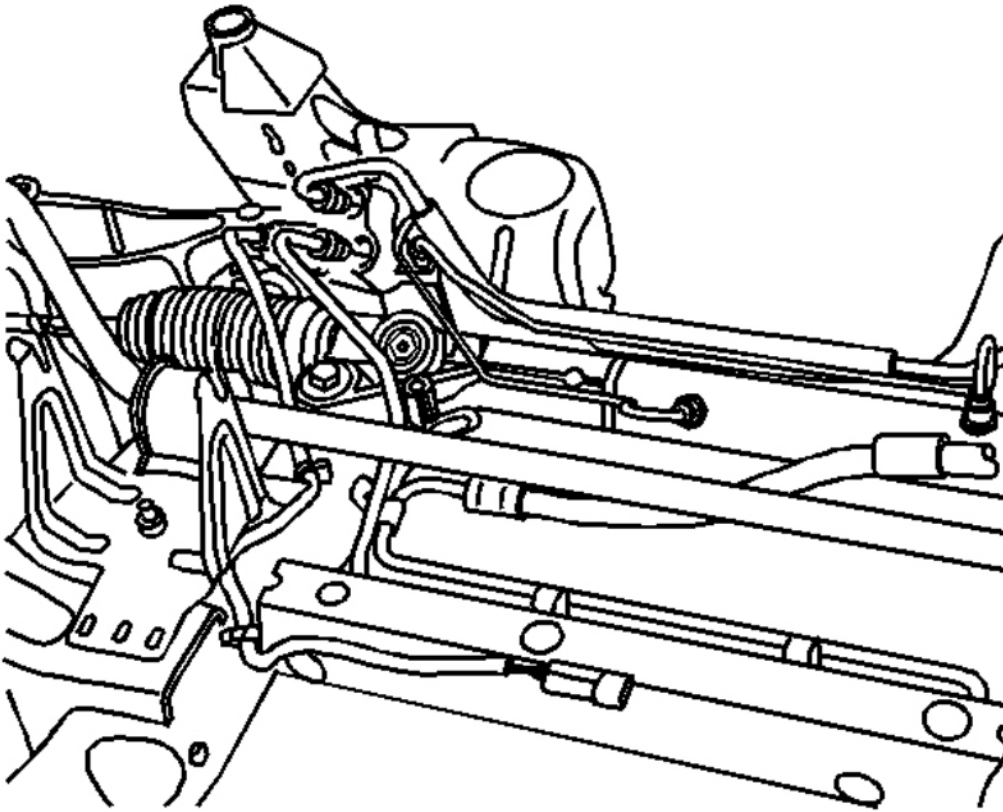


Fig. 105: Installing Power Steering Pressure Hose To Vehicle
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Loosely install the pressure hose and retainers before tightening.

1. Install the power steering pressure hose to the vehicle.
2. Install the power steering pressure hose to the power steering gear.

Tighten: Tighten the power steering pressure hose to steering gear to 30 N.m (22 lb ft).

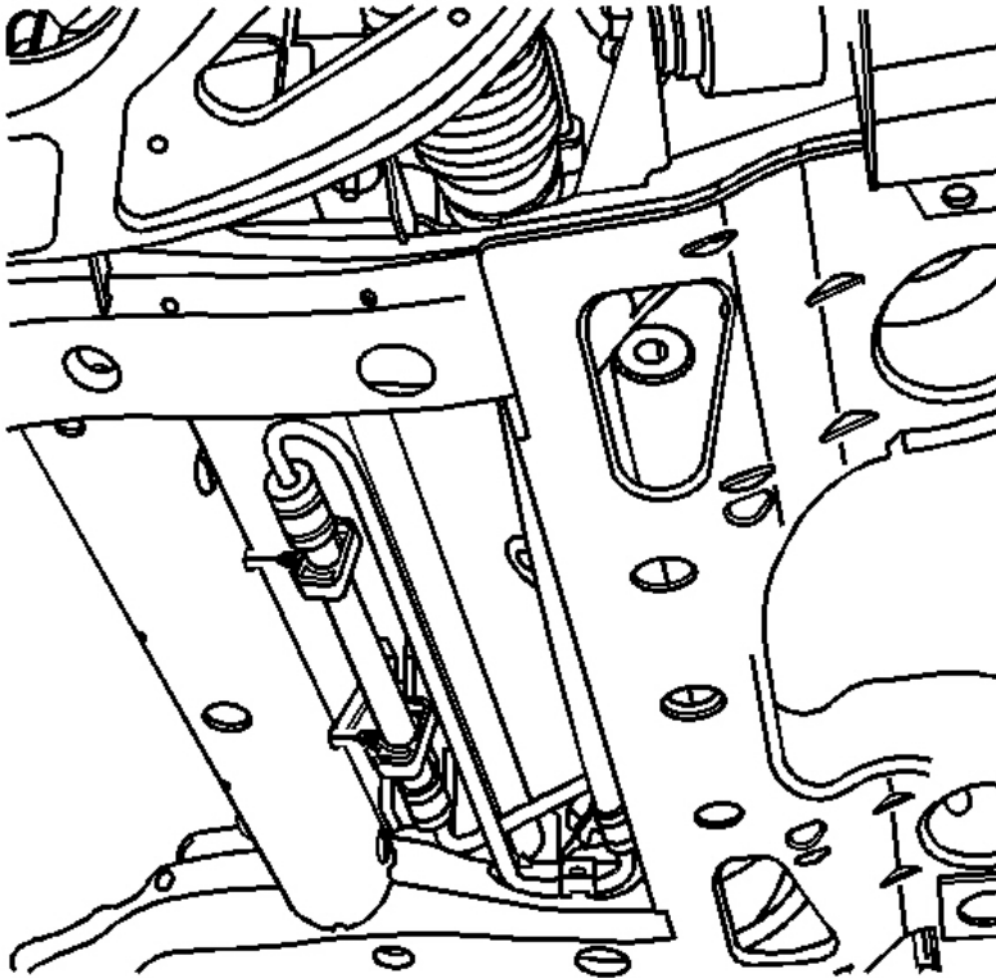


Fig. 106: Pushing Power Steering Pressure Hose Retaining Clips Into Cradle
Courtesy of GENERAL MOTORS CORP.

3. Push the power steering pressure hose retaining clips into the cradle.

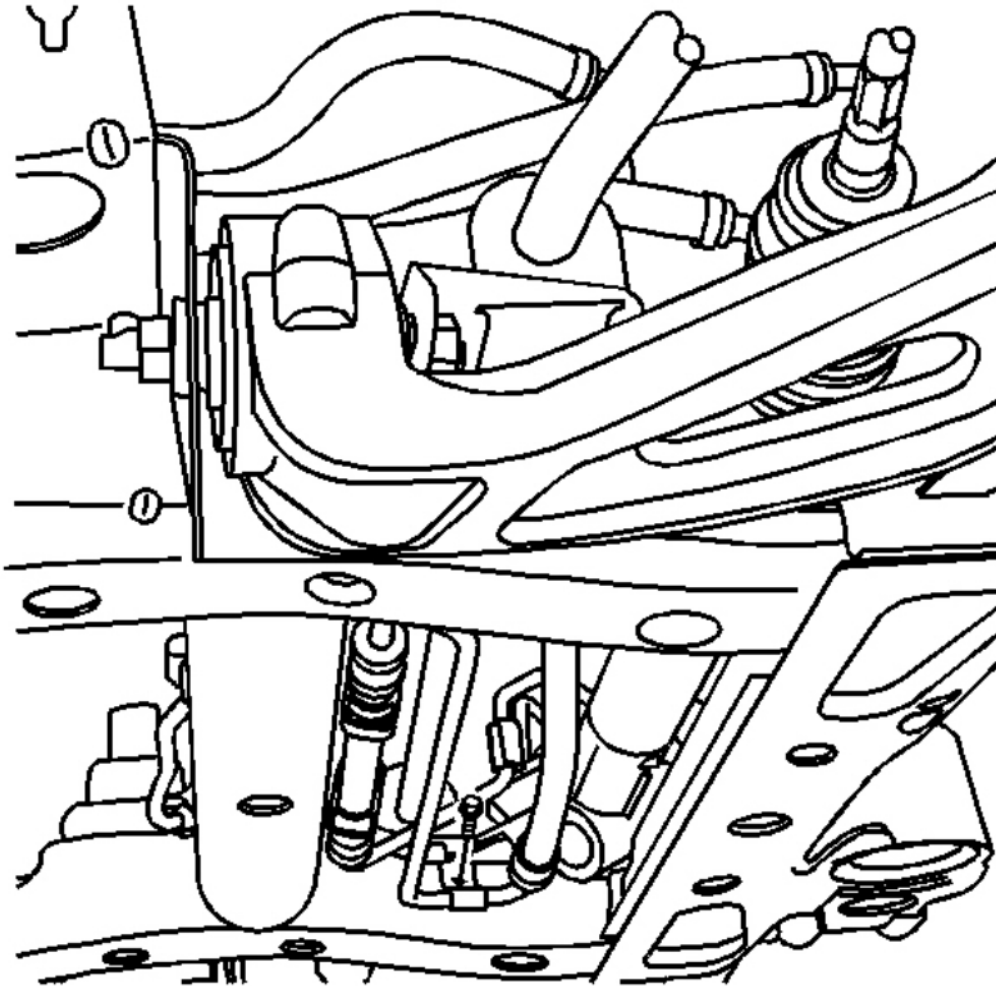


Fig. 107: Installing Power Steering Pressure Hose To Cradle Mounting Bolt
Courtesy of GENERAL MOTORS CORP.

4. Install the power steering pressure hose to cradle mounting bolt.

Tighten: Tighten the power steering pressure hose to cradle mounting bolt to 9 N.m (80 lb in).

5. Lower the vehicle.

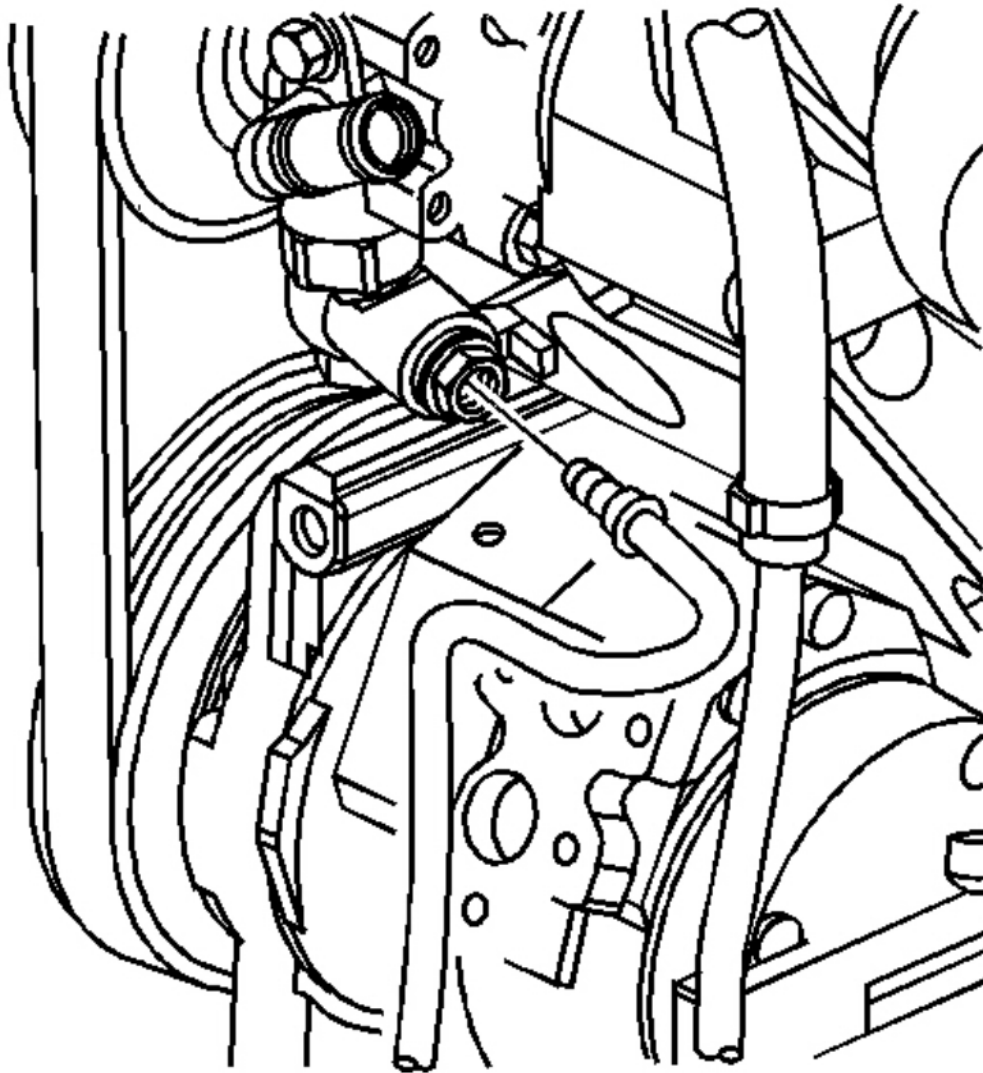


Fig. 108: Installing Power Steering Pressure Hose Fitting To Power Steering Pump
Courtesy of GENERAL MOTORS CORP.

6. Install the power steering pressure hose fitting to the power steering pump.

IMPORTANT: When installing the power steering pressure hose into the power steering pump a distinct click should be heard when

the hose is fully seated.

7. Connect the power steering pressure hose to the power steering pump.

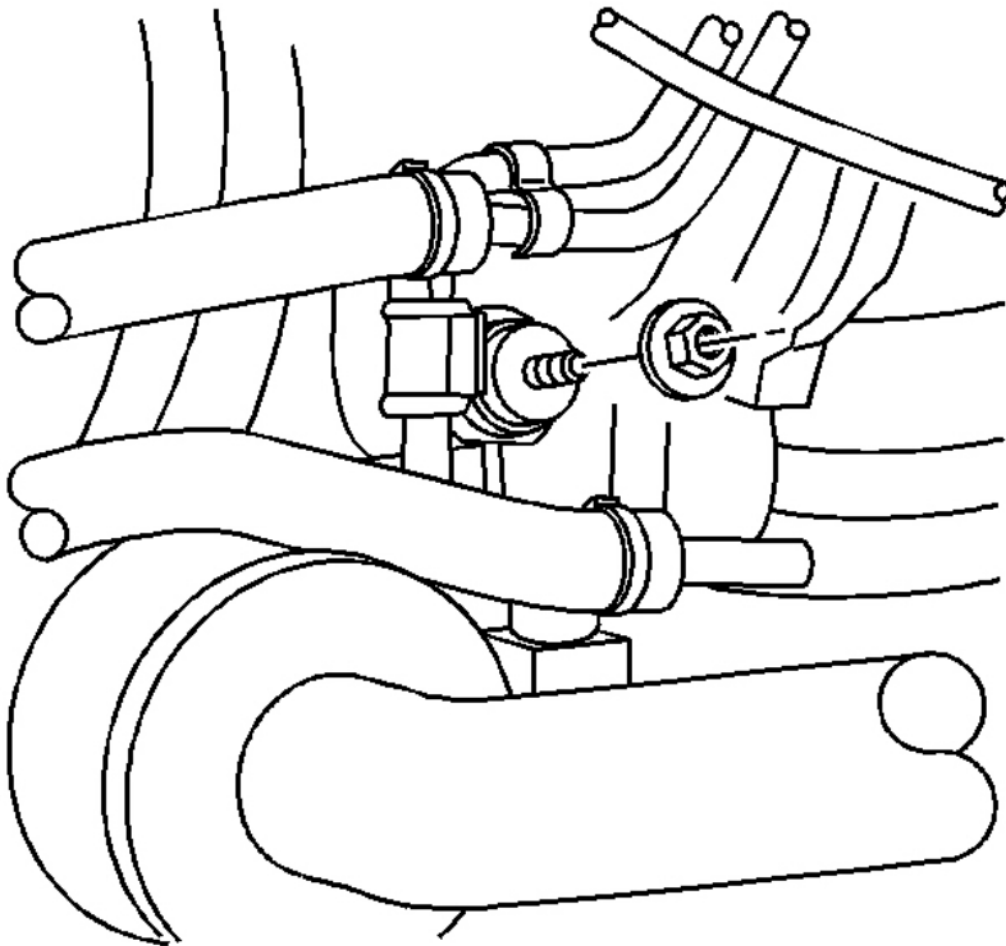


Fig. 109: Installing Power Steering Pressure Hose Retaining Nut To Air Conditioning Compressor
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

8. Install the power steering pressure hose retaining nut to the air conditioning compressor.

Tighten:

- Tighten the hose to pump fitting to 40 N.m (30 lb ft).
 - Tighten the hose to air condition compressor nut to 8 N.m (71 lb in).
 - Tighten the hose to cradle bolt to 9 N.m (80 lb in).
 - Tighten the hose to gear 30 N.m (22 lb ft).
9. Install the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.
 10. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls - 2.6L and 3.2L.
 11. Remove the drain pan from under the vehicle.
 12. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.

POWER STEERING PRESSURE PIPE/HOSE REPLACEMENT (5.7L)**Removal Procedure**

1. Place a drain pan under the vehicle.
2. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls - 5.7L.
3. Remove the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.

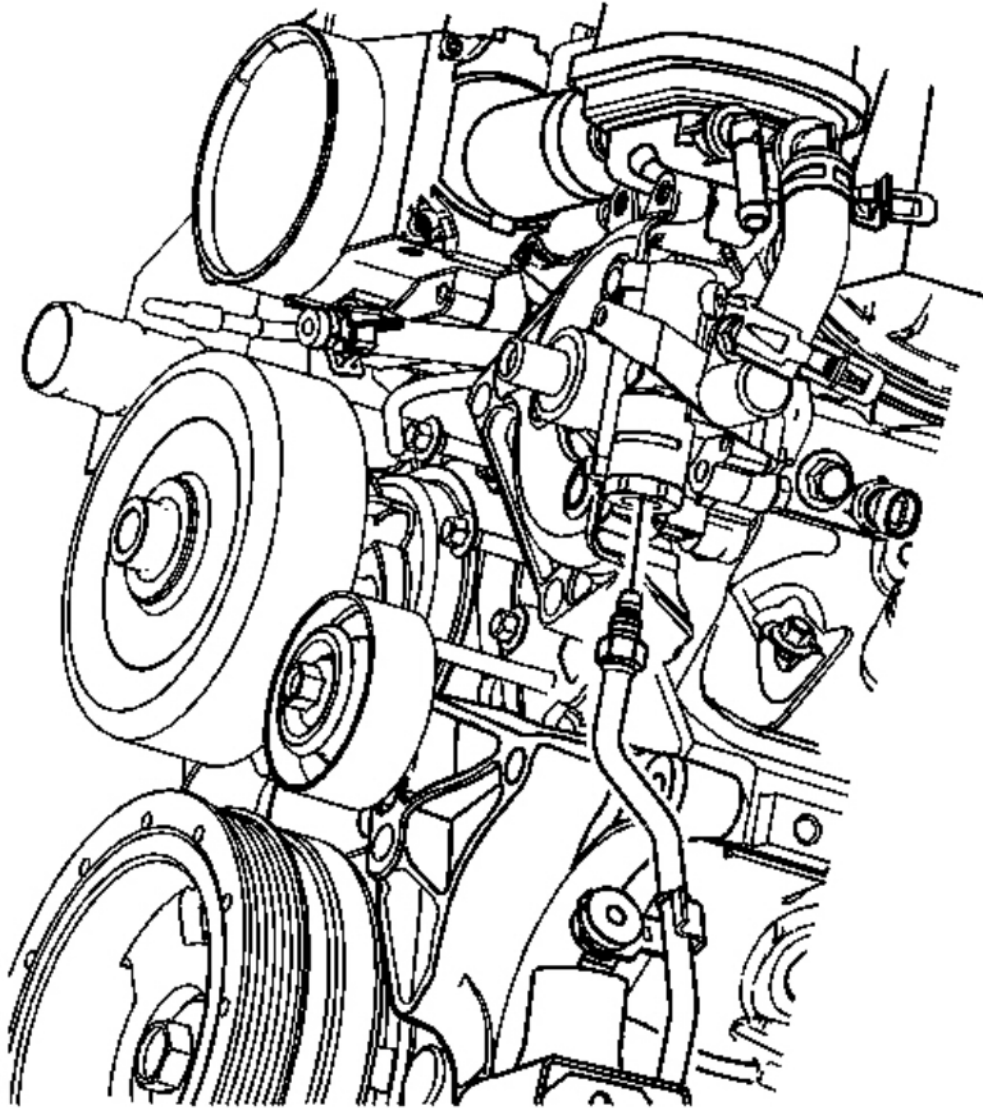


Fig. 110: Removing Power Steering Pressure Hose Retaining Bolt From Generator
Courtesy of GENERAL MOTORS CORP.

4. Remove the power steering pressure hose retaining bolt from the generator.
5. Disconnect the power steering pressure hose from the power steering pump.

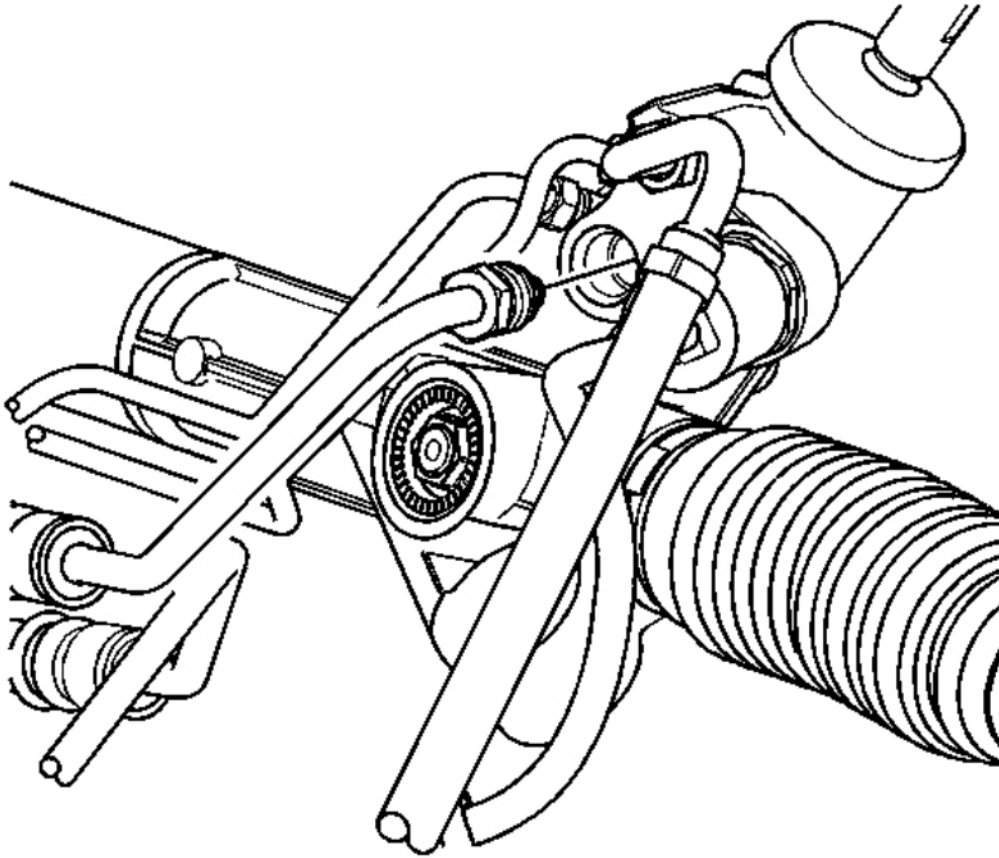


Fig. 111: Disconnect the power steering pressure hose from the power steering gear
Courtesy of GENERAL MOTORS CORP.

6. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
7. Disconnect the power steering pressure hose from the power steering gear.

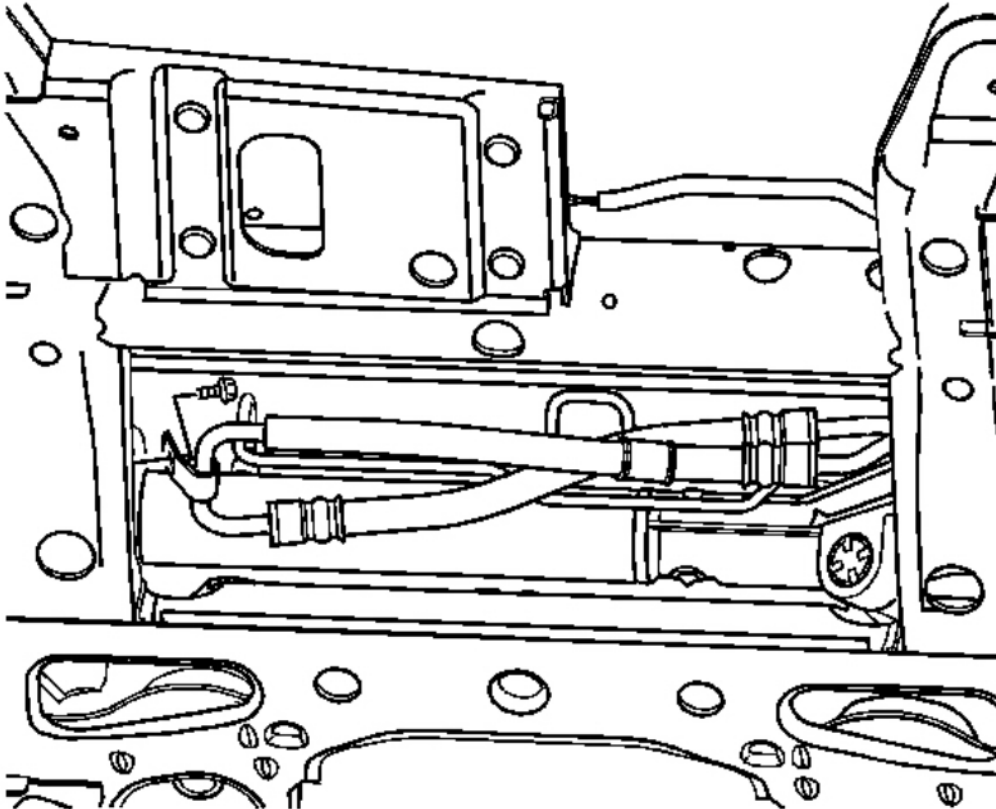


Fig. 112: Removing Power Steering Pressure Hose To Cradle Mounting Bolt
Courtesy of GENERAL MOTORS CORP.

8. Remove the power steering pressure hose to cradle mounting bolt.
9. Remove the power steering pressure hose from the vehicle.

Installation Procedure

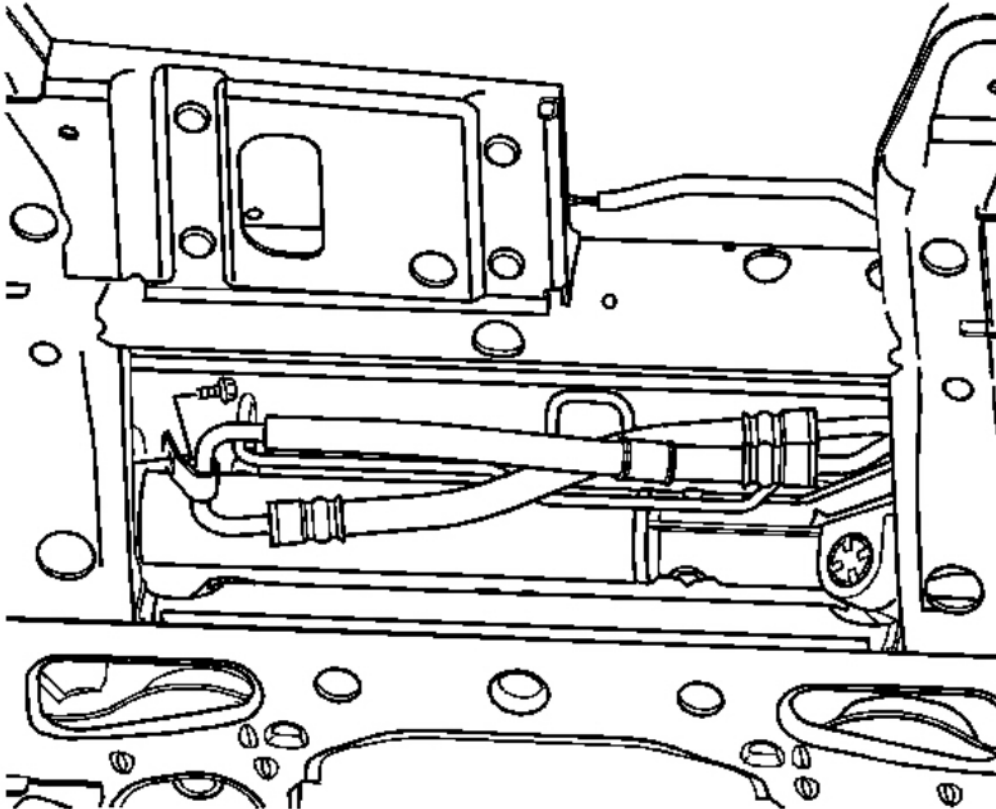


Fig. 113: Installing Power Steering Pressure Hose
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Loosely install the pressure hose and retainers before tightening.

1. Install the power steering pressure hose.
2. Install the power steering pressure hose retaining bolt.

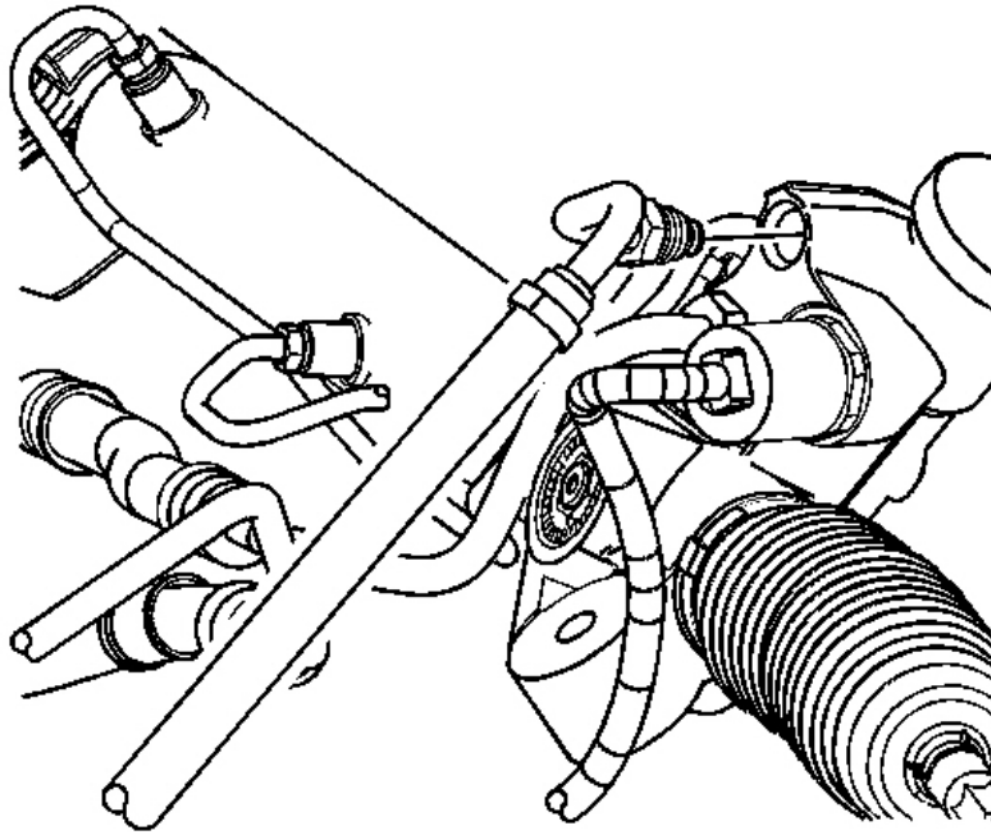


Fig. 114: Connecting Power Steering Pressure Hose To Power Steering Gear
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Install a new seal on the power steering pressure hose before installing to the power steering gear.

3. Connect the power steering pressure hose to the power steering gear.
4. Lower the vehicle.

NOTE: Refer to Fastener Notice in Cautions and Notices.

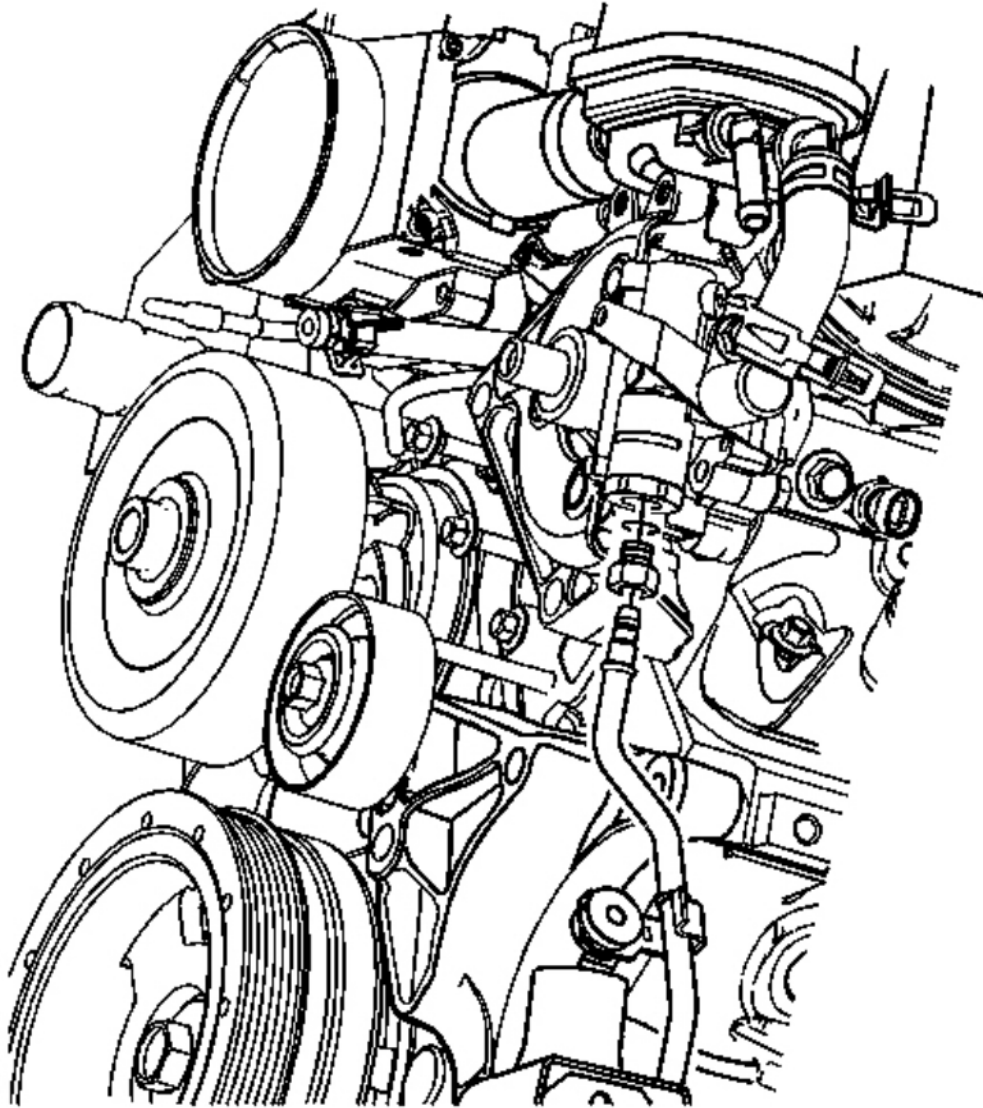


Fig. 115: Installing Power Steering Pressure Hose Fitting To Power Steering Pump
Courtesy of GENERAL MOTORS CORP.

5. Install the power steering pressure hose fitting to the power steering pump.

Tighten: Tighten the hose to pump fitting to 40 N.m (30 lb ft).

IMPORTANT: When installing the power steering pressure hose into the power steering pump a distinct click should be heard when the hose is fully seated.

6. Connect the power steering pressure hose to the power steering pump.
7. Install the power steering pressure hose retaining bolt to the generator.

Tighten:

- Tighten the hose to generator retaining bolt to 9 N.m (80 lb in).
 - Tighten the hose to the cradle retaining bolt to 9 N.m (80 lb in).
 - Tighten the hose to gear fittings to 30 N.m (22 lb ft).
8. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls - 5.7L.
 9. Remove the drain pan from under the vehicle.
 10. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.
 11. Install the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.

POWER STEERING RETURN HOSE REPLACEMENT (LHD)

Removal Procedure

1. Place a drain pan under the vehicle.
2. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls-2.6L and 3.2L.

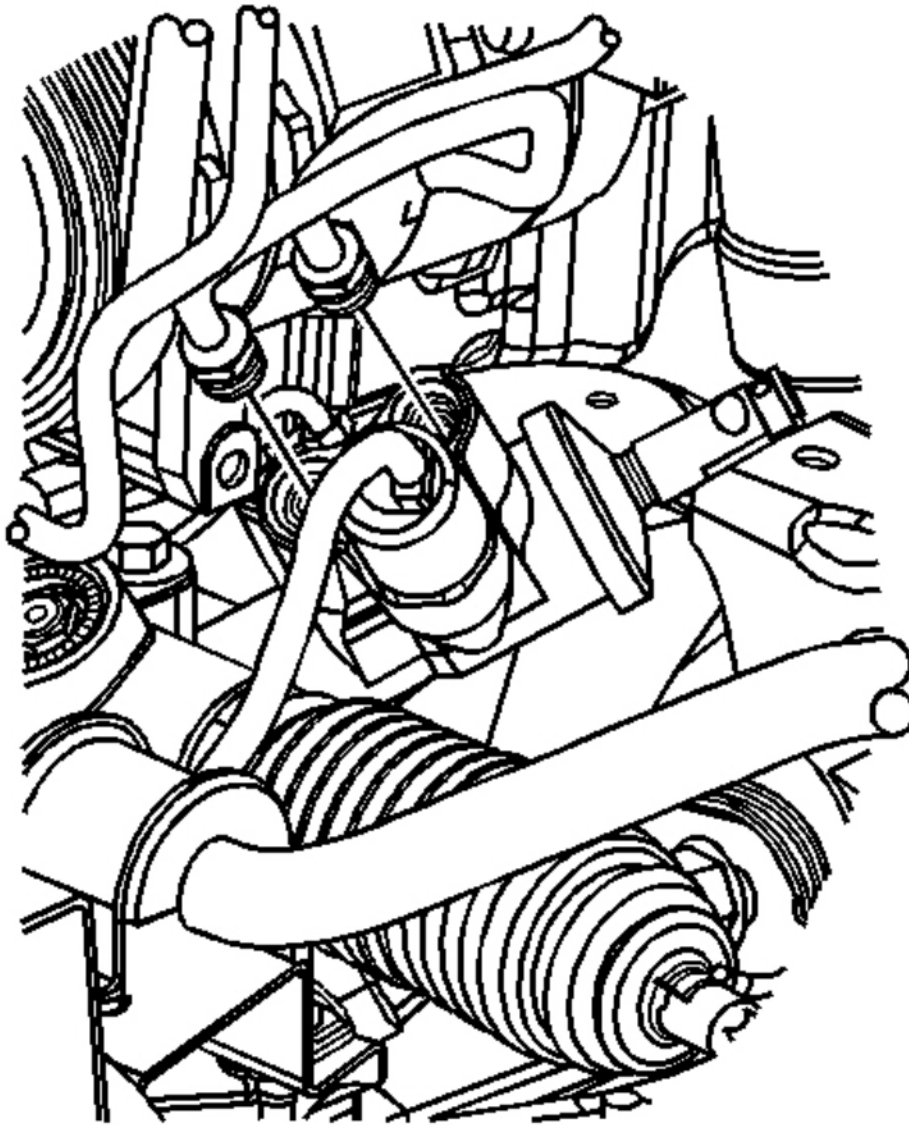


Fig. 116: Disconnecting Power Steering Return Hose From The Power Steering Gear
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the power steering return hose from the power steering gear.

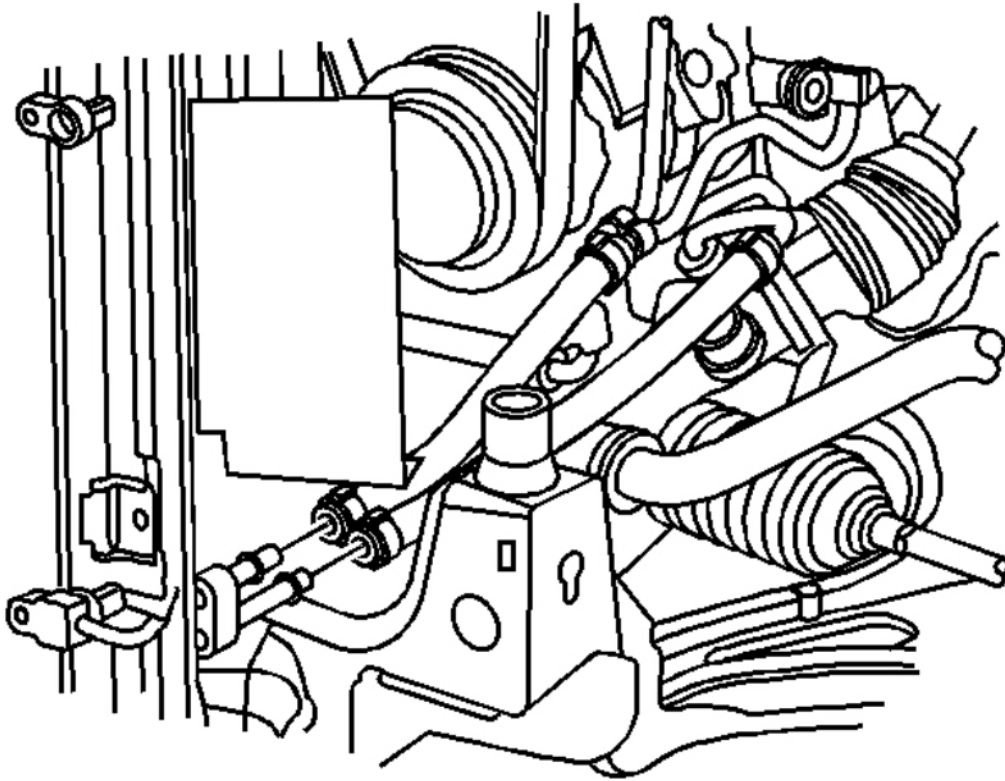


Fig. 117: Disconnecting Power Steering Return Hose From Power Steering Cooler
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the power steering return hose from the power steering cooler.
5. Remove the power steering return hose.

Installation Procedure

1. Install the power steering return hose.

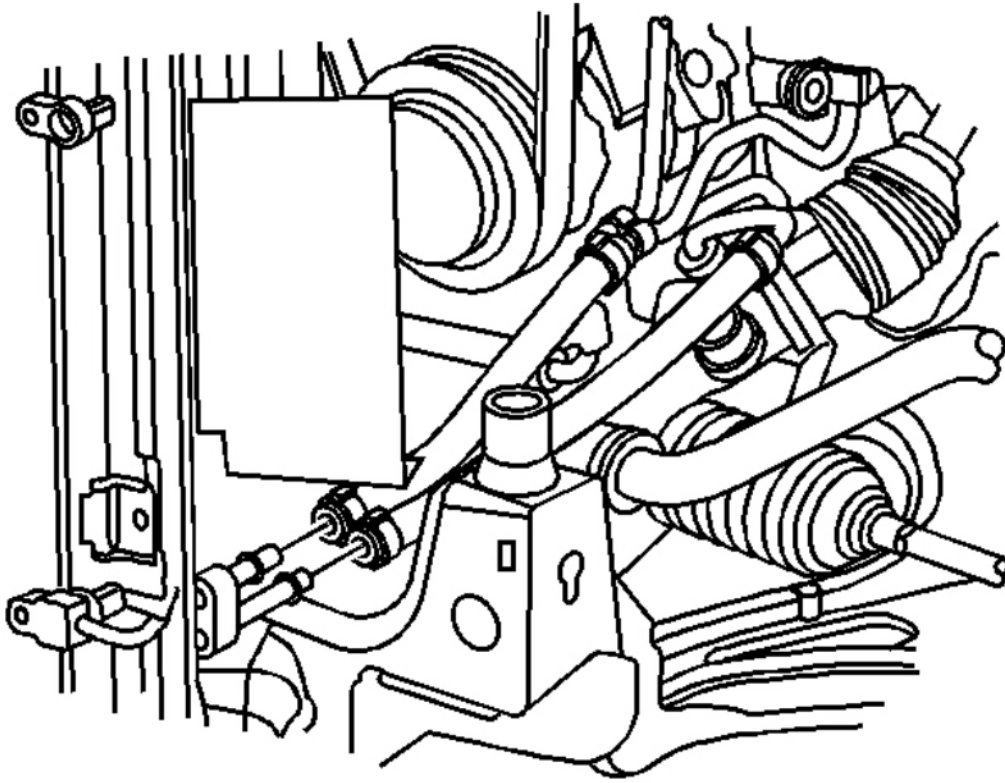


Fig. 118: Connecting Power Steering Return Hose To Power Steering Cooler
Courtesy of GENERAL MOTORS CORP.

2. Connect the power steering return hose to the power steering cooler.

NOTE: Refer to Fastener Notice in Cautions and Notices.

IMPORTANT: Install a new seal on the power steering return hose.

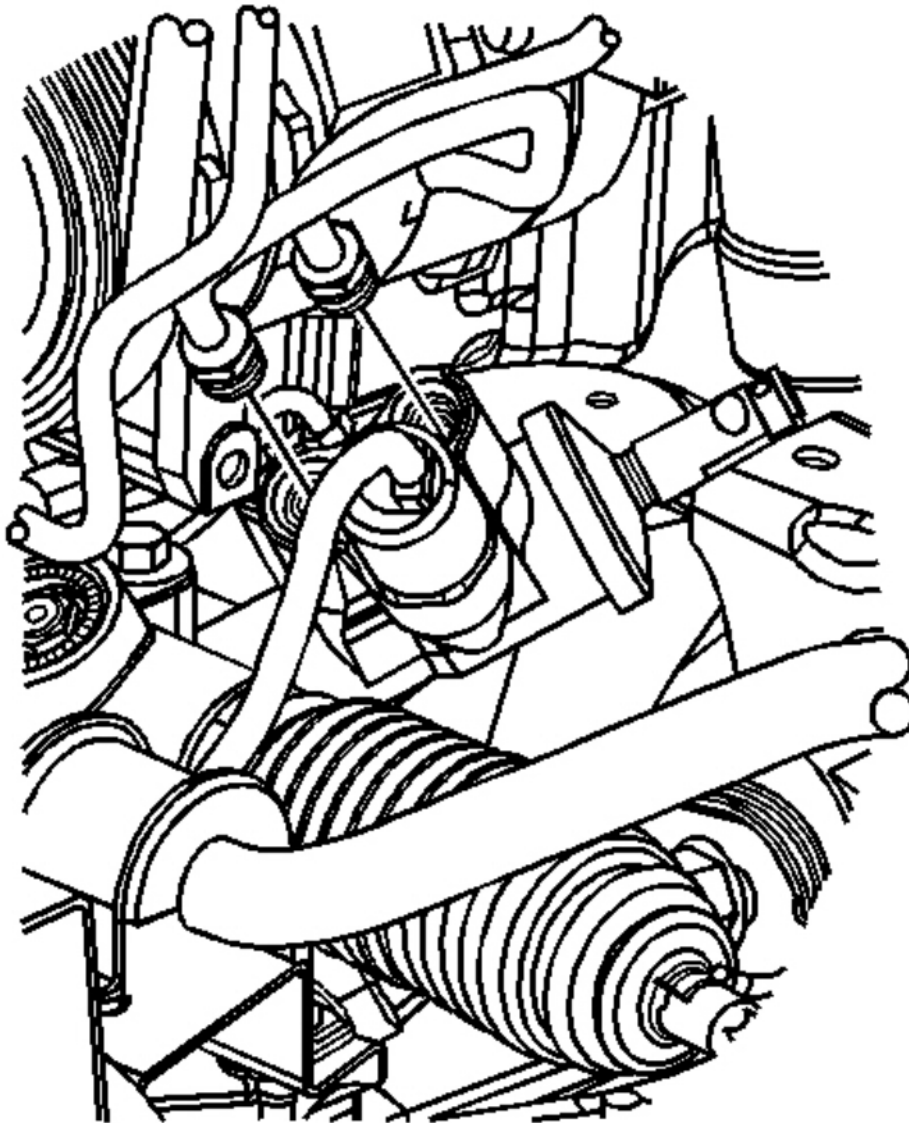


Fig. 119: Connecting Power Steering Return Hose To Power Steering Gear
Courtesy of GENERAL MOTORS CORP.

3. Connect the power steering return hose to the power steering gear.

Tighten: Tighten the hose to 30 N.m (22 lb ft).

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2004 STEERING Power Steering System - CTS

4. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) in Engine Controls-2.6L and 3.2L.
5. Remove the drain pan from under the vehicle.
6. Bleed the power steering system. Refer to [Bleeding the Power Steering System](#).

POWER STEERING RETURN HOSE REPLACEMENT (RHD)

Removal Procedure

1. Place a drain pan under the vehicle.
2. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#) in Engine Controls 2.6L and 3.2L.

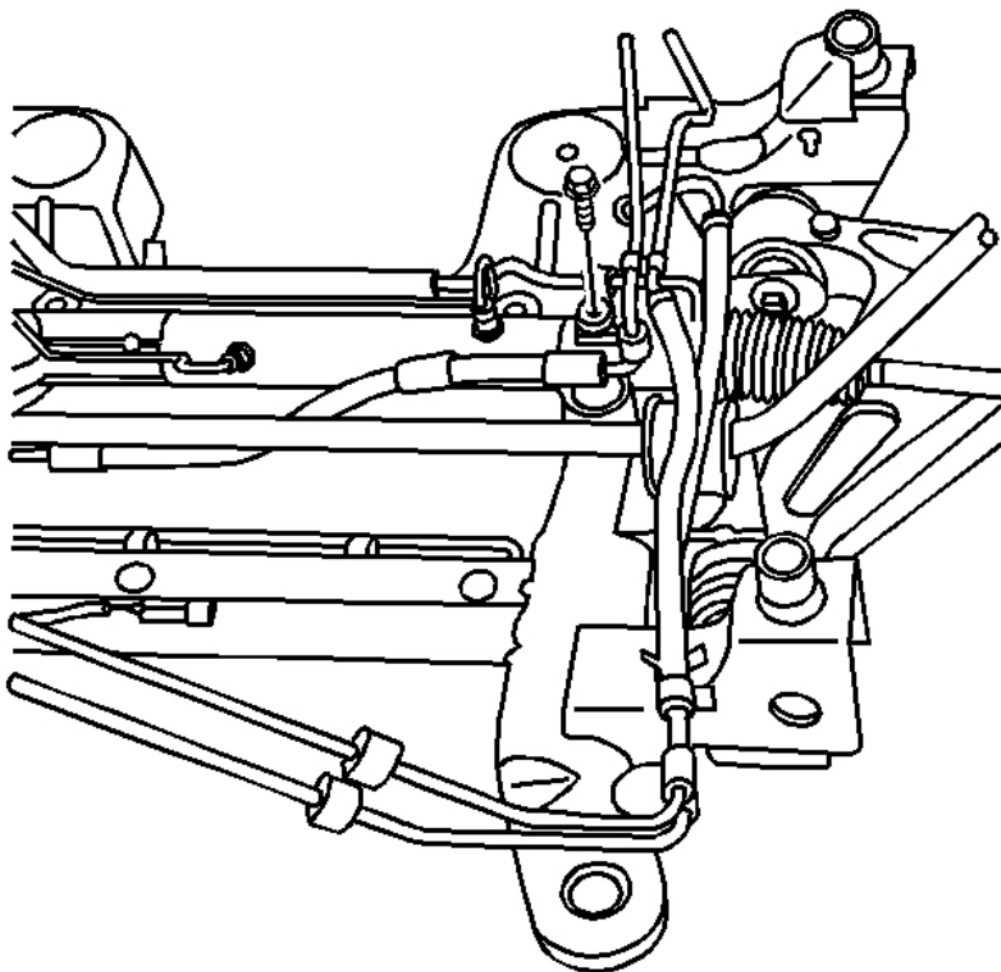


Fig. 120: Removing Power Steering Return Hose To Power Steering Gear Retaining Bolt

Courtesy of GENERAL MOTORS CORP.

3. Remove the power steering return hose to power steering gear retaining bolt.
4. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
5. Remove the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.

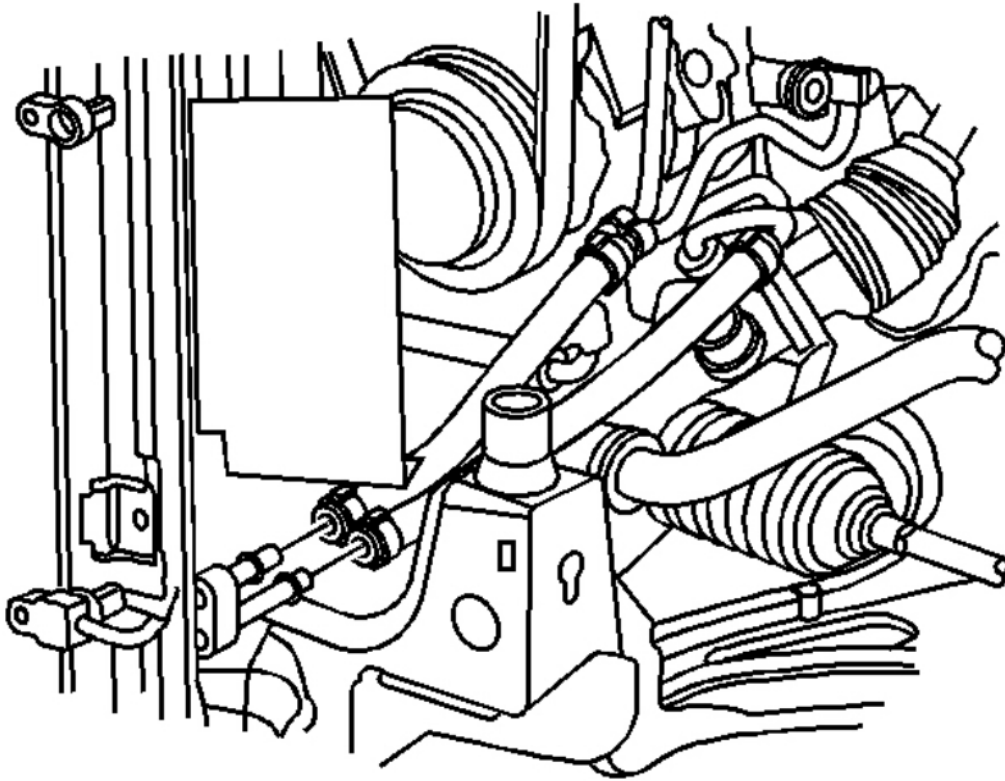


Fig. 121: Disconnecting Power Steering Return Hose From Power Steering Cooler
Courtesy of GENERAL MOTORS CORP.

6. Disconnect the power steering return hose from the power steering cooler.

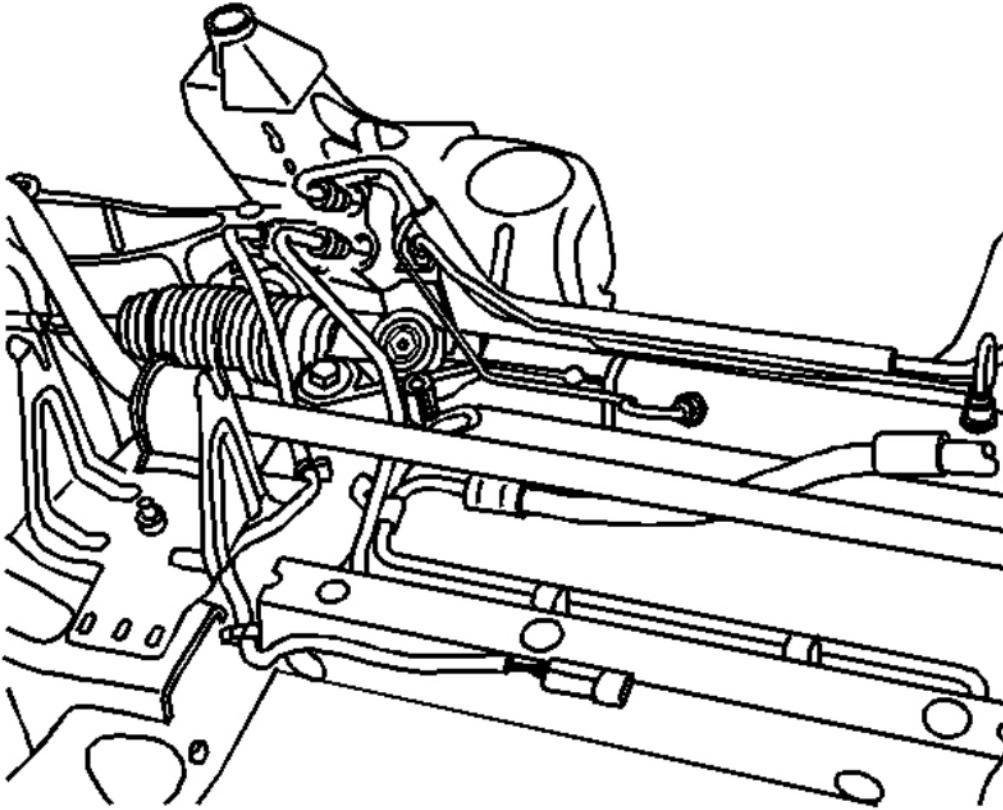


Fig. 122: Disconnecting Power Steering Return Hose From Power Steering Gear
Courtesy of GENERAL MOTORS CORP.

7. Disconnect the power steering return hose from the power steering gear.
8. Remove the power steering return hose from the vehicle.

Installation Procedure

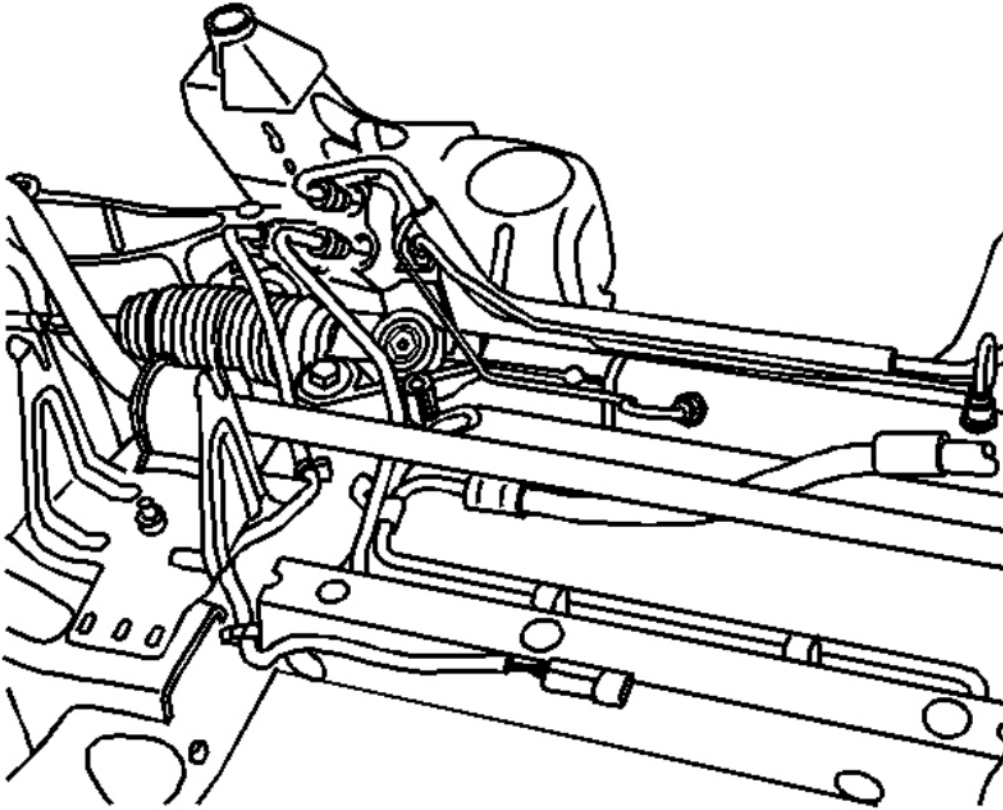


Fig. 123: Installing Power Steering Return Hose To Vehicle
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Loosely install the return hose and retainers before tightening.

1. Install the power steering return hose to the vehicle.
2. Install the power steering return hose to the power steering gear.

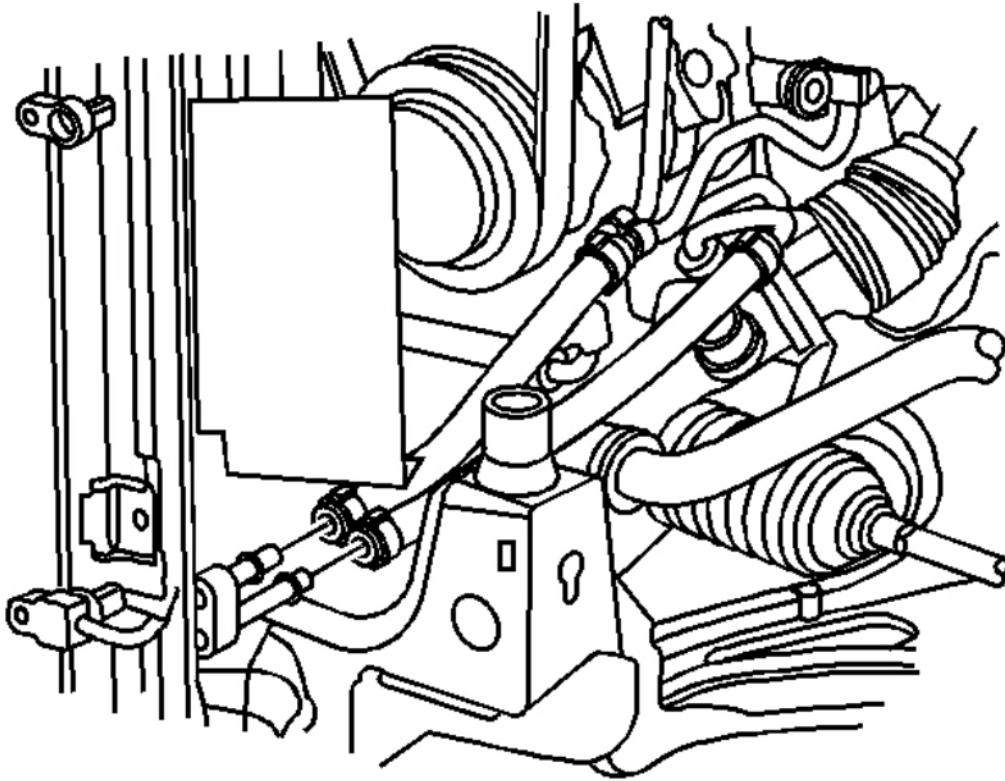


Fig. 124: Installing Power Steering Return Hose To Power Steering Cooler
Courtesy of GENERAL MOTORS CORP.

3. Install the power steering return hose to the power steering cooler.

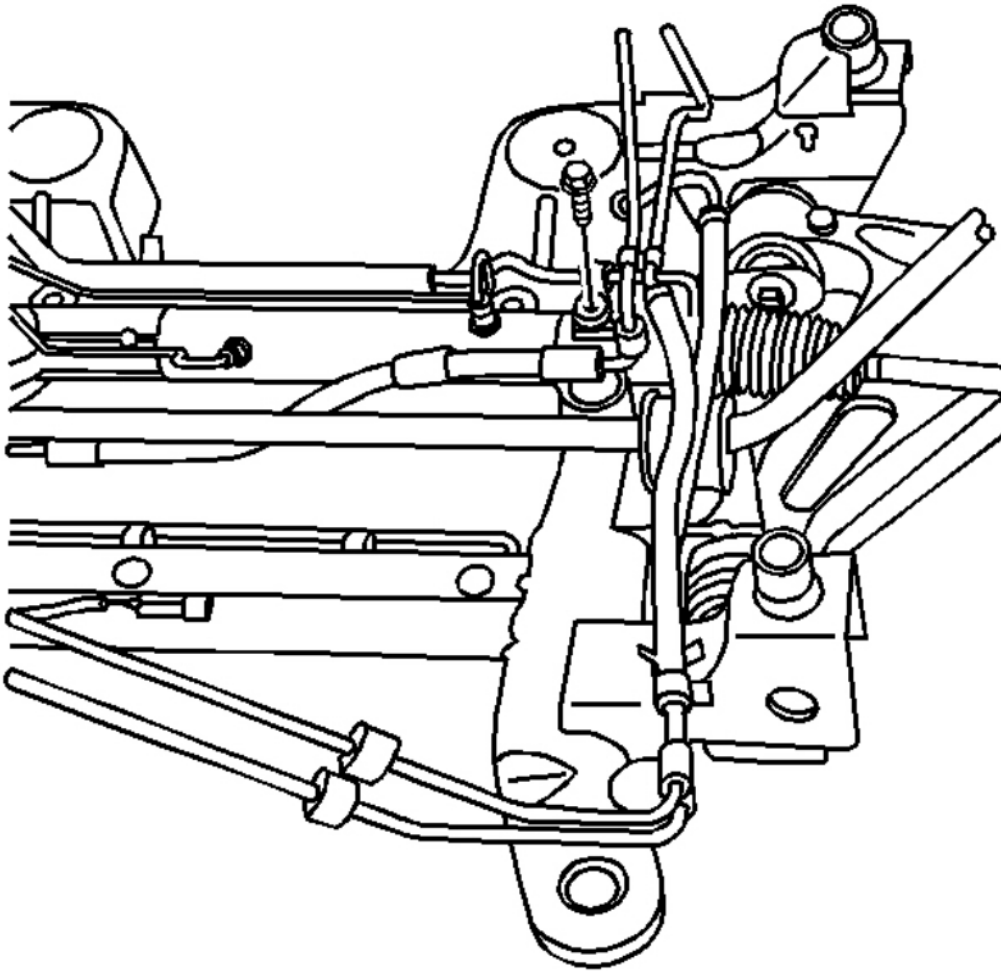


Fig. 125: Installing Power Steering Return Hose To Power Steering Gear Retaining Bolt

Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the power steering return hose to power steering gear retaining bolt.

Tighten:

- Tighten the hose to gear bolt to 9 N.m (80 lb in).
- Tighten the hose to gear fitting 30 N.m (22 lb in).

2004 Cadillac CTS

2004 STEERING Power Steering System - CTS

5. Install the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.
6. Lower the vehicle.
7. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls 2.6L and 3.2L.
8. Remove the drain pan from under the vehicle.
9. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.

POWER STEERING RETURN HOSE REPLACEMENT (LS6)

Removal Procedure

1. Place a drain pan under the vehicle.
2. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls-5.7L.

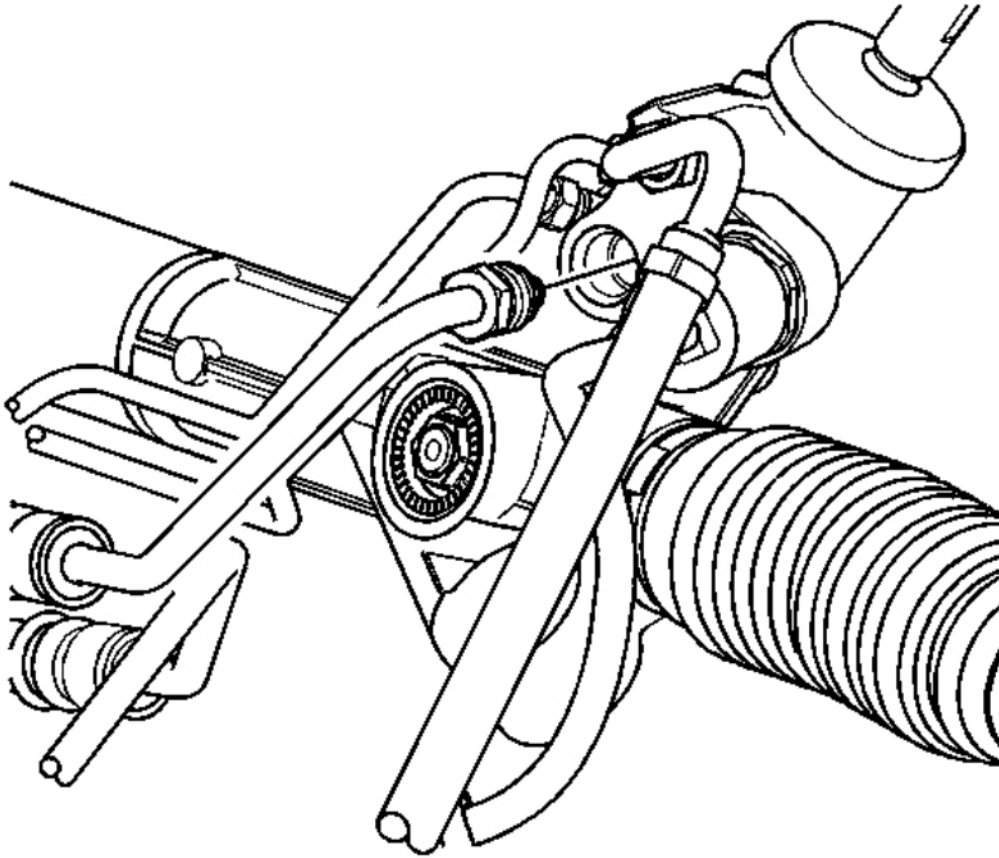


Fig. 126: Disconnecting Power Steering Return Hose From The Power Steering Gear
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the power steering return hose from the power steering gear.

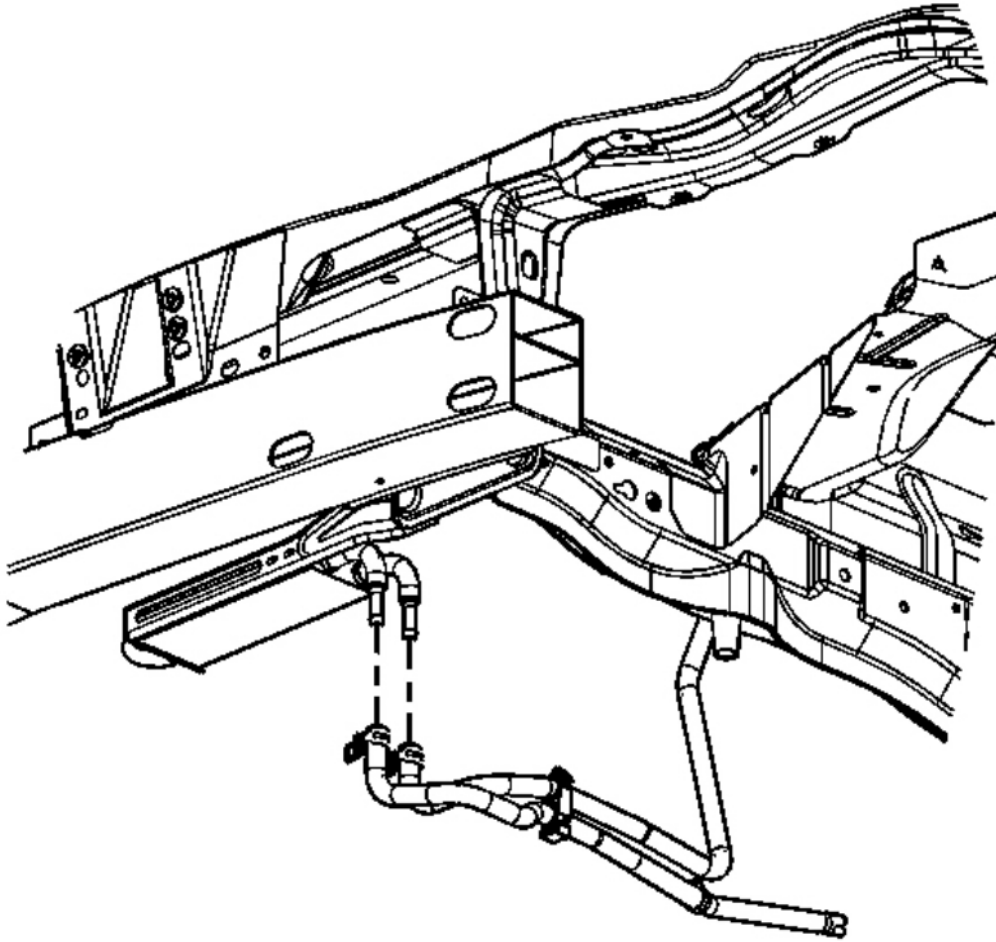


Fig. 127: Disconnecting Power Steering Return Hose From Power Steering Cooler
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the power steering return hose from the power steering cooler.
5. Remove the power steering return hose.

Installation Procedure

1. Install the power steering return hose.

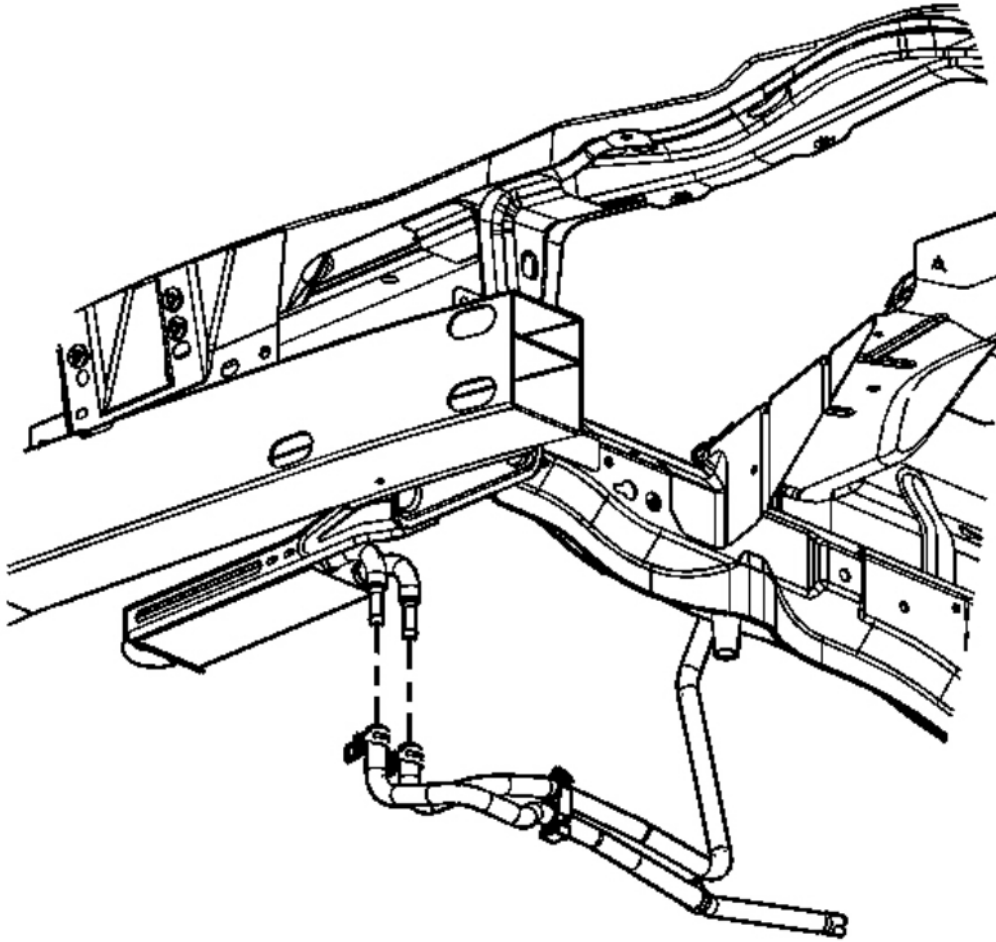


Fig. 128: Connecting Power Steering Return Hose To The Power Steering Cooler
Courtesy of GENERAL MOTORS CORP.

2. Connect the power steering return hose to the power steering cooler.

NOTE: Refer to Fastener Notice in Cautions and Notices.

IMPORTANT: Install a new seal on the power steering return hose.

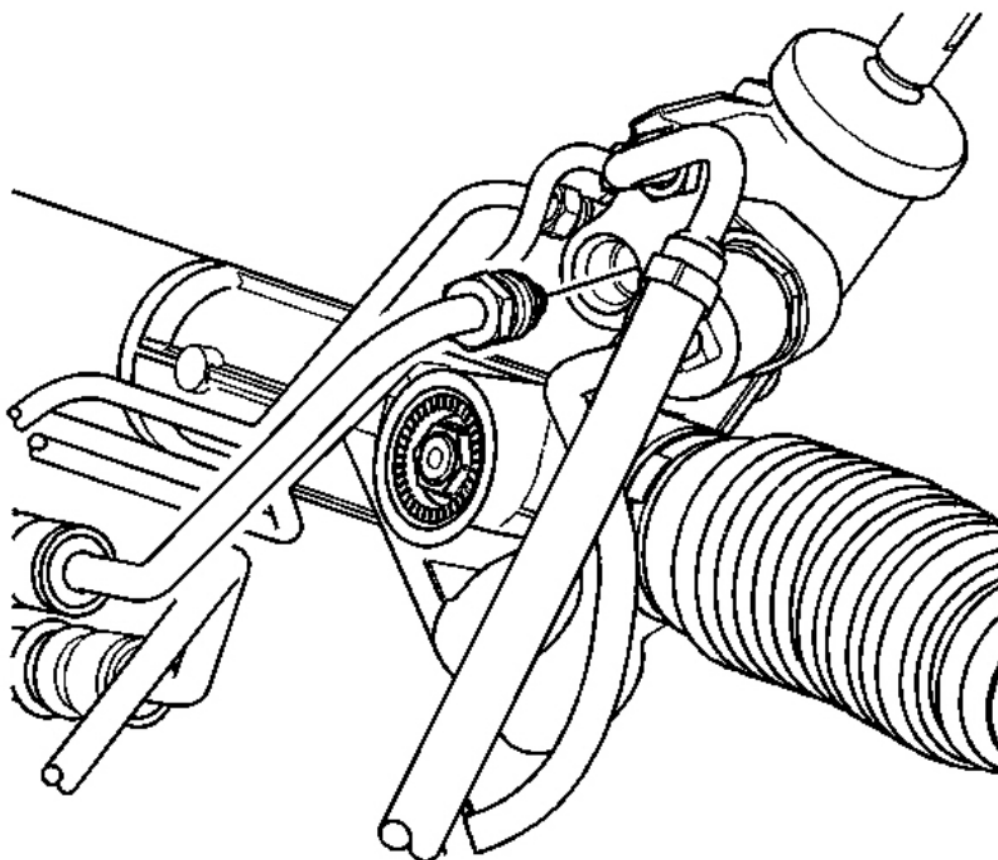


Fig. 129: Connecting Power Steering Return Hose To The Power Steering Gear
Courtesy of GENERAL MOTORS CORP.

3. Connect the power steering return hose to the power steering gear.

Tighten: Tighten the hose to 30 N.m (22 lb ft).

4. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls-5.7L.
5. Remove the drain pan from under the vehicle.
6. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the front tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Remove the front air deflector for access. Refer to **Air Deflector Replacement - Front** in Body Front End.
4. Clean any dirt or debris from the power steering gear solenoid wiring harness to brake controller connector.

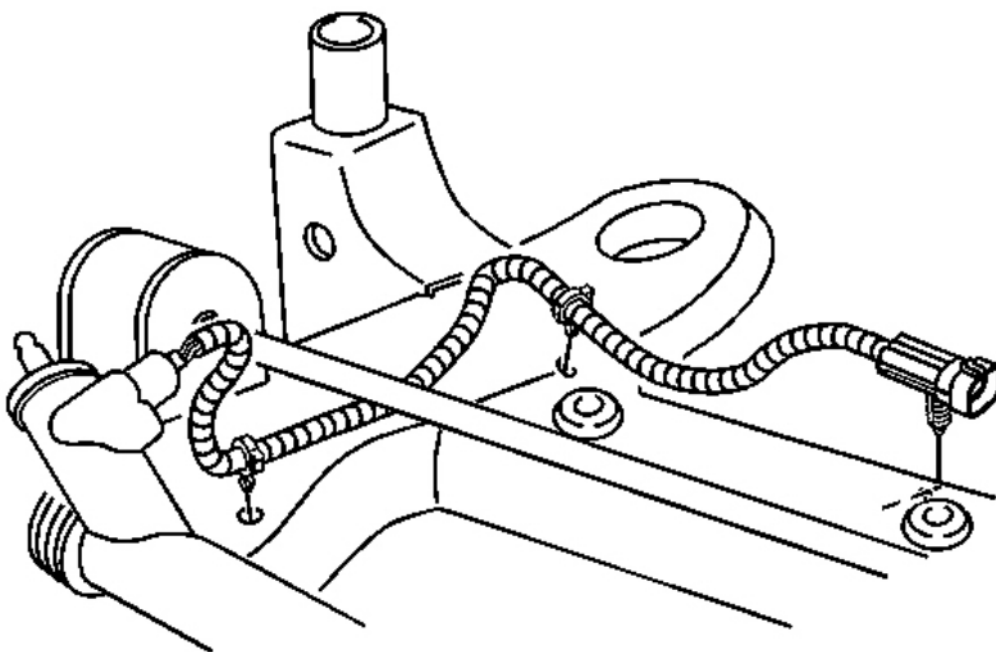


Fig. 130: Removing Power Steering Gear Solenoid/Actuator Wiring Harness
Courtesy of GENERAL MOTORS CORP.

5. Remove the power steering gear solenoid/actuator wiring harness from the 2 plastic wiring harness retainers.
6. Disconnect the power steering gear solenoid/actuator wiring harness.

IMPORTANT: Do not get dirt on the lower portion or the solenoid below the hex or inside the solenoid port of the steering gear.

7. Clean any dirt or debris from the power steering gear solenoid/actuator.

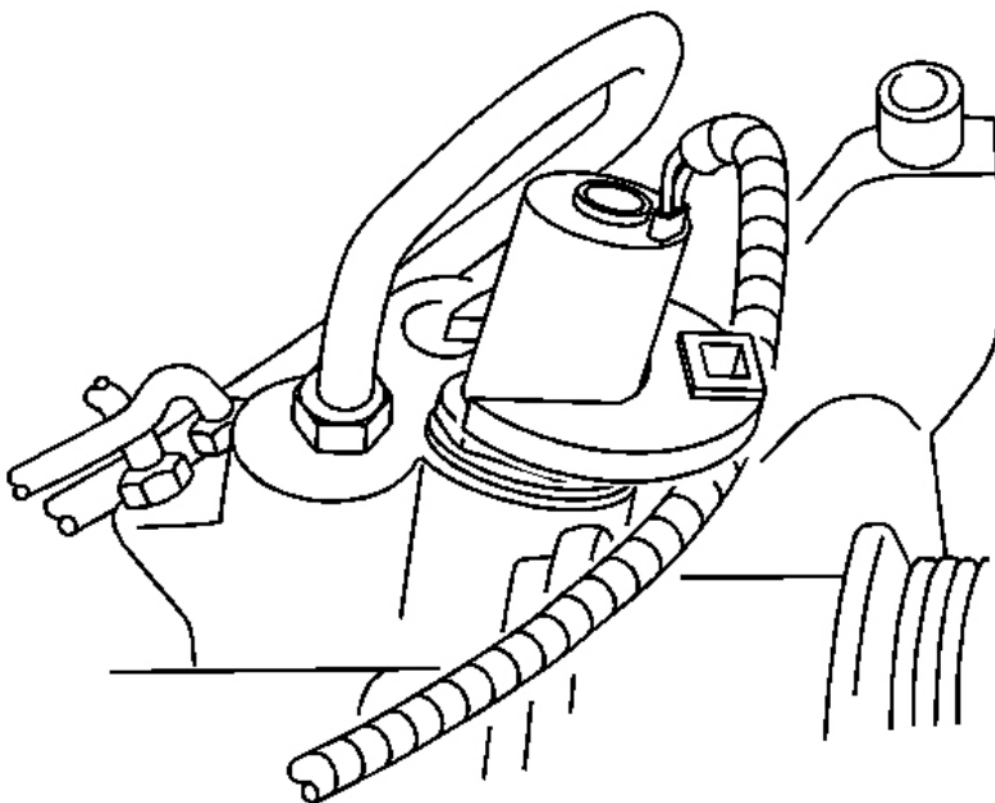


Fig. 131: Removing Power Steering Gear Solenoid/Actuator
Courtesy of GENERAL MOTORS CORP.

8. Using a pair of adjustable pliers or equivalent, remove the power steering gear solenoid/actuator from the steering gear in a counter clockwise rotation.
9. Remove the power steering gear solenoid/actuator from the vehicle.

Installation Procedure

1. Insure the new power steering gear solenoid/actuator has 2 O-rings visible beneath the hex.

2. Taking care not to contaminate the steering gear, install the power steering gear solenoid/actuator.

NOTE: Refer to Fastener Notice in Cautions and Notices.

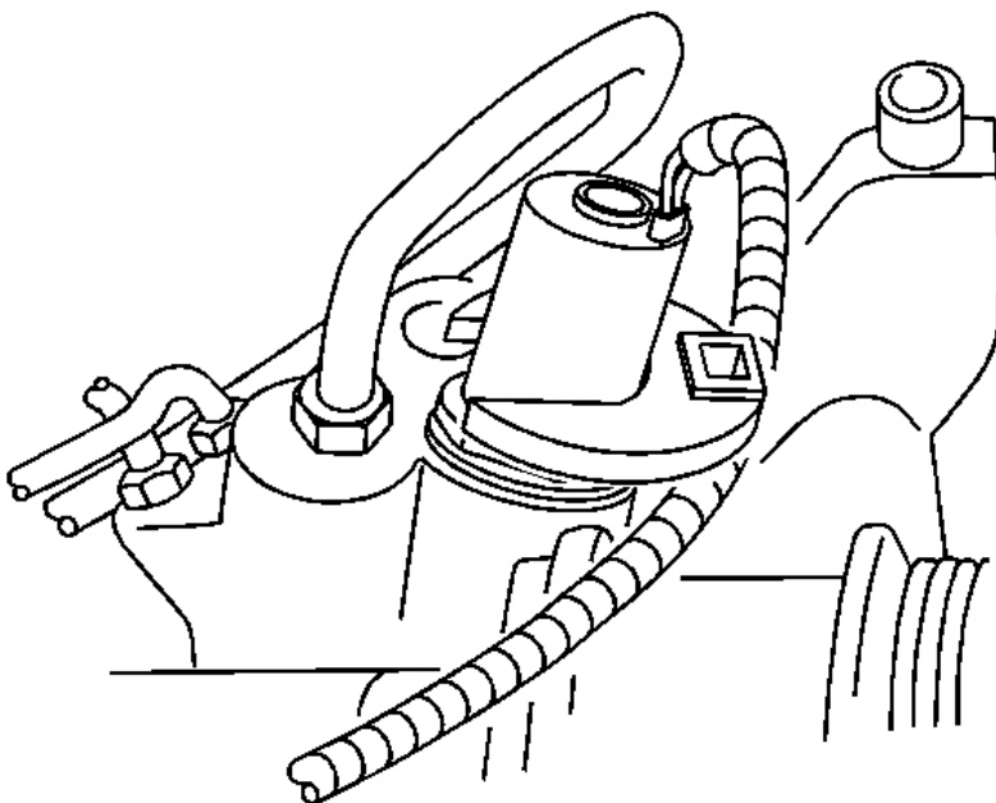


Fig. 132: Installing Power Steering Gear Solenoid/Actuator In Steering Gear
Courtesy of GENERAL MOTORS CORP.

- Using the open-end crowfoot that comes in the kit, install the power steering gear solenoid/actuator in the steering gear.

Tighten: Tighten the solenoid to 18 N.m (14 lb ft).

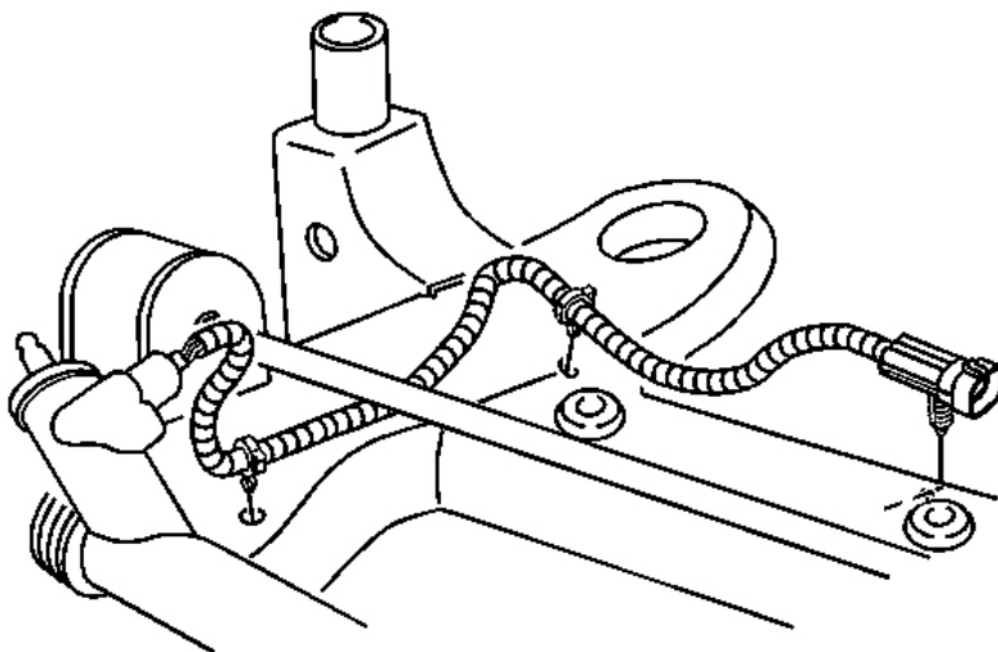


Fig. 133: Connecting Power Steering Gear Solenoid/Actuator Wiring Harness
Courtesy of GENERAL MOTORS CORP.

4. Connect the power steering gear solenoid/actuator wiring harness.
5. Install the power steering gear solenoid/actuator wiring harness to the 2 plastic wiring harness retainers.
6. Install the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.
7. Install the front tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
8. Fill and bleed the power steering system. Refer to **Bleeding the Power Steering System**.
9. Lower the vehicle

POWER STEERING GEAR REPLACEMENT (LHD)

Tools Required

- **J 24319-B** Steering Linkage and Tie Rod Puller
- **J 42640** Steering Column Anti-Rotation Pin

Removal Procedure

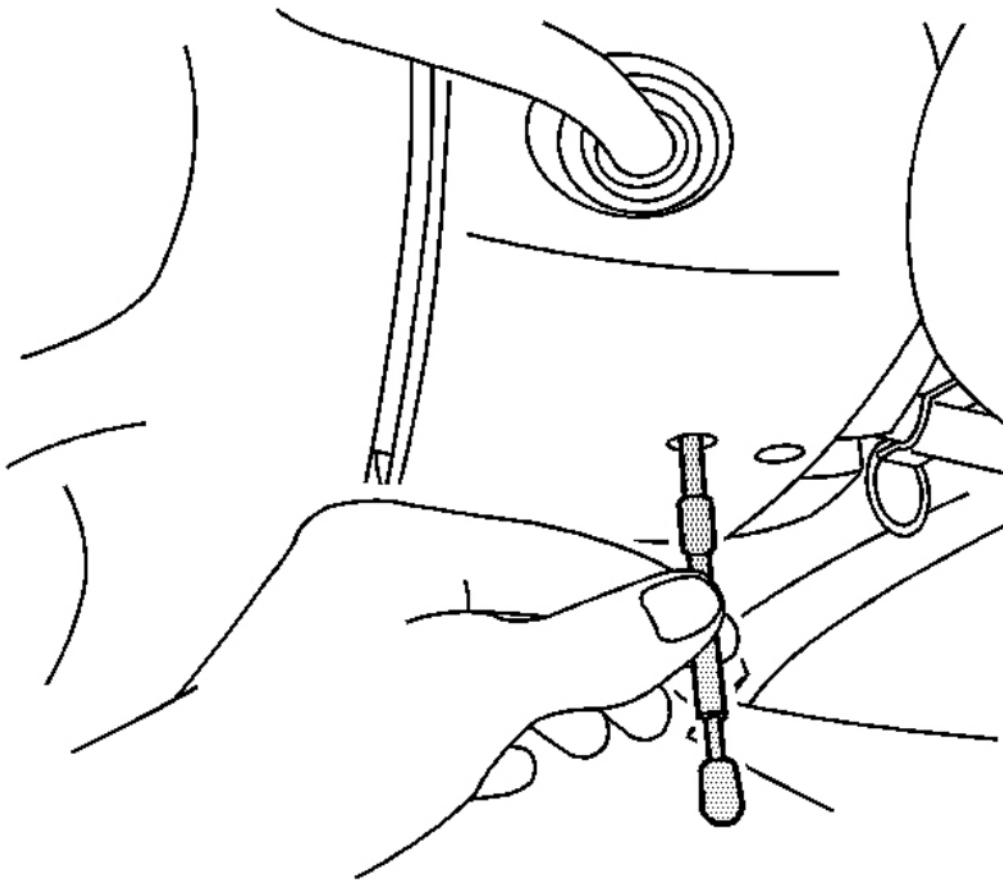


Fig. 134: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

1. Install **J 42640** to the steering column.
2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

3. Remove the front tires and wheels. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
4. Remove the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.

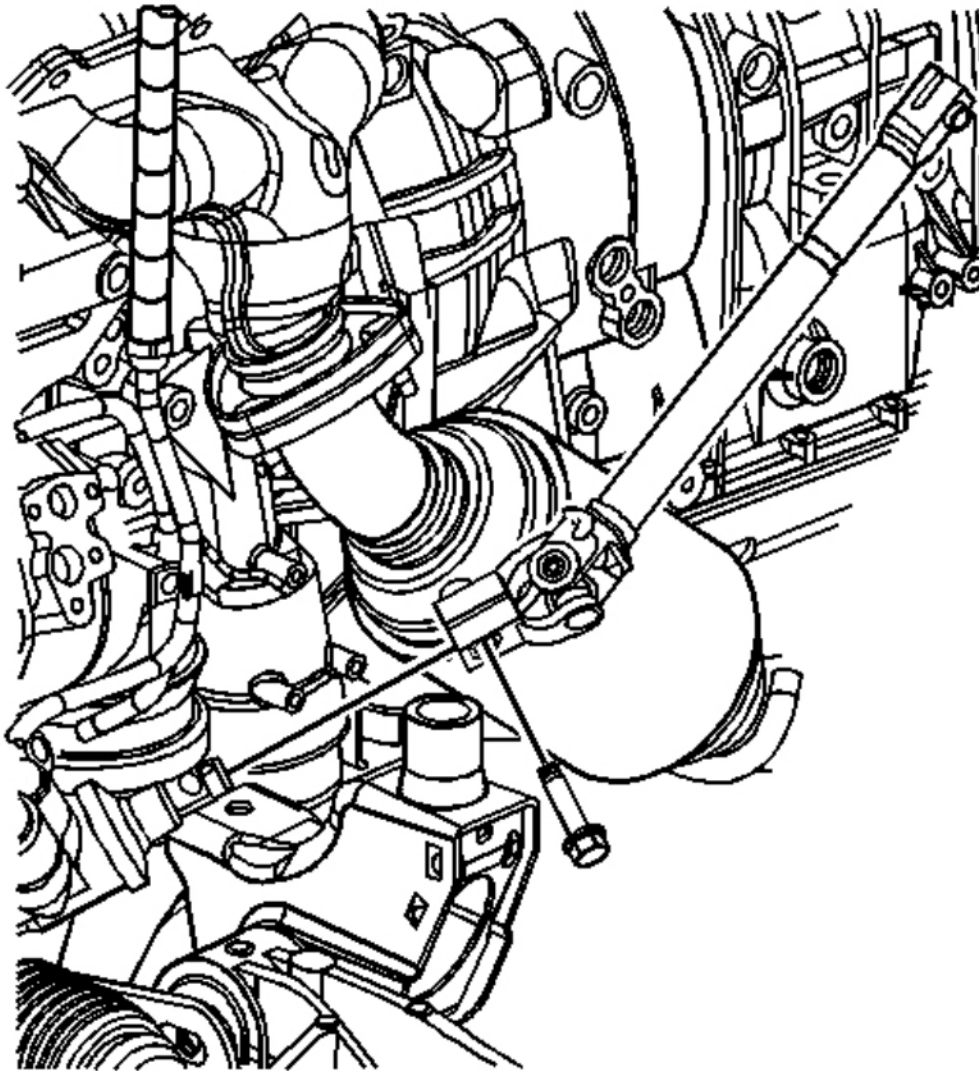


Fig. 135: Removing Intermediate Shaft Lower Pinch Bolt
Courtesy of GENERAL MOTORS CORP.

CAUTION: Failure to disconnect the intermediate shaft from the rack and pinion stub shaft can result in damage to the steering gear and/or intermediate shaft. This damage can cause loss of steering control which could result in personal injury.

NOTE: The wheels of the vehicle must be straight ahead and the steering column in the LOCK position before disconnecting the steering column or intermediate shaft from the steering gear. Failure to do so will cause the coil assembly in the steering column to become uncentered which will cause damage to the coil assembly.

5. Remove the intermediate shaft lower pinch bolt.
6. Disconnect the intermediate shaft from the power steering gear.

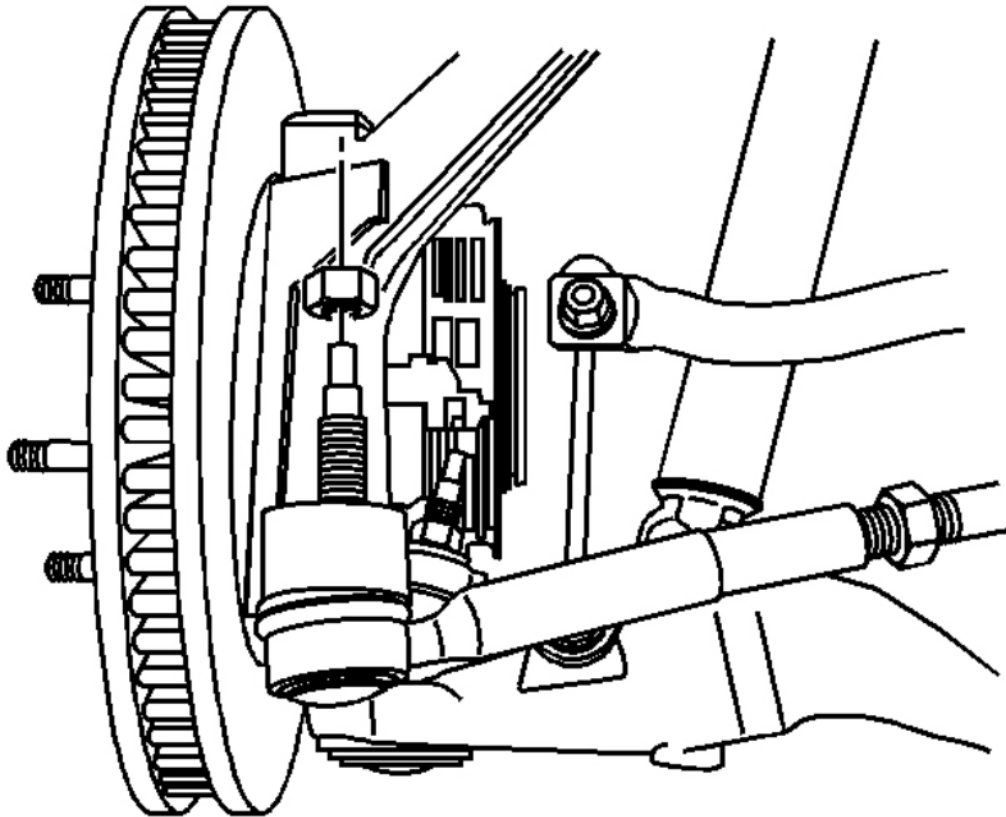


Fig. 136: View Of Outer Tie Rod-To-Steering Knuckle And Retaining Nut
Courtesy of GENERAL MOTORS CORP.

7. Remove the outer tie rod retaining nuts.

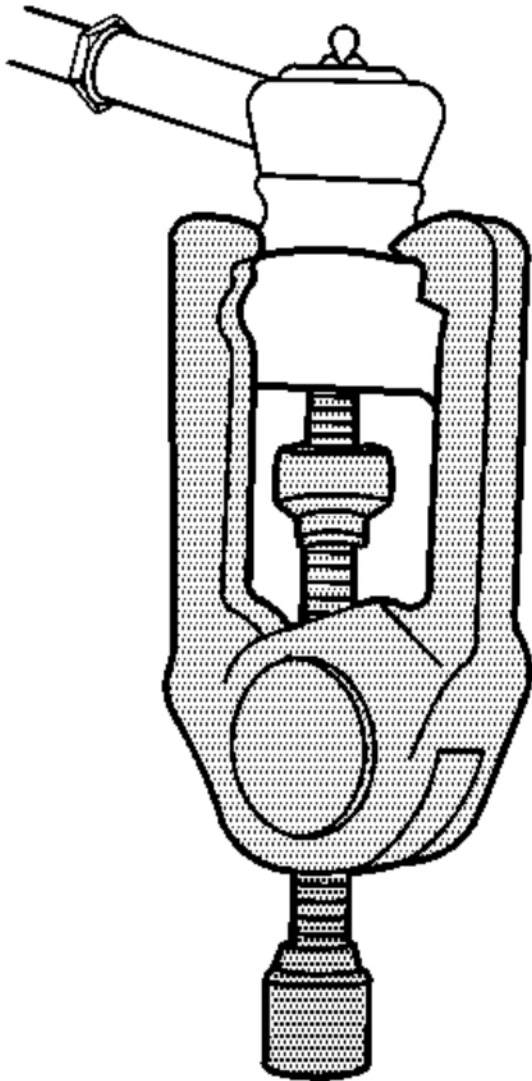


Fig. 137: Removing Outer Tie Rod Assembly From Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

8. Using **J 24319-B** separate the outer tie rod from the steering knuckles.

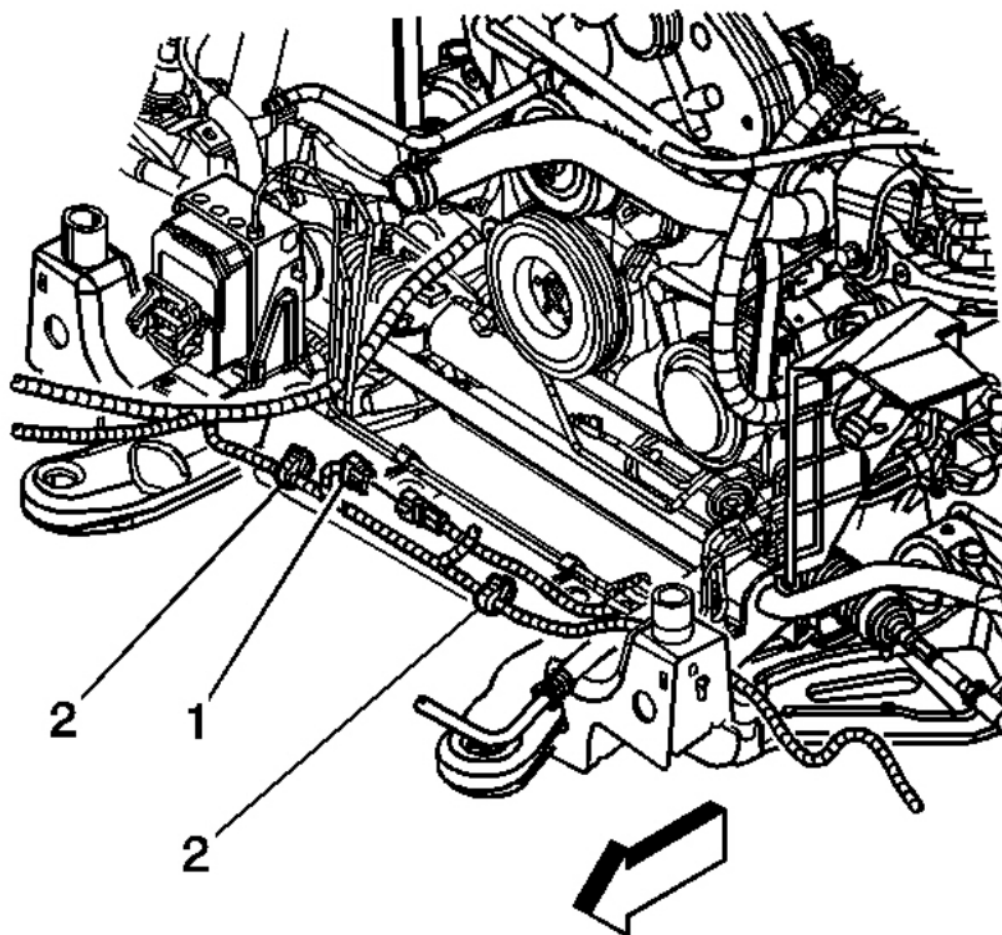


Fig. 138: Disconnecting Variable Effort Steering Electrical Connector From Power Steering Gear

Courtesy of GENERAL MOTORS CORP.

9. If equipped, disconnect the variable effort steering electrical connector (1) from the power steering gear.
10. Remove the stabilizer shaft. Refer to **Stabilizer Shaft Replacement** in Front Suspension.
11. Place a drain pan under the vehicle.

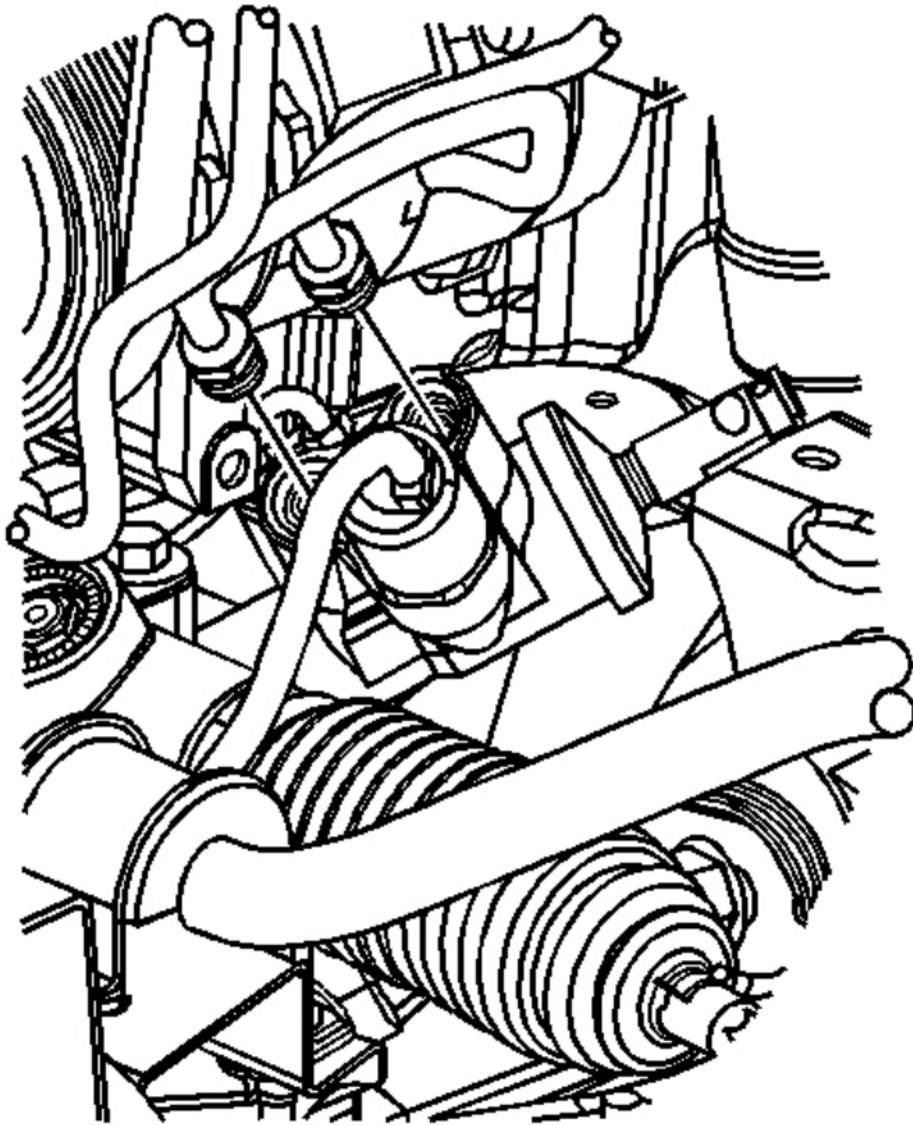


Fig. 139: Removing Power Steering Gear Pressure And Return Hoses From Power Steering Gear

Courtesy of GENERAL MOTORS CORP.

12. Remove the power steering gear pressure and return hoses from the power steering gear.

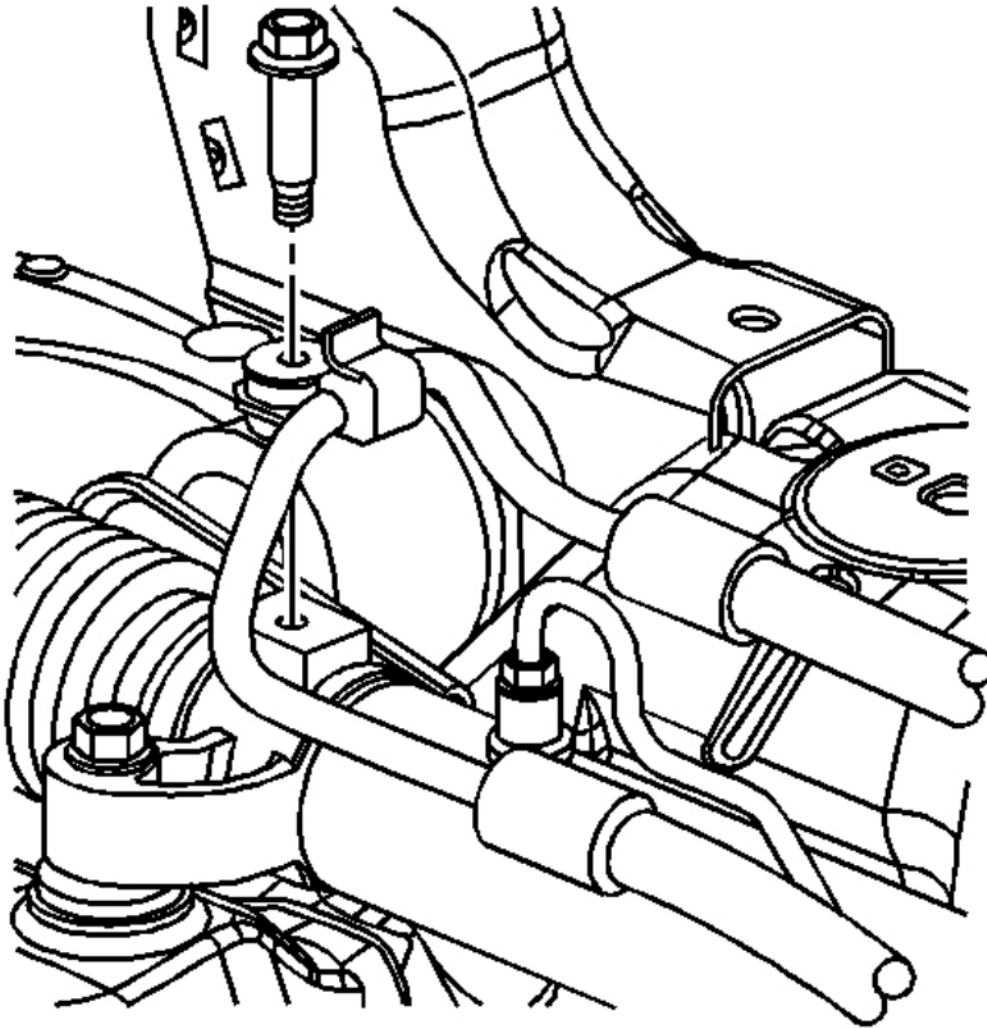


Fig. 140: Removing Power Steering Pressure Hose Retaining Bolt From Power Steering Gear

Courtesy of GENERAL MOTORS CORP.

13. Remove the power steering pressure hose retaining bolt from the power steering gear.

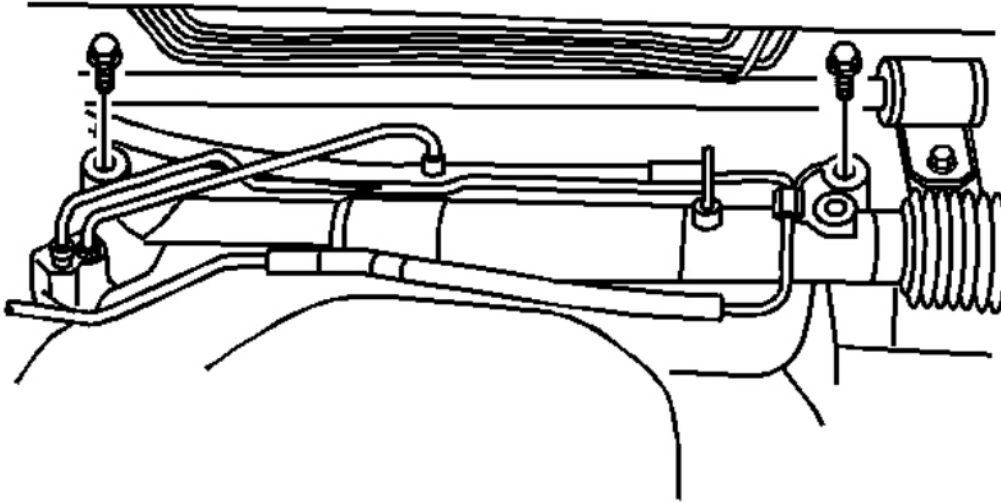


Fig. 141: Removing Power Steering Gear Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

14. Remove the power steering gear mounting bolts.
15. Remove the power steering gear through the left wheel opening.
16. Transfer the outer tie rods if replacing the power steering gear.

Installation Procedure

1. Install the power steering gear through the left wheel opening.

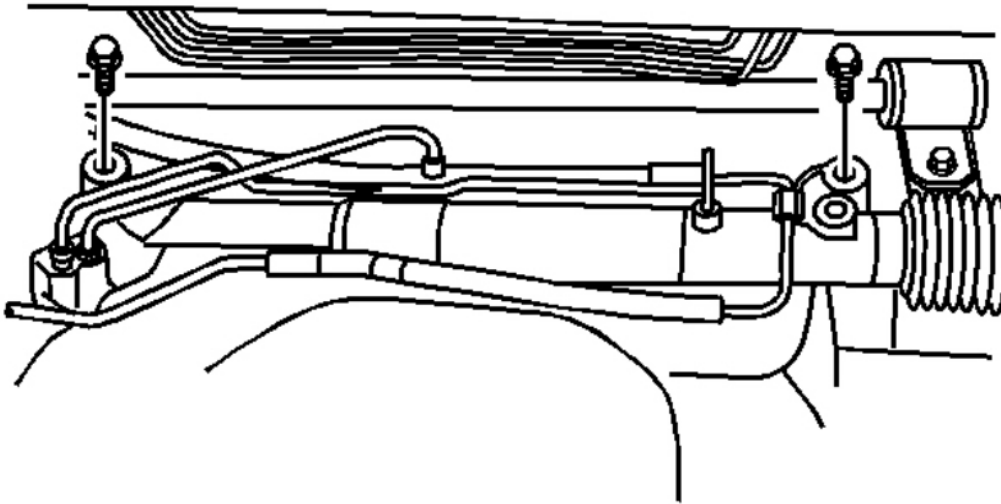


Fig. 142: Installing Power Steering Gear Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the power steering gear mounting bolts.

Tighten: Tighten the bolts to 95 N.m (70 lb ft).

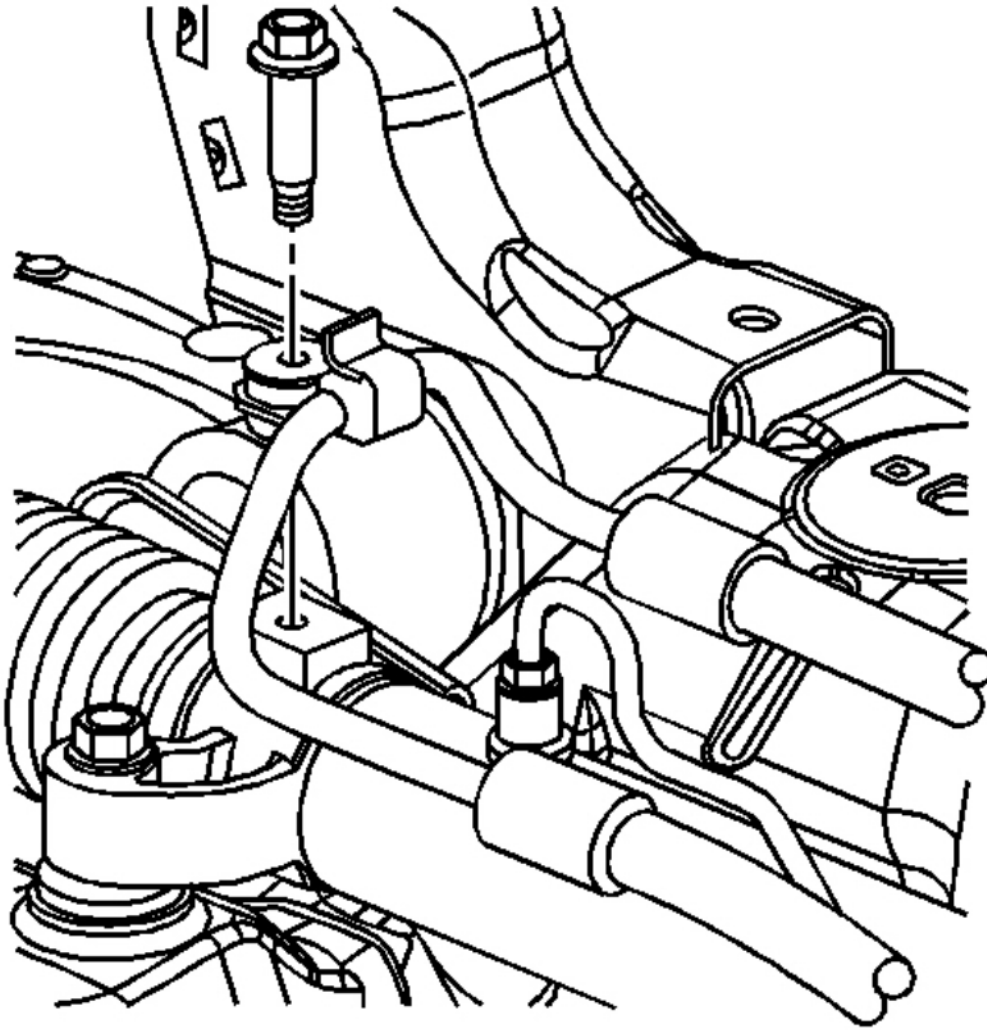


Fig. 143: Installing Power Steering Pressure Hose To Steering Gear Retaining Bolt
Courtesy of GENERAL MOTORS CORP.

3. Install the power steering pressure hose to the steering gear retaining bolt.

Tighten: Tighten the bolt to 9 N.m (80 lb in).

4. Install the stabilizer shaft. Refer to **Stabilizer Shaft Replacement** in Front Suspension.

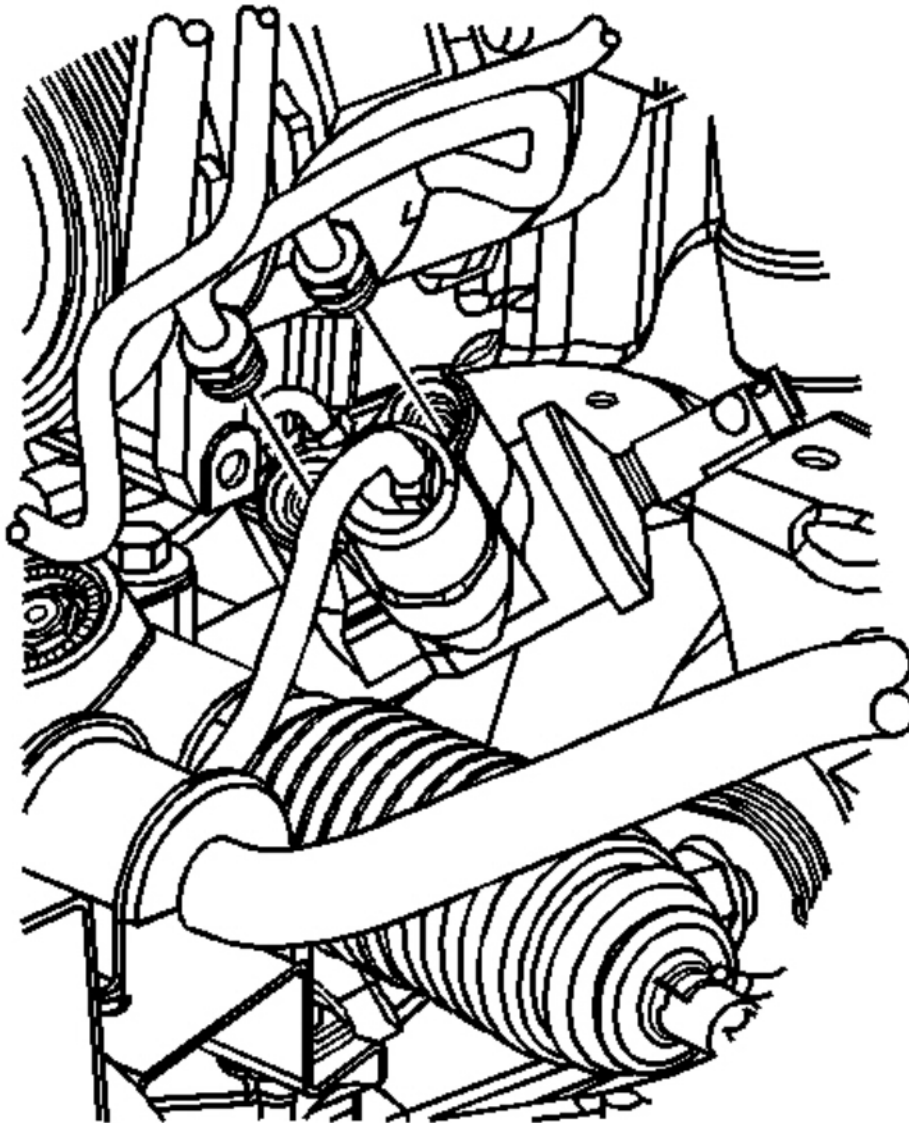


Fig. 144: Installing Power Steering Gear Pressure And Return Hoses To Power Steering Gear

Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Install new seals on the power steering pressure and return hoses.

5. Install the power steering gear pressure and return hoses to the power steering gear.

Tighten: Tighten the hoses to 30 N.m (22 lb ft).

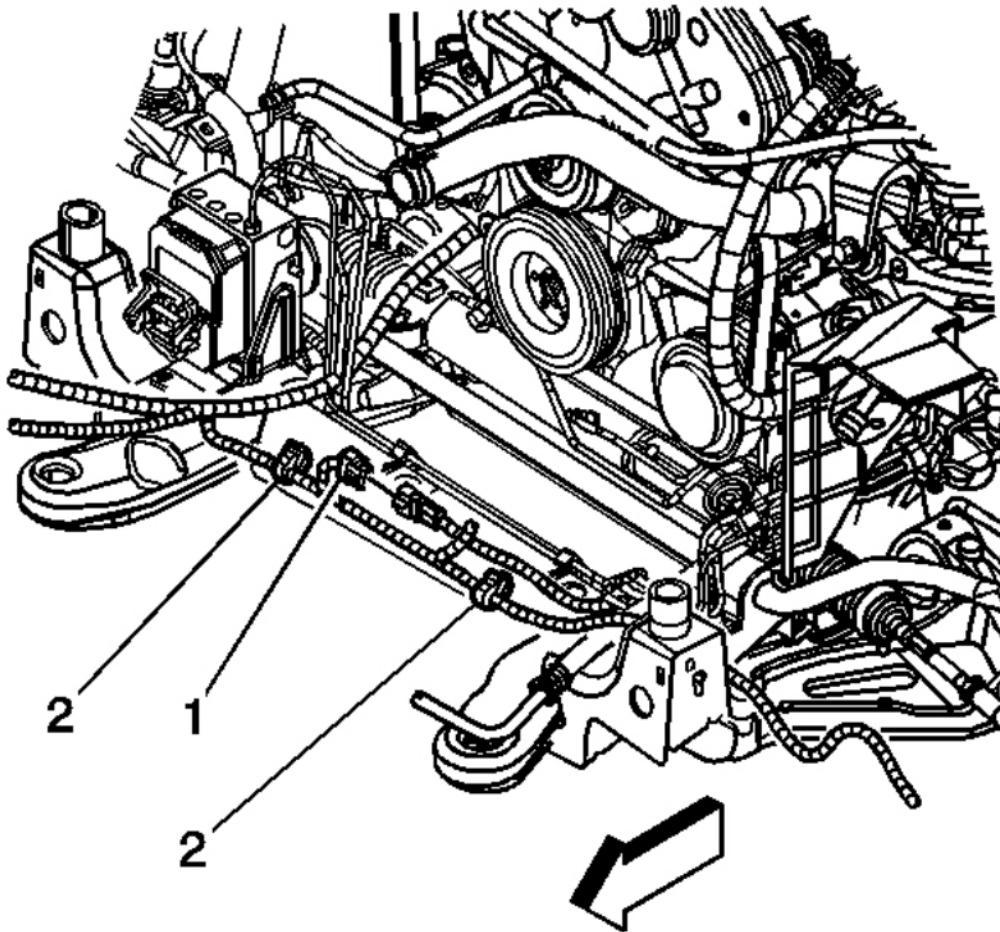


Fig. 145: Connecting Variable Effort Steering Electrical Connector
Courtesy of GENERAL MOTORS CORP.

6. If equipped, connect the variable effort steering electrical connector (1).

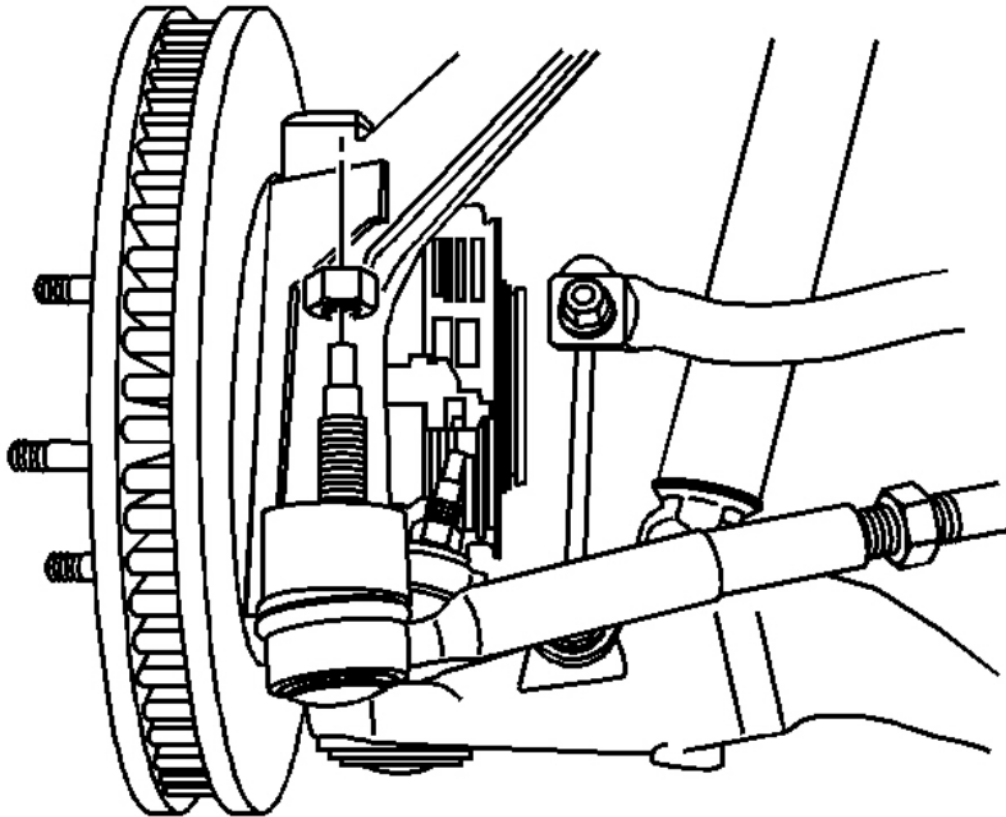


Fig. 146: View Of Outer Tie Rod-To-Steering Knuckle And Retaining Nut
Courtesy of GENERAL MOTORS CORP.

7. Install the outer tie rod end to the steering knuckles.
8. Install the outer tie rods nut.

Tighten: Tighten the nuts to 70 N.m (52 lb ft).

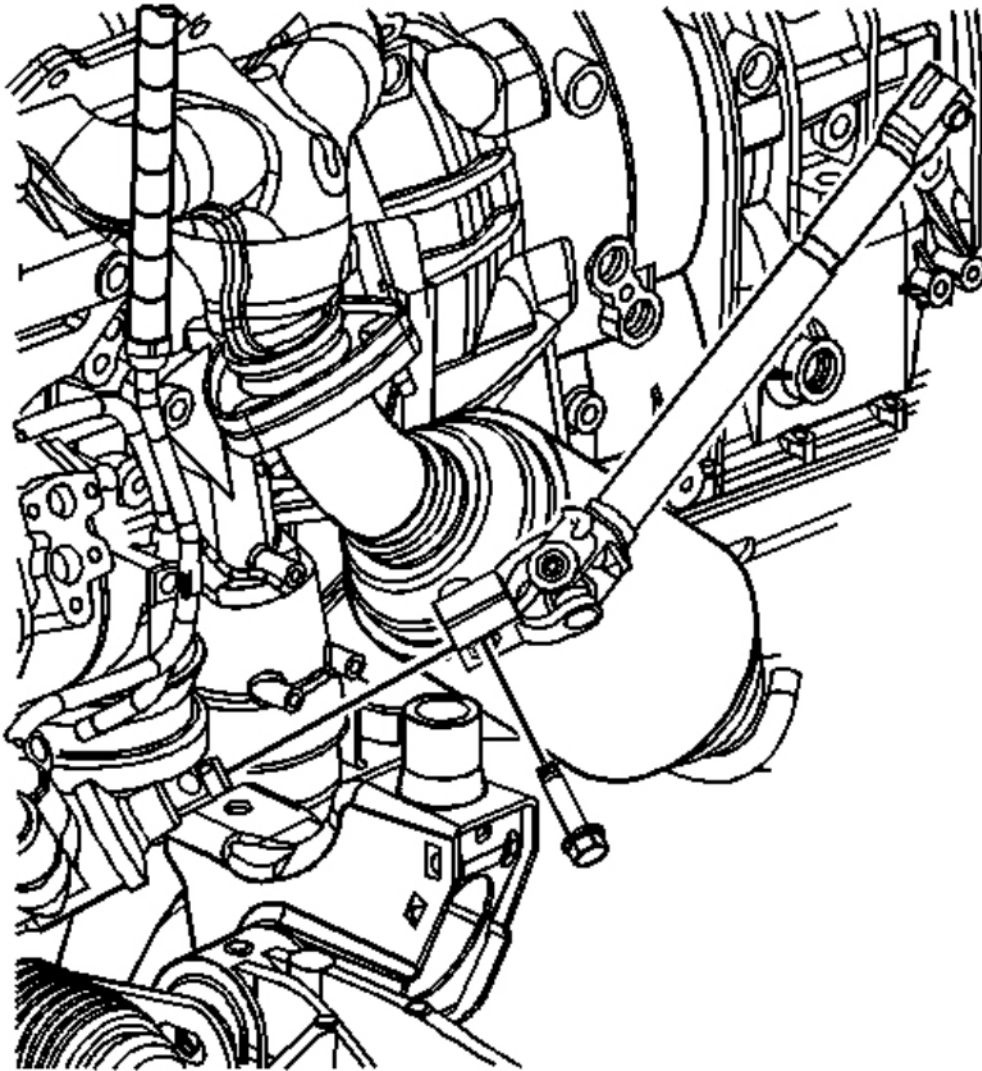


Fig. 147: Connecting Intermediate Shaft To Power Steering Gear
Courtesy of GENERAL MOTORS CORP.

9. Connect the intermediate shaft to the power steering gear.
10. Install the intermediate shaft lower pinch bolt.

Tighten: Tighten the bolt to 47 N.m (35 lb ft).

11. Install the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.
12. Install the tire and wheels. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
13. Lower the vehicle.

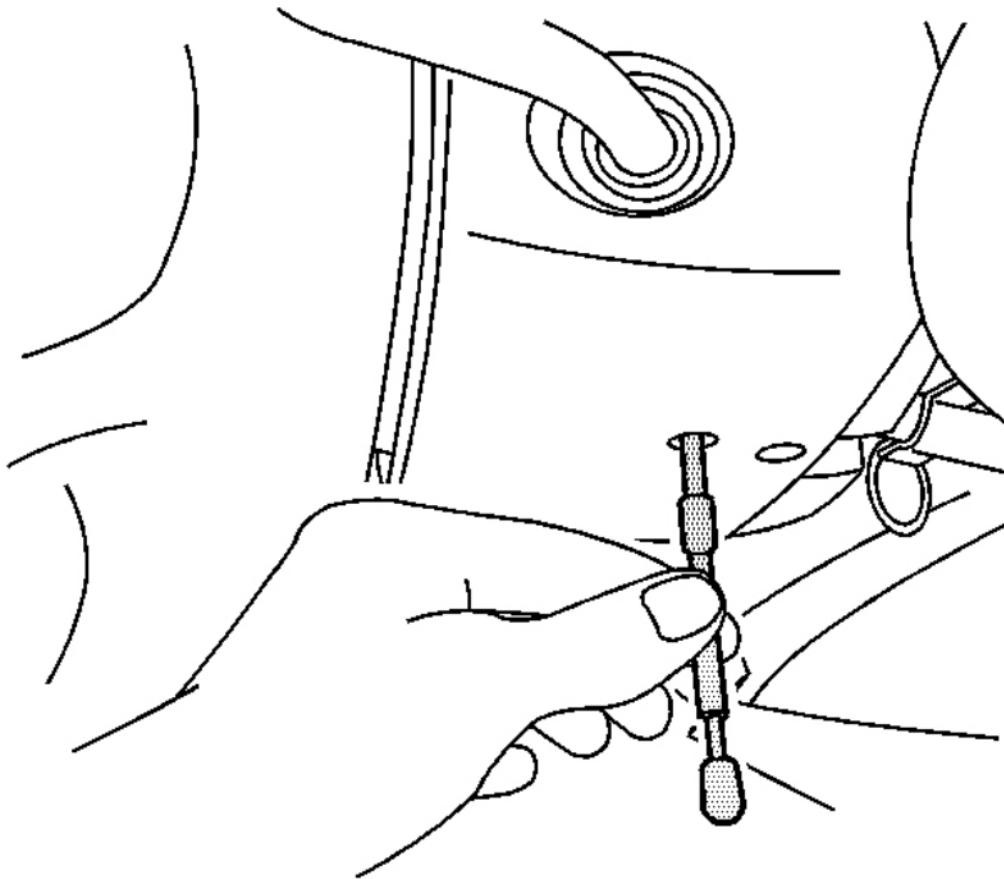


Fig. 148: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

14. Remove **J 42640** from the steering column.
15. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.
16. Adjust the front toe. Refer to **Front Toe Adjustment**.

POWER STEERING GEAR REPLACEMENT (RHD)

Tools Required

- **J 24319-B** Steering Linkage and Tie Rod Puller
- **J 42640** Steering Column Anti-Rotation Pin

Removal Procedure

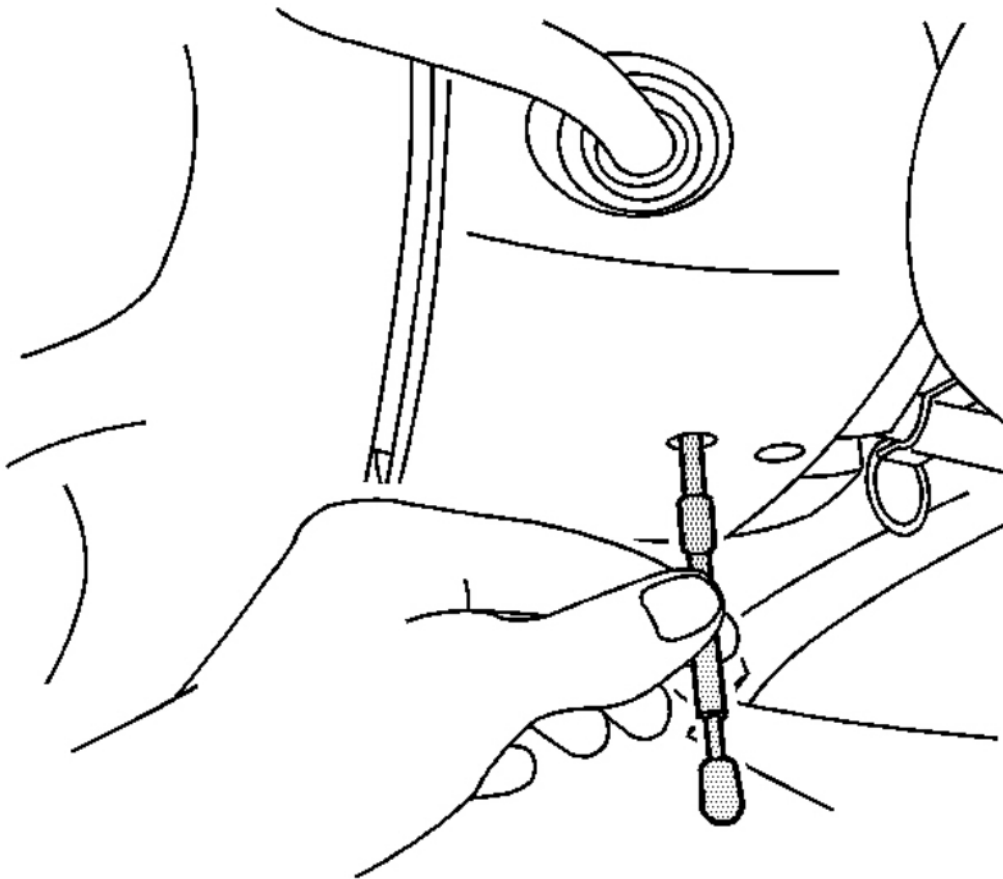


Fig. 149: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

1. Install **J 42640** to the steering column.
2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General

Information.

3. Remove the front tires and wheels. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
4. Remove the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.

CAUTION: Failure to disconnect the intermediate shaft from the rack and pinion stub shaft can result in damage to the steering gear and/or intermediate shaft. This damage can cause loss of steering control which could result in personal injury.

NOTE: The wheels of the vehicle must be straight ahead and the steering column in the LOCK position before disconnecting the steering column or intermediate shaft from the steering gear. Failure to do so will cause the coil assembly in the steering column to become uncentered which will cause damage to the coil assembly.

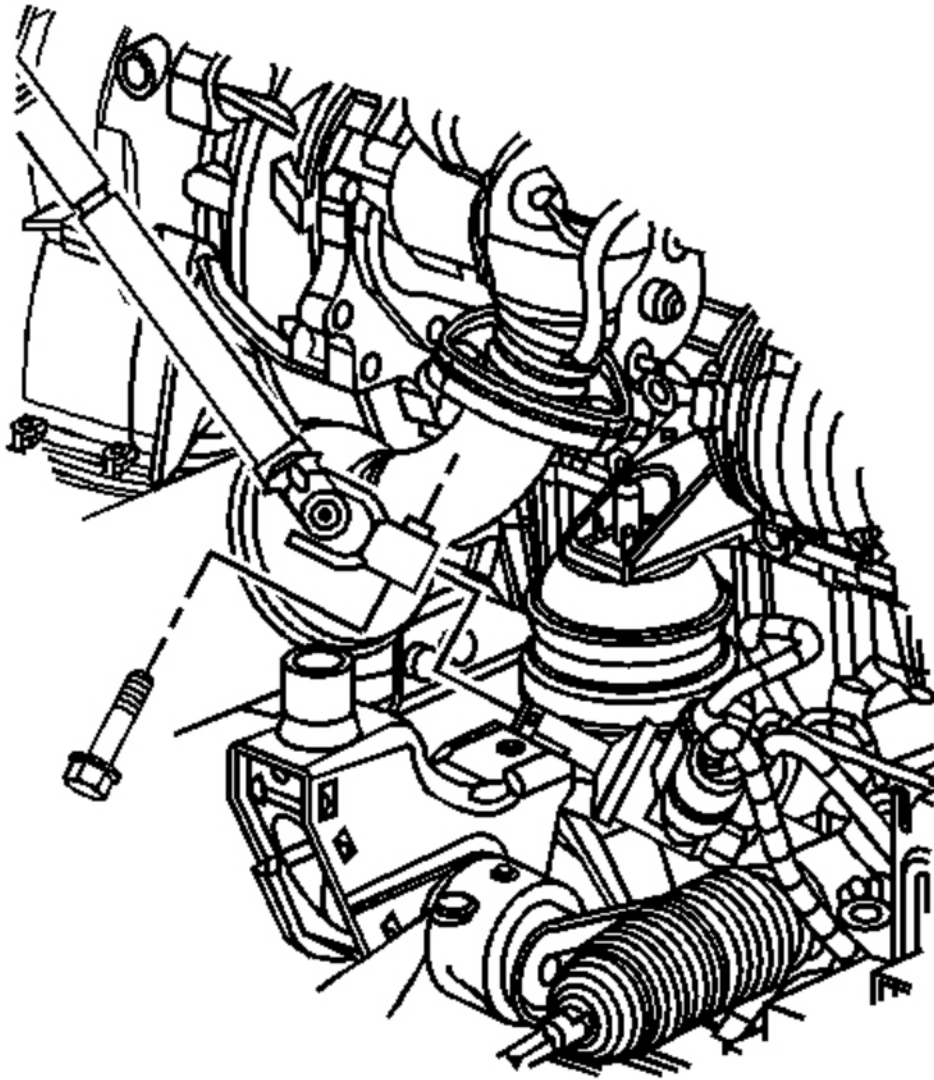


Fig. 150: Removing Intermediate Shaft Lower Pinch Bolt
Courtesy of GENERAL MOTORS CORP.

5. Remove the intermediate shaft lower pinch bolt.
6. Disconnect the intermediate shaft from the power steering gear.

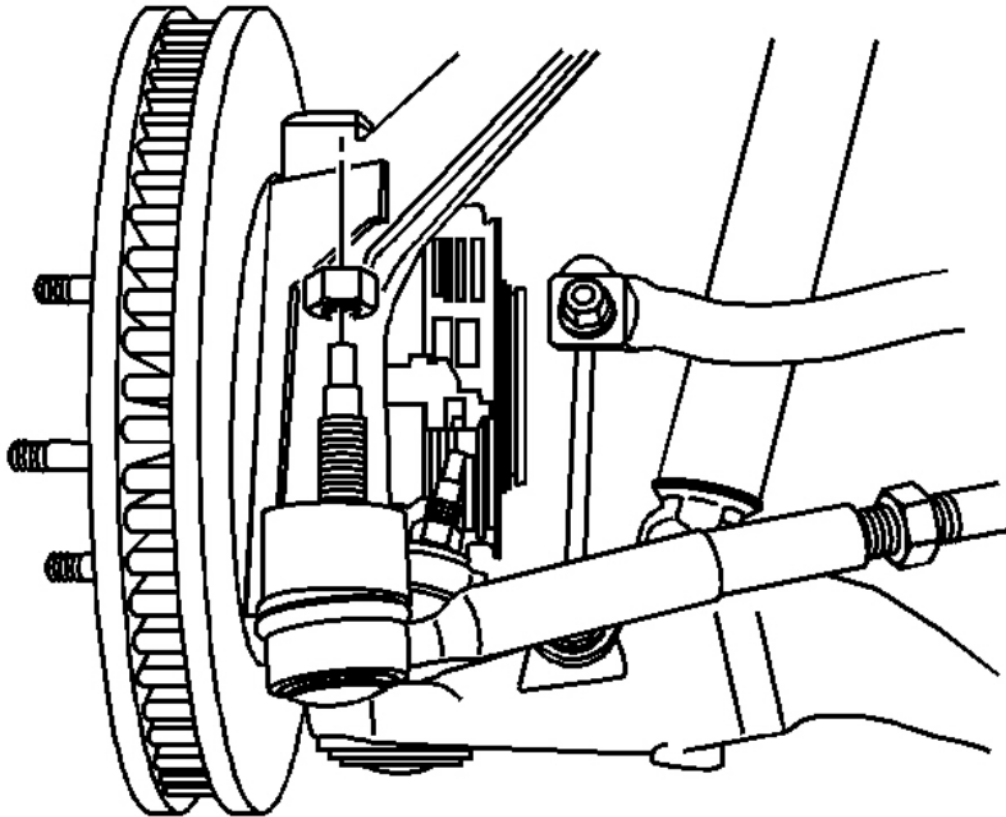


Fig. 151: View Of Outer Tie Rod-To-Steering Knuckle And Retaining Nut
Courtesy of GENERAL MOTORS CORP.

7. Remove the outer tie rod retaining nuts.

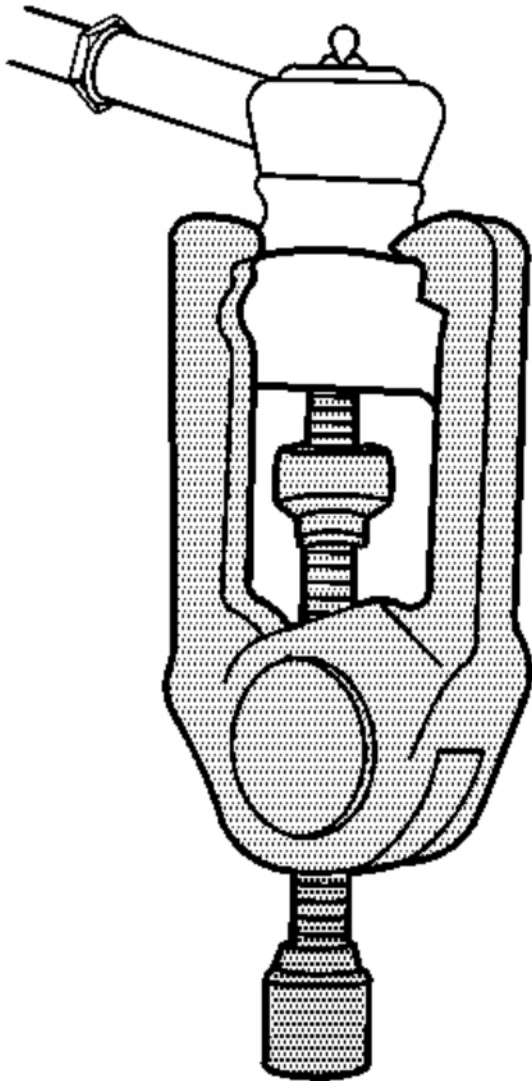


Fig. 152: Removing Outer Tie Rod Assembly From Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

8. Using **J 24319-B** separate the outer tie rod from the steering knuckles.

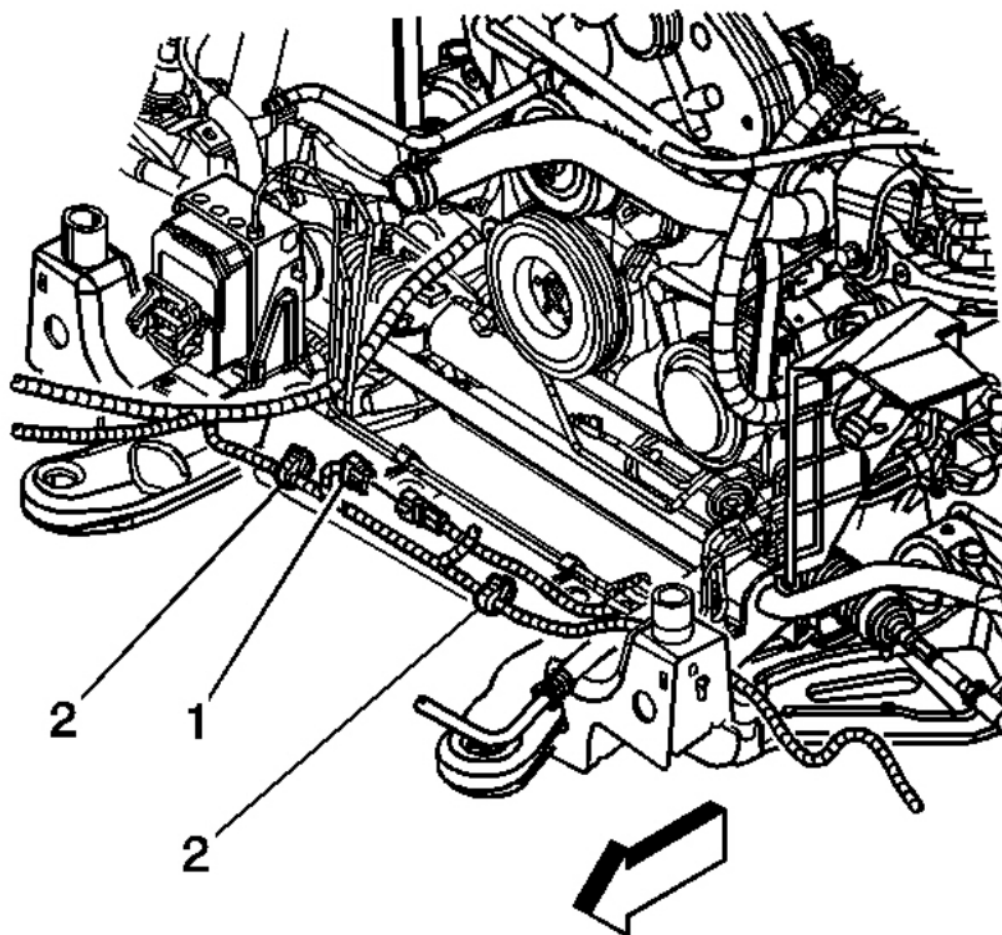


Fig. 153: Disconnecting Variable Effort Steering Electrical Connector From Power Steering Gear

Courtesy of GENERAL MOTORS CORP.

9. If equipped, disconnect the variable effort steering electrical connector (1) from the power steering gear.
10. Remove the stabilizer shaft. Refer to **Stabilizer Shaft Replacement** in Front Suspension.
11. Place a drain pan under the vehicle.

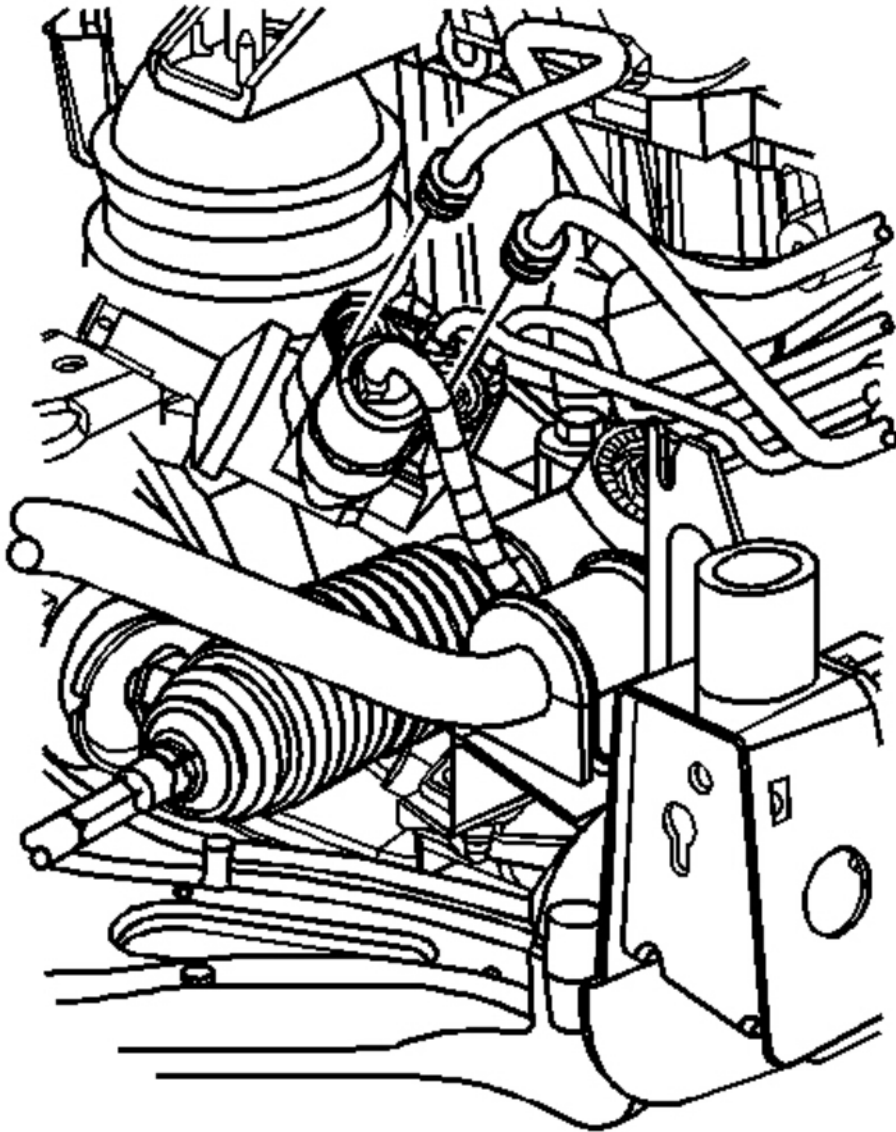


Fig. 154: Removing Power Steering Gear Pressure
Courtesy of GENERAL MOTORS CORP.

12. Remove the power steering gear pressure and return hoses from the power steering gear.

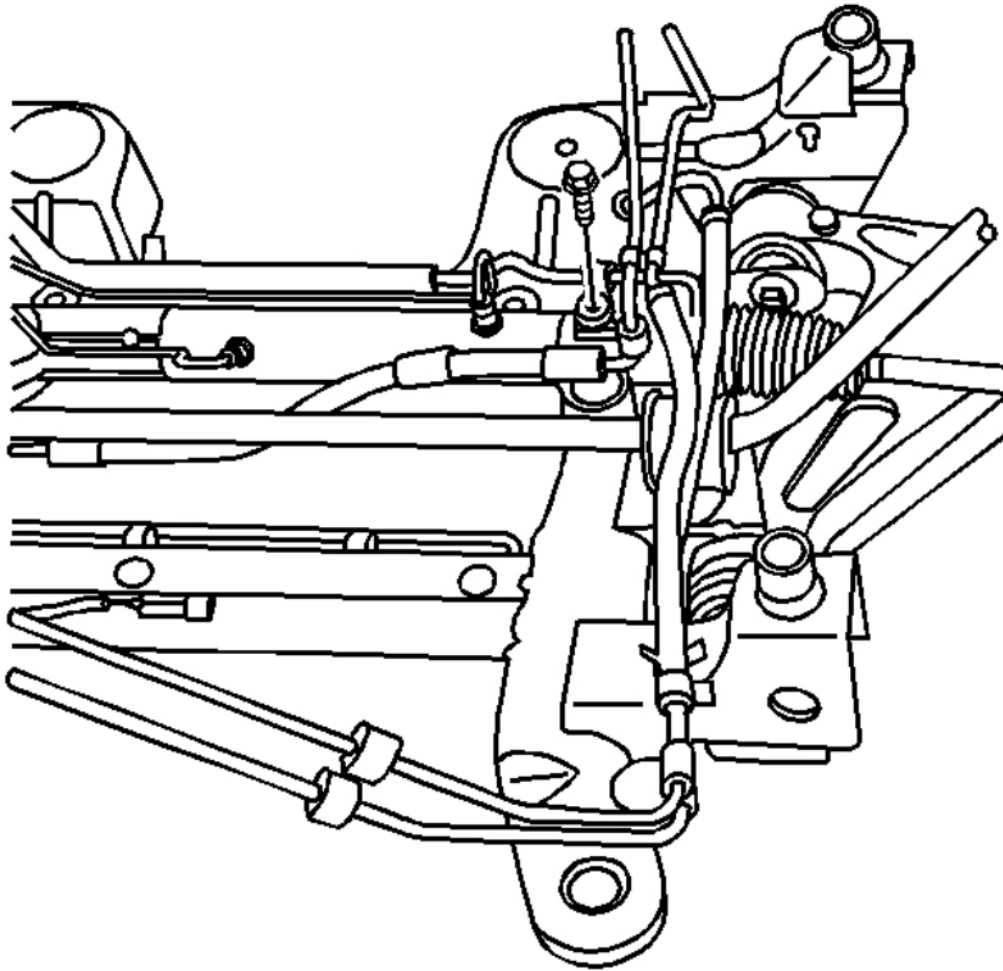


Fig. 155: Removing Power Steering Return Hose Retaining Bolt From Power Steering Gear

Courtesy of GENERAL MOTORS CORP.

13. Remove the power steering return hose retaining bolt from the power steering gear.

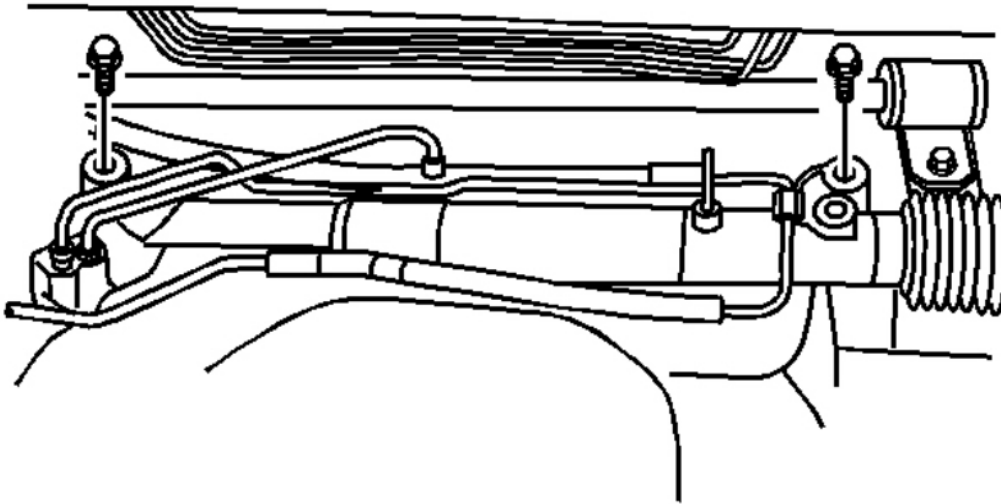


Fig. 156: Removing Power Steering Gear Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

14. Remove the power steering gear mounting bolts.
15. Remove the power steering gear through the right wheel opening.
16. Transfer the outer tie rods if replacing the power steering gear.

Installation Procedure

1. Install the power steering gear through the left wheel opening.

NOTE: Refer to **Fastener Notice** in Cautions and Notices.

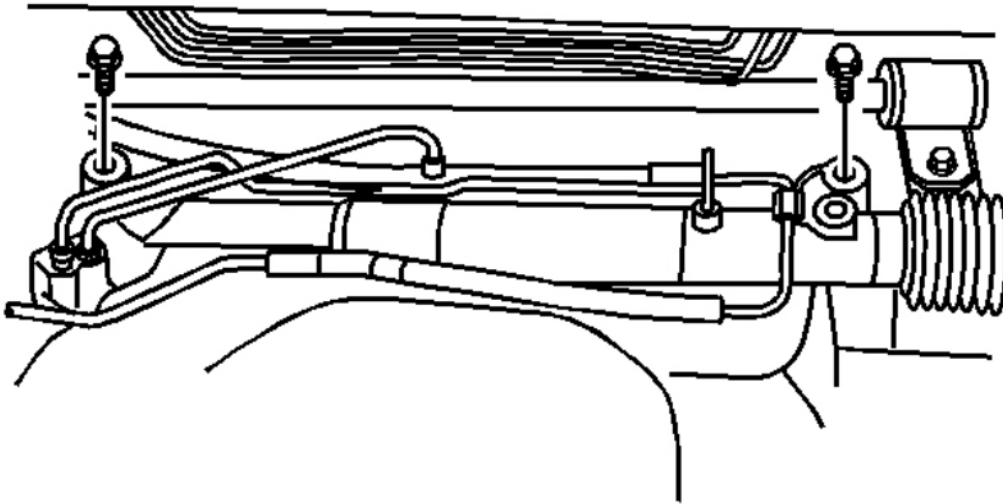


Fig. 157: Installing Power Steering Gear Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

2. Install the power steering gear mounting bolts.

Tighten: Tighten the power steering gear mounting bolts to 95 N.m (70 lb ft).

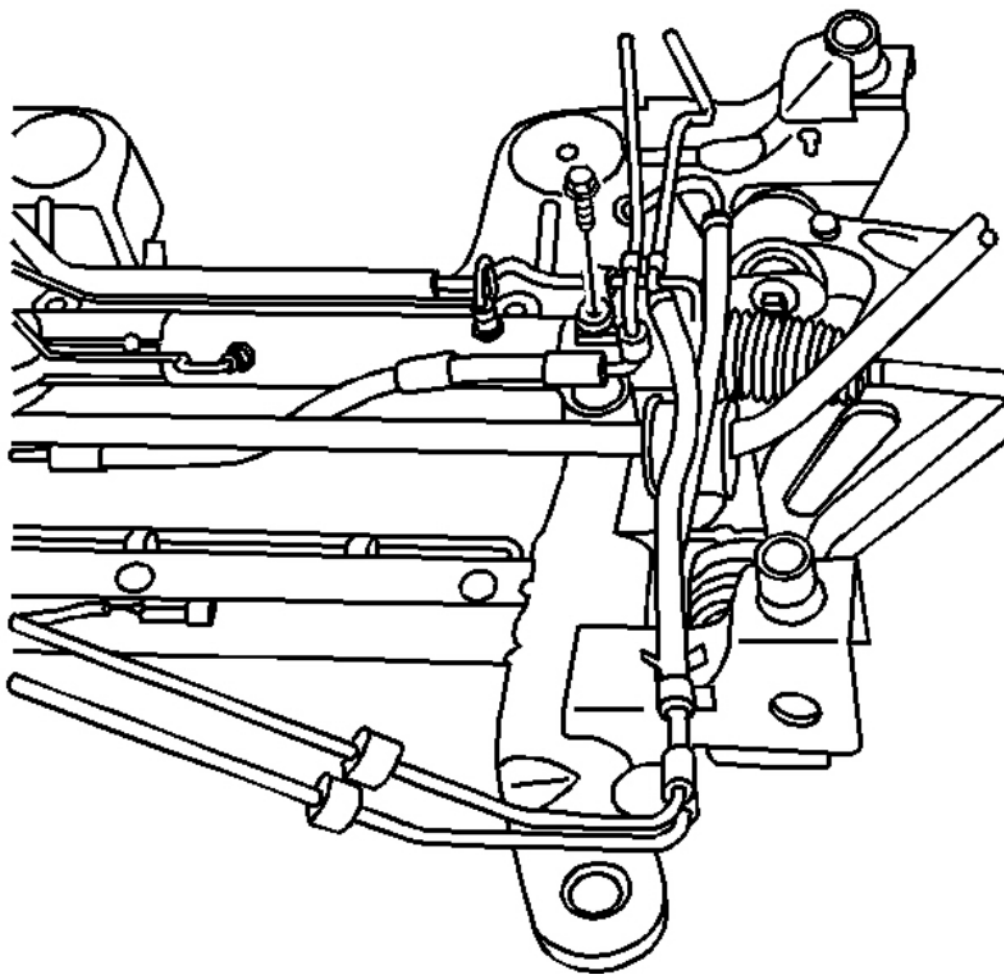


Fig. 158: Installing Power Steering Return Hose To Steering Gear Retaining Bolt
Courtesy of GENERAL MOTORS CORP.

3. Install the power steering return hose to the steering gear retaining bolt.

Tighten: Tighten the bolt to 9 N.m (80 lb in).

4. Install the stabilizer shaft. Refer to **Stabilizer Shaft Replacement** in Front Suspension.

IMPORTANT: Install new seals on the power steering pressure and return lines.

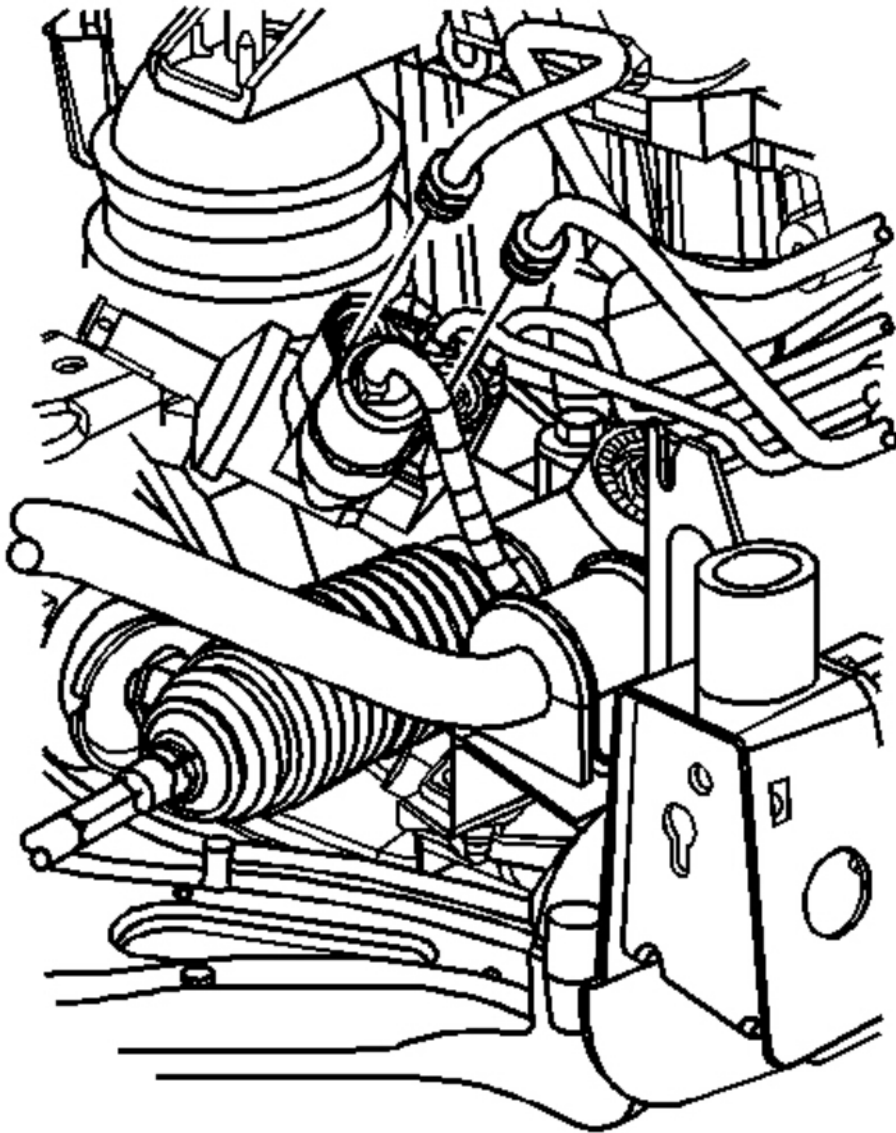


Fig. 159: Installing Power Steering Gear Pressure And Return Hoses To Power Steering Gear

Courtesy of GENERAL MOTORS CORP.

5. Install the power steering gear pressure and return hoses to the power steering gear.

Tighten: Tighten the hoses to 30 N.m (22 lb ft).

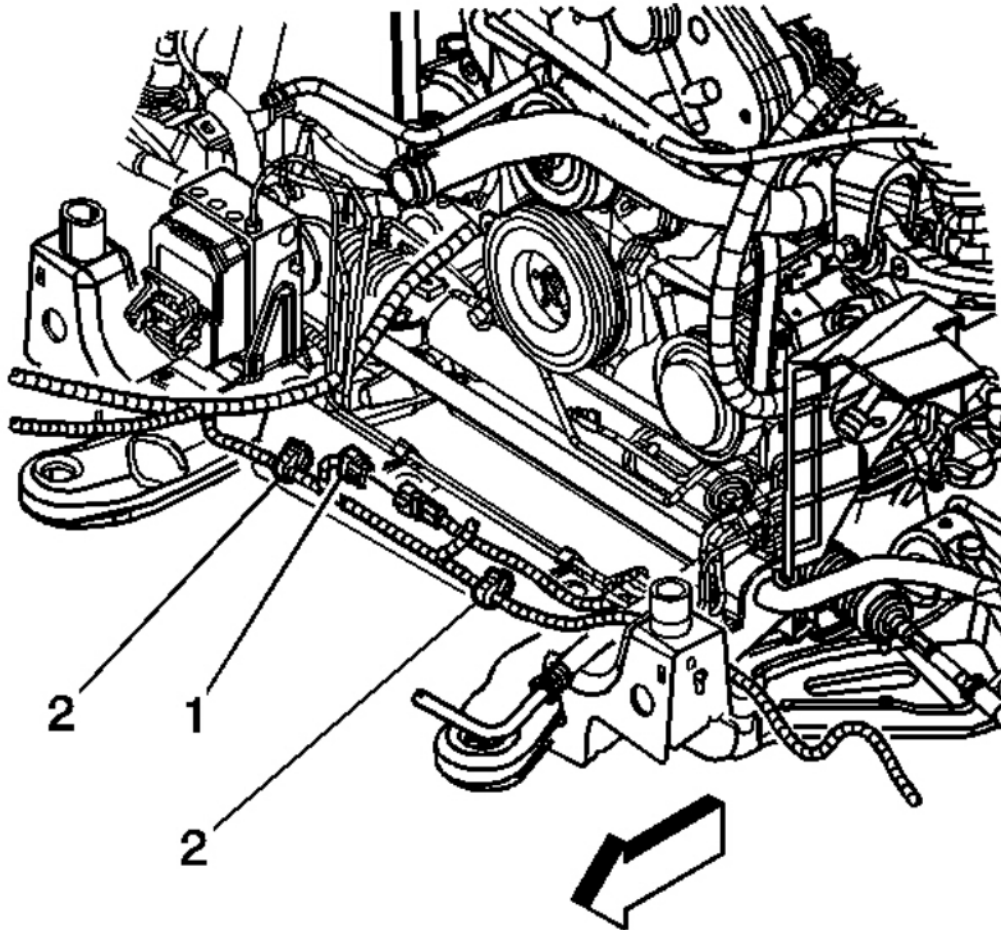


Fig. 160: Connecting Variable Effort Steering Electrical Connector
Courtesy of GENERAL MOTORS CORP.

6. If equipped, connect the variable effort steering electrical connector (1).

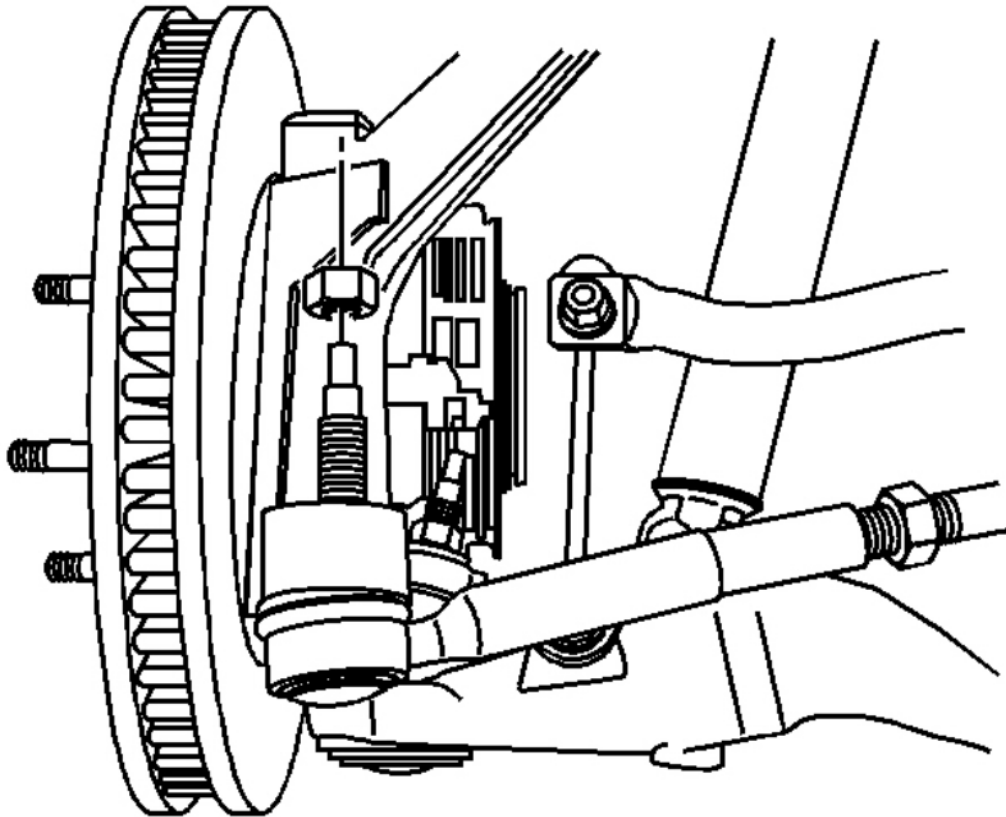


Fig. 161: View Of Outer Tie Rod-To-Steering Knuckle And Retaining Nut
Courtesy of GENERAL MOTORS CORP.

7. Install the outer tie rod end to the steering knuckles.
8. Install the outer tie rods nuts.

Tighten: Tighten the nuts to 70 N.m (52 lb ft).

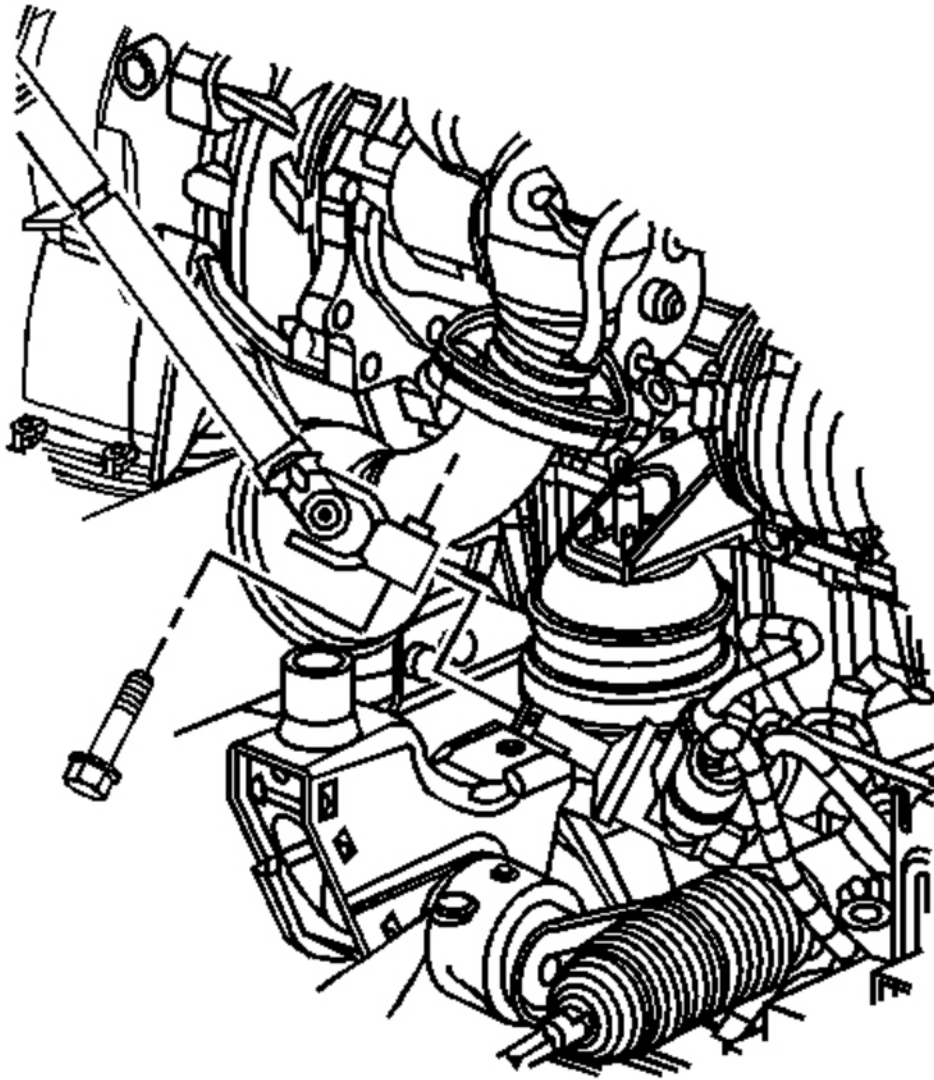


Fig. 162: Connecting Intermediate Shaft To Power Steering Gear
Courtesy of GENERAL MOTORS CORP.

9. Connect the intermediate shaft to the power steering gear.
10. Install the intermediate shaft lower pinch bolt.

Tighten: Tighten the bolt to 47 N.m (35 lb ft).

11. Install the front air deflector. Refer to **Air Deflector Replacement - Front** in Body Front End.
12. Install the tire and wheels. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
13. Lower the vehicle.

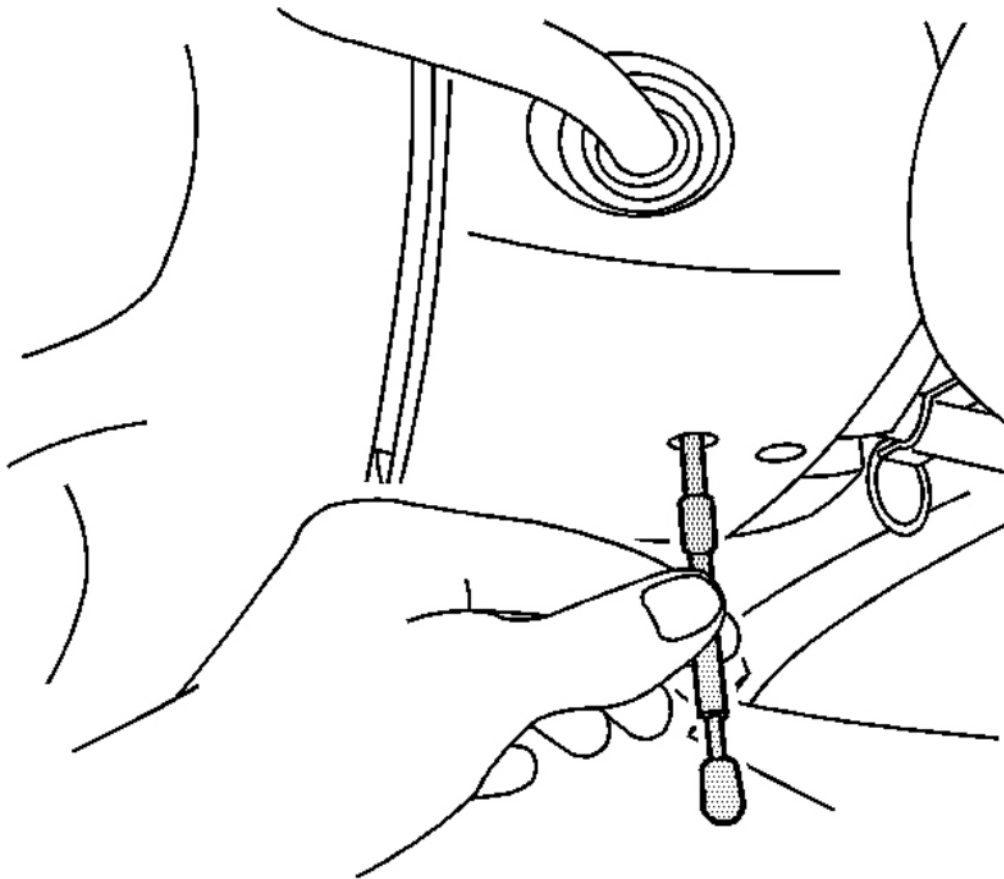


Fig. 163: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

14. Remove **J 42640** from the steering column.
15. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.
16. Adjust the front toe. Refer to **Front Toe Adjustment**.

DESCRIPTION AND OPERATION

POWER STEERING SYSTEM DESCRIPTION AND OPERATION (W/O ELECTRO-HYDRAULIC STEERING)

The hydraulic power steering pump is a constant displacement vane-type pump that provides hydraulic pressure and flow for the power steering gear. The hydraulic power steering pumps are either belt-driven or direct-drive, cam-driven.

The power steering fluid reservoir holds the power steering fluid and may be integral with the power steering pump or remotely located. The following locations are typical locations for the remote reservoir:

- Mounted to the front of the dash panel
- Mounted to the inner fender
- Mounted to a bracket on the engine

The 2 basic types of power steering gears are listed below:

- A recirculating ball system
- A rack and pinion system

In the recirculating ball system, a worm gear converts steering wheel movement to movement of a sector shaft. A pitman arm attached to the bottom of the sector shaft actually moves one tie rod and an intermediate rod move the other tie rod.

In the rack and pinion system, the rack and the pinion are the 2 components that convert steering wheel rotation to lateral movement. The steering shaft is attached to the pinion in the steering gear. The pinion rotates with the steering wheel. Gear teeth on the pinion mesh with the gear teeth on the rack. The rotating pinion moves the rack from side to side. The lateral action of the rack pushes and pulls the tie rods in order to change the direction of the vehicle's front wheels.

The power steering pressure hose connects the power steering pump union fitting to the power steering gear and allows pressurized power steering fluid to flow from the pump to the gear.

The power steering return hose returns fluid from the power steering gear back to the power steering fluid reservoir. The power steering return line may contain an integral fin-type or line-type power steering fluid cooler.

In a typical power steering system, a pump generates hydraulic pressure, causing fluid to flow, via the pressure hose, to the steering gear valve assembly. The steering gear valve assembly regulates

2004 Cadillac CTS

2004 STEERING Power Steering System - CTS

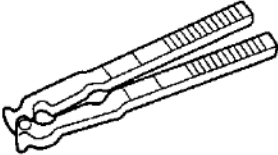
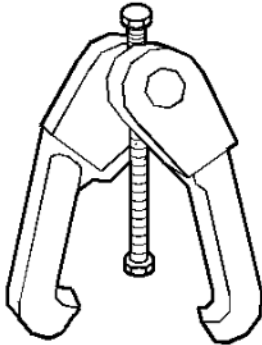
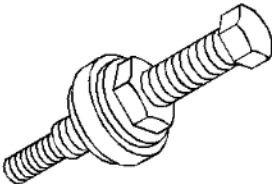
the incoming fluid to the right and left chambers in order to assist in right and left turns.

Turning the steering wheel activates the valve assembly, which applies greater fluid pressure and flow to 1 side of the steering gear piston, and lower pressure and flow to the other side of the piston. The pressure assists the movement of the gear piston. Tie rods transfer this force to the front wheels, which turn the vehicle right or left.

SPECIAL TOOLS AND EQUIPMENT

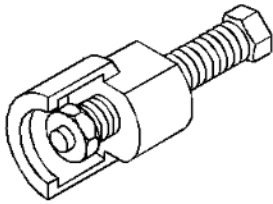
SPECIAL TOOLS

Special Tools

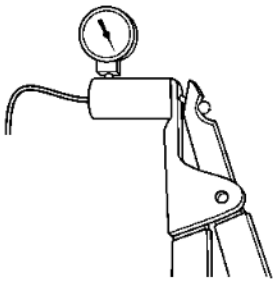
Illustration	Tool Number/ Description
	J 22610 Keystone Clamp Pliers
	J 24319-B Steering Linkage and Tie Rod Puller
	J 25033-C Pulley Installer

2004 Cadillac CTS

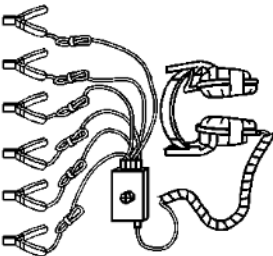
2004 STEERING Power Steering System - CTS



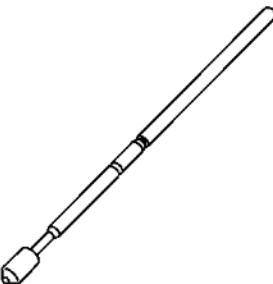
J 25034-C
Pulley Remover



J 35555
Metal Mity® Vac



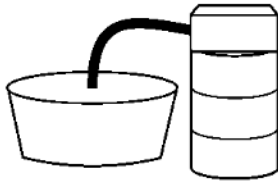
J 39570
Chassis Ear



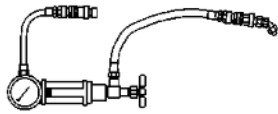
J 42640
Steering Column Anti-Rotation Pin

2004 Cadillac CTS

2004 STEERING Power Steering System - CTS



J 43485
Power Steering Bleeder Adapter



J 44721
Power Steering Analyzer