

ACCESSORIES & EQUIPMENT

Frame and Underbody - CTS Coupe & Wagon

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Brake Line Bracket to Frame Nut	10 N.m	89 lb in
Brake Module to Bracket Nut	10 N.m	89 lb in
Brake Pipe Fittings	15 N.m	11 lb ft
Driveline and Rear Suspension Frame to Body Bolts - Front Bolts	200 N.m plus 65 degrees turn	148 lb ft plus 65 degrees turn
Engine Mount Nuts to Frame	50 N.m	37 lb ft
Front Suspension Frame to Body Bolts - Front	250 N.m	184 lb ft
Frame to Body Bolts - Rear Bolts	100 N.m plus 90 degrees turn	74 lb ft plus 90 degrees turn
Front Compartment Lower Noise Shield	5 N.m	44 lb in
Transmission Mount Lower Nuts	58 N.m	43 lb ft
Transmission Support to Body Bolts	60 N.m	44 lb ft
Under Body Brace	58 N.m	43 lb ft
Upper Control Arm to Knuckle Bolt	60 N.m plus 120 degrees turn	44 lb ft plus 120 degrees turn
Washer Solvent Bottle Bracket Nut	10 N.m	89 lb in

REPAIR INSTRUCTIONS

FRONT COMPARTMENT LOWER NOISE SHIELD REPLACEMENT (ALL WHEEL DRIVE)

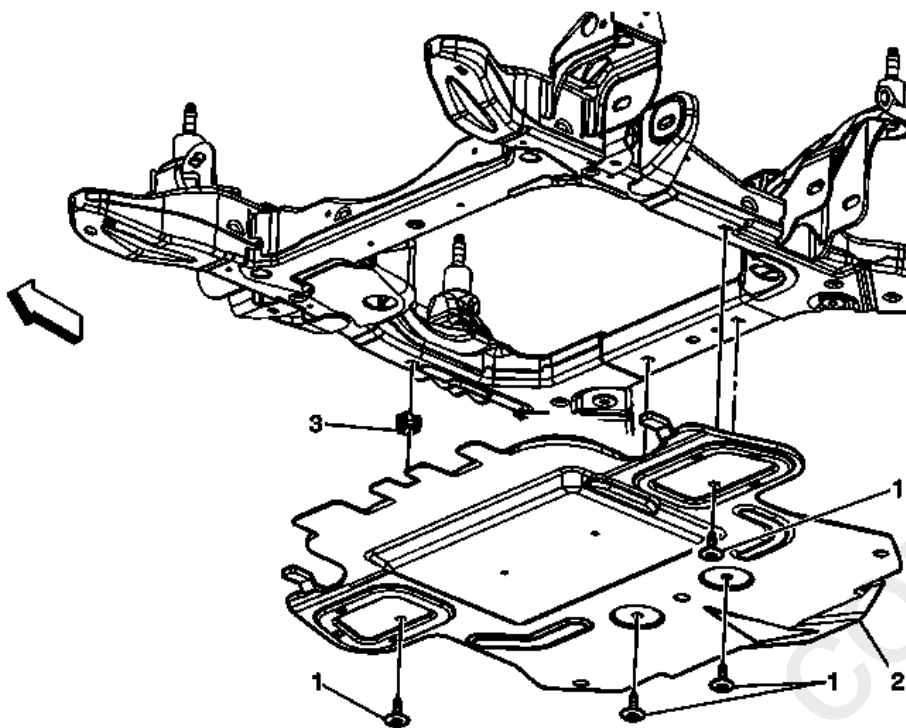


Fig. 1: Front Compartment Lower Noise Shield (All Wheel Drive)
Courtesy of GENERAL MOTORS COMPANY

Front Compartment Lower Noise Shield Replacement (All Wheel Drive)

Callout	Component Name
Preliminary Procedure	
Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Front Compartment Lower Noise Shield Bolt (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 5 N.m (44 lb in)
2	Front Compartment Lower Noise Shield
3	Front Compartment Lower Noise Shield Nut (Qty: 4)

FRONT COMPARTMENT LOWER NOISE SHIELD REPLACEMENT (REAR WHEEL DRIVE)

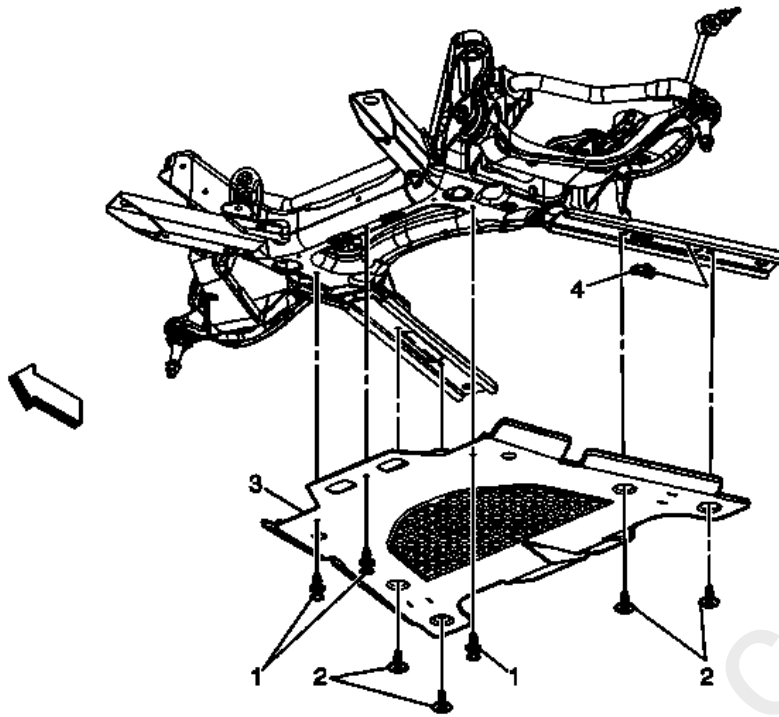


Fig. 2: Front Compartment Lower Noise Shield (Rear Wheel Drive)
 Courtesy of GENERAL MOTORS COMPANY

Front Compartment Lower Noise Shield Replacement (Rear Wheel Drive)

Callout	Component Name
Preliminary Procedure	
Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .	
1	Front Compartment Lower Noise Shield Retainer (Qty: 3)
2	Front Compartment Lower Noise Shield Bolt (Qty: 4) CAUTION: Refer to Fastener Caution . Tighten 5 N.m (44 lb in)
3	Front Compartment Lower Noise Shield
4	Front Compartment Lower Noise Shield Nut (Qty: 4)

DRIVETRAIN AND FRONT SUSPENSION FRAME REPLACEMENT (ALL WHEEL DRIVE)

Special Tools

J 39580 Engine Support Stand

Removal Procedure

1. Install the engine support fixture. Refer to Engine Support Fixture .
2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
3. Remove the front wheels. Refer to Tire and Wheel Removal and Installation .
4. Remove the front compartment lower noise shield. Refer to Front Compartment Lower Noise Shield Replacement (All Wheel Drive).

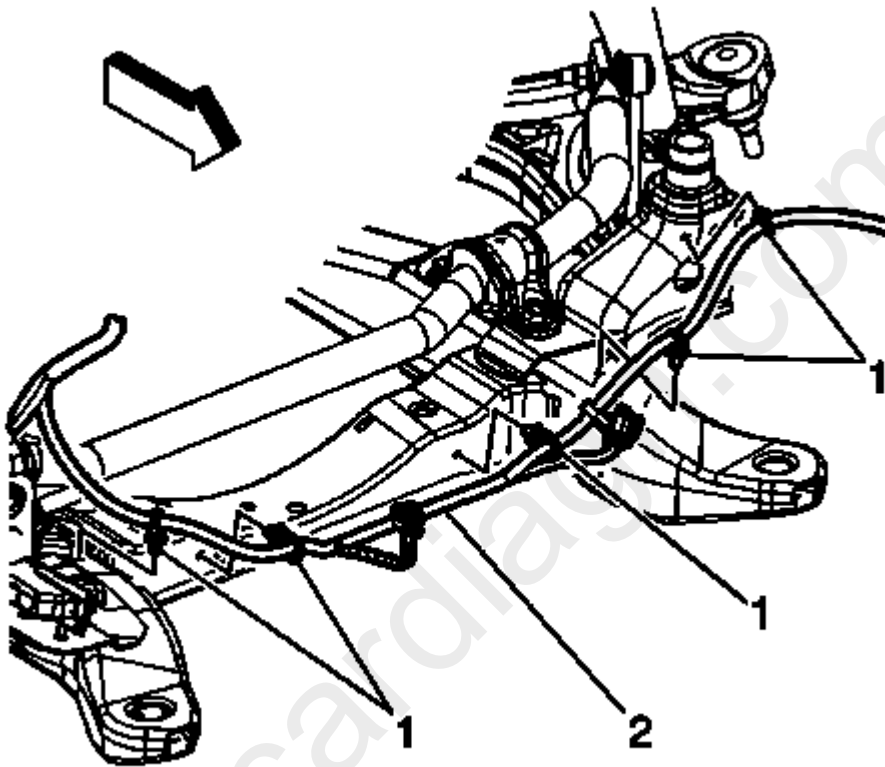


Fig. 3: View of Electrical Harness Retainers
Courtesy of GENERAL MOTORS COMPANY

5. Remove the electrical harness retainers (1) securing the engine harness (2) to the frame.
6. Remove the wheel speed sensor wire harness from the frame.
7. Remove the brake pipes from the frame.
8. Remove the brake pressure modulator valve from the bracket assembly. Refer to Brake Pressure Modulator Valve Replacement (CTS) , Brake Pressure Modulator Valve Replacement (CTS-V) .
9. Using mechanics wire, support the radiator and AC condenser assembly to the vehicle body.

NOTE: Mark the stabilizer shaft to ensure the correct position when reinstalling.

10. Loosen the stabilizer shaft mounting bolts.
11. Remove the antilock brake system wire harness from the sway bar links.
12. Remove the lower stabilizer shaft link from the lower control arm. Refer to **Stabilizer Shaft Link Replacement (AWD)** .
13. Remove the power steering gear mounting bolts. Refer to **Steering Gear Replacement (LHD With AWD)** .
14. Using mechanics wire secure the power steering gear to the engine.
15. Remove the lower control arms. Refer to **Lower Control Arm Replacement (AWD)** .
16. Remove the power steering and brake line retainers from the frame.
17. Remove the engine mounts lower retaining nuts.

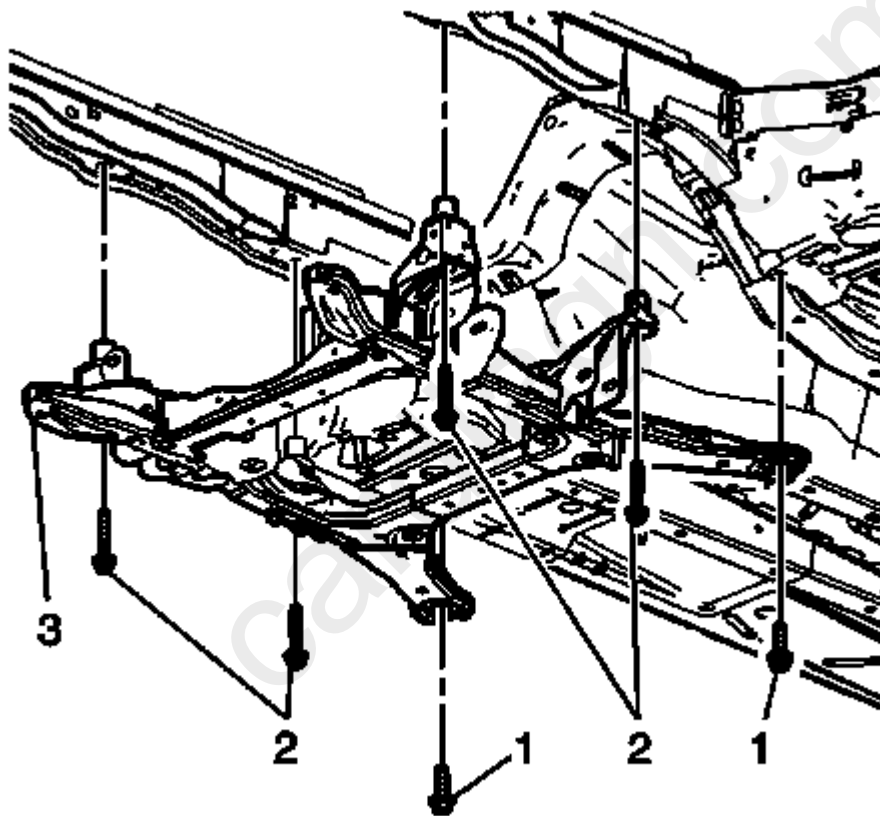


Fig. 4: Front Frame Bolts

Courtesy of GENERAL MOTORS COMPANY

18. Install **J 39580** engine support stand under the frame.
19. Lower the vehicle to the frame support table.
20. Remove the frame mounting bolts (1, 2).
21. With the aid of an assistant, carefully raise the body from the frame.
22. Ensure when raising the body the following items are clear from the frame.

- Brake pipes
- Steering knuckles
- Electrical wiring harnesses

23. Remove the stabilizer shaft. Refer to **Stabilizer Shaft Replacement (AWD)** .

24. With the aid of an assistant, remove the frame from the support fixture.

Installation Procedure

1. Install the stabilizer shaft to the frame. Refer to **Stabilizer Shaft Replacement (AWD)** .

Do not tighten the stabilizer shaft mounting bolts at this time.

2. With the aid of an assistant, position and secure the new frame assembly to the support fixture.
3. With the aid of an assistant, carefully lower the body to the frame.
4. Ensure the following components are clear from the frame.
 - The electrical harness
 - The steering knuckle assembly
 - The brake pipes

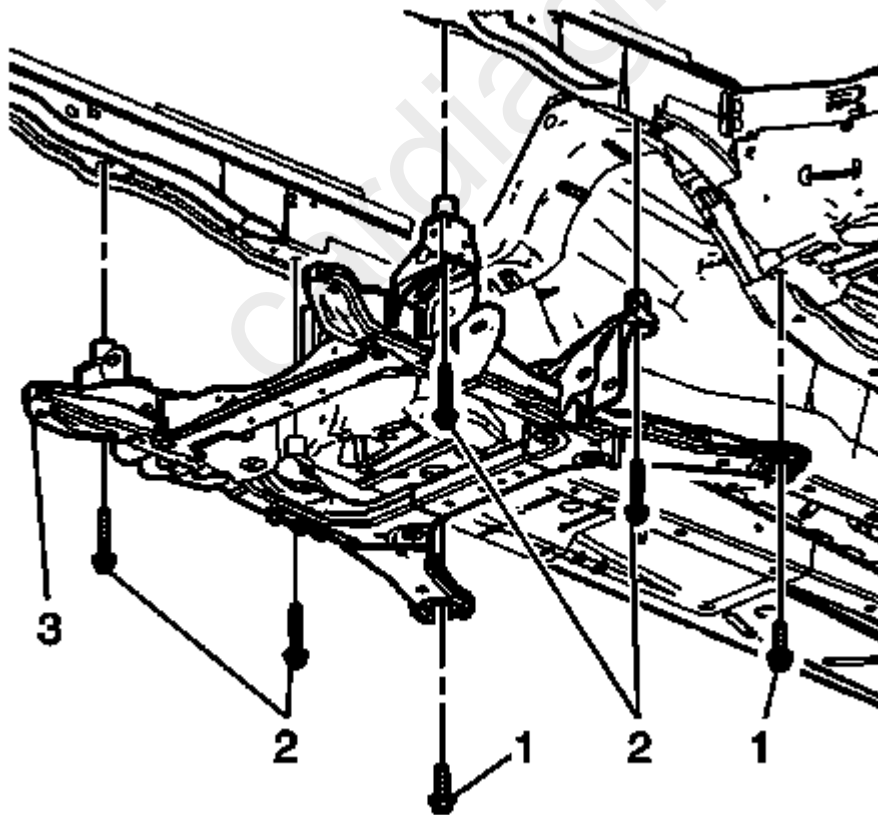


Fig. 5: Front Frame Bolts

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

5. Install the frame mountings bolts (2) and tighten to 191 (141 lb ft).
6. Install the frame to body bolts (1) and tighten to 250 (180 lb ft)
7. Raise the vehicle.
8. Install the engine mount lower retaining nuts (2) and tighten to 50 (37 lb ft).
9. Remove the **J 39580** engine support stand from under the vehicle.
10. Install the power steering and brake line retainers to the frame.
11. Remove the mechanics wire supporting the power steering gear.
12. Install the power steering gear mounting bolts. Refer to **Steering Gear Replacement (LHD With AWD)** .
13. Install the lower control arms. Refer to **Lower Control Arm Replacement (AWD)** .

NOTE: Ensure correct position from the previously marked spots.

14. Tighten the stabilizer shaft bolts to 100 (74 lb ft).
15. Install the stabilizer shaft link to the lower control arms. Refer to **Stabilizer Shaft Link Replacement (AWD)** .
16. Install the brake pressure modulator valve to the bracket. Refer to **Brake Pressure Modulator Valve Replacement (CTS)** , **Brake Pressure Modulator Valve Replacement (CTS-V)** .
17. Install the brake pipes to the frame.
18. Remove the mechanics wire supporting the radiator.
19. Install the wheel speed sensor wire harness to the frame.

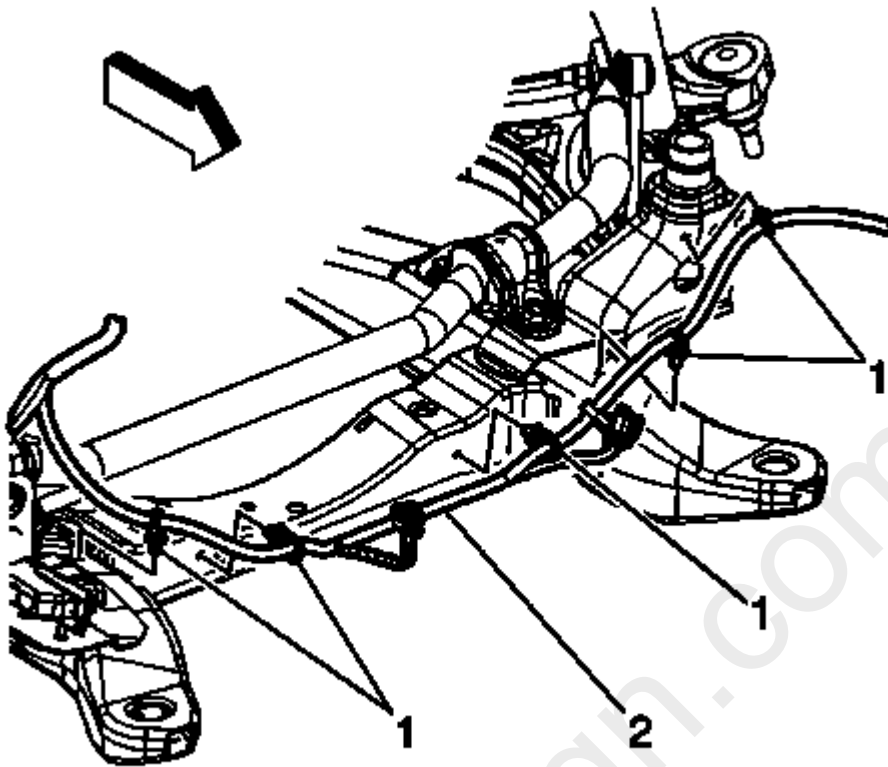


Fig. 6: View of Electrical Harness Retainers
Courtesy of GENERAL MOTORS COMPANY

20. Install the electrical harness retainers (1) securing the engine harness (2) to the frame.
21. Install the front compartment lower noise shield. Refer to **Front Compartment Lower Noise Shield Replacement (All Wheel Drive)**.
22. Install the front tires and wheels . Refer to **Tire and Wheel Removal and Installation** .
23. Lower the vehicle.
24. Remove the engine support fixture. Refer to **Engine Support Fixture** .
25. Align the vehicle. Refer to **Wheel Alignment Measurement** .

DRIVETRAIN AND FRONT SUSPENSION FRAME REPLACEMENT (REAR WHEEL DRIVE)

Special Tools

J 39580 Engine Support Stand

Removal Procedure

1. Install the engine support fixture. Refer to **Engine Support Fixture** , for the 3.0L or 3.6L engine or **Engine Support Fixture** for the 6.2L 7.0L engine.

2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
3. Remove the front wheels. Refer to Tire and Wheel Removal and Installation .
4. Remove the front compartment lower noise shield. Refer to Front Compartment Lower Noise Shield Replacement (Rear Wheel Drive).

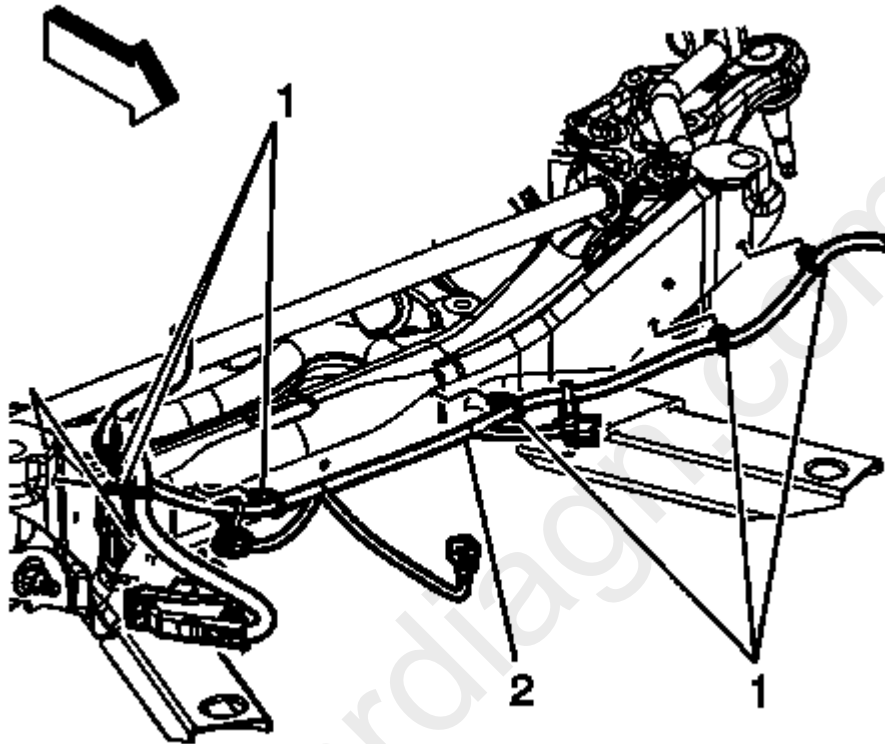


Fig. 7: View of Electrical and Engine Harness to Frame
 Courtesy of GENERAL MOTORS COMPANY

5. Remove the electrical harness retainers (1) securing the engine harness (2) to the frame.
6. Remove the wheel speed sensor wire harness from the frame.
7. Remove the brake pipes from the frame.
8. Lower the vehicle.
9. Remove the brake pressure modulator valve from the bracket assembly. Refer to Brake Pressure Modulator Valve Replacement (CTS) , Brake Pressure Modulator Valve Replacement (CTS-V) .
10. Using mechanics wire, support the radiator and AC condenser assembly to the vehicle body.

NOTE: Mark the stabilizer shaft to ensure the correct position when reinstalling.

11. Remove the lower stabilizer shaft link from the lower control arm. Refer to Stabilizer Shaft Link

Replacement (RWD) .

12. Remove the power steering gear mounting bolts. Refer to **Steering Gear Replacement (RHD) , Steering Gear Replacement (LHD With RWD) .**
13. Using mechanics wire secure the power steering gear to the engine.
14. Separate the outer tie rod from the steering knuckle. Refer to **Steering Linkage Outer Tie Rod Replacement (RWD) .**
15. Disconnect the lower ball joint from the steering knuckle. Refer to **Lower Control Arm Replacement (RWD) .**
16. Remove the shock module yokes from the lower control arms. Refer to **Front Shock Absorber Yoke Replacement .**
17. Remove the engine mounts lower retaining nuts.

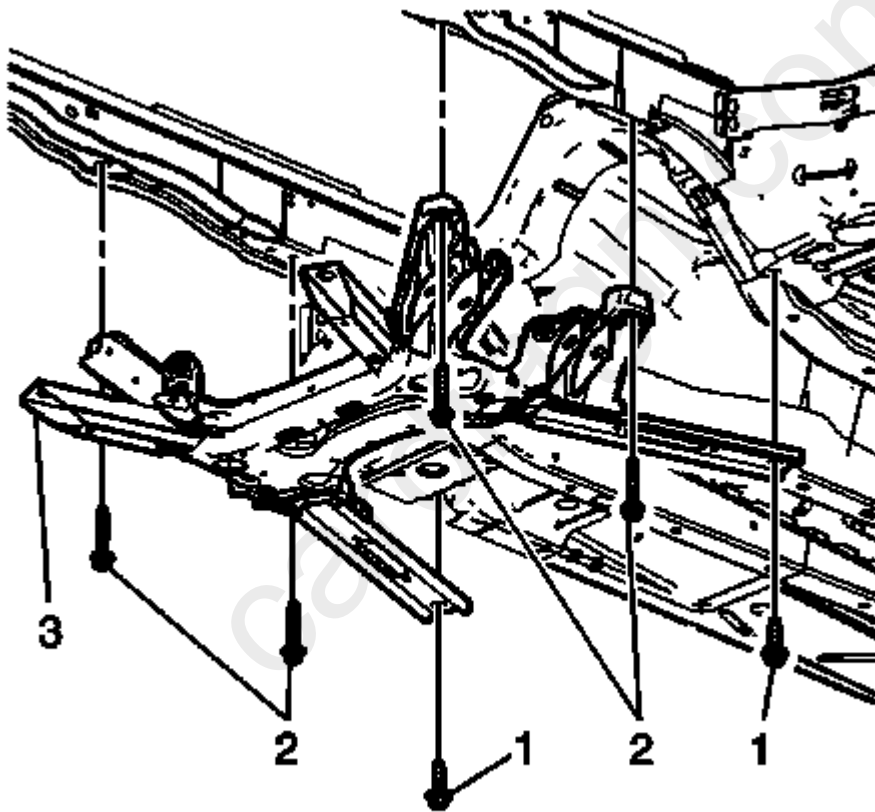


Fig. 8: Identifying Frame Mounting Bolts
Courtesy of GENERAL MOTORS COMPANY

18. Install **J 39580** engine support stand under the frame.
19. Lower the vehicle to the frame support table.
20. Remove the frame mounting bolts (1, 2).
21. With the aid of an assistant, carefully raise the body from the frame.

22. Ensure when raising the body the following items are clear from the frame:
 - Brake pipes
 - Steering knuckles
 - Electrical wiring harnesses
23. Remove the lower control arms. Refer to **Lower Control Arm Replacement (RWD)** .
24. Remove the stabilizer shaft. Refer to **Stabilizer Shaft Replacement (RWD)** .
25. With the aid of an assistant, remove the frame from the support fixture.

Installation Procedure

1. Install the lower control arm to the frame. Refer to **Lower Control Arm Replacement (RWD)** .
2. Install the stabilizer shaft to the frame. Refer to **Stabilizer Shaft Replacement (RWD)** .

Do not tighten the stabilizer shaft mounting bolts at this time.

3. With the aid of an assistant, position and secure the new frame assembly to the support fixture.
4. With the aid of an assistant, carefully lower the body to the frame.
5. Ensure the following components are clear from the frame:
 - The electrical harness
 - The steering knuckle assembly
 - The brake pipes

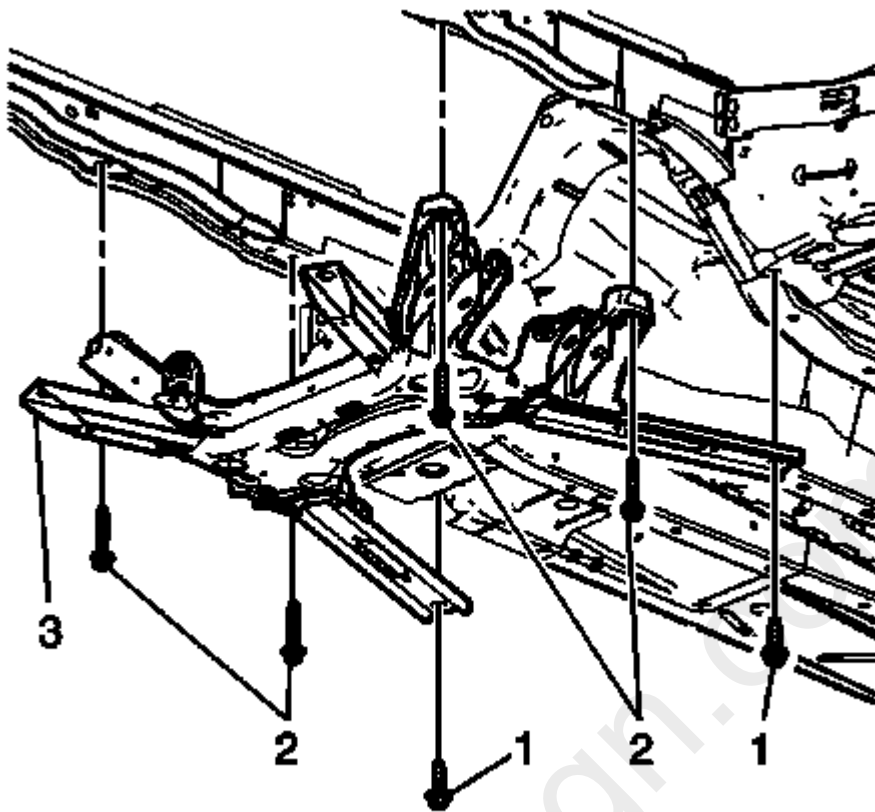


Fig. 9: Identifying Frame Mounting Bolts
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

6. Install the frame mountings bolts (2) and tighten to 191 (141 lb ft).
7. Install the frame to body bolts (1) and tighten to 250 (180 lb ft)
8. Raise the vehicle.
9. Install the engine mount lower retaining nuts and tighten to 50 (37 lb ft).
10. Remove the **J 39580** engine support stand from under the vehicle.
11. Remove the mechanics wire supporting the power steering gear.
12. Install the shock module yokes to the lower control arms. Refer to **Front Shock Absorber Yoke Replacement** .
13. Install the power steering gear mounting bolts. Refer to **Steering Gear Replacement (RHD)** , **Steering Gear Replacement (LHD With RWD)** .
14. Install the ball joint to the steering knuckle. Refer to **Lower Control Arm Replacement (RWD)** .
15. Install the outer tie rod to the steering knuckle. Refer to **Steering Linkage Outer Tie Rod Replacement (RWD)** .

NOTE: Ensure correct position from the previously marked spots.

16. Tighten the stabilizer shaft bolts and tighten 65 (48 lb ft).
17. Install the stabilizer shaft link to the lower control arms. Refer to **Stabilizer Shaft Link Replacement (RWD)** .
18. Install the brake pressure modulator valve to the bracket. Refer to **Brake Pressure Modulator Valve Replacement (CTS)** , **Brake Pressure Modulator Valve Replacement (CTS-V)** .
19. Install the brake pipes to the frame.
20. Remove the mechanics wire supporting the radiator.
21. Install the wheel speed sensor wire harness to the frame.

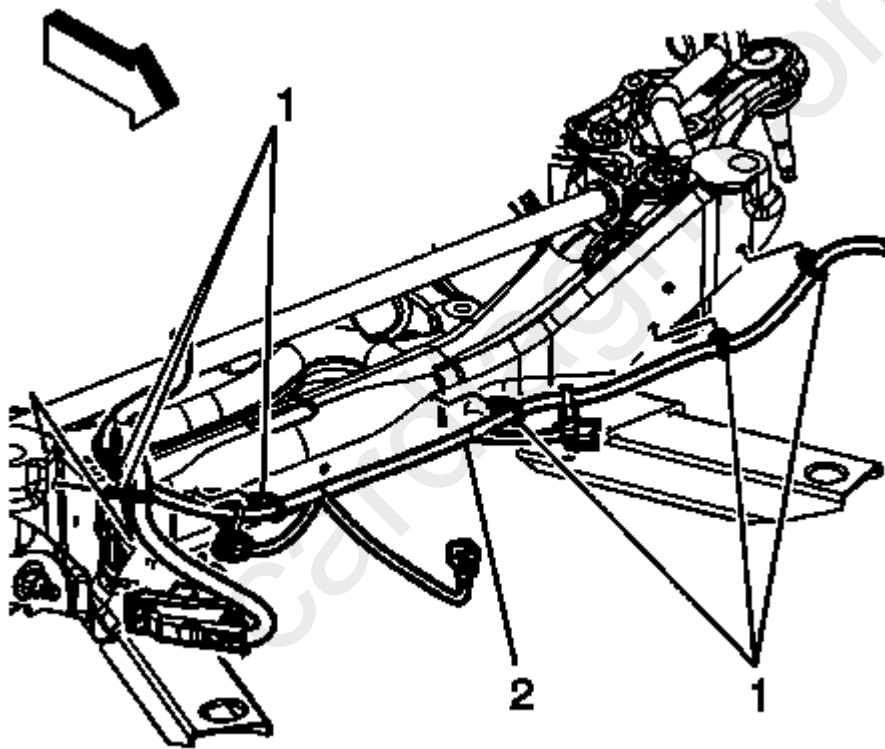


Fig. 10: View of Electrical and Engine Harness to Frame
Courtesy of GENERAL MOTORS COMPANY

22. Install the electrical harness retainers (1) securing the engine harness (2) to the frame.
23. Install the front tires and wheels . Refer to **Tire and Wheel Removal and Installation** .
24. Install the front compartment lower noise shield. Refer to **Front Compartment Lower Noise Shield Replacement (Rear Wheel Drive)**.
25. Lower the vehicle.

26. Remove the engine support fixture.
27. Align the vehicle. Refer to Wheel Alignment Measurement .

REAR FRAME REPLACEMENT

Special Tools

J 39580 Engine Support Stand

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the rear wheels. Refer to Tire and Wheel Removal and Installation .
3. Remove the exhaust system. Refer to Exhaust System Replacement (LSA-Coupe) , Exhaust System Replacement (LSA-Wagon) , Exhaust System Replacement (Single Exhaust) , Exhaust System Replacement (LFX/LFW-Coupe) , Exhaust System Replacement (LFX/LFW-Wagon) .
4. Remove the propeller shaft. Refer to Rear Propeller Shaft Replacement (RPO LSA) , Rear Propeller Shaft Replacement (RPO LFX or LFW with MXO) , Rear Propeller Shaft Replacement (RPO LFX or LFW with MX7 or MN6) .

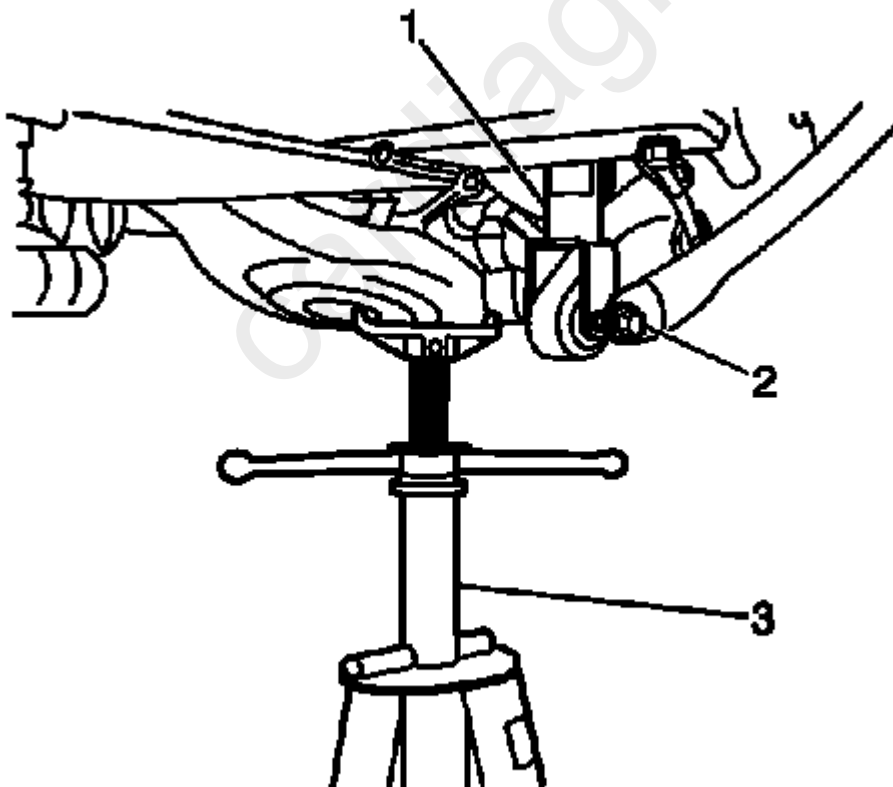


Fig. 11: Supporting Control Arm Using Support Fixture

Courtesy of GENERAL MOTORS COMPANY

NOTE: The lower control arms will drop approximately 3 inches when the shock to lower control arm bolts are removed.

5. Install the support fixture (3), in order to raise the lower control arm to relieve the tension from the shock.
6. Remove the shocks lower mounting bolt (2).
7. Remove the support fixture.
8. Disconnect the electrical connectors for the rear wheel speed sensors (WSS).
9. Disconnect the WSS wiring harness retainer clips from the upper control arms.

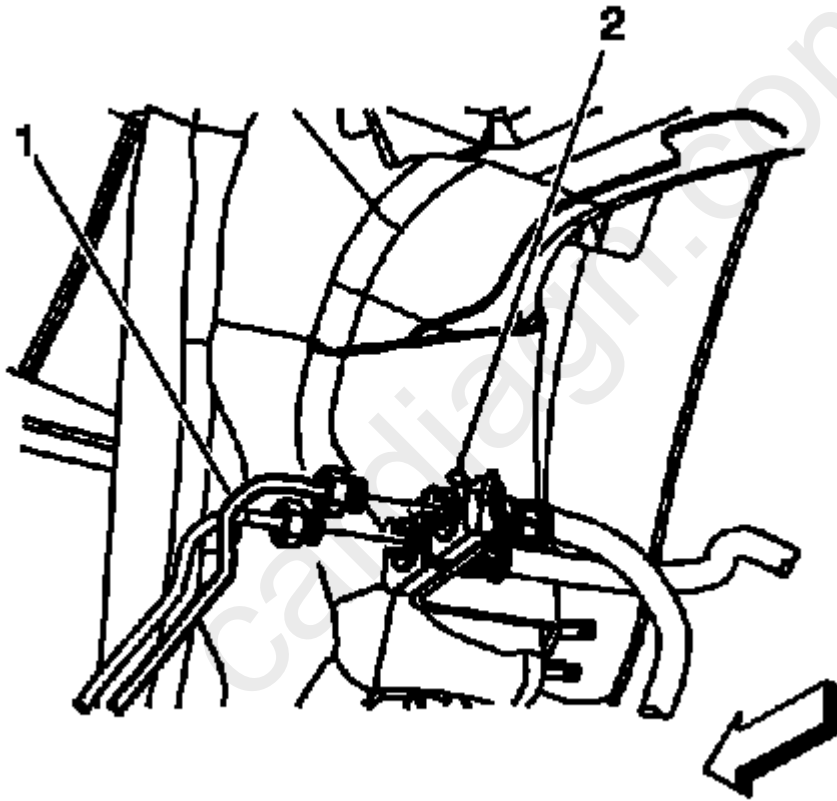


Fig. 12: View Of Rear Brake Pipe Lines

Courtesy of GENERAL MOTORS COMPANY

10. Disconnect the rear brake pipe lines (1) forward of the rear wheelhouse.

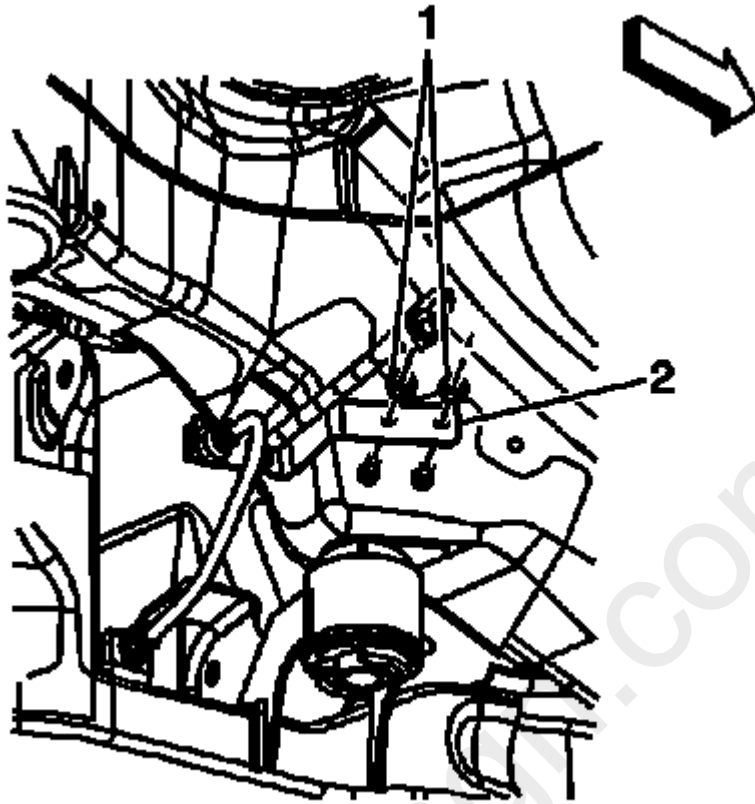


Fig. 13: View Of Intermediate Brake Hose Assembly & Mounting Nuts
Courtesy of GENERAL MOTORS COMPANY

11. Remove the fastener for the brake pipe bracket (1).
12. Remove the brake pipe bracket (2) from the studs in the body.

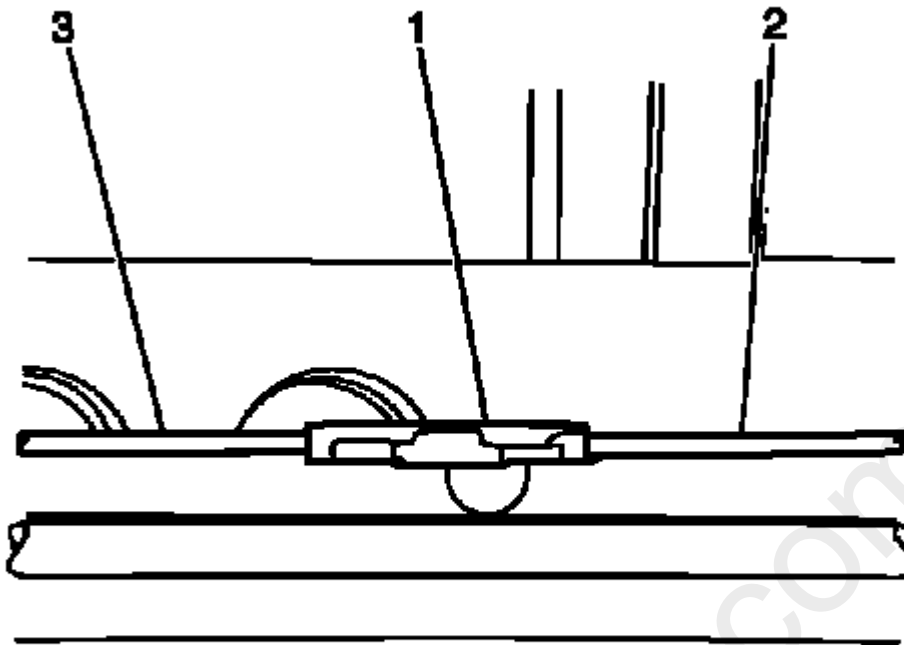


Fig. 14: View Of Park Brake Cable
Courtesy of GENERAL MOTORS COMPANY

13. Disconnect the intermediate park brake cable (2) from the front park brake cable connector.
14. Remove the intermediate park brake cable from body bracket.
15. Position the frame support table **J 39580** engine support stand.

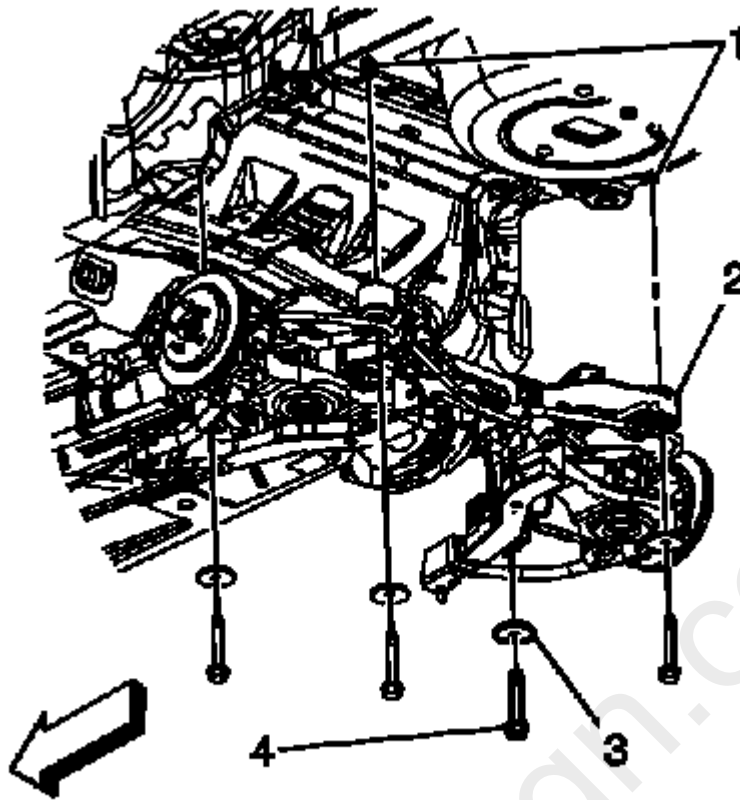


Fig. 15: Frame-To-Body Mounting Bolts & Washers
Courtesy of GENERAL MOTORS COMPANY

16. Remove the frame to body mounting bolts (4) and washers (3).

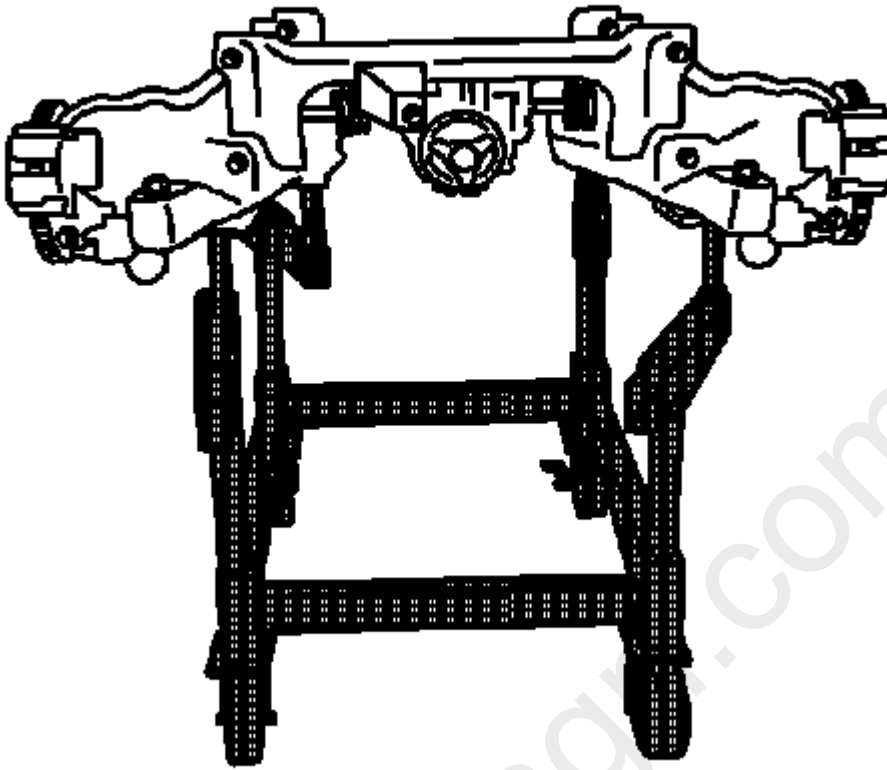


Fig. 16: View Of Support Table

Courtesy of GENERAL MOTORS COMPANY

17. Carefully raise the vehicle from the rear frame assembly.
18. Remove the following components from the rear frame:
 - **Headlamp Leveling Rear Suspension Height Sensor Replacement**
 - **Lower Control Arm Replacement**
 - **Upper Control Arm Replacement**
 - The rear brake pipes
 - **Parking Brake Rear Cable Replacement - Left Side (With Electronic Park Brake) , Parking Brake Rear Cable Replacement - Left Side (Without Electronic Park Brake) , or Parking Brake Rear Cable Replacement - Right Side (Without Electronic Park Brake) , Parking Brake Rear Cable Replacement - Right Side (With Electronic Park Brake)**
 - **Stabilizer Shaft Replacement**
 - **Adjust Link Replacement**
 - **Trailing Arm Replacement**
 - **Stabilizer Shaft Link Replacement**
 - **Rear Brake Caliper Replacement (J56) , Rear Brake Caliper Replacement (JE5, J55)**
 - **Rear Brake Rotor Replacement (J56) , Rear Brake Rotor Replacement (JE5, J55)**

- **Differential Replacement**

19. With the aid from an assistant, remove the frame from the hydraulic jack.

Installation Procedure

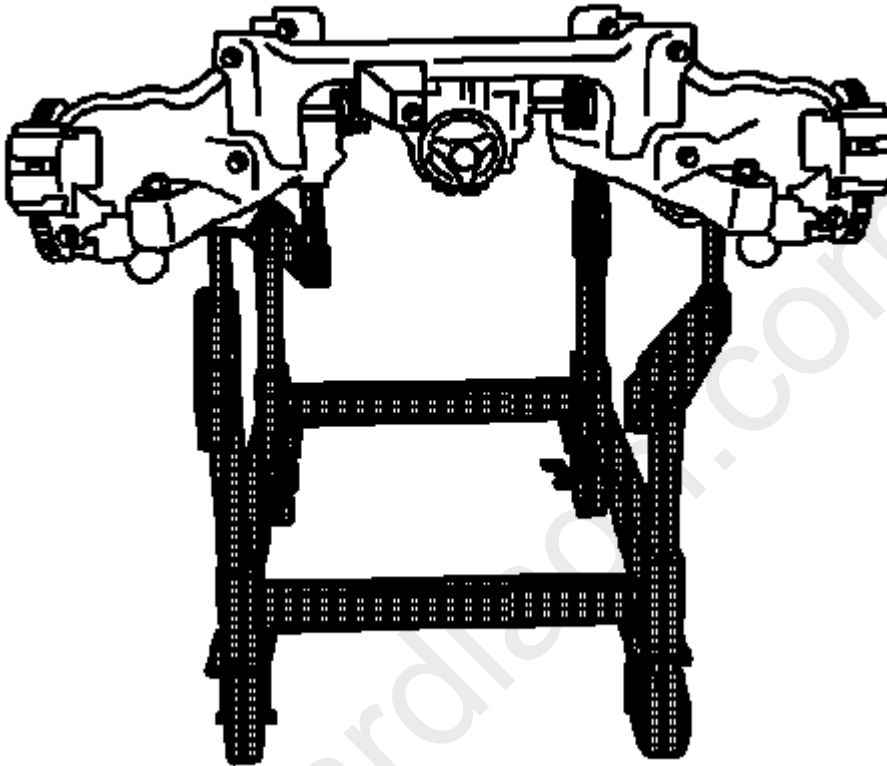


Fig. 17: View Of Support Table

Courtesy of GENERAL MOTORS COMPANY

1. With the aid from an assistant, position and secure the new rear frame on the engine support fixture.
2. Install the following components to the rear frame assembly:
 - **Differential Replacement**
 - **Rear Brake Rotor Replacement (J56) , Rear Brake Rotor Replacement (JE5, J55)**
 - **Rear Brake Caliper Replacement (J56) , Rear Brake Caliper Replacement (JE5, J55)**
 - **Stabilizer Shaft Link Replacement**
 - **Trailing Arm Replacement**
 - **Adjust Link Replacement**
 - **Stabilizer Shaft Replacement**
 - **Parking Brake Rear Cable Replacement - Left Side (With Electronic Park Brake) , Parking Brake Rear Cable Replacement - Left Side (Without Electronic Park Brake) , or Parking**

Brake Rear Cable Replacement - Right Side (Without Electronic Park Brake) , Parking Brake Rear Cable Replacement - Right Side (With Electronic Park Brake)

- The rear brake pipes
- **Upper Control Arm Replacement**
- **Lower Control Arm Replacement**
- **Headlamp Leveling Rear Suspension Height Sensor Replacement**

NOTE: The rear coil springs need to be indexed into the lower spring insulators prior to assembly.

3. Index the rear coil springs to the spring insulators.

NOTE: Ensure the intermediate brake cable is clear of the front frame to body mount prior to securing the frame bolts.

4. Ensure the intermediate park brake cable is positioned over left side frame assembly on the left side.
5. Lower the vehicle to the frame.

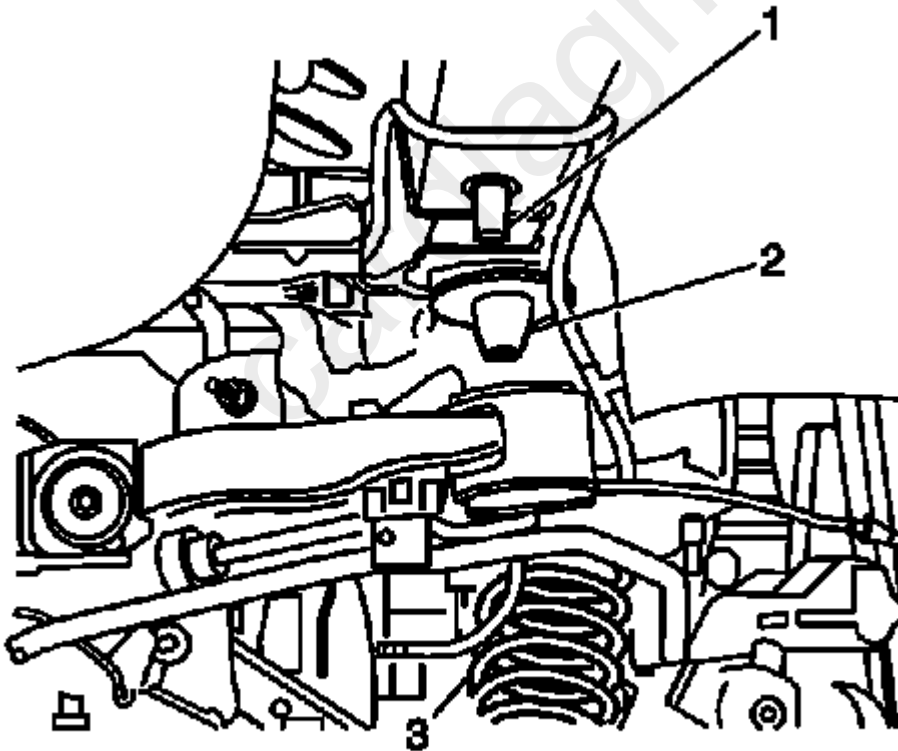


Fig. 18: View Of Rear Locator Sleeves, Upper Spring Insulator & Coil Springs
Courtesy of GENERAL MOTORS COMPANY

6. Position the coil springs (3) to the upper spring insulator (2).

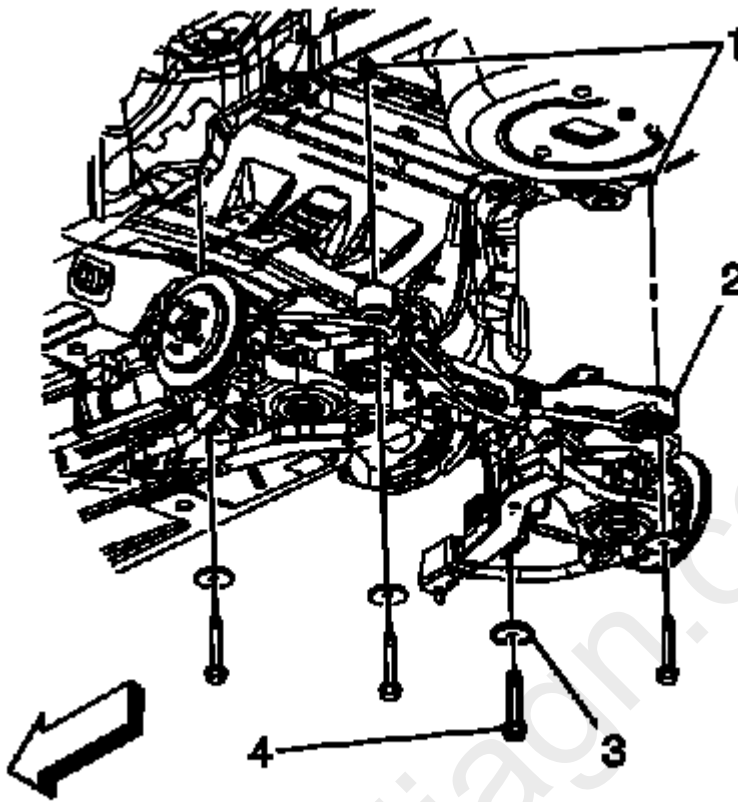


Fig. 19: Frame-To-Body Mounting Bolts & Washers
Courtesy of GENERAL MOTORS COMPANY

7. Index the rear side frame mounts to the rear locator sleeves (1) located on the body.
8. Lower the vehicle until the frame mounts contact the body rail.

CAUTION: Refer to Fastener Caution .

9. Install the rear frame washers (3) and anchor bolts (4).
 - Tighten the front bolts to 200 (148 lb ft) + 65 Degrees.
 - Tighten the rear bolts to 100 (74 lb ft) + 90 Degrees.
10. Raise the vehicle.
11. Remove the **J 39580** engine support stand.

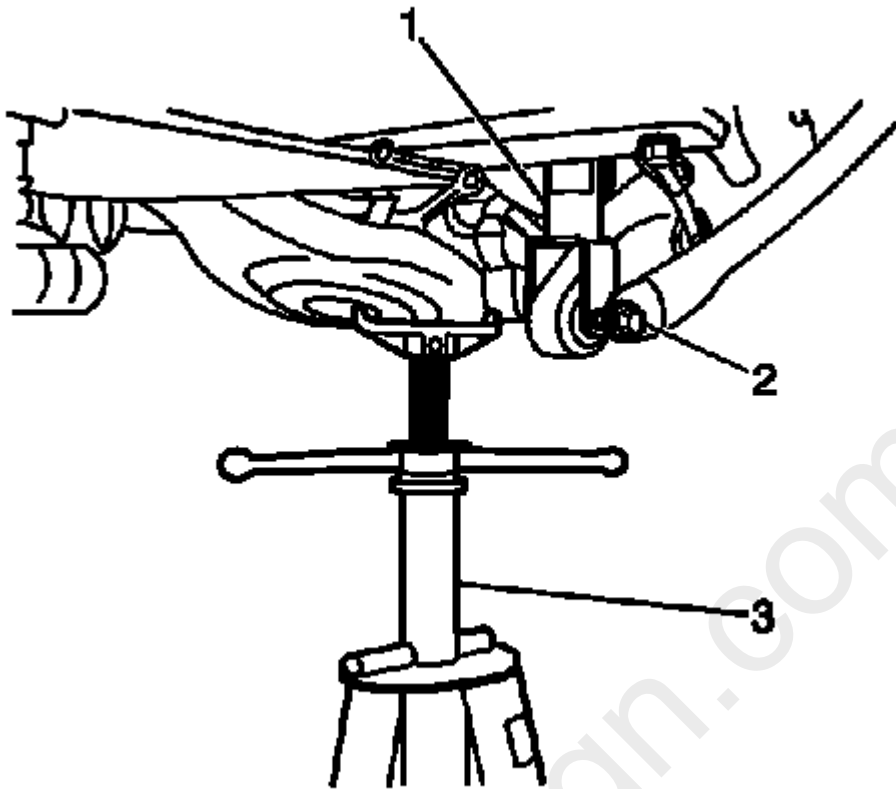


Fig. 20: Supporting Control Arm Using Support Fixture
Courtesy of GENERAL MOTORS COMPANY

12. Install the support fixture (3) in order to raise the lower control arms for ease of lower shock bolt installation (2).
13. Install the lower shock bolt (2) to 150 (111 lb ft).
14. Repeat the above step for the other side.
15. Remove the support fixture (3).
16. Install the intermediate park brake cable to the body bracket.

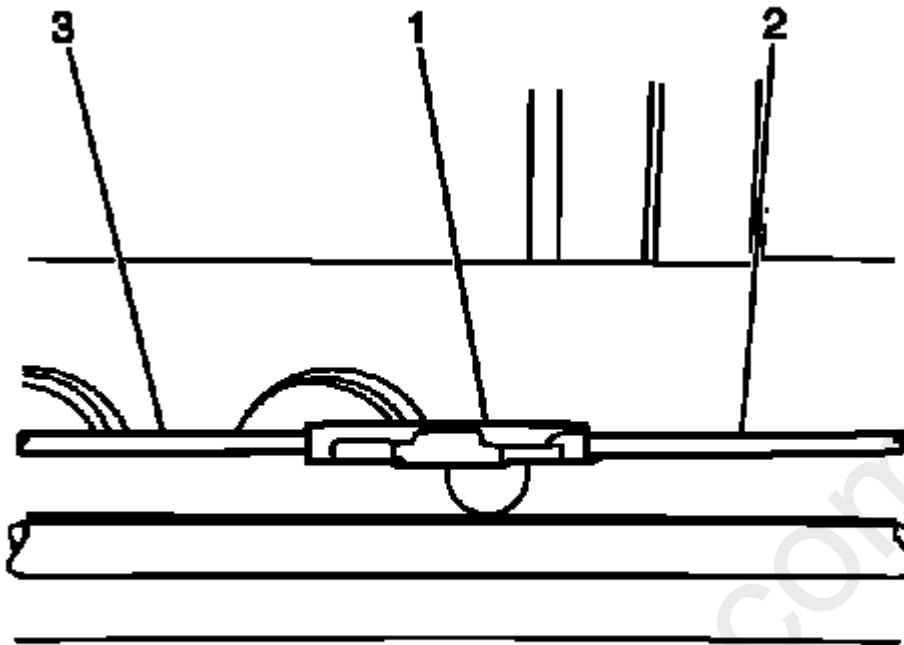


Fig. 21: View Of Park Brake Cable
Courtesy of GENERAL MOTORS COMPANY

17. Connect the intermediate park brake cable (2) to the front park brake cable connector.

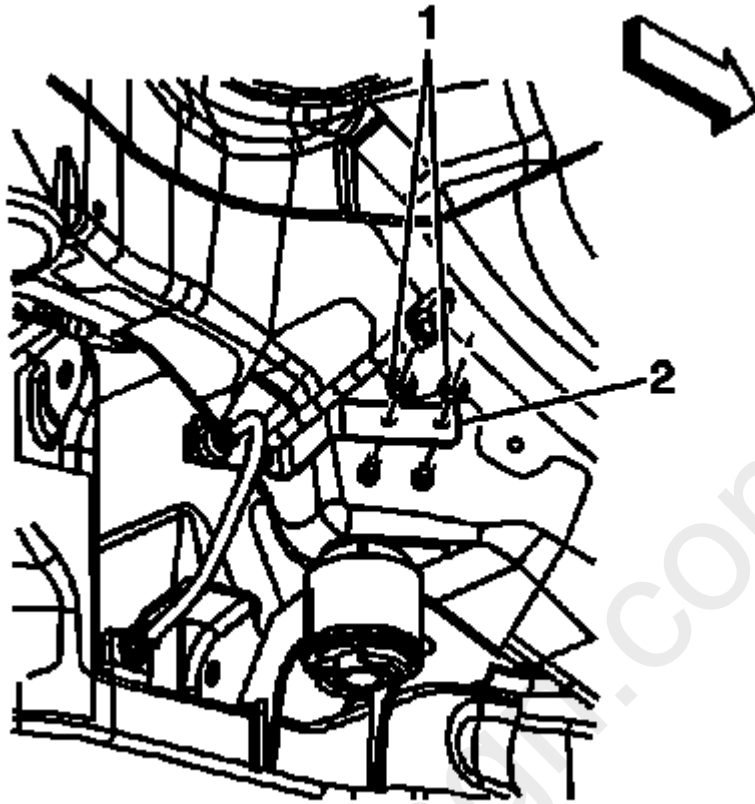


Fig. 22: View Of Intermediate Brake Hose Assembly & Mounting Nuts
Courtesy of GENERAL MOTORS COMPANY

18. Position the brake pipe bracket (2) to the body studs.
19. Install the brake pipe bracket retaining nuts (1) and tighten to 10 (89 lb in).

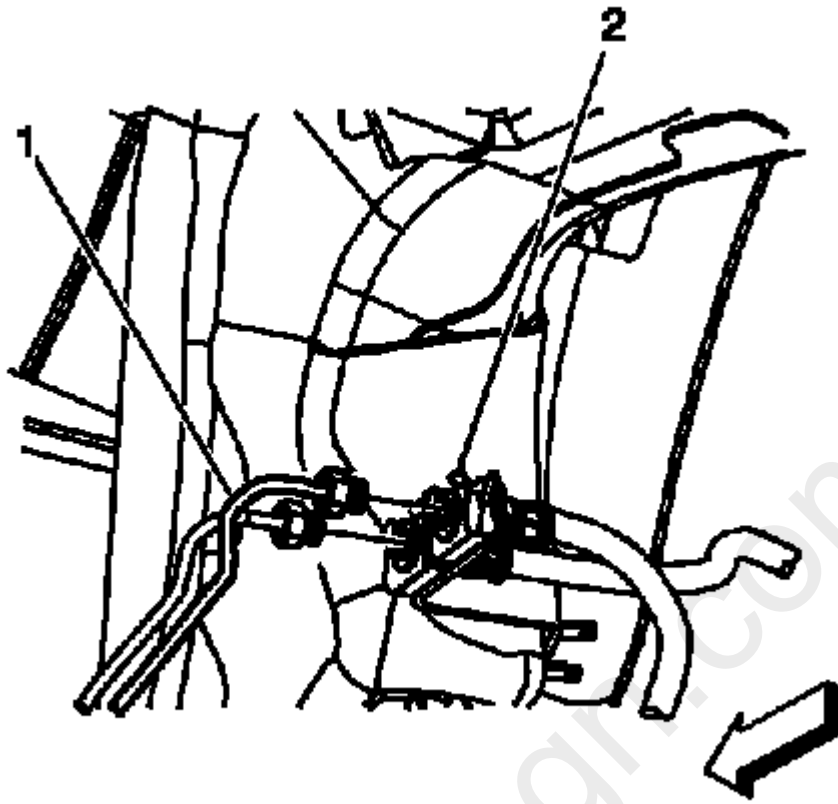


Fig. 23: View Of Rear Brake Pipe Lines
Courtesy of GENERAL MOTORS COMPANY

20. Connect the rear brake lines (1) at the forward rear wheelhouse and tighten the lines to 15 (11 lb ft).
21. Connect the rear WSS electrical connectors.
22. Secure the WSS electrical harness retainer clips to the upper control arms.
23. Install the propeller shaft. Refer to **Rear Propeller Shaft Replacement (RPO LSA)** , **Rear Propeller Shaft Replacement (RPO LFX or LFW with MXO)** , **Rear Propeller Shaft Replacement (RPO LFX or LFW with MX7 or MN6)** .
24. Install the exhaust system. Refer to **Exhaust System Replacement (LSA-Coupe)** , **Exhaust System Replacement (LSA-Wagon)** , **Exhaust System Replacement (Single Exhaust)** , **Exhaust System Replacement (LFX/LFW-Coupe)** , **Exhaust System Replacement (LFX/LFW-Wagon)** .
25. Install the rear wheels. Refer to **Tire and Wheel Removal and Installation** .
26. Lower the vehicle.
27. Bleed the hydraulic brake system. Refer to **Hydraulic Brake System Bleeding (Manual)** , **Hydraulic Brake System Bleeding (Pressure)** .
28. Align the vehicle. Refer to **Wheel Alignment Measurement** .

FRONT WHEELHOUSE LINER REPLACEMENT

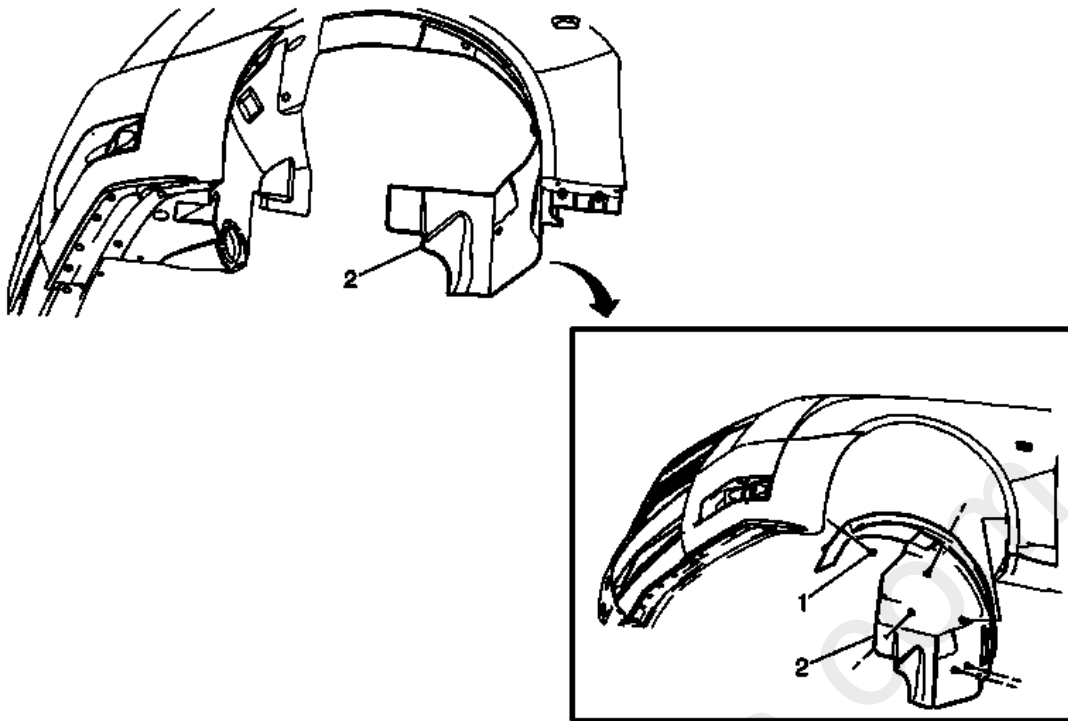


Fig. 24: Front Wheelhouse Liner
 Courtesy of GENERAL MOTORS COMPANY

Front Wheelhouse Liner Replacement

Callout	Component Name
Preliminary Procedure	
Remove the engine splash shield. Refer to <u>Engine Splash Shield Replacement</u> .	
1	Front Wheelhouse Liner Push-Pin (Qty: 4)
2	Front Wheelhouse Liner

REAR WHEELHOUSE LINER REPLACEMENT (COUPE)

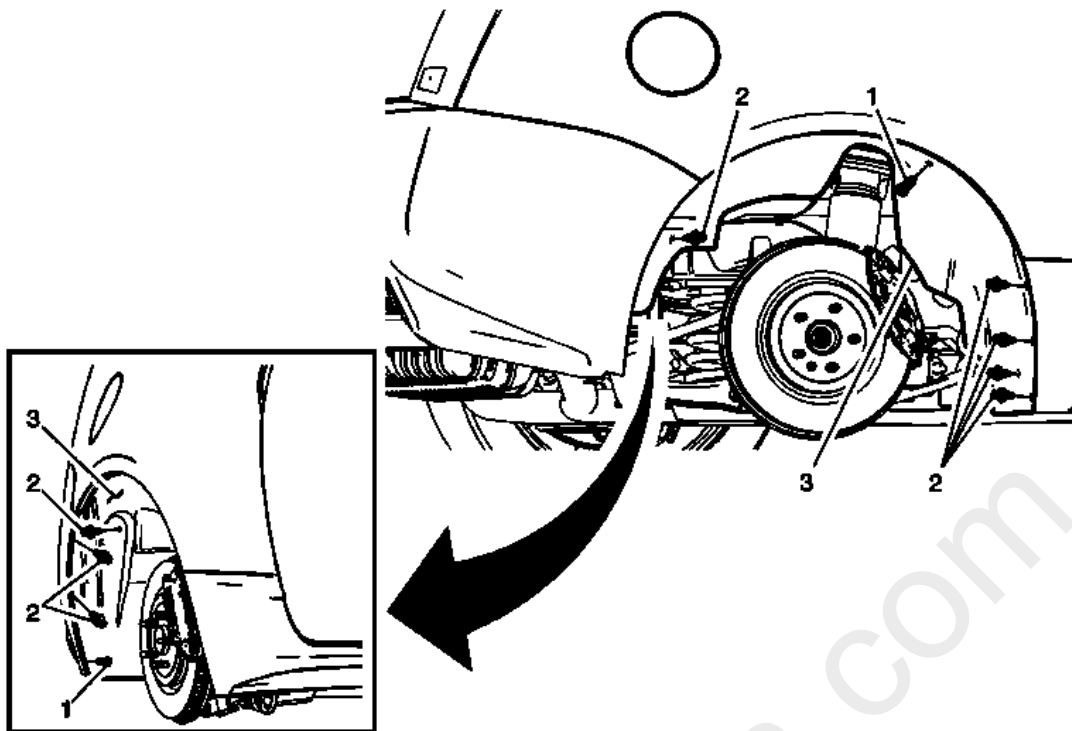


Fig. 25: Rear Wheelhouse Panel Liner, Retainers & Screws
 Courtesy of GENERAL MOTORS COMPANY

Rear Wheelhouse Liner Replacement (Coupe)

Callout	Component Name
Preliminary Procedure Remove the tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> .	
1	Rear Wheelhouse Panel Liner Screw (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 3 N.m (27 lb in)
2	Rear Wheelhouse Panel Liner Push-In Retainer (Qty: 8)
3	Rear Wheelhouse Panel Liner

REAR WHEELHOUSE LINER REPLACEMENT (WAGON)

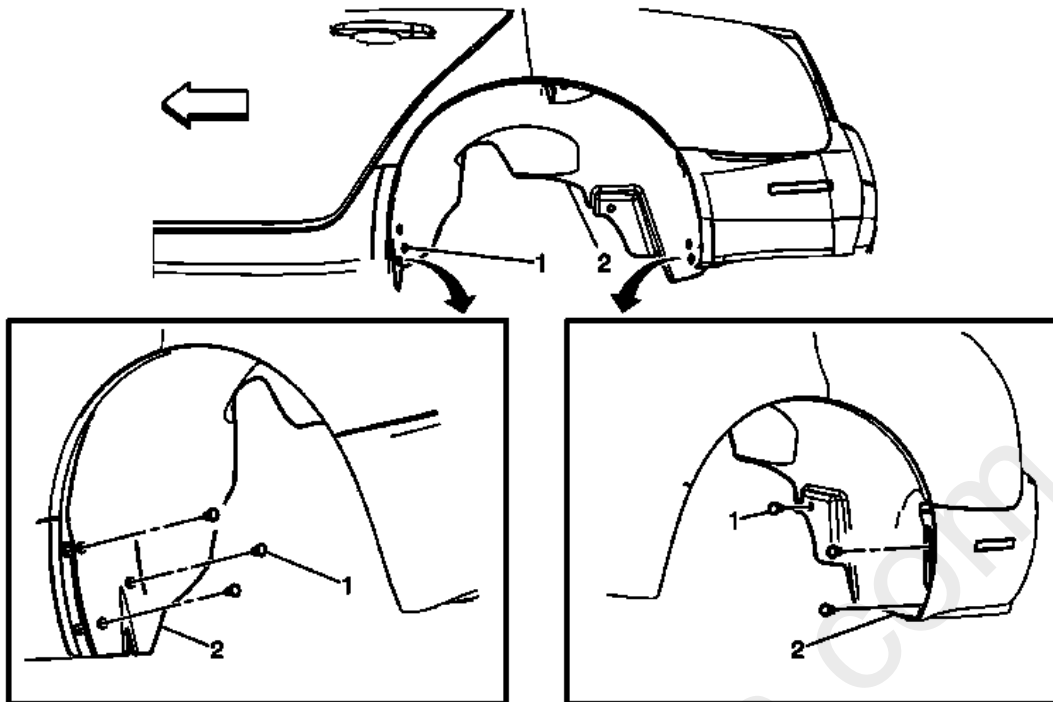


Fig. 26: Rear Wheelhouse Liner Panel
 Courtesy of GENERAL MOTORS COMPANY

Rear Wheelhouse Liner Replacement (Wagon)

Callout	Component Name
Preliminary Procedure	
Remove the tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> .	
1	Rear Wheelhouse Panel Liner Plastic Retainer (Qty: 6)
2	Rear Wheelhouse Panel Liner

WHEELHOUSE EXTENSION REPLACEMENT

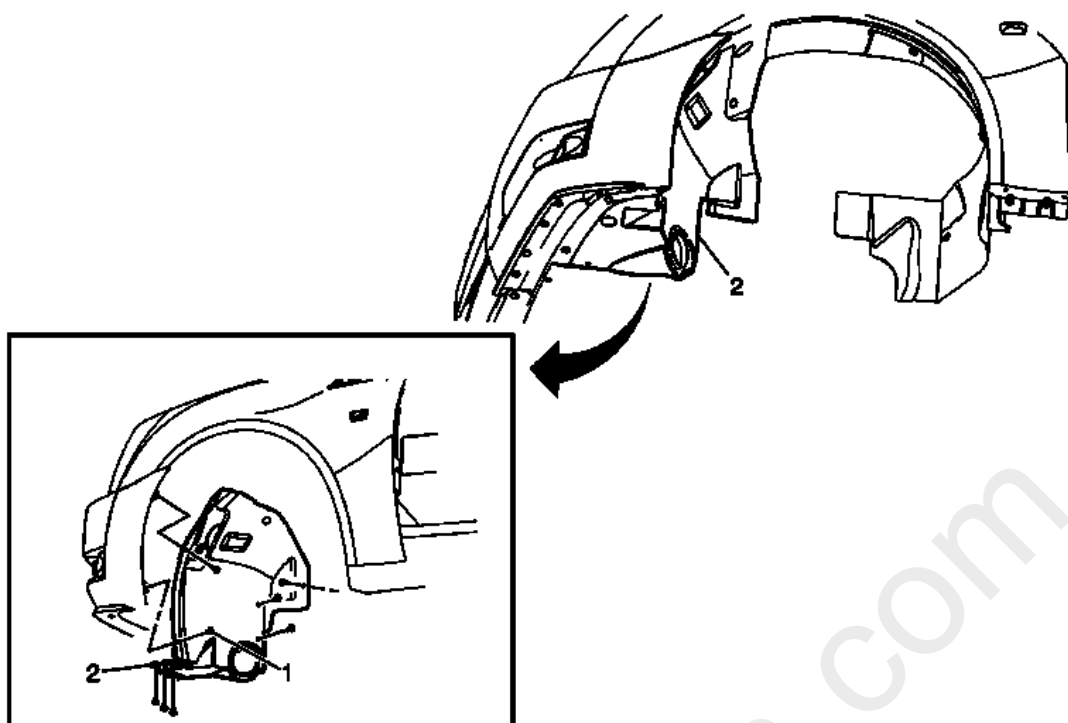


Fig. 27: Wheelhouse Extension

Courtesy of GENERAL MOTORS COMPANY

Wheelhouse Extension Replacement

Callout	Component Name
Preliminary Procedures	
1.	Remove the engine splash shield. Refer to <u>Engine Splash Shield Replacement.</u>
2.	Remove the front fender liner. Refer to <u>Front Wheelhouse Liner Replacement.</u>
1	Wheelhouse Extension Push-Pin (Qty: 8)
2	Wheelhouse Extension TIP: Turn the extension to the side to remove.

FRONT BRAKE ROTOR COOLING DUCT REPLACEMENT (EUROPEAN)

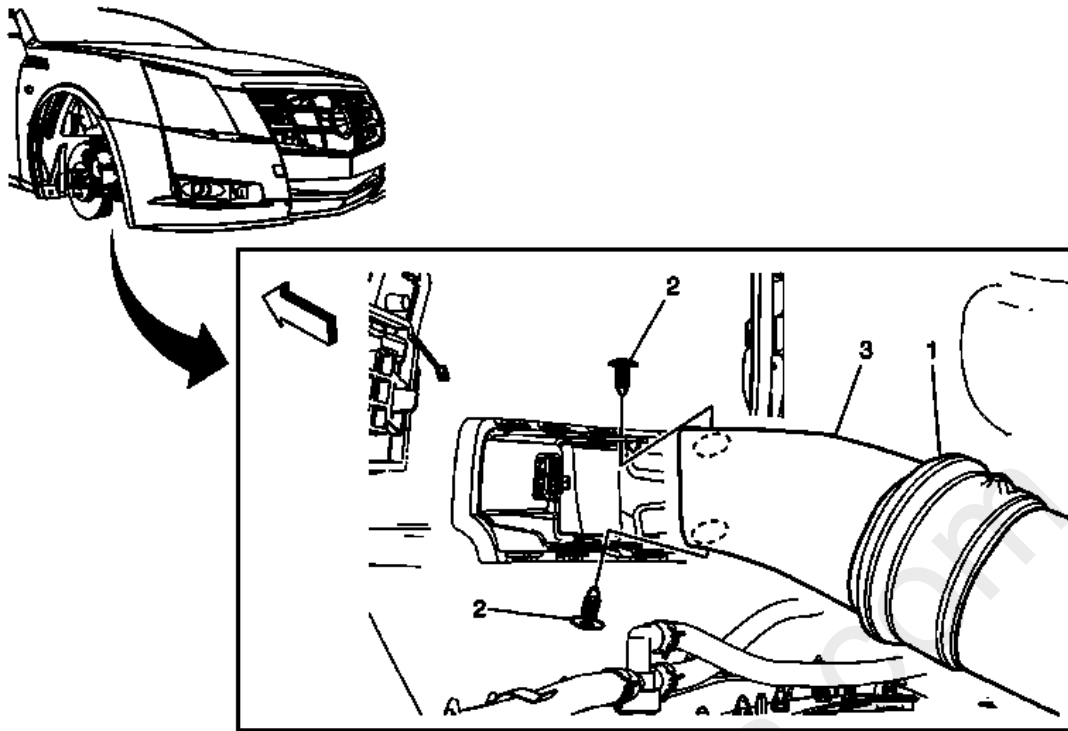


Fig. 28: Front Brake Caliper Cooling Duct (European)

Courtesy of GENERAL MOTORS COMPANY

Front Brake Rotor Cooling Duct Replacement (European)

Callout	Component Name
Preliminary Procedure	
Remove the front wheelhouse extension. Refer to <u>Wheelhouse Extension Replacement.</u>	
1	Front Brake Caliper Cooling Duct Rear
2	Front Brake Caliper Cooling Duct Retainer (Qty: 2) TIP: Use a suitable tool in order to remove the brake caliper cooling duct retainers.
3	Front Brake Caliper Cooling Duct Front TIP: Remove the duct from the bottomside of the windshield washer container assembly.

FRONT BRAKE ROTOR COOLING DUCT REPLACEMENT (NORTH AMERICA)

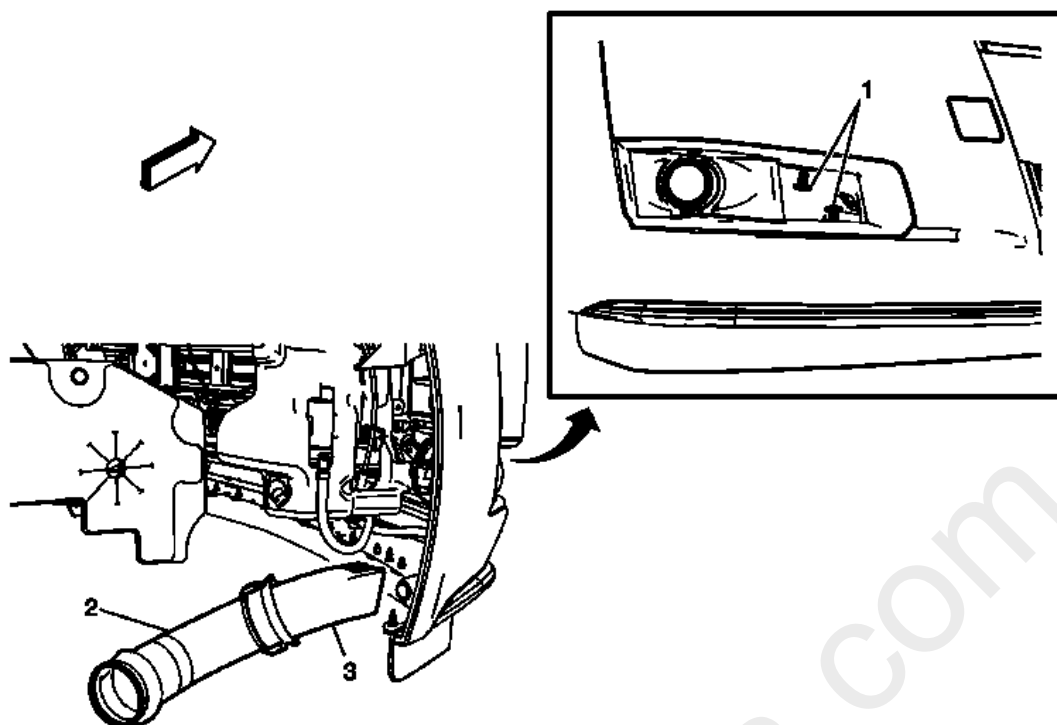


Fig. 29: Front Brake Caliper Cooling Duct (North America)

Courtesy of GENERAL MOTORS COMPANY

Front Brake Rotor Cooling Duct Replacement (North America)

Callout	Component Name
Preliminary Procedure	
Remove the front wheelhouse extension. Refer to <u>Wheelhouse Extension Replacement</u> .	
1	Front Brake Caliper Cooling Duct Retainer (Qty: 2) TIP: Use a suitable tool in order to remove the brake caliper cooling duct retainers from the front side of the bumper fascia.
2	Front Brake Caliper Cooling Duct Rear
3	Front Brake Caliper Cooling Duct Front TIP: Remove the duct from the front fog lamp bezel assembly.

ENGINE SPLASH SHIELD REPLACEMENT

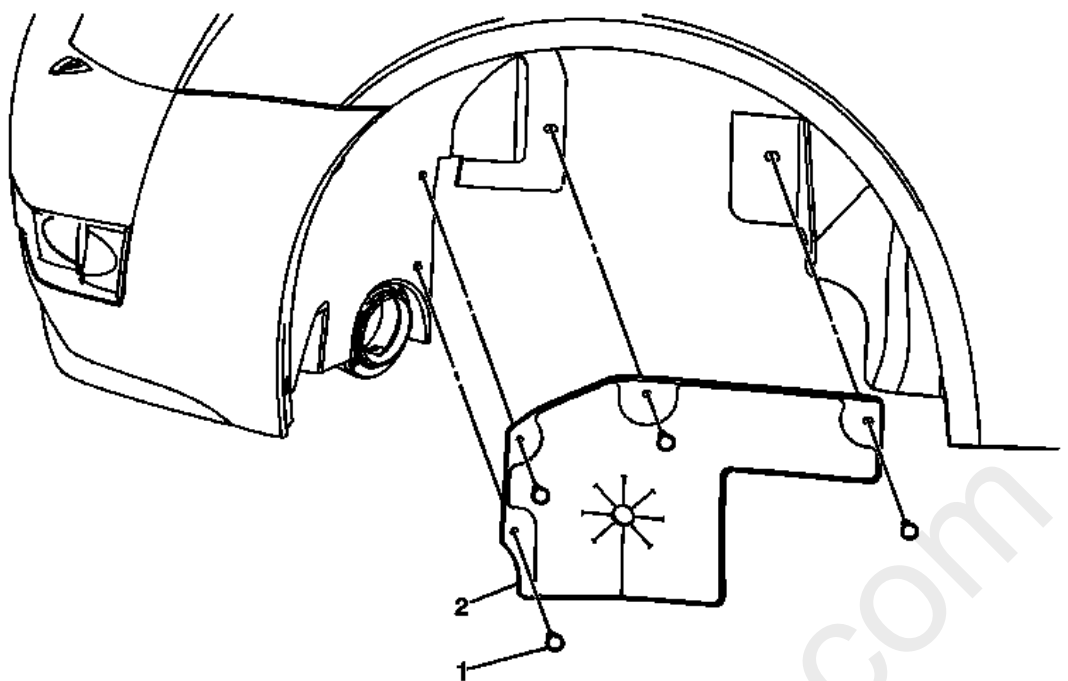


Fig. 30: Engine Splash Shield

Courtesy of GENERAL MOTORS COMPANY

Engine Splash Shield Replacement

Callout	Component Name
Preliminary Procedure	
Remove the tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> .	
1	Engine Splash Shield Plastic Retainer (Qty: 4)
2	Engine Splash Shield

TRANSMISSION SUPPORT REPLACEMENT (MANUAL EXCEPT CTS-V)

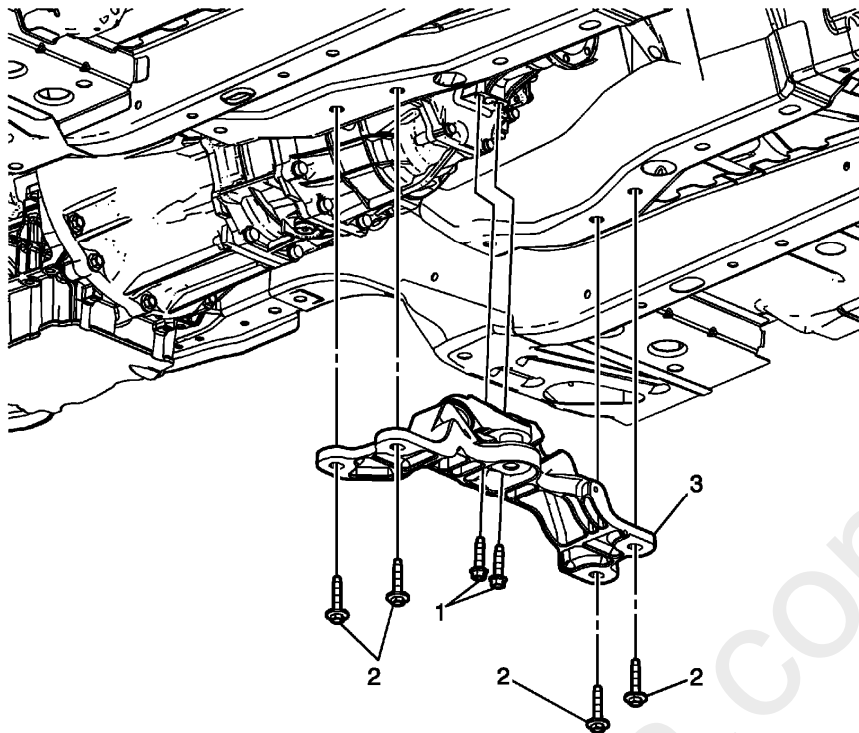


Fig. 31: Transmission Support (Manual Transmission)

Courtesy of GENERAL MOTORS COMPANY

Transmission Support Replacement (Manual except CTS-V)

Callout	Component Name
Preliminary Procedures	
1. Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Support the transmission.	
1	Transmission Mount Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 60 N.m (44 lb ft)
2	Transmission Support Bolt (Qty: 4) Tighten 60 N.m (44 lb ft)
3	Transmission Support

TRANSMISSION SUPPORT REPLACEMENT (AUTOMATIC RWD EXCEPT CTS-V)

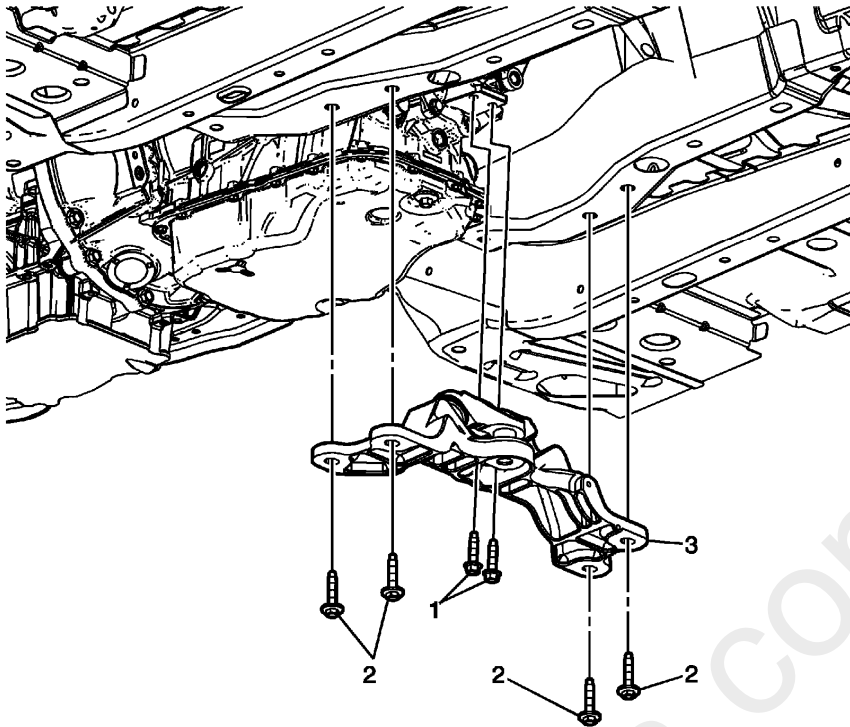


Fig. 32: Transmission Support (Automatic Transmission)
 Courtesy of GENERAL MOTORS COMPANY

Transmission Support Replacement (Automatic RWD except CTS-V)

Callout	Component Name
Preliminary Procedures 1. Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Support the transmission.	
1	Transmission Mount Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 60 N.m (44 lb ft)
2	Transmission Support Bolt (Qty: 4) Tighten 60 N.m (44 lb ft)
3	Transmission Support

TRANSMISSION SUPPORT REPLACEMENT (AUTOMATIC CTS-V)

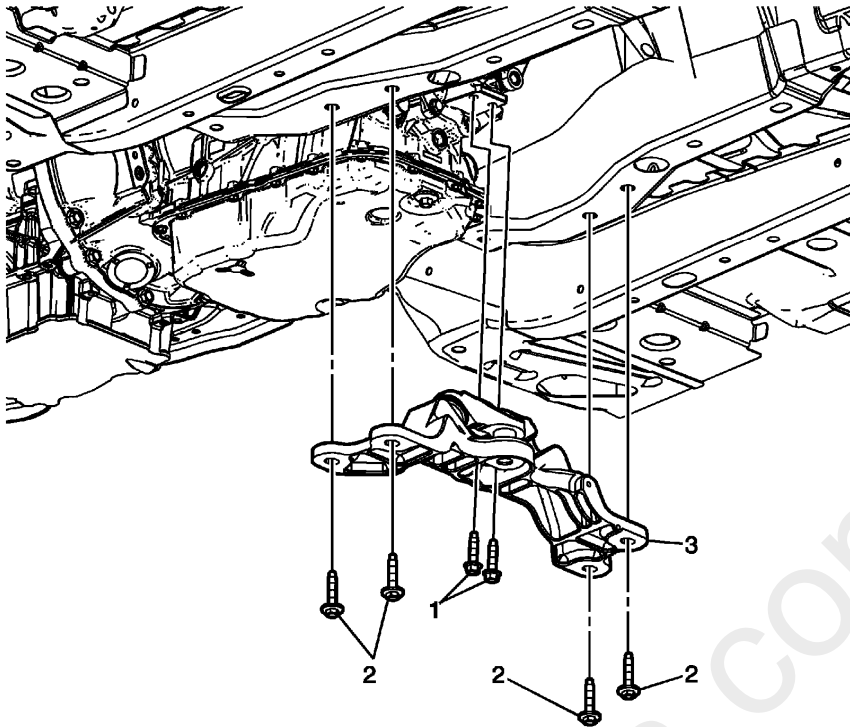


Fig. 33: Transmission Support Replacement (Automatic Transmission)
 Courtesy of GENERAL MOTORS COMPANY

Transmission Support Replacement (Automatic CTS-V)

Callout	Component Name
Preliminary Procedures	
1. Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Support the transmission.	
1	Transmission Mount Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 80 N.m (59 lb ft)
2	Transmission Support Bolt (Qty: 4) Tighten 60 N.m (44 lb ft)
3	Transmission Support

TRANSMISSION SUPPORT REPLACEMENT (MANUAL CTS-V)

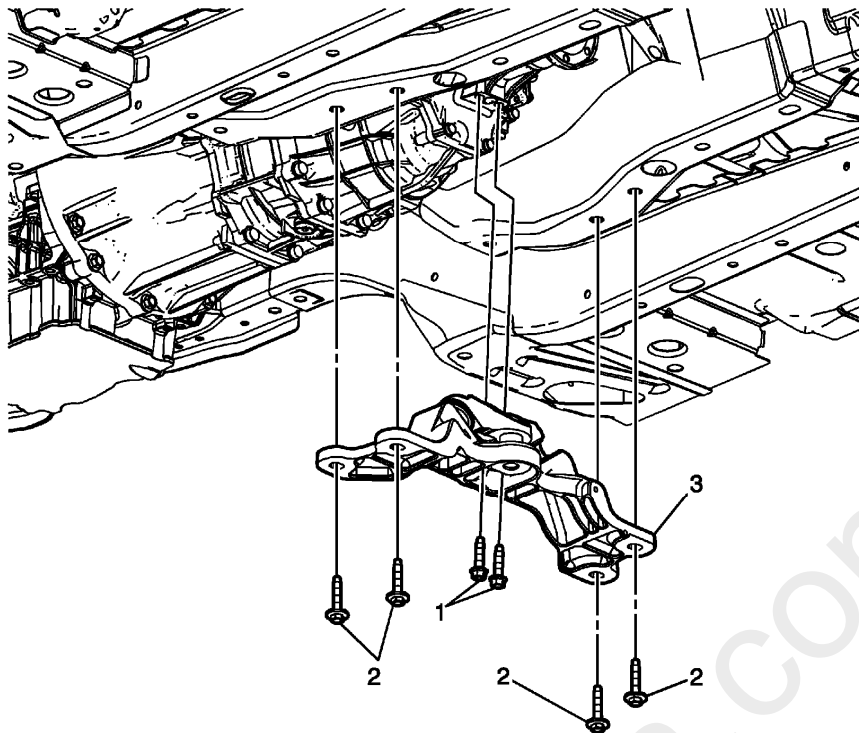


Fig. 34: Transmission Support (Manual Transmission)

Courtesy of GENERAL MOTORS COMPANY

Transmission Support Replacement (Manual CTS-V)

Callout	Component Name
Preliminary Procedures	
1. Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Support the transmission.	
1	Transmission Mount Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 80 N.m (59 lb ft)
2	Transmission Support Bolt (Qty: 4) Tighten 60 N.m (44 lb ft)
3	Transmission Support

TRANSMISSION SUPPORT REPLACEMENT (AUTOMATIC AWD)

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle
2. Remove the exhaust system from the vehicle. Refer to Exhaust System Replacement (LSA-Coupe) , Exhaust System Replacement (LSA-Wagon) , Exhaust System Replacement (Single Exhaust) , Exhaust System Replacement (LFX/LFW-Coupe) , Exhaust System Replacement (LFX/LFW-Wagon)

NOTE: The engine mounts must NOT bend or deflect from the vertical position, damage to the mount will occur.

3. Support the transmission with a suitable jack and a block of wood.

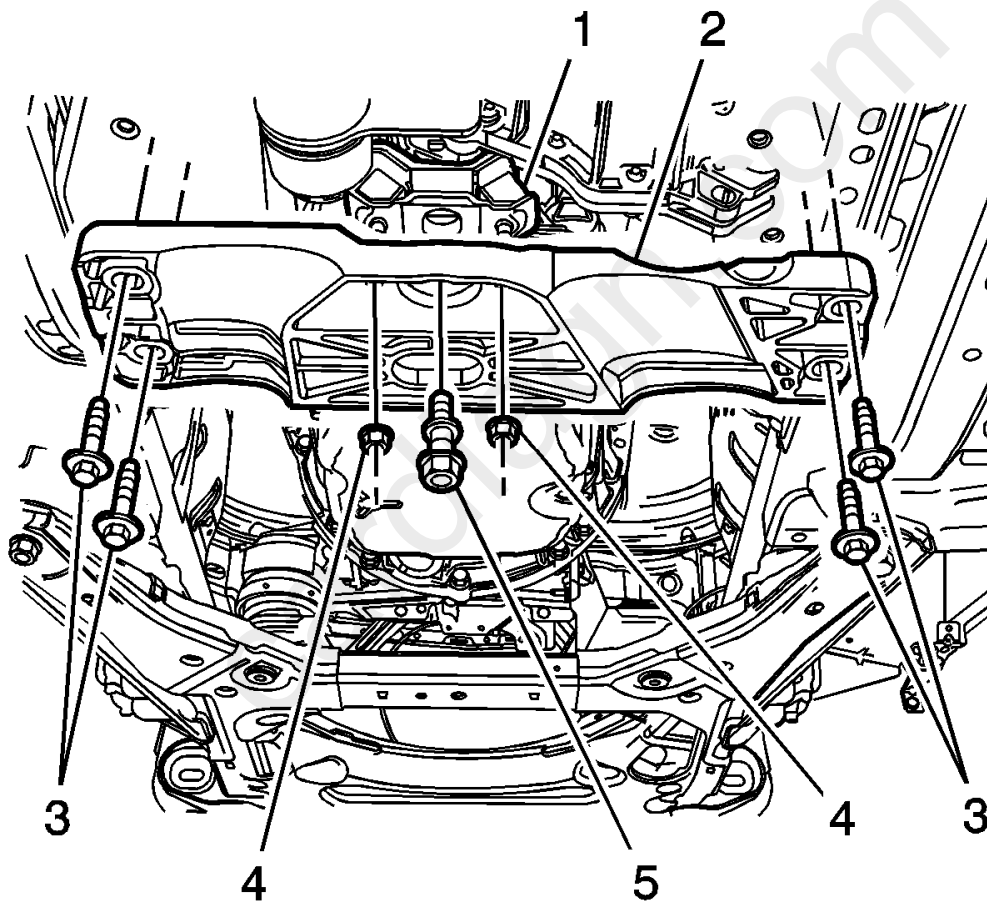


Fig. 35: Identifying Transmission Support, Restrictor And Retaining Bolts
Courtesy of GENERAL MOTORS COMPANY

4. Remove the travel mount restrictor bolt (5).
5. Remove the transmission support retaining bolts (3), then remove the transmission support (2) from the vehicle

Installation Procedure

1. Install the transmission support.

NOTE: The engine mounts must NOT bend or deflect from the vertical position, damage to the mount will occur.

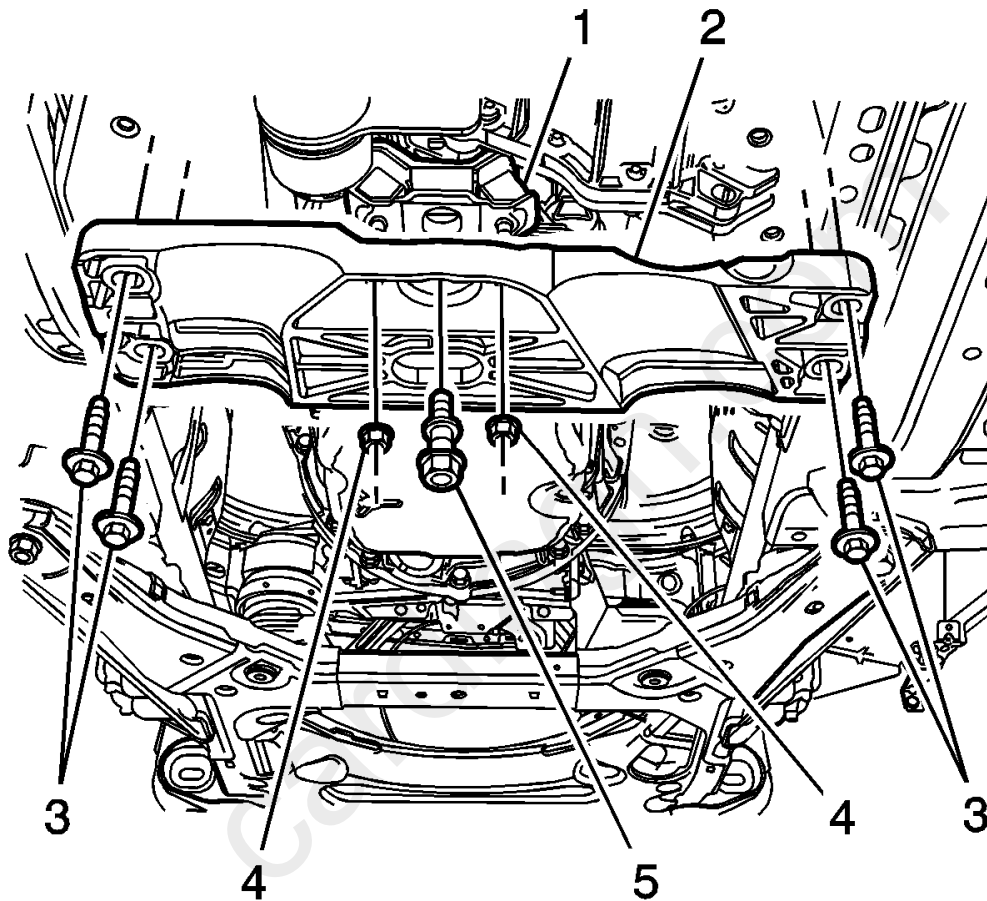


Fig. 36: Identifying Transmission Support, Restrictor And Retaining Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

2. Install the transmission support bolts (3) and tighten to 60 N.m (44 lb ft)
3. Install the transmission travel mount restrictor bolt and tighten to 100 N.m (74 lb ft)
4. Remove the support from under the transmission.
5. Install the exhaust system from the vehicle. Refer to Exhaust System Replacement (LSA-Coupe) ,

Exhaust System Replacement (LSA-Wagon) , Exhaust System Replacement (Single Exhaust) , Exhaust System Replacement (LFX/LFW-Coupe) , Exhaust System Replacement (LFX/LFW-Wagon)

6. Lower the vehicle.

TRANSMISSION SUPPORT ADJUSTMENT (MANUAL EXCEPT CTS-V)

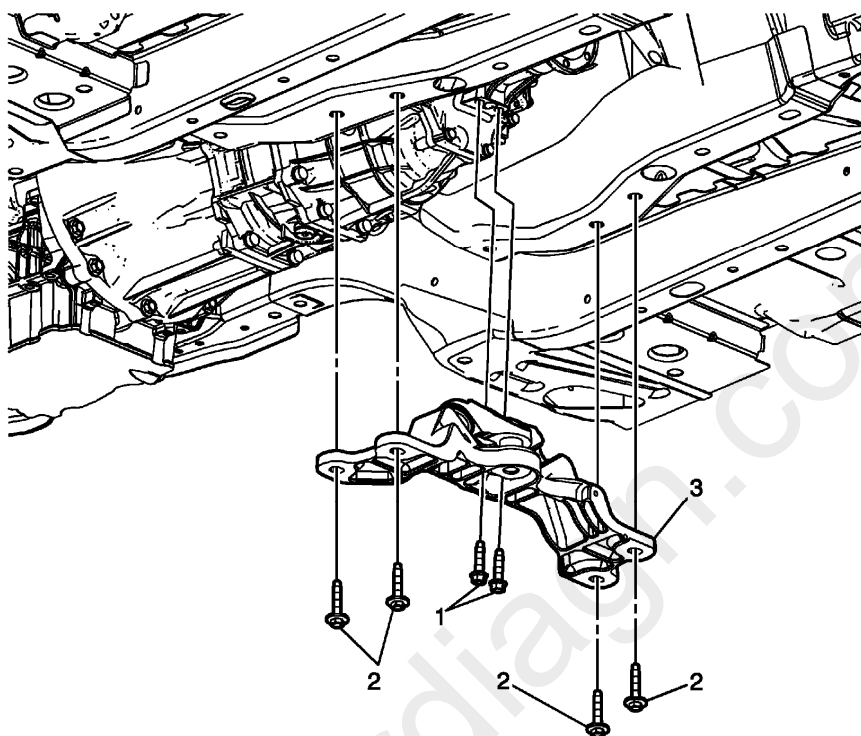


Fig. 37: Transmission Support Replacement (Manual Transmission)
Courtesy of GENERAL MOTORS COMPANY

Transmission Support Adjustment (Manual except CTS-V)

Callout	Component Name
Preliminary Procedures	
1. Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Support the transmission. 3. Loosen the four transmission support to body bolts. 4. Loosen the two mount to transmission tail cone bolts. 5. Reposition the transmission mount and support.	
	Transmission Mount Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> .

1	Procedure Re-torque the two mount to transmission tail cone bolts first. TIP: Ensure transmission support is perpendicular to the driveline or parallel to the body. Tighten 60 N.m (44 lb ft)
2	Transmission Support Bolt (Qty: 4) Procedure Re-torque the four transmission support to body bolts. Tighten 60 N.m (44 lb ft)
3	Transmission Support Procedure Inspect to make certain the vertical travel limiter is not binding against support.

TRANSMISSION SUPPORT ADJUSTMENT (AUTOMATIC RWD EXCEPT CTS-V)

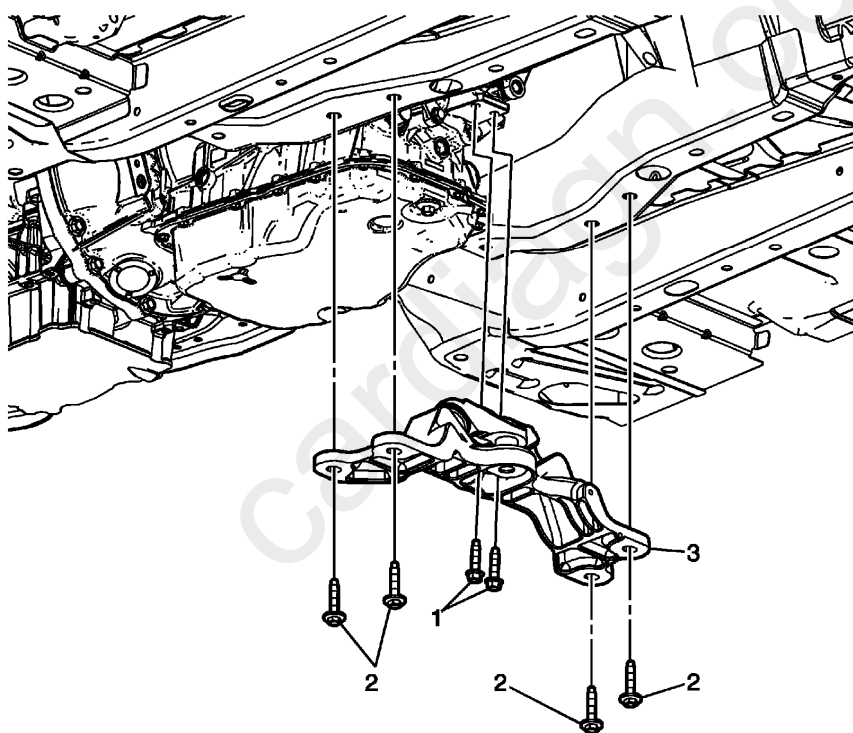


Fig. 38: Transmission Support Replacement (Automatic Transmission)
Courtesy of GENERAL MOTORS COMPANY

Transmission Support Adjustment (Automatic RWD except CTS-V)

Callout	Component Name
Preliminary Procedures	
1.	Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .

	2. Support the transmission. 3. Loosen the four transmission support to body bolts. 4. Loosen the two mount to transmission tail cone bolts. 5. Reposition the transmission mount and support.
1	Transmission Mount Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Procedure Re-torque the two mount to transmission tail cone bolts first. TIP: Ensure transmission support is perpendicular to the driveline or parallel to the body. Tighten 60 N.m (44 lb ft)
2	Transmission Support Bolt (Qty: 4) Procedure Re-torque the four transmission support to body bolts. Tighten 60 N.m (44 lb ft)
3	Transmission Support Procedure Inspect to make certain is not the vertical travel limiter binding against support.

TRANSMISSION SUPPORT ADJUSTMENT (AUTOMATIC CTS-V)

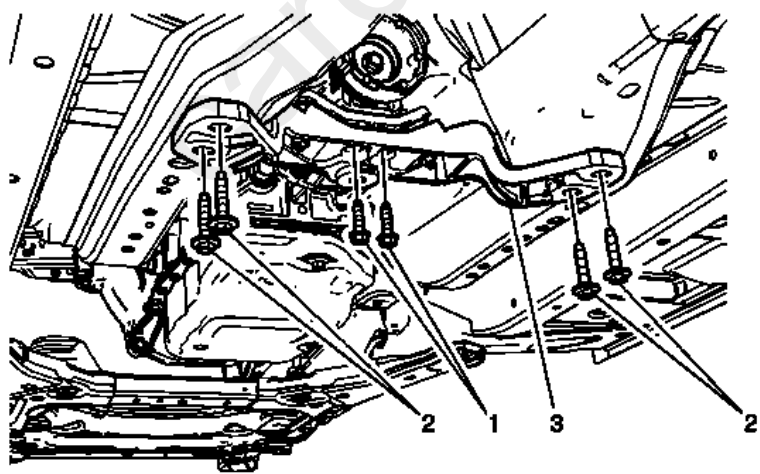


Fig. 39: Transmission Support (Manual CTS-V)
 Courtesy of GENERAL MOTORS COMPANY

Transmission Support Adjustment (Automatic CTS-V)

Callout	Component Name
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Preliminary Procedures

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Support the transmission.
3. Loosen the four transmission support to body bolts.
4. Loosen the two mount to transmission tail cone bolts.
5. Reposition the transmission the mount and support.

1	Transmission Mount Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Procedure Re-torque the two mount to transmission tail cone bolts first. TIP: Ensure transmission support is perpendicular to the driveline or parallel to the body. Tighten 80 N.m (59 lb ft)
2	Transmission Support Bolt (Qty: 4) Procedure Re-torque the four transmission support to body bolts. Tighten 60 N.m (44 lb ft)
3	Transmission Support Procedure Inspect to make certain the vertical travel limiter is not binding against support.

TRANSMISSION SUPPORT ADJUSTMENT (MANUAL CTS-V)

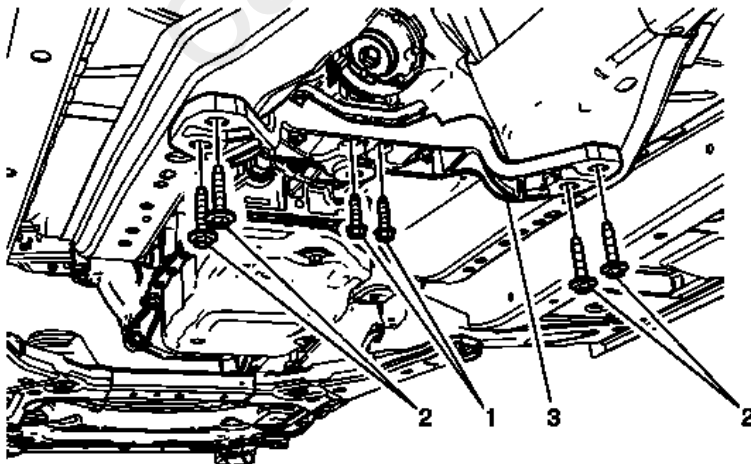


Fig. 40: Transmission Support (Manual CTS-V)
Courtesy of GENERAL MOTORS COMPANY

Transmission Support Adjustment (Manual CTS-V)

Callout	Component Name
Preliminary Procedures 1. Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Support the transmission. 3. Loosen the four transmission support to body bolts. 4. Loosen the two mount to transmission tail cone bolts. 5. Reposition the transmission mount and support.	
1	Transmission Mount Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Procedure Re-torque the two mount to transmission tail cone bolts first. TIP: Ensure transmission support is perpendicular to the driveline or parallel to the body. Tighten 80 N.m (59 lb ft)
2	Transmission Support Bolt (Qty: 4) Procedure Re-torque the four transmission support to body bolts. Tighten 60 N.m (44 lb ft)
3	Transmission Support Procedure Inspect to make certain the vertical travel limiter is not binding against support.

UNDERBODY INSPECTION

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Check for obvious deterioration of the floor pan.
3. Check for loose dirt and corrosion around the inside of the floor pan reinforcement member access holes. This is the first indication that corrosion may exist in hidden areas, and repairs may be required before the final cleaning and protective treatment is performed.
4. Using a chisel, ensure that the drain provisions in the floor pan reinforcement members are open. There are drain holes in the body side panels also. These holes can be opened using a punch or a drift. The side panel drain holes are in the rear section of the rocker panels, and in the lower rear quarter panels.

DESCRIPTION AND OPERATION

FRAME AND UNDERBODY DESCRIPTION

The following components are supported by a front crossmember frame which is rigidly bolted to the body rail at 4 locations:

- The engine
- The transmission mounts
- The front suspension lower control arms
- The steering linkage

The following components are supported by the rear suspension frame which is attached to the body rail through rubber insulators at 3 locations:

- The rear differential
- The rear axles
- The rear suspension components

The underbody frames must be properly aligned to maintain the correct suspension and wheel alignment.

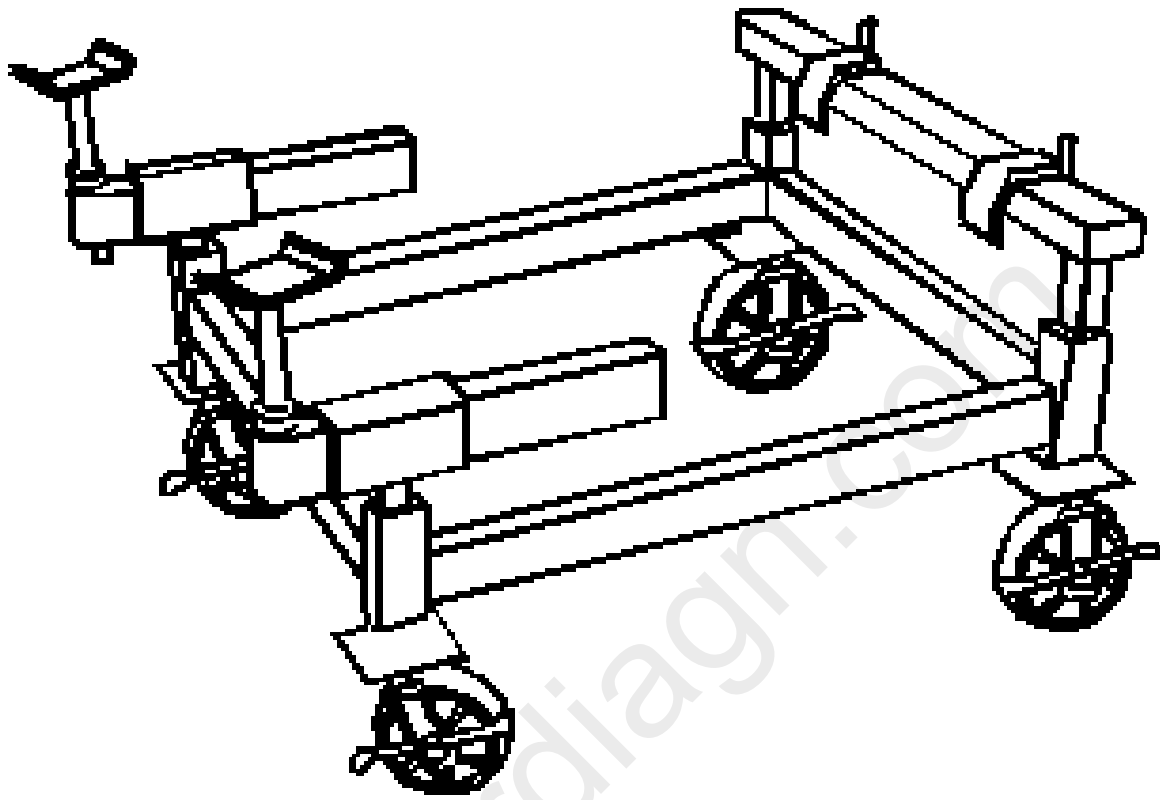
The individual underbody components contribute directly to the overall strength of the unibody. Use proper welding techniques during service repair operations. Refer to Collision Repair for welding information and for vehicle preparation.

The components must be corrosion protected whenever body repair operations damage or destroy the original sealing surfaces. Use a 2 part catalyzed primer such as PPG DP40 or equivalent when corrosion protection is needed to welded surfaces. Apply the sealers and anti-corrosion materials as necessary. Refer to **Anti-Corrosion Treatment and Repair** , . Do not combine paint systems. Refer to **Basecoat/Clearcoat Paint Systems** for further information.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/Description



J 39580
Engine
Support
Stand