

Driveline/Axle Propeller

Shaft - CTS Sedan

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Front Propeller Shaft Heat Shield Bolts	9 N.m	80 lb in
Front Propeller Shaft Bolts	30 N.m	22 lb ft
Propeller Shaft Bearing Bolts	50 N.m	37 lb ft
Rear Propeller Shaft Bolts	90 N.m	66 lb ft

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material	GM Part Number	
		United States	Canada
Propeller Shaft Coupler to Drive Flange	Lubricant	1052949	-
Propeller Shaft-to-Flange Bolts	Threadlocker	89021297	10953488

DIAGNOSTIC INFORMATION AND PROCEDURES

SYMPTOMS - PROPELLER SHAFT

Before beginning diagnosis, review the system description and operation in order to familiarize yourself with the system function. Refer to **Propeller Shaft Description and Operation**.

Classifying the Symptom

Propeller Shaft symptoms can usually be classified into the following categories:

- Noises
- Vibrations

Noise related symptoms are diagnosed within the Propeller Shaft section. For vibration related symptoms, refer to **Diagnostic Starting Point - Vehicle**.

Visual/Physical Inspection

- Inspect the system for aftermarket devices which could affect the operation of the Propeller Shaft.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could

cause the symptom.

- Inspect any and all fasteners for damage or excessive wear.

Symptom List

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

- **Universal Joint Noise**
- **Ping, Snap, or Click Noise**
- **Knock or Clunk Noise**
- **Scraping Noise**
- **Squeak Noise**
- **Shudder on Acceleration at Low Speed**

PROPELLER SHAFT DIAGNOSIS

Review the propeller shaft system function. Refer to **Propeller Shaft Description and Operation**.

Inspect for loose or missing propeller shaft-to-flange bolts. Tighten or replace as necessary. Refer to **Front Axle Propeller Shaft Replacement**, and **Two-Piece Propeller Shaft Replacement (LFX, LF3)**, **Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)**.

Inspect for loose center bracket bolts and damaged rubber bushings. Tighten or replace as necessary. Refer to **Two-Piece Propeller Shaft Replacement (LFX, LF3)**, **Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)**.

The propeller shaft and the joints are not serviceable.

The joint seals should be inspected for the following:

- Tears
- Cracks
- Contamination of the lubricating grease

Carefully pinch the seal and feel for the presence of grit

- Loose or missing seal clamps
- Leakage of lubricating grease from the seals

The joints should be inspected for the following conditions:

- Binding or impeded motion during axial movement of the front and rear joints
- Binding or impeded motion during lateral movement of the rear joint
- Loose or missing crimped-on end caps

- Leakage of lubricating grease from the end caps

The propeller shaft must be replaced if any of the above conditions exist. This will ensure that the propeller shaft continues to operate as intended, and does not damage the other driveline components.

UNIVERSAL JOINT NOISE

Universal Joint Noise

Problem	Action
One or more of the universal joints are worn or damaged.	Replace the propeller shaft assembly.
One or more of the universal joints have lost lubricant.	Replace the propeller shaft assembly.
Rubber coupling bolts loose at transmission or axle flange.	Tighten the bolts to specifications. Refer to <u>Fastener Tightening Specifications</u> .
Bolts loose at propeller shaft flange and coupling.	Tighten the bolts to specifications. Refer to <u>Fastener Tightening Specifications</u> .

PING, SNAP, OR CLICK NOISE

Ping, Snap, or Click Noise

Checks	Action
DEFINITION: A ping, snap or click is usually heard on initial load after the transmission is in gear, either in forward or reverse.	
A loose pinion yoke or companion flange	Tighten the bolts and the pinion nut to specified torque. Refer to <u>Fastener Tightening Specifications</u> .
Loose rubber coupling	Tighten the bolts to specified torque. Refer to <u>Fastener Tightening Specifications</u> .
One or more of the universal joints are worn or damaged	Replace the propeller shaft assembly.
Heat shield interference	Eliminate interference.

KNOCK OR CLUNK NOISE

Knock or Clunk Noise

Cause	Correction
DEFINITION: Knocking or clunking noise occurs when operating the vehicle in high gear or coasting in neutral at 16 km/h (10 mph).	
C/V joint worn or loose/ripped boot	Replace the propeller shaft assembly. Refer to <u>Two-Piece Propeller Shaft Replacement (LFX, LF3)</u> , <u>Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)</u> , and <u>Front Axle Propeller Shaft Replacement</u> .
The side gear hub counterbore in the differential is worn oversize.	Replace the differential case and/or the side gears. Refer to <u>Front Differential Carrier Assembly Replacement</u> .

SCRAPING NOISE

Scraping Noise

Checks	Action
DEFINITION: A scraping noise occurs when driving the vehicle at various speeds.	
The pinion flange deflector or the center bearing is rubbing.	Correct the interference as necessary.
Center bearing heat shield	Correct the interference as necessary.
Exhaust pipe contact	Correct the interference as necessary.

SQUEAK NOISE

Squeak Noise

Checks	Action
DEFINITION: When driving the vehicle at various speeds a squeaking sound occurs.	
One or more of the universal joints have lost lubricant.	Replace the rear propeller shaft. Refer to <u>Two-Piece Propeller Shaft Replacement (LFX, LF3), Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)</u> .
C/V boot worn or torn	Replace the front propeller shaft. Refer to <u>Front Axle Propeller Shaft Replacement</u> .

SHUDDER ON ACCELERATION AT LOW SPEED

Shudder on Acceleration at Low Speed

Checks	Action
DEFINITION: When the vehicle is accelerating at low speed a shudder occurs.	
The driveline center bearing splined shaft angle is excessive or incorrectly set.	Determine if the driveline angle is incorrect then correct as necessary. Refer to <u>Diagnostic Starting Point - Vehicle</u> .
One or more of the universal joints are worn or damaged.	Replace the driveshaft complete. Refer to <u>Two-Piece Propeller Shaft Replacement (LFX, LF3), Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)</u> .
Rubber coupling bolts loose	Tighten the bolts to specifications. Refer to <u>Fastener Tightening Specifications</u> .

REPAIR INSTRUCTIONS

FRONT AXLE PROPELLER SHAFT HEAT SHIELD REPLACEMENT

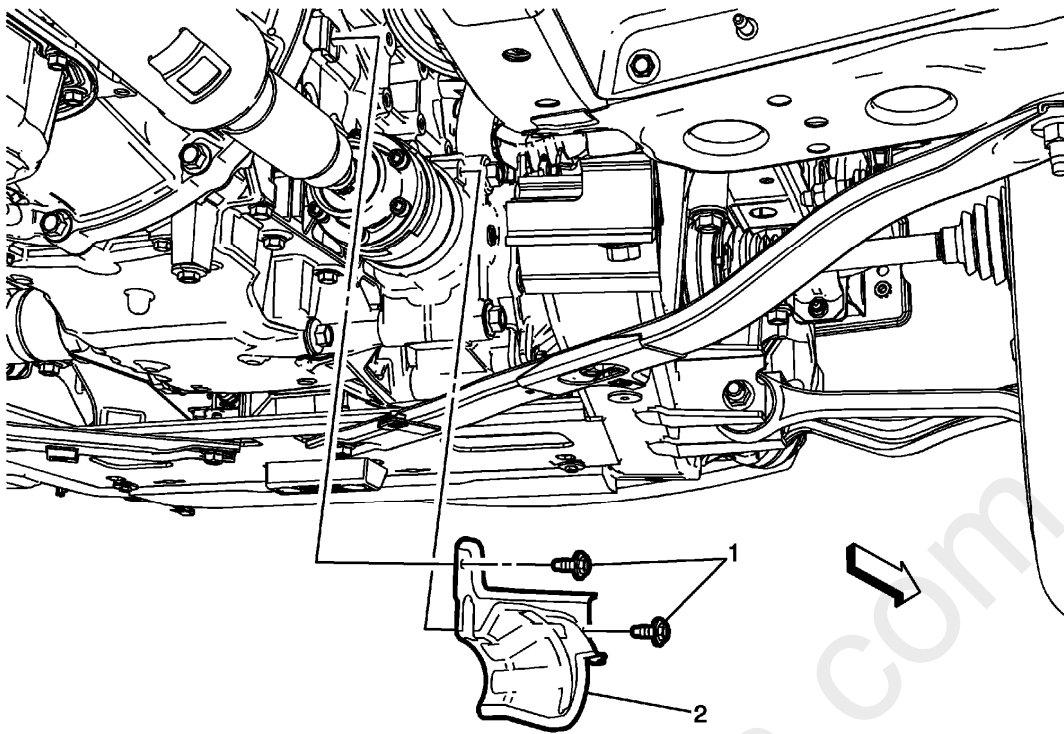


Fig. 1: Front Axle Propeller Shaft Heat Shield & Bolts
 Courtesy of GENERAL MOTORS COMPANY

Front Axle Propeller Shaft Heat Shield Replacement

Callout	Component Name
Preliminary Procedure Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> , . If equipped with LFX, remove the right catalytic converter. Refer to <u>Catalytic Converter Replacement - Right Side (LFX)</u> , <u>Catalytic Converter Replacement - Right Side (LF3)</u> .	
1	Front Axle Propeller Shaft Heat Shield Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9 (80 lb in)
2	Front Axle Propeller Shaft Heat Shield

FRONT AXLE PROPELLER SHAFT REPLACEMENT

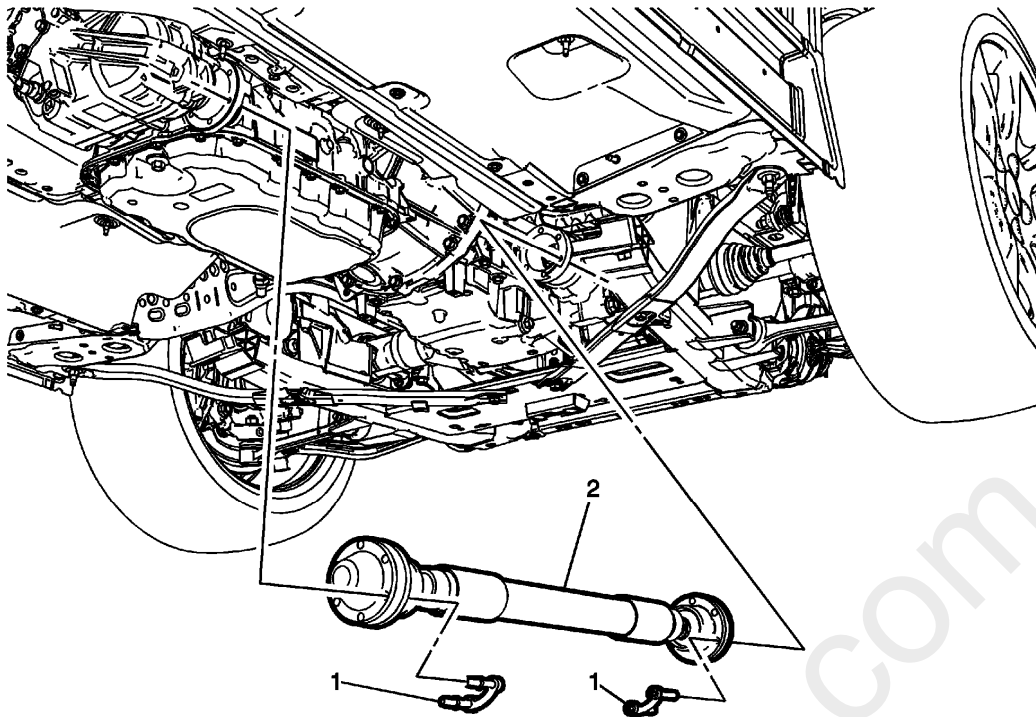


Fig. 2: Front Axle Propeller Shaft & Bolts
 Courtesy of GENERAL MOTORS COMPANY

Front Axle Propeller Shaft Replacement

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the front propeller shaft heat shield. Refer to <u>Front Axle Propeller Shaft Heat Shield Replacement</u>.	
1	Front Propeller Shaft Bolts (Qty: 12) CAUTION: Refer to <u>Fastener Caution</u> . Procedure 1. Mark the relationship of the propeller shaft to the flange. 2. Thoroughly clean and apply threadlocker to the threads of any of the reused propeller shaft bolts. Refer to <u>Adhesives, Fluids, Lubricants, and Sealers</u>. 3. Using the appropriate tool, tighten the front propeller shaft bolts. NOTE: If the bolts or nuts are found to be damaged or are excessively worn, DO NOT reuse.

	Replace with new. NOTE: If reusing the propeller shaft bolts, to ensure proper adhesion and fastener retention, the threads must be free of debris prior to the application of threadlocker. Use an appropriate cleaner to thoroughly clean the threads and allow to dry. Apply threadlocker to the propeller shaft to flange bolts. Ensure that there are no gaps in the threadlocker along the length of the filled area of the bolts. Allow the threadlocker to cure approximately 10 minutes before installation. Tighten 30 (22 lb ft)
2	Front Propeller Shaft

TWO-PIECE PROPELLER SHAFT REPLACEMENT (LFX, LF3)

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the floor panel number 4 cross bar. Refer to **Floor Panel Number 4 Cross Bar Replacement** .
3. Remove the exhaust system. Refer to **Exhaust System Replacement (LF3)** , **Exhaust System Replacement (LFX)** .
4. Remove the intermediate body exhaust heat shield. Refer to **Intermediate Body Exhaust Heat Shield Replacement** .
5. Remove the floor panel number 2 cross bar reinforcement. Refer to **Floor Panel Number 2 Cross Bar Reinforcement Replacement** .

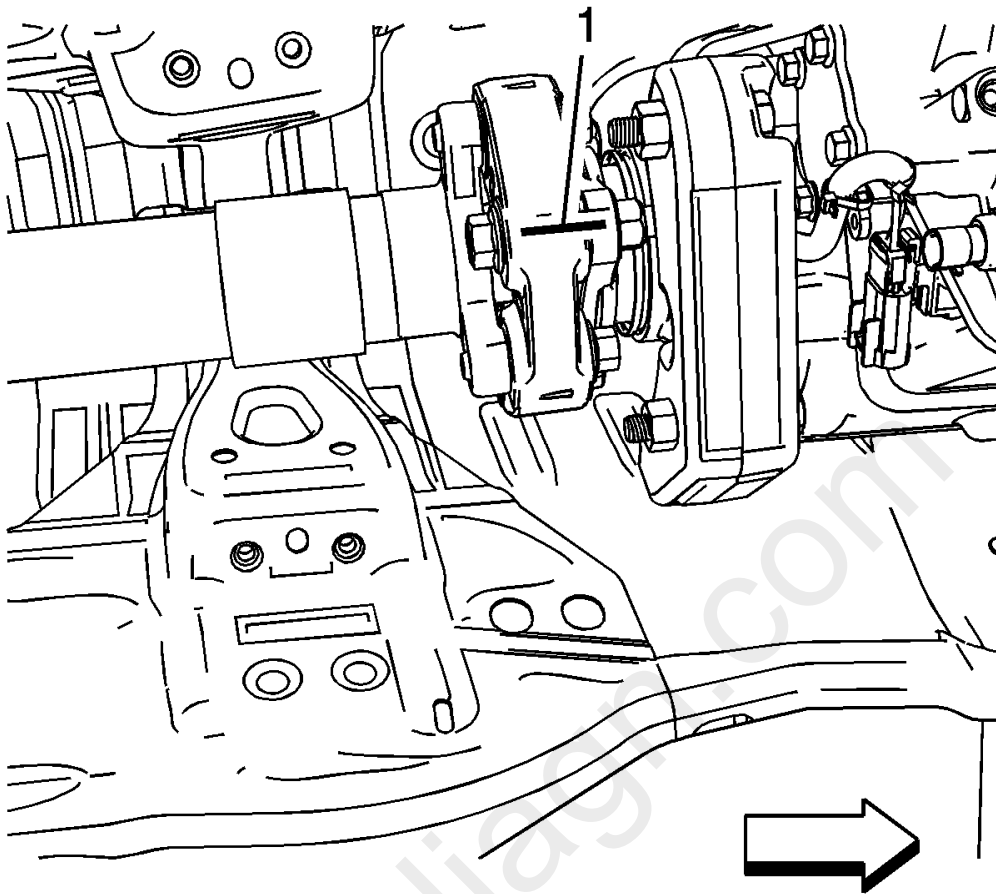


Fig. 3: Identifying Propeller Shaft Flange/Transmission Output Flange Relationship Mark
Courtesy of GENERAL MOTORS COMPANY

NOTE: Before removing the propeller shaft from the vehicle, paint or scribe references marks on the transfer case or transmission flange to the propeller shaft and the rear differential drive flange to ensure minimal driveline system imbalance.

6. Mark (1) the relationship of the propeller shaft flange and the output flange of the transmission.

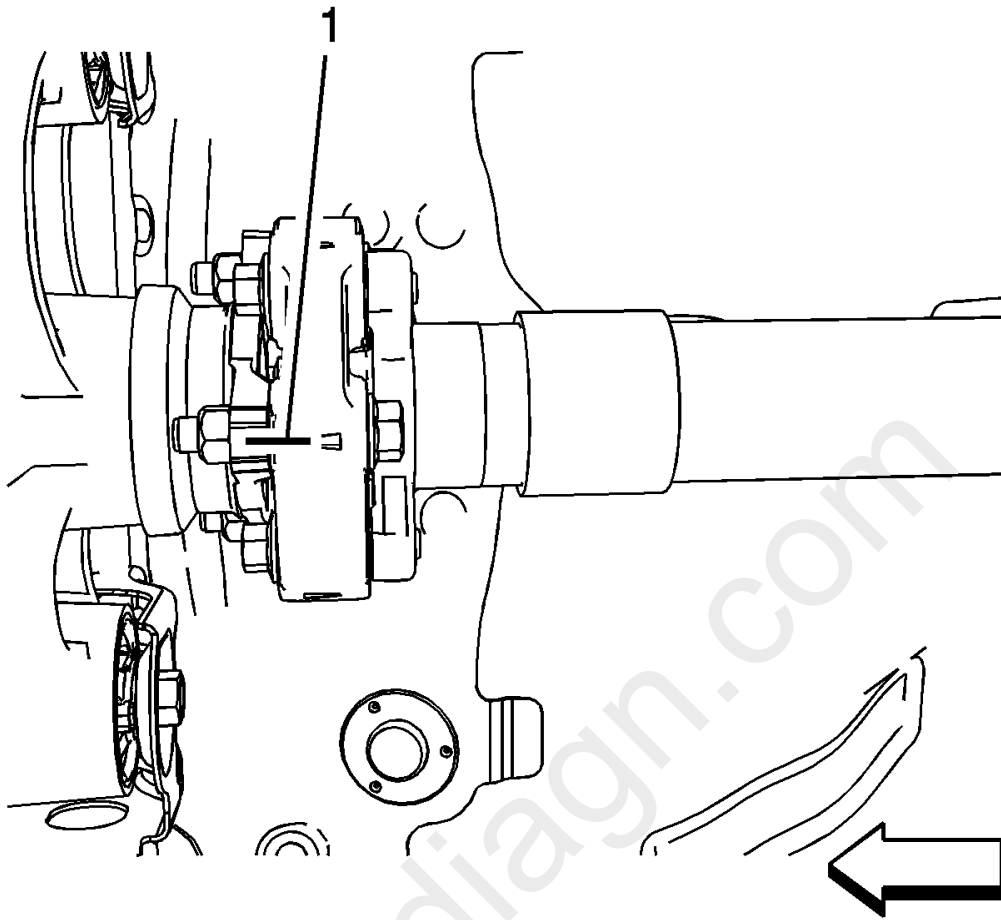


Fig. 4: Identifying Propeller Shaft Flange/Rear Wheel Drive Shaft Flange Relationship Mark
Courtesy of GENERAL MOTORS COMPANY

7. Mark (1) the relationship of the propeller shaft flange and the rear wheel drive shaft flange.

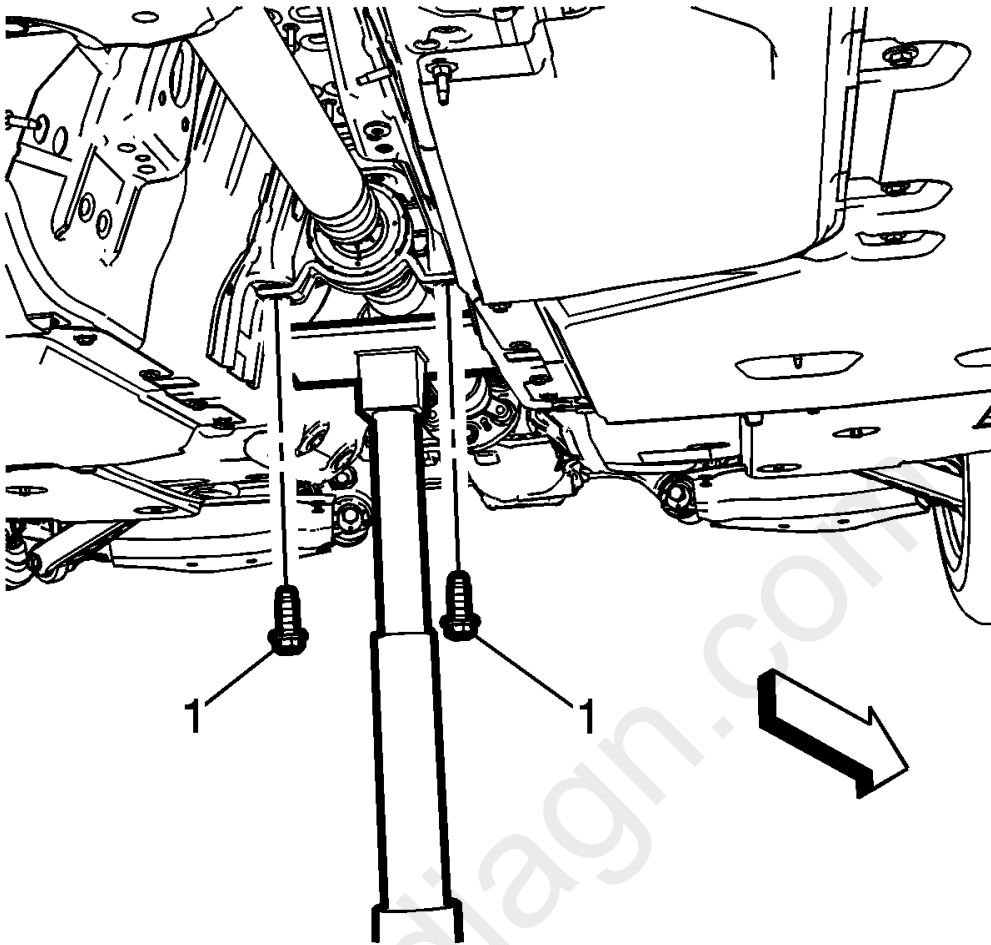


Fig. 5: Propeller Shaft Bearing Support Bolts
Courtesy of GENERAL MOTORS COMPANY

NOTE: Ensure that the propeller shaft is secured to the hydraulic jack stand.

8. Support the propeller shaft with a suitable hydraulic jack stand.
9. Remove the 2 propeller shaft bearing support bolts (1).

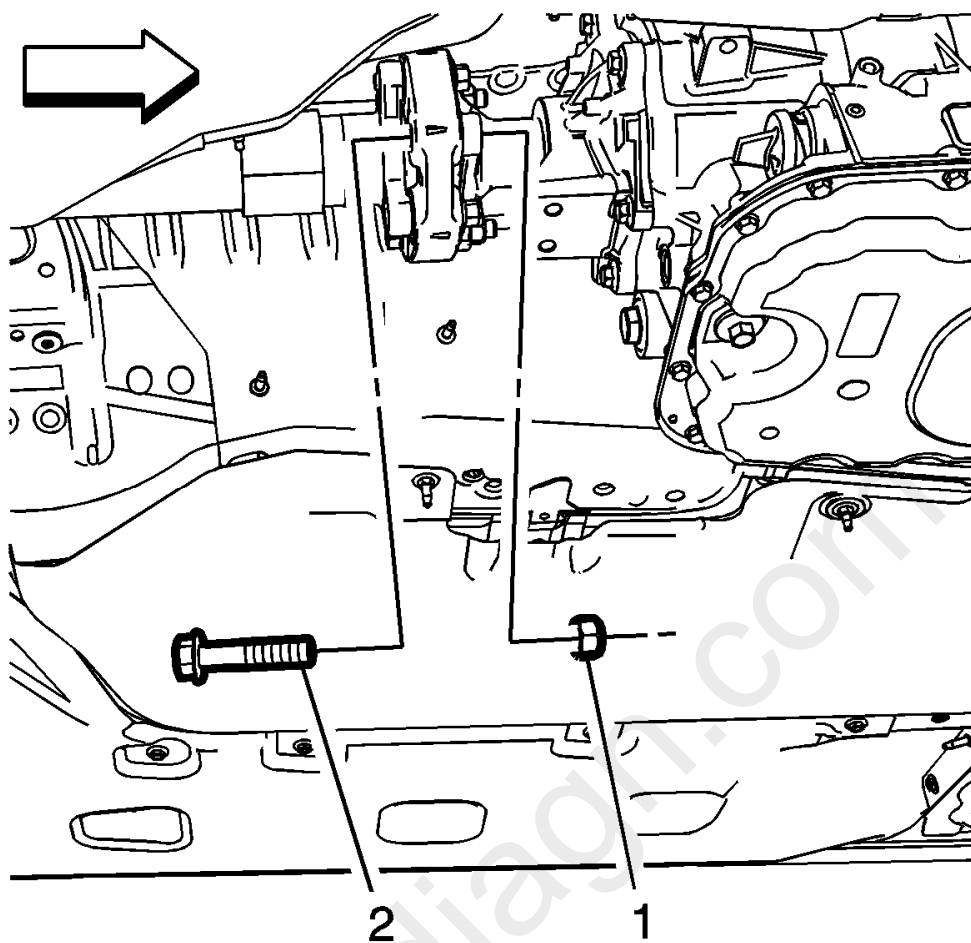


Fig. 6: Front Propeller Shaft Bolt & Nuts
Courtesy of GENERAL MOTORS COMPANY

NOTE: If the bolts or nuts are found to be damaged or are excessively worn, DO NOT reuse. Replace with new.

10. Remove the 3 front propeller shaft bolts (2) and the nuts (1).

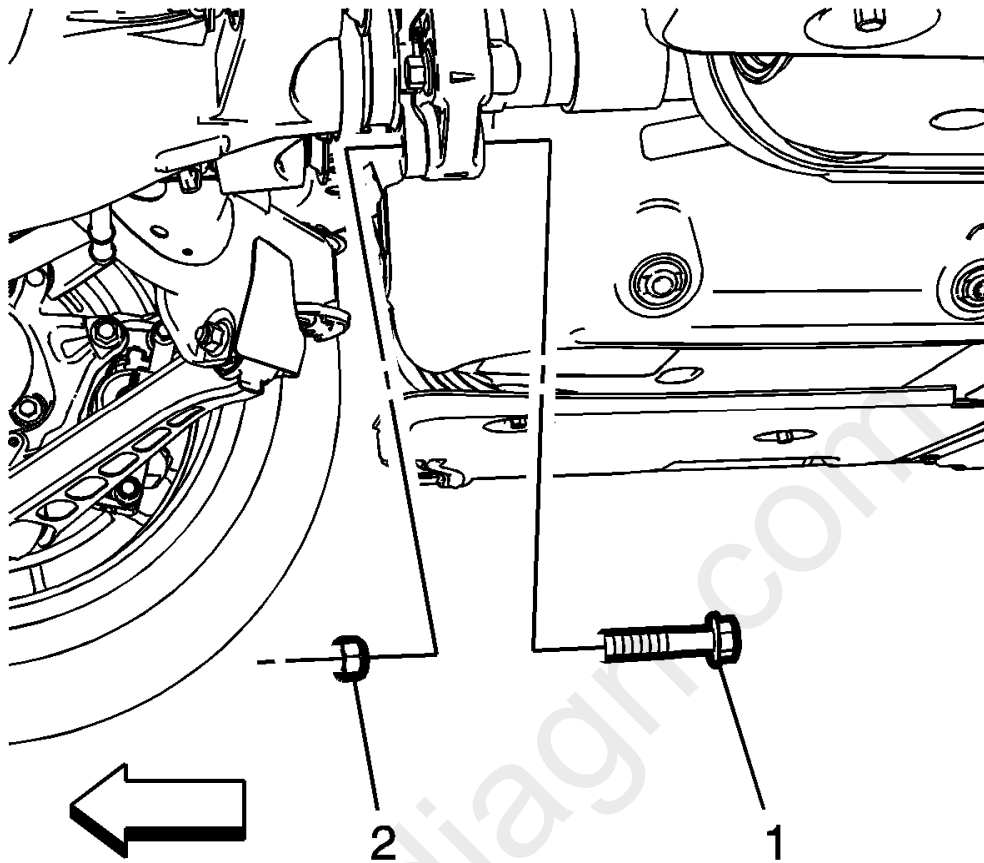


Fig. 7: Rear Propeller Shaft Bolt & Nuts
Courtesy of GENERAL MOTORS COMPANY

NOTE: If the bolts or nuts are found to be damaged or are excessively worn, DO NOT reuse. Replace with new.

11. Remove the 3 rear propeller shaft bolts (1) and the nuts (2).

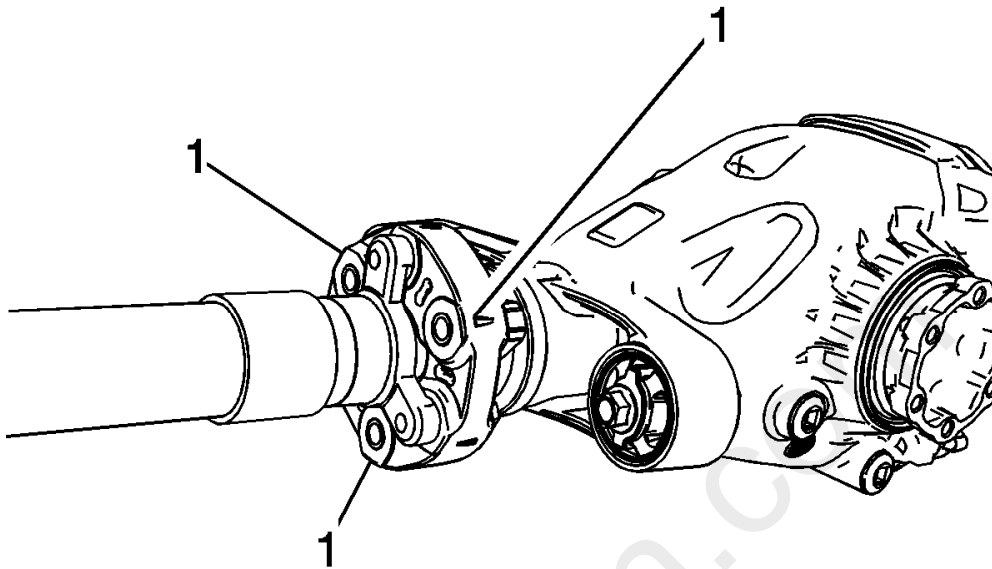


Fig. 8: Identifying Propeller Shaft Coupling Lubricant Application & Tapping Points
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Care should be taken not to use sharp or pry tools when separating the propeller shaft coupler from the drive flange. Damage to the coupler could result and replacement of the entire propeller shaft would be required.

NOTE: It may be necessary to apply a small amount of penetrating lubricant or WD-40® to the area shown (1) to aid in separation of the propeller shaft coupling.

12. If the propeller shaft does not easily separate from the differential, transmission or transfer case, use a hammer to gently tap the locations (1) on the rubber coupling shown above to separate.

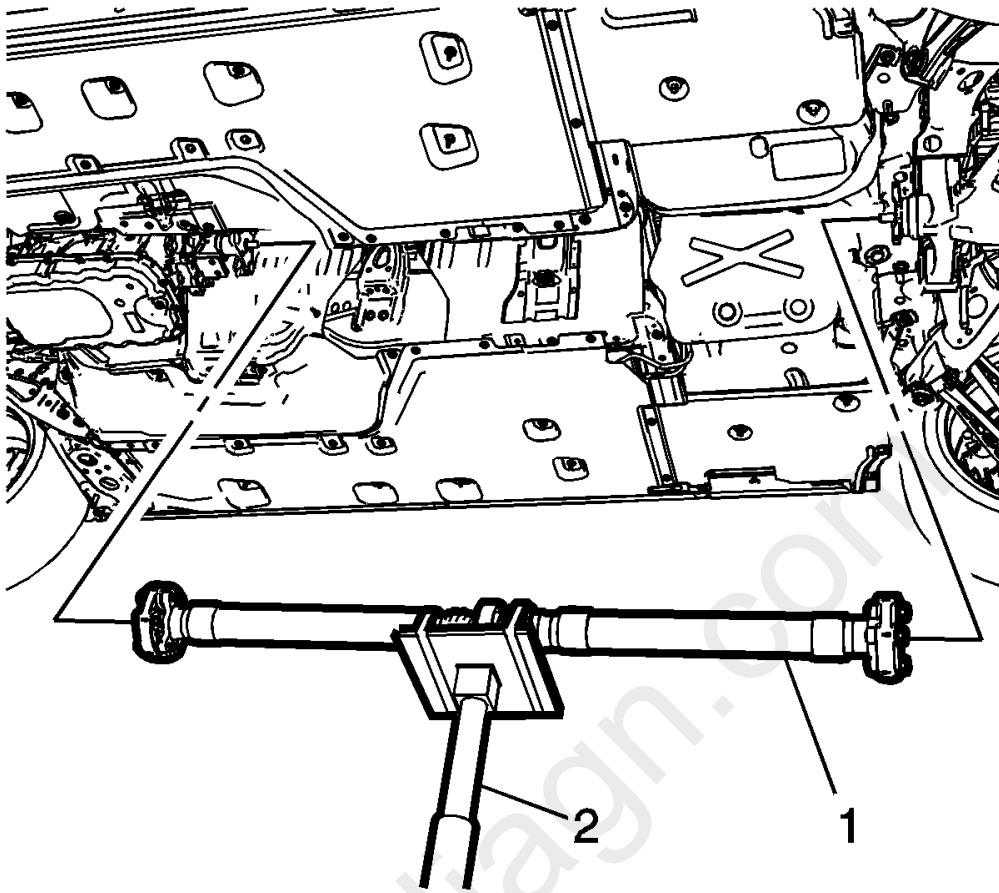


Fig. 9: Propeller Shaft
Courtesy of GENERAL MOTORS COMPANY

13. Remove the propeller shaft (1) from the vehicle.

Installation Procedure

NOTE: If reusing the propeller shaft bolts, to ensure proper adhesion and fastener retention, the threads must be free of debris prior to the application of threadlocker. Use an appropriate cleaner to thoroughly clean the threads and allow to dry. Apply threadlocker to the propeller shaft to flange bolts. Ensure that there are no gaps in the threadlocker along the length of the filled area of the bolts. Allow the threadleocker to cure approximately 10 minutes before installation.

1. Thoroughly clean apply threadlocker to the threads of the propeller shaft bolts. Refer to Adhesives, Fluids, Lubricants, and Sealers.

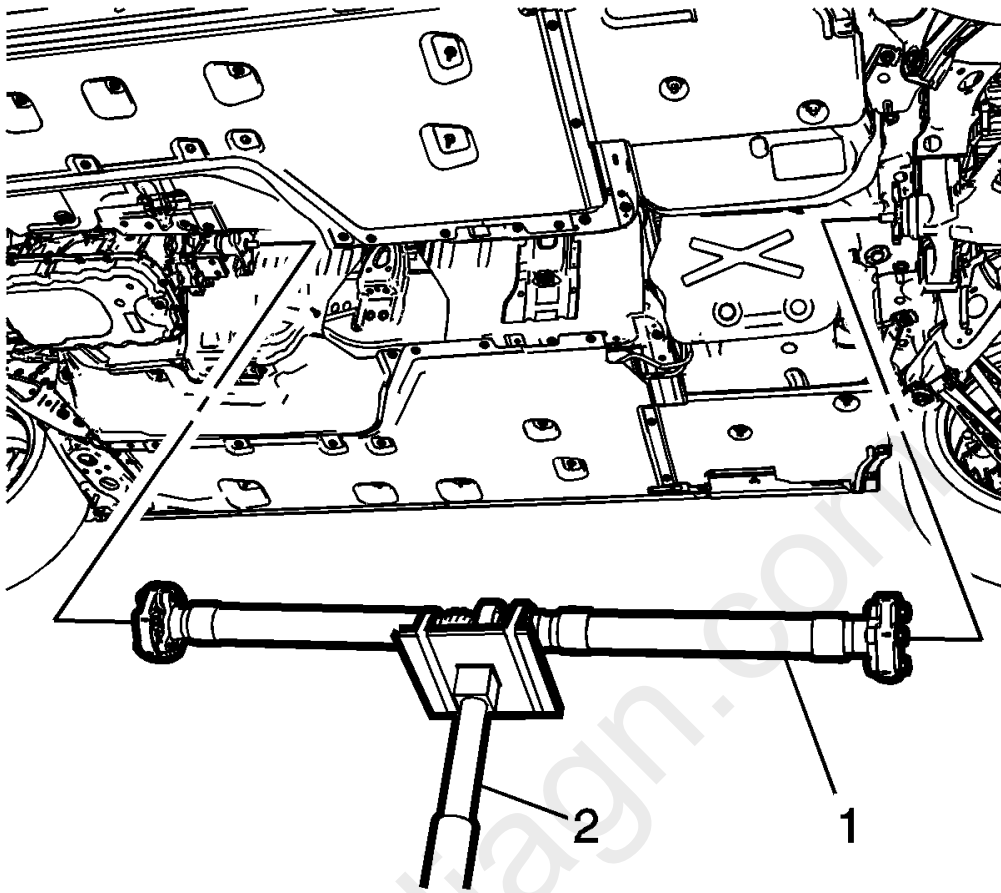


Fig. 10: Propeller Shaft
Courtesy of GENERAL MOTORS COMPANY

2. Position the propeller shaft (1) in the vehicle.

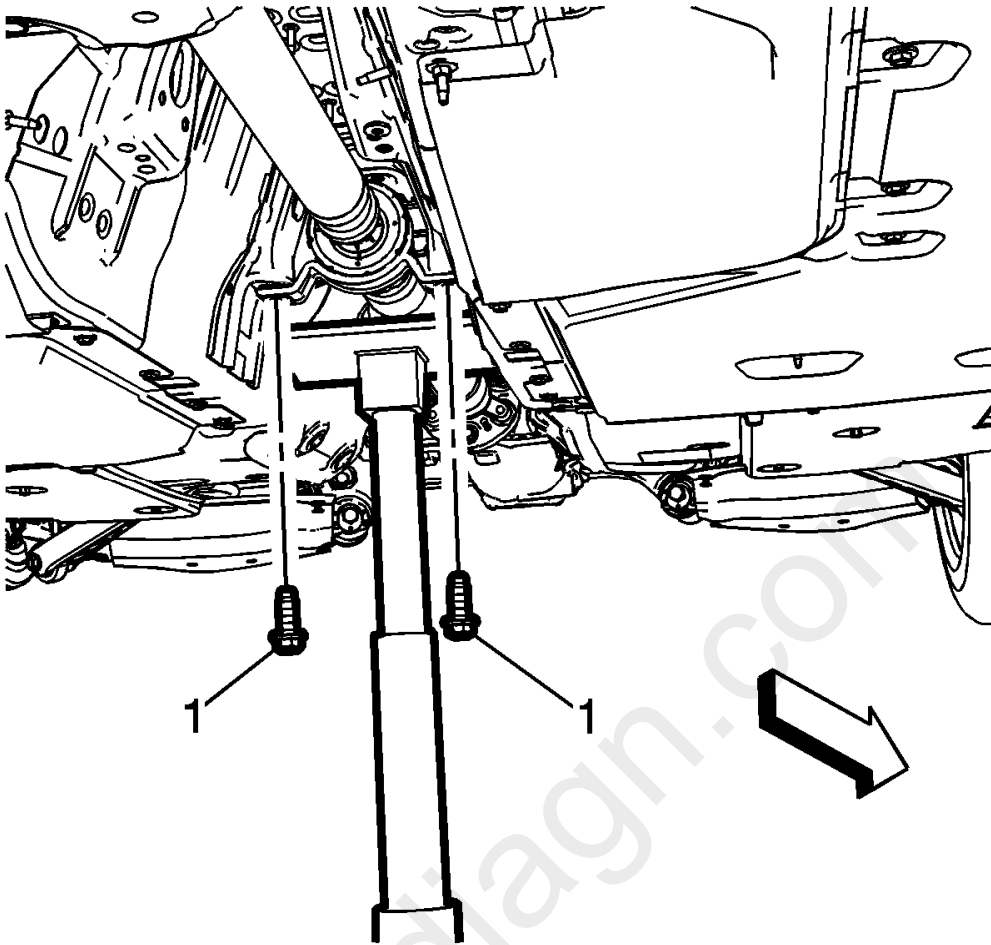


Fig. 11: Propeller Shaft Bearing Support Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Install the 2 propeller shaft bearing bolts (1) and tighten to 50 (37 lb ft).

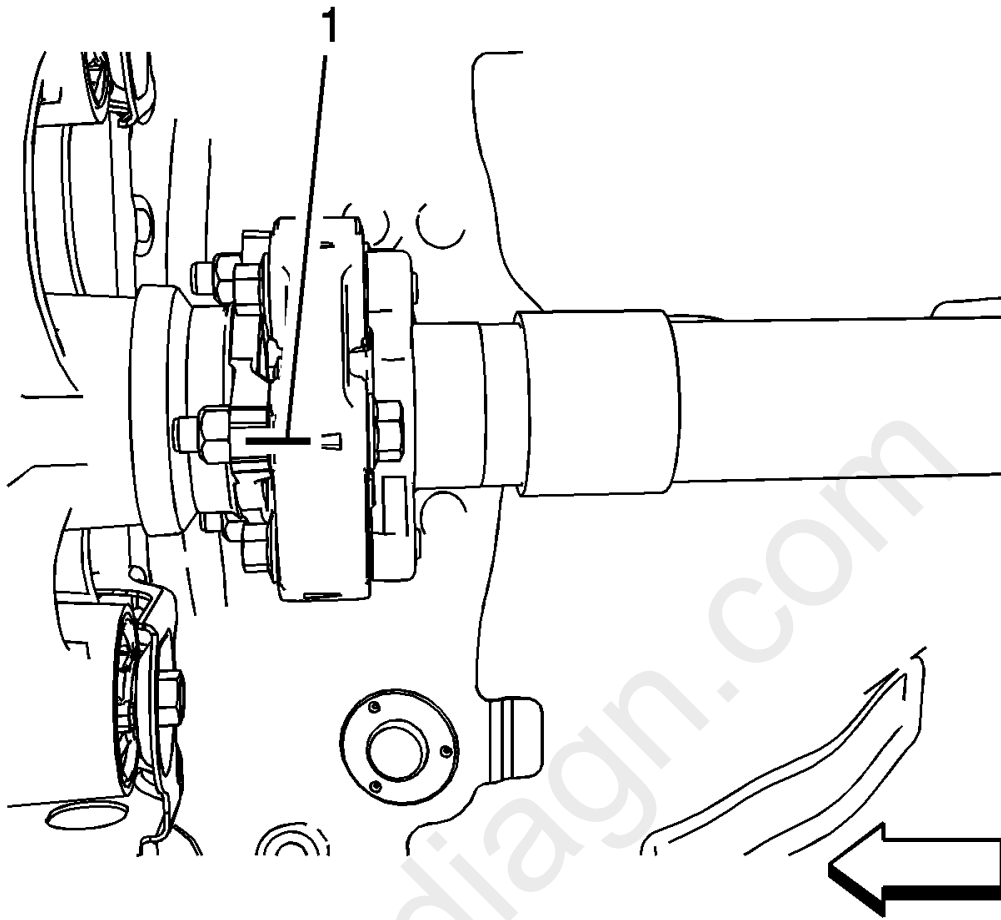


Fig. 12: Identifying Propeller Shaft Flange/Rear Wheel Drive Shaft Flange Relationship Mark
Courtesy of GENERAL MOTORS COMPANY

4. Align the reference marks (1) between the propeller shaft flange and the rear wheel drive shaft flange.

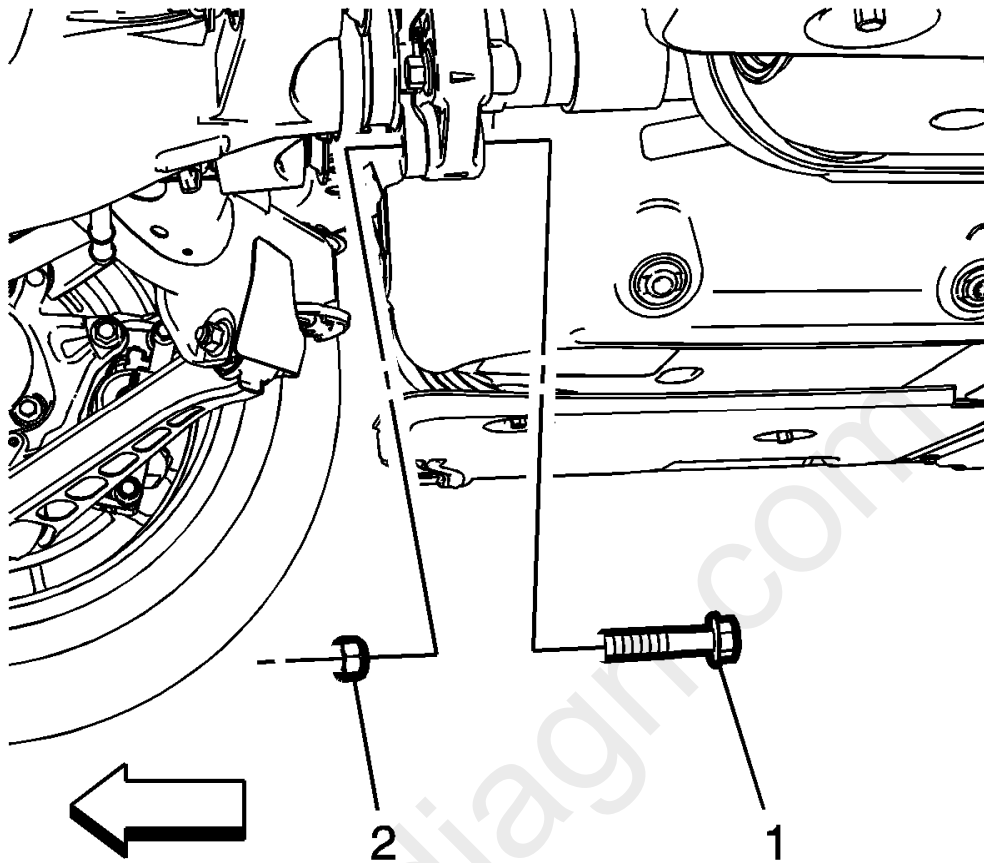


Fig. 13: Rear Propeller Shaft Bolt & Nuts
Courtesy of GENERAL MOTORS COMPANY

5. Install the 3 rear propeller shaft nuts (2) and the bolts (1).
6. Tighten the bolts (1) to 90 (66 lb ft).

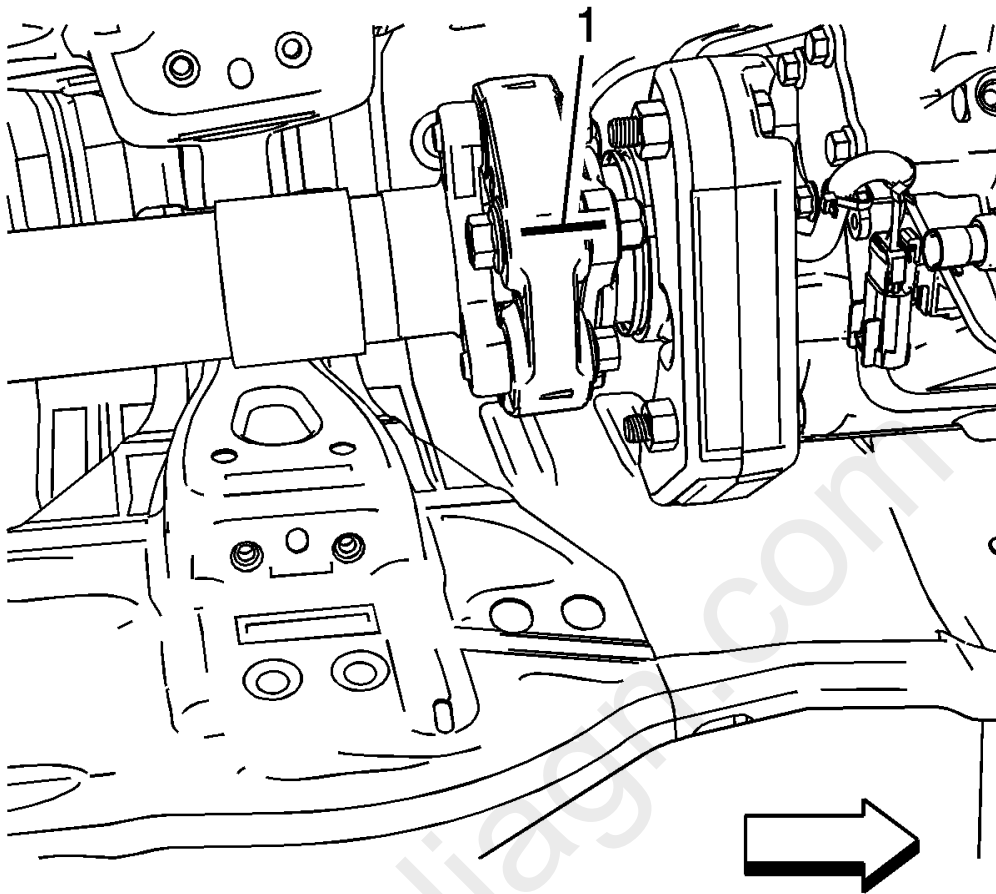


Fig. 14: Identifying Propeller Shaft Flange/Transmission Output Flange Relationship Mark
Courtesy of GENERAL MOTORS COMPANY

7. Align the reference marks (1) between the propeller shaft flange and the output flange of the transmission.

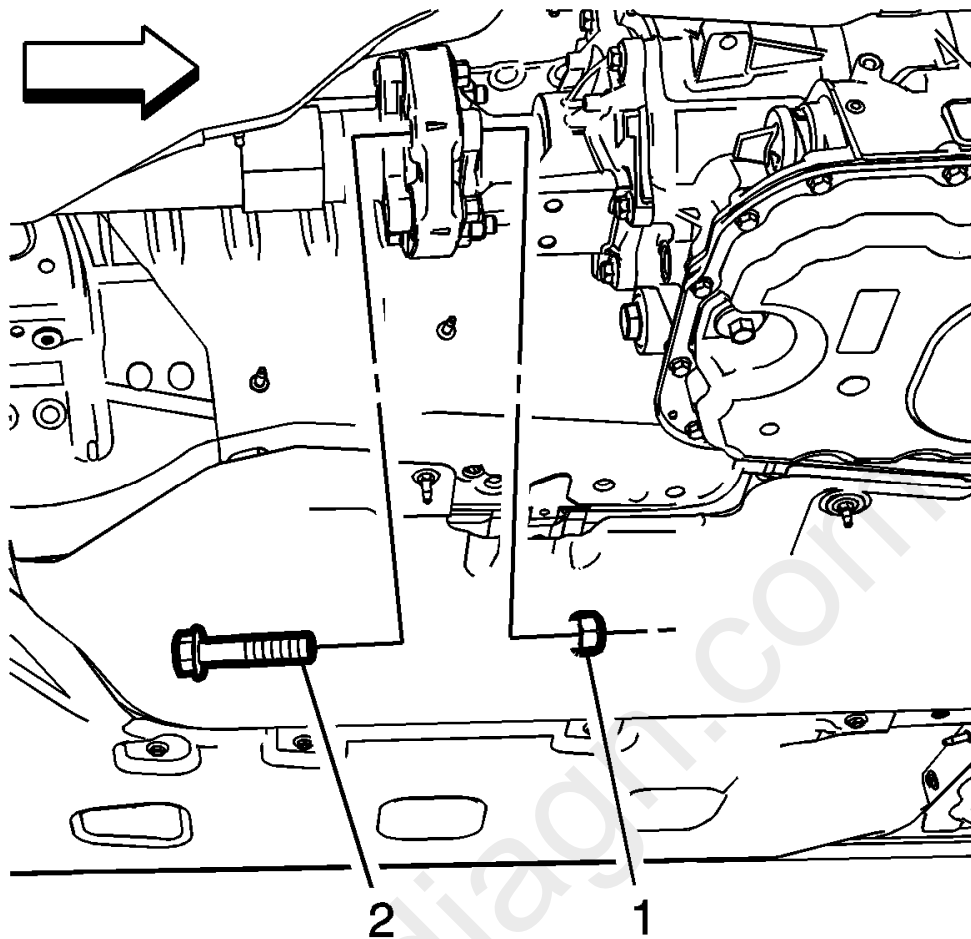


Fig. 15: Front Propeller Shaft Bolt & Nuts
 Courtesy of GENERAL MOTORS COMPANY

8. Install the 3 front propeller shaft nuts (2) and the bolts (1).
9. Tighten the bolts (1) to 90 (66 lb ft).
10. Install the floor panel number 2 cross brace.
11. Install the intermediate body exhaust heat shield. Refer to **Intermediate Body Exhaust Heat Shield Replacement** .
12. Install the exhaust system. Refer to **Exhaust System Replacement (LF3)** , **Exhaust System Replacement (LFX)** .
13. Install the floor panel number 4 cross bar. Refer to **Floor Panel Number 4 Cross Bar Replacement** .
14. Remove the support and lower the vehicle.

TWO-PIECE PROPELLER SHAFT REPLACEMENT (LTG, LCV, LKW)

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .

2. Remove the floor panel number 4 cross bar. Refer to **Floor Panel Number 4 Cross Bar Replacement** .
3. Remove the exhaust system. Refer to or **Exhaust Muffler Replacement (LTG)** .
4. Remove the intermediate body exhaust heat shield. Refer to **Intermediate Body Exhaust Heat Shield Replacement** .
5. Remove the floor panel number 2 cross bar reinforcement. Refer to **Floor Panel Number 2 Cross Bar Reinforcement Replacement** .

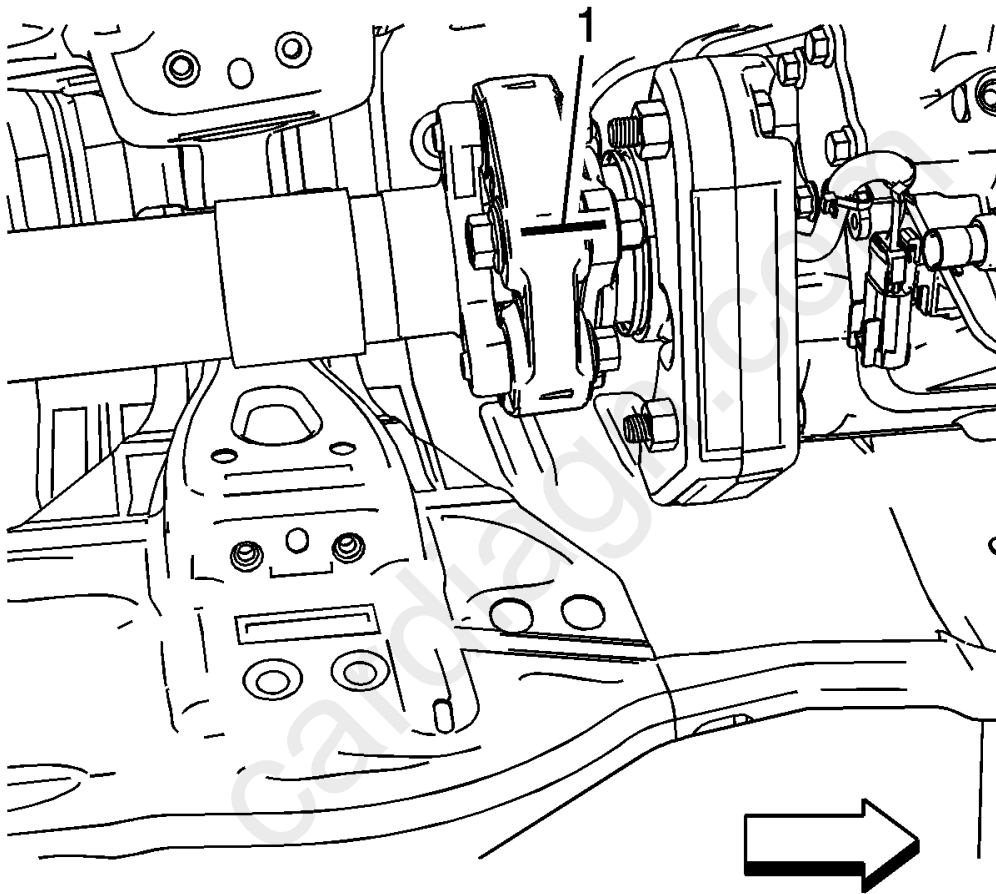


Fig. 16: Identifying Propeller Shaft Flange/Transmission Output Flange Relationship Mark
Courtesy of GENERAL MOTORS COMPANY

NOTE: Before removing the propeller shaft from the vehicle, paint or scribe references marks on the transfer case or transmission flange to the propeller shaft and the rear differential drive flange to ensure minimal driveline system imbalance.

6. Mark (1) the relationship of the propeller shaft flange and the output flange of the transmission.

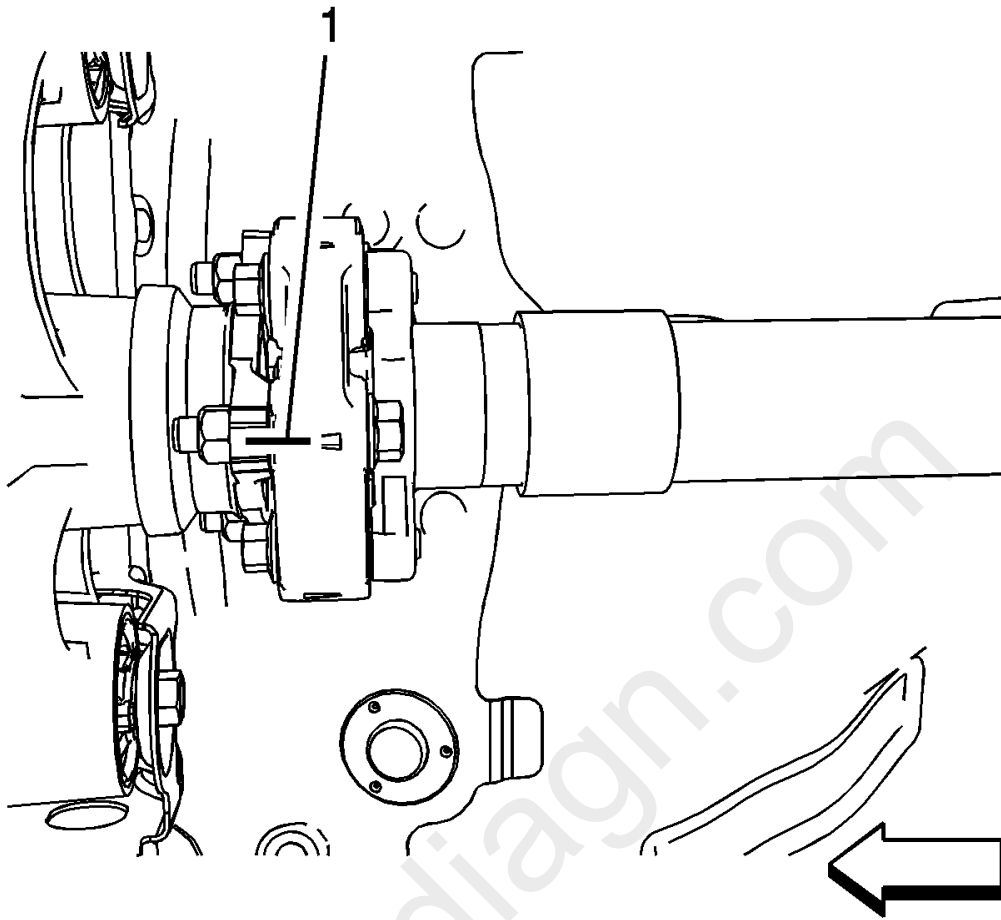


Fig. 17: Identifying Propeller Shaft Flange/Rear Wheel Drive Shaft Flange Relationship Mark
Courtesy of GENERAL MOTORS COMPANY

7. Mark (1) the relationship of the propeller shaft flange and the rear wheel drive shaft flange.

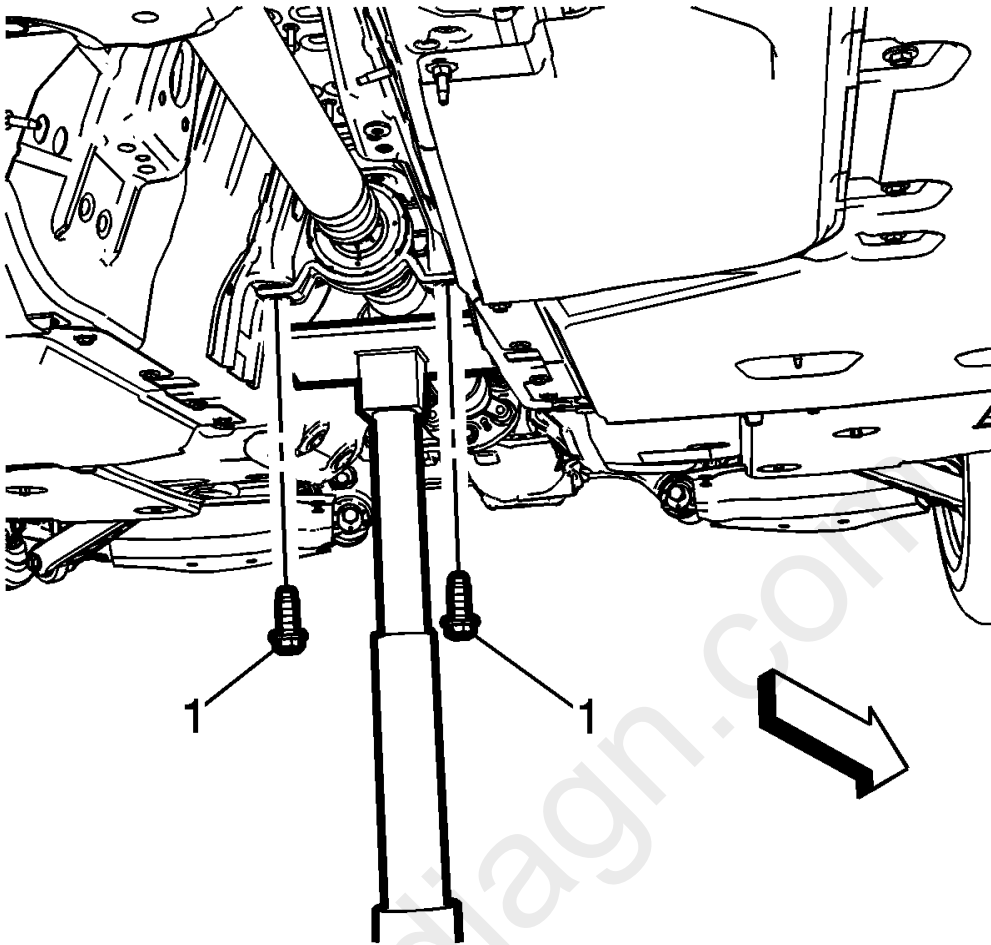


Fig. 18: Propeller Shaft Bearing Support Bolts
Courtesy of GENERAL MOTORS COMPANY

NOTE: Ensure that the propeller shaft is secured to the hydraulic jack stand.

8. Support the propeller shaft with a suitable hydraulic jack stand.
9. Remove the 2 propeller shaft bearing support bolts (1).

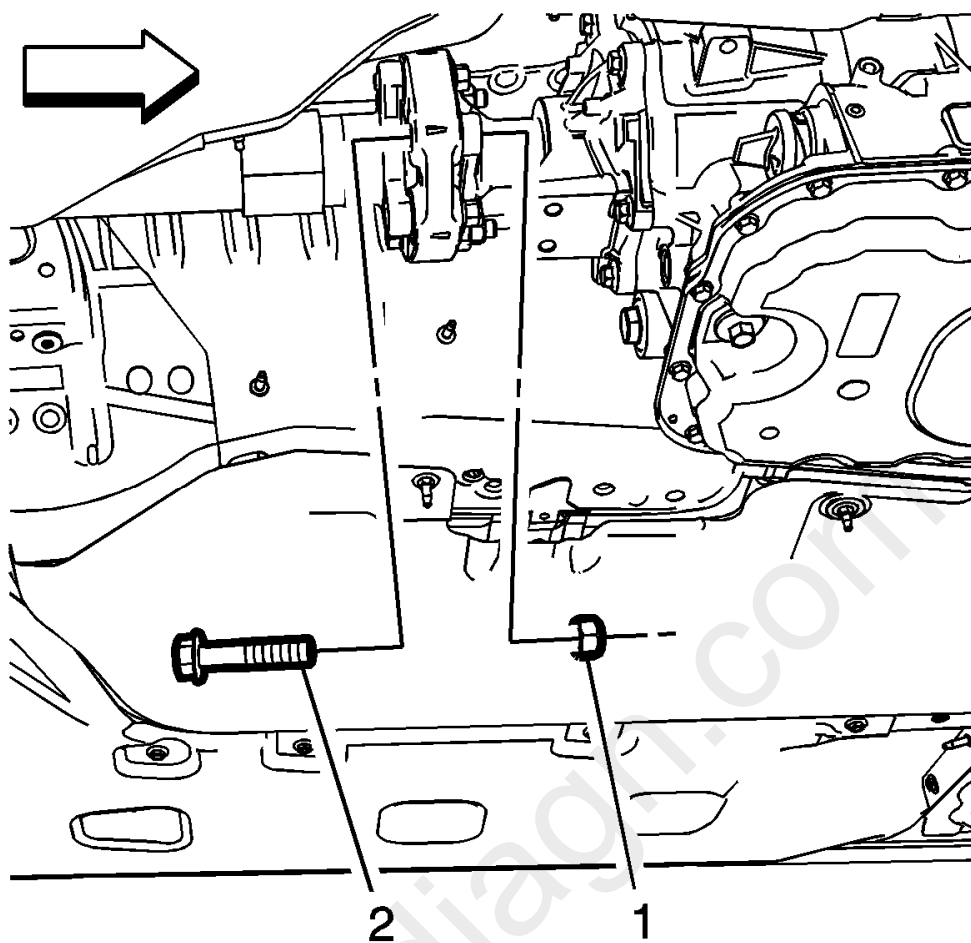


Fig. 19: Front Propeller Shaft Bolt & Nuts
Courtesy of GENERAL MOTORS COMPANY

NOTE: If the bolts or nuts are found to be damaged or are excessively worn, DO NOT reuse. Replace with new.

10. Remove the 3 front propeller shaft bolts (2) and the nuts (1).

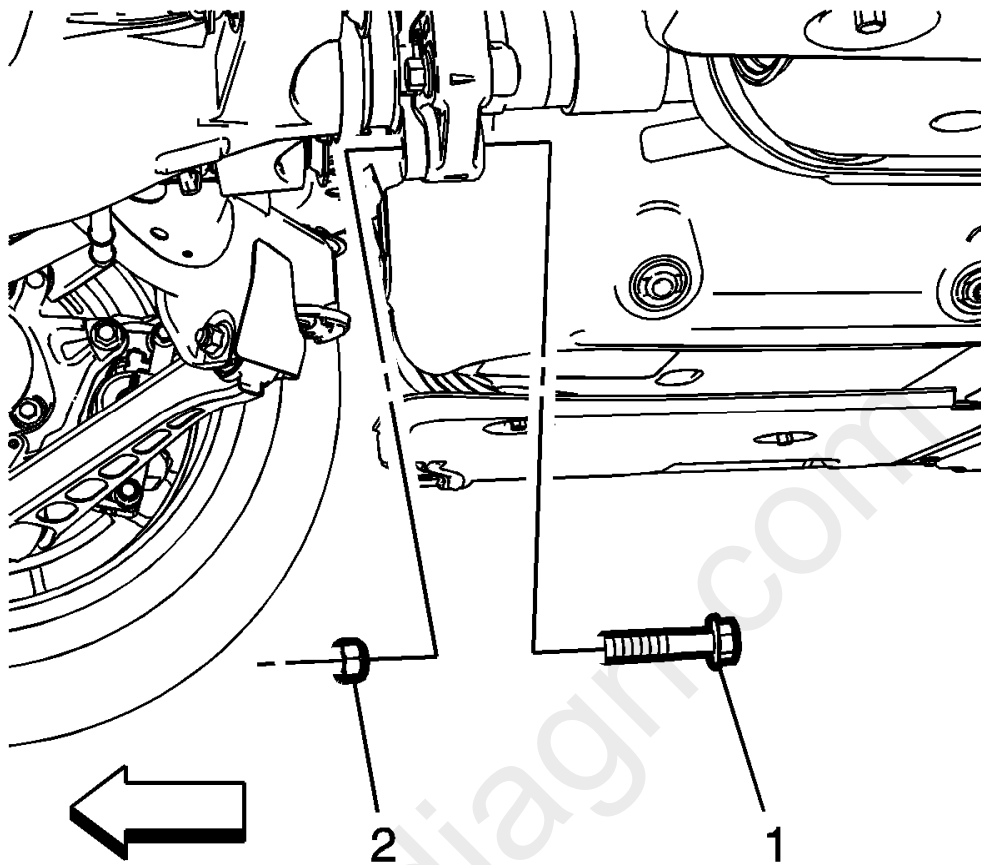


Fig. 20: Rear Propeller Shaft Bolt & Nuts
Courtesy of GENERAL MOTORS COMPANY

NOTE: If the bolts or nuts are found to be damaged or are excessively worn, DO NOT reuse. Replace with new.

11. Remove the 3 rear propeller shaft bolts (1) and the nuts (2).

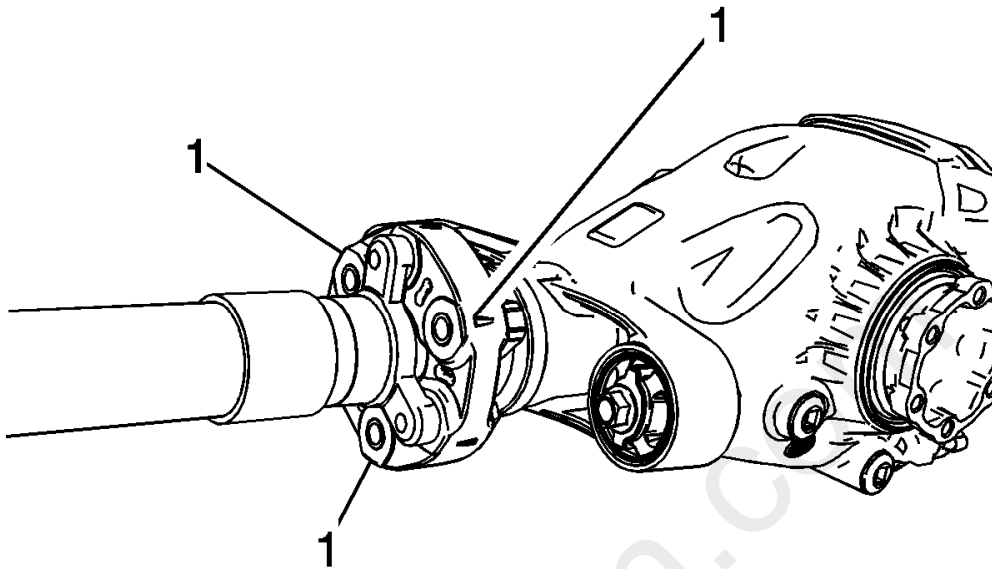


Fig. 21: Identifying Propeller Shaft Coupling Lubricant Application & Tapping Points
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Care should be taken not to use sharp or pry tools when separating the propeller shaft coupler from the drive flange. Damage to the coupler could result and replacement of the entire propeller shaft would be required.

NOTE: It may be necessary to apply a small amount of penetrating lubricant or WD-40® to the area shown (1) to aid in separation of the propeller shaft coupling.

12. If the propeller shaft does not easily separate from the differential, transmission or transfer case, use a hammer to gently tap the locations (1) on the rubber coupling shown above to separate.

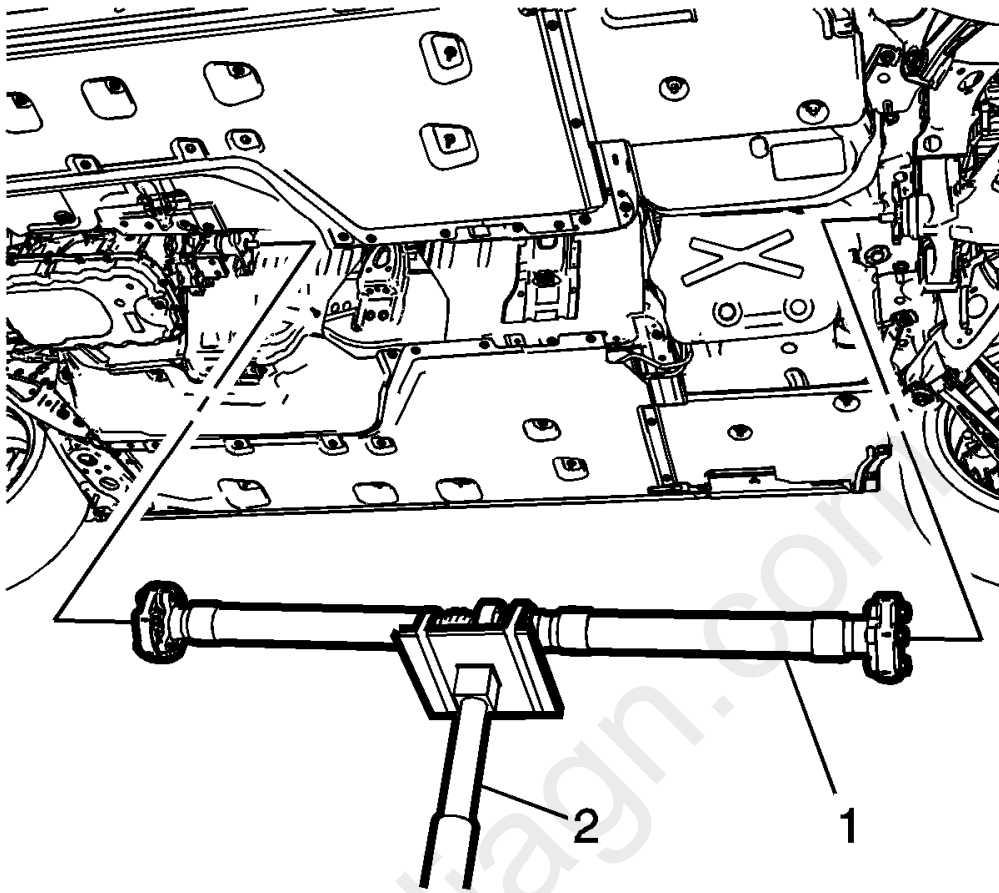


Fig. 22: Propeller Shaft
Courtesy of GENERAL MOTORS COMPANY

13. Remove the propeller shaft (1) from the vehicle.

Installation Procedure

NOTE: If reusing the propeller shaft bolts, to ensure proper adhesion and fastener retention, the threads must be free of debris prior to the application of threadlocker. Use an appropriate cleaner to thoroughly clean the threads and allow to dry. Apply threadlocker to the propeller shaft to flange bolts. Ensure that there are no gaps in the threadlocker along the length of the filled area of the bolts. Allow the threadleocker to cure approximately 10 minutes before installation.

1. Thoroughly clean apply threadlocker to the threads of the propeller shaft bolts. Refer to Adhesives, Fluids, Lubricants, and Sealers.

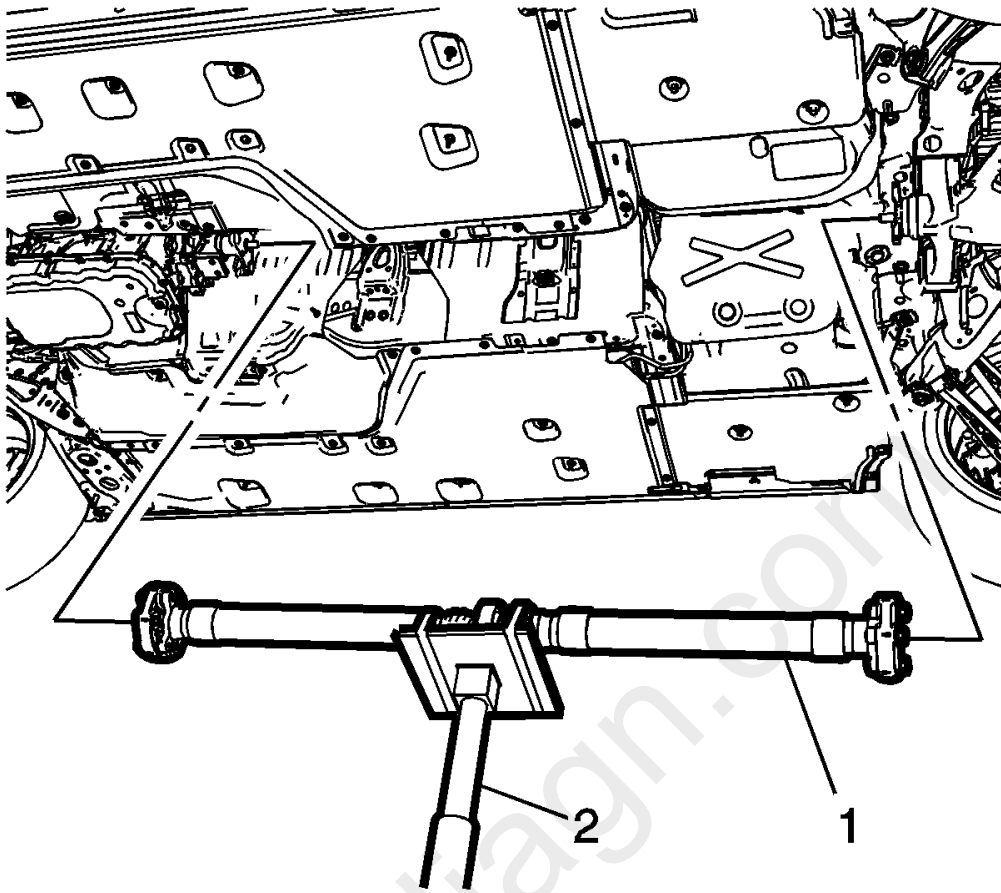


Fig. 23: Propeller Shaft
Courtesy of GENERAL MOTORS COMPANY

2. Position the propeller shaft (1) in the vehicle.

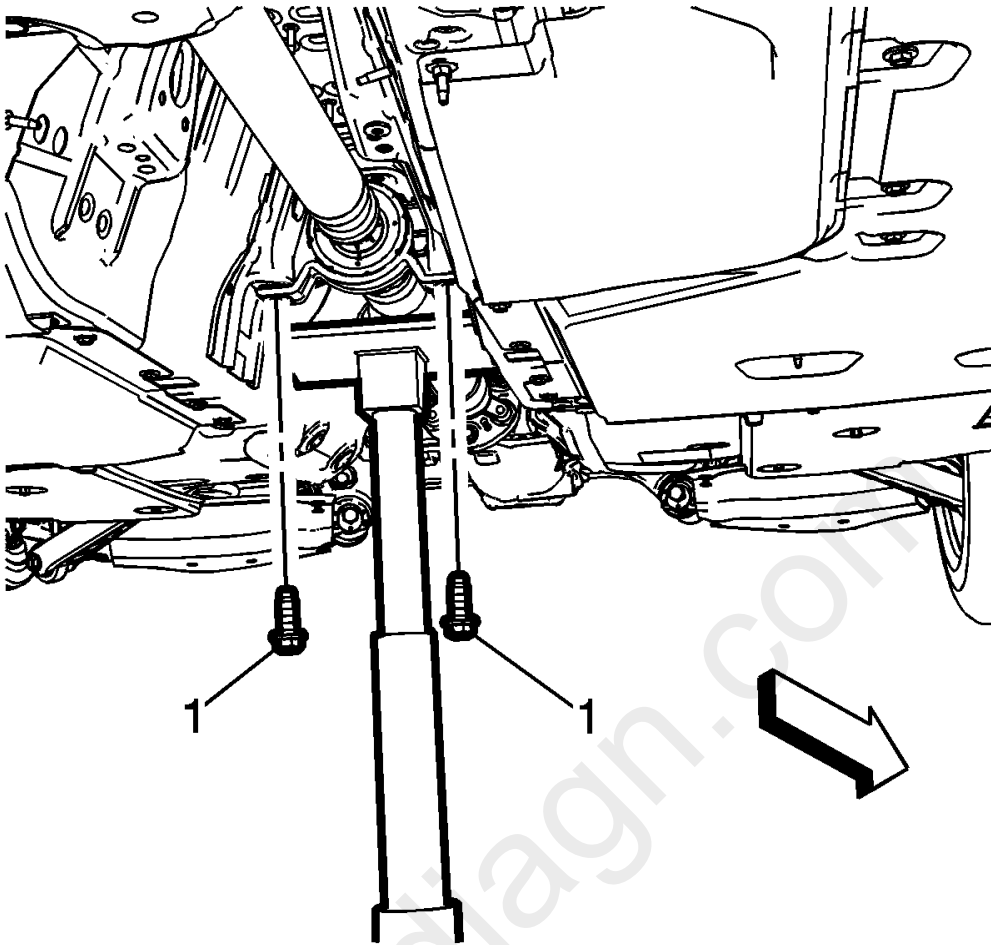


Fig. 24: Propeller Shaft Bearing Support Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Install the 2 propeller shaft bearing bolts (1) and tighten to 50 (37 lb ft).

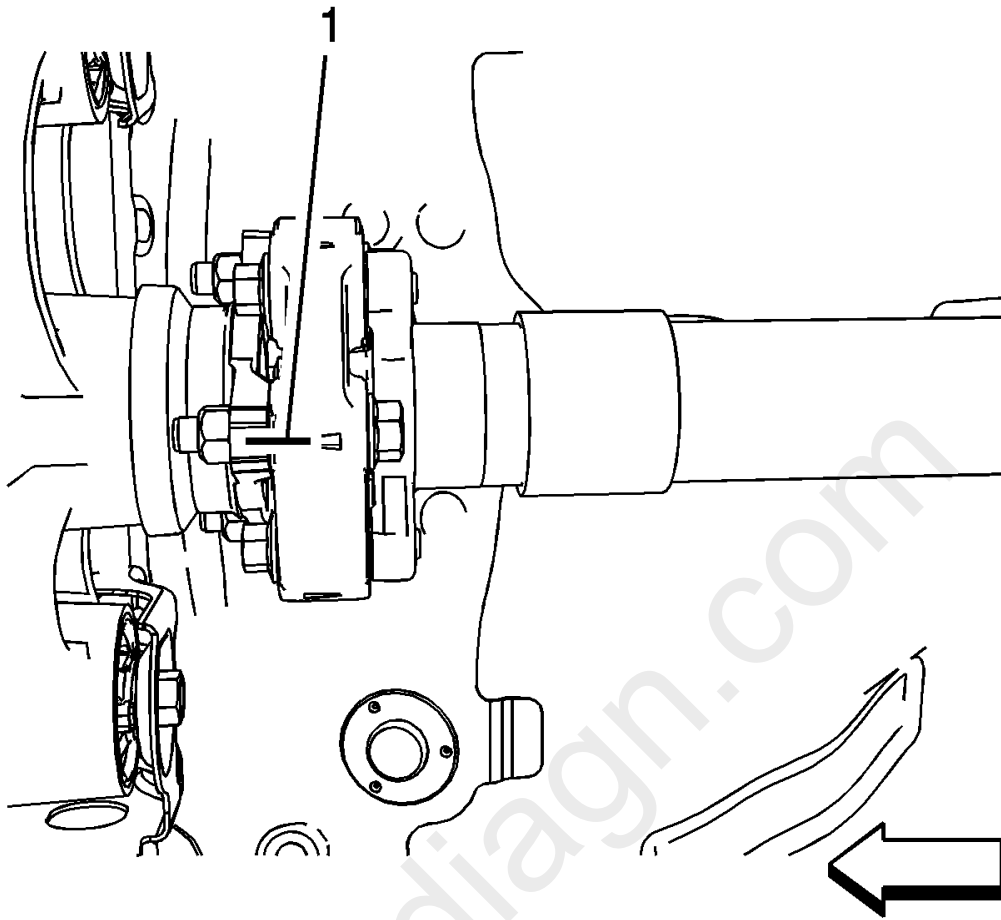


Fig. 25: Identifying Propeller Shaft Flange/Rear Wheel Drive Shaft Flange Relationship Mark
Courtesy of GENERAL MOTORS COMPANY

4. Align the reference marks (1) between the propeller shaft flange and the rear wheel drive shaft flange.

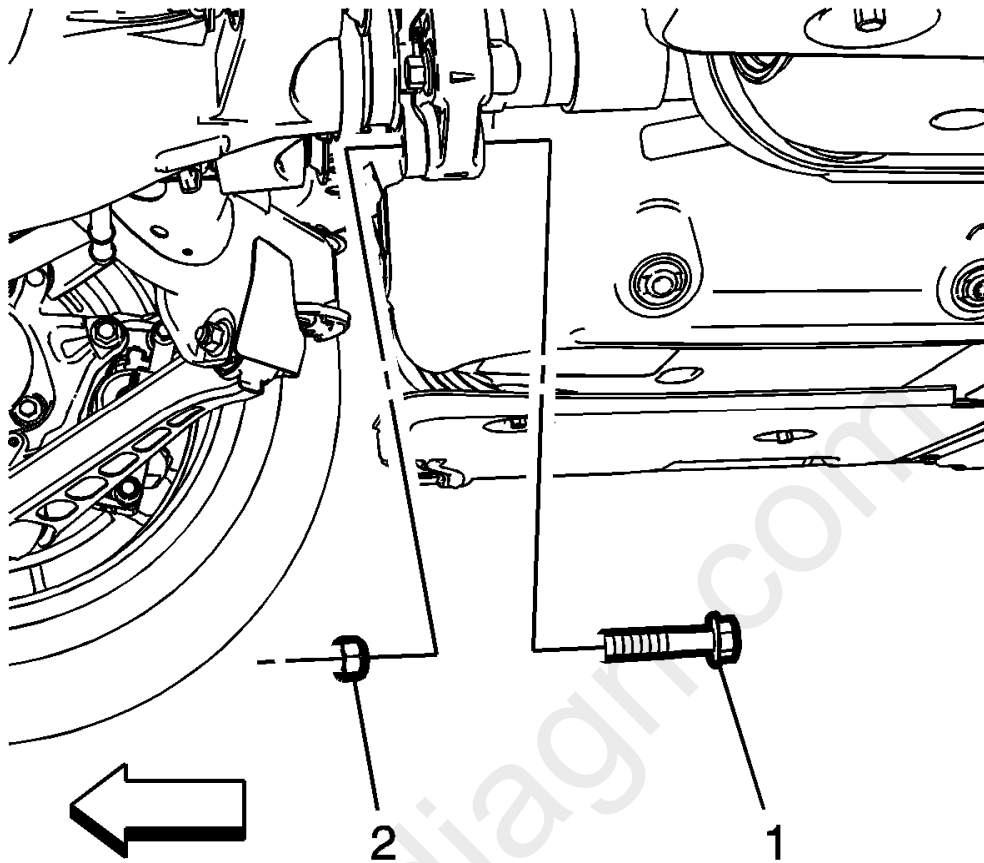


Fig. 26: Rear Propeller Shaft Bolt & Nuts
Courtesy of GENERAL MOTORS COMPANY

5. Install the 3 rear propeller shaft nuts (2) and the bolts (1).
6. Tighten the bolts (1) to 90 (66 lb ft).

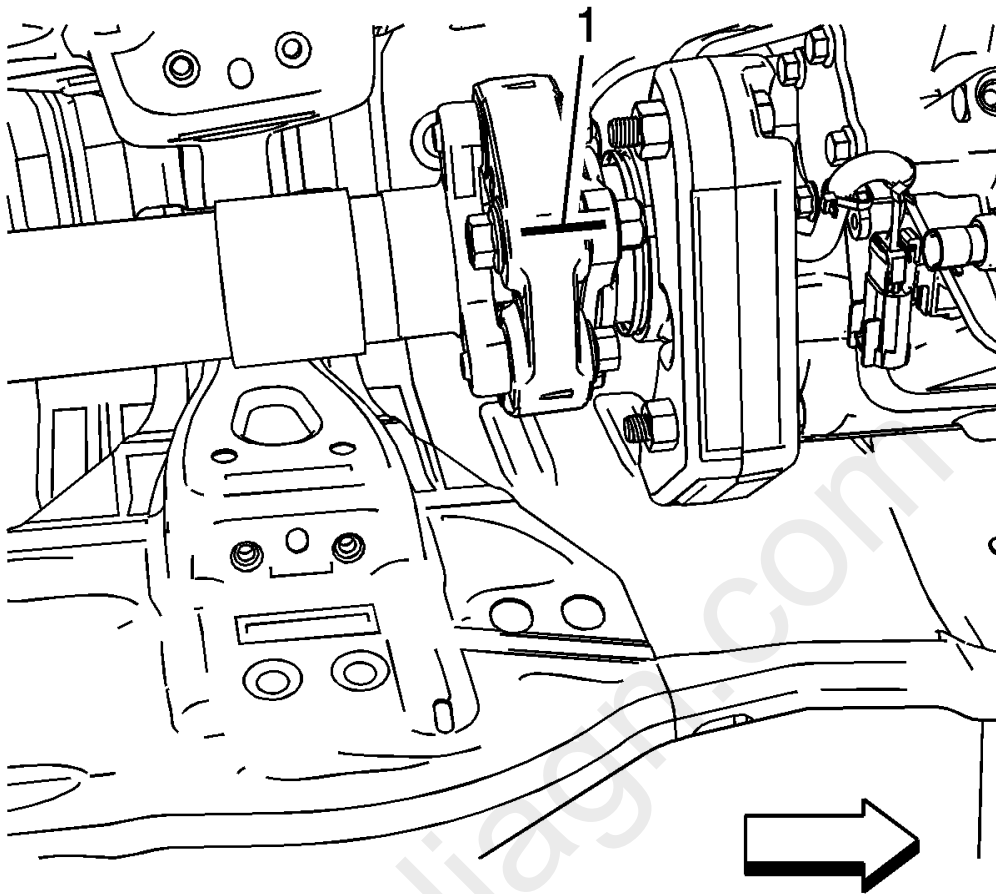


Fig. 27: Identifying Propeller Shaft Flange/Transmission Output Flange Relationship Mark
Courtesy of GENERAL MOTORS COMPANY

7. Align the reference marks (1) between the propeller shaft flange and the output flange of the transmission.

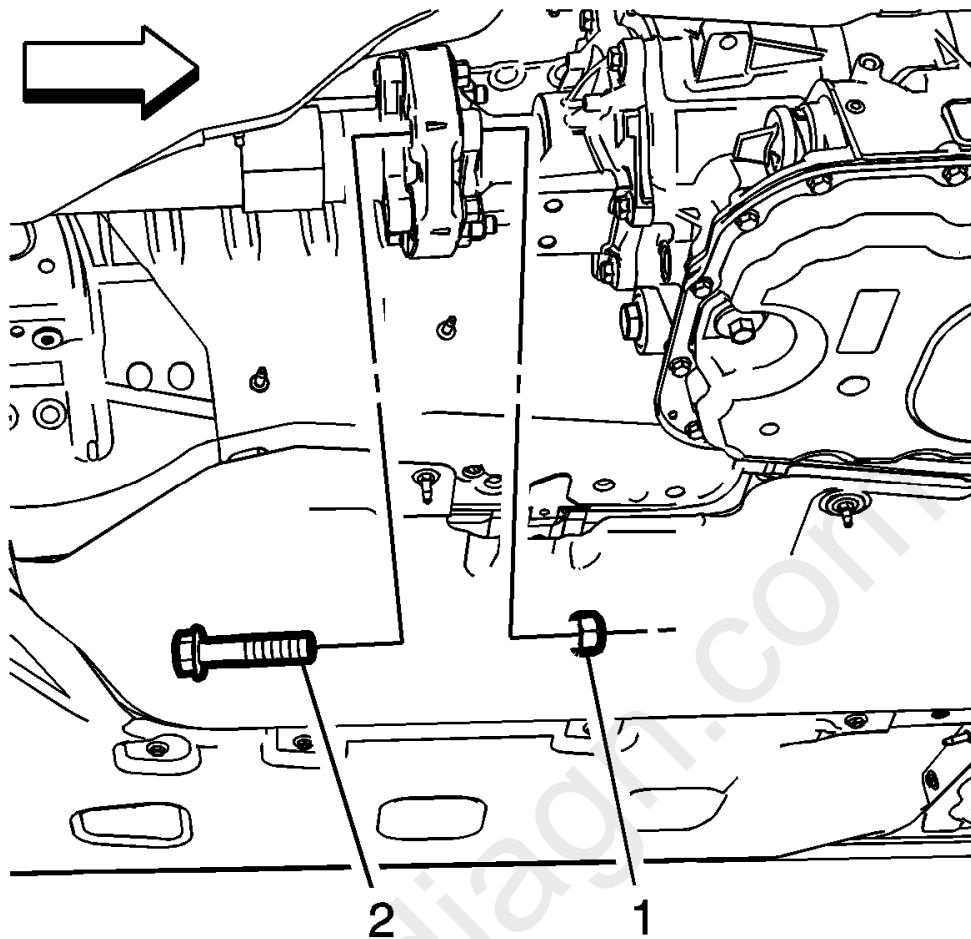


Fig. 28: Front Propeller Shaft Bolt & Nuts
Courtesy of GENERAL MOTORS COMPANY

8. Install the 3 front propeller shaft nuts (2) and the bolts (1).
9. Tighten the bolts (1) to 90 (66 lb ft).
10. Install the floor panel number 2 cross brace.
11. Install the intermediate body exhaust heat shield. Refer to **Intermediate Body Exhaust Heat Shield Replacement** .
12. Install the exhaust system. Refer to or **Exhaust Muffler Replacement (LTG)** .
13. Install the floor panel number 4 cross bar. Refer to **Floor Panel Number 4 Cross Bar Replacement** .
14. Remove the support and lower the vehicle.

DESCRIPTION AND OPERATION

PROPELLER SHAFT DESCRIPTION AND OPERATION

The propeller shaft is a tube with rubber couplers at each end which do not require periodic maintenance. This

transmits power from the transfer case or transmission output shaft to the differential.

Two-Piece Propeller Shaft Description

There is 1 universal joint used in this two-piece propeller shaft design and connects the two pieces together. A center bearing assembly is used to support the propeller shaft connection point, and help isolate the vehicle from vibration.

Propeller Shaft Phasing Description

The propeller shaft is designed and built with the yoke lugs, ears, in line with each other. This produces the smoothest running shaft possible. A propeller shaft designed with built in yoke lugs in line is known as in-phase. An out of phase propeller shaft often causes vibration. The propeller shaft generates vibration from speeding up and slowing down each time the universal joint goes around. The vibration is the same as a person snapping a rope and watching the wave reaction flow to the end. An in phase propeller shaft is similar to 2 persons snapping a rope at the same time and watching the waves meet and cancel each other out. A total cancellation of vibration produces a smooth flow of power in the driveline.

Universal Joint Description

The universal joint connects the two-piece propeller shaft. The universal consist of 4 caps with needle bearings and grease seals mounted on the trunnions of a cross or spider. These bearings and caps are greased at the factory and no periodic maintenance is required. The bearings and caps are pressed into the yokes and staked in place. Universal joints are designed to handle the effects of various loads and rear axle windup conditions during acceleration and braking. The universal joint operates efficiently and safely within the designed angle variations. When the design angles are exceeded, the operational life of the joint decreases.

Center Bearing Description

Center bearings support the driveline when using a 2 or more piece propeller shaft. The center bearing is a ball bearing mounted in a rubber cushion that attaches to a frame crossmember. The manufacturer prelubricates and seals the bearing. The cushion allows vertical motion at the driveline and helps isolate the vehicle from vibration.