


Steering Wheel Flutter at Highway Speeds

Service Category Steering

Section Steering Gear/Linkage

Market USA

Lexus Supports
ASE Certification 

Applicability

YEAR(S)	MODEL(S)	ADDITIONAL INFORMATION
2010 – 2012	GX460	

Introduction

Some vehicles may exhibit a steering flutter condition while driven at approximately 55 – 70 mph. In some cases, this concern is caused by a wheel imbalance or RFV (Radial Force Variation) that is out of range. If the tire and wheel assembly is satisfactory, a steering control valve preload spring is available to reduce the steering flutter felt through the steering wheel.

Warranty Information

OP CODE	DESCRIPTION	TIME	OFF	T1	T2
ST1201	R & R Steering Rack Preload Spring	4.2	44200-60220	9B	42

NOTE

Use the Op Code above **ONLY** for steering control valve preset spring replacement. For all other repairs, use the Flat Rate Manual to select the Op Code relevant to the work performed.

APPLICABLE WARRANTY

- This repair is covered under the Lexus Comprehensive Warranty. This warranty is in effect for 48 months or 50,000 miles, whichever occurs first, from the vehicle's in-service date.
- Warranty application is limited to occurrence of the specified condition described in this bulletin.

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Parts Information

PREVIOUS PART NUMBER	CURRENT PART NUMBER	PART NAME	QTY
–	44215-60010*	Spring, Control Valve Preset	1
–	44215-60020*		1
–	44215-60030*		1
–	44215-60040*		1
–	90460-60008	Clamp, Hose	2

* Please order all 4 steering control valve preset springs before starting work to prevent unnecessary delays. Return any unused springs to part stock to be used for future repairs.

Required Tools & Equipment

SPECIAL SERVICE TOOLS (SST)	PART NUMBER	QTY
Driveshaft Remover**	09520-01010-02	1
Differential Side Gear Shaft Tool** (Shocker Set)	09520-24010 (09520-32040)	1
Rack & Pinion Holding Tool**	09612-00012-01	1
Steering Rack Adjustment Kit (Steering Worm Bearing Adjusting Socket)	09612-10030-02 (09616-00010-02)	1
Variable Open Wrench**	09922-10010-01	1
Beam Torque Wrench**	00002-02955	1
Drive Shaft Boot Clamping Tool (or equivalent)	09521-24010-02	1
Haweka Flange Plate #2 (40 mm)**	02002-02400	1

** Essential SST.

NOTE

Additional SSTs may be ordered by calling 1-800-933-8335.

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Required Tools & Equipment (Continued)

REQUIRED TOOLS & EQUIPMENT	QUANTITY
High Lift Transmission Jack	1
Utility Stand	1
Hunter Low Taper Cone #169 (or equivalent)	1

REQUIRED MATERIAL	QUANTITY
Toyota Genuine Adhesive 1344, Three Bond 1344, Loctite® 242, or equivalent	As Needed
Toyota Genuine Differential Gear Oil LT SAE 75W-85 API GL-5, or equivalent	1.43 to 1.53 U.S. qts (1.35 to 1.45 liters, 1.18 to 1.27 Imp. qts.)
Power Steering Oil, Dextron II, III, or equivalent	As Needed
MP (Multi-Purpose) Grease	As Needed

TSIB Overview

1. Check for source of steering flutter — if tires/wheels or other causes are eliminated as the source of flutter, proceed to next step.
2. Remove the steering rack.
3. Replace the rack guide preload spring with one of four springs with different spring rates.
4. Check steering rack preload.
5. If necessary, install different spring until desired preload is achieved.
6. Reinstall the steering rack.

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Repair Procedure

Preparation: Measuring Balance and RFV

1. Confirm vibration/flutter complaint.
2. Warm up tires to normal operating temperatures to remove cold-soak flat spots. (Drive 10 minutes at 65 mph.)

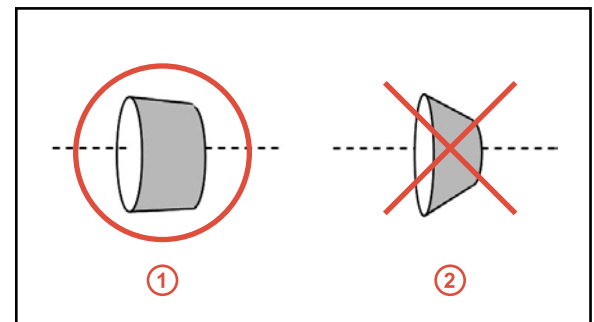
NOTE
 Road test the vehicle at the same speeds and on the same type of road surfaces as the customer complaint.

Does vibration/flutter decrease after the tires warm up?

- **YES** — Tires are temporarily flat spotting. This TSIB does NOT apply. Return vehicle to customer.
 - **NO** — Go to step 3.
3. Proceed with checking the wheel balance and RFV (radial force variation). Balance the tire and wheel assembly using the correct wheel balance attachments.
 - A. Mount the tire/wheel assembly to the balancer machine as illustrated in Figure 2.

NOTE
 When balancing the tire, ensure that the correct cone adapter is being used. Make sure to use a low taper balancer cone.

Figure 1.



1	Low Taper Balancer Cone
2	High Taper Balancer Cone

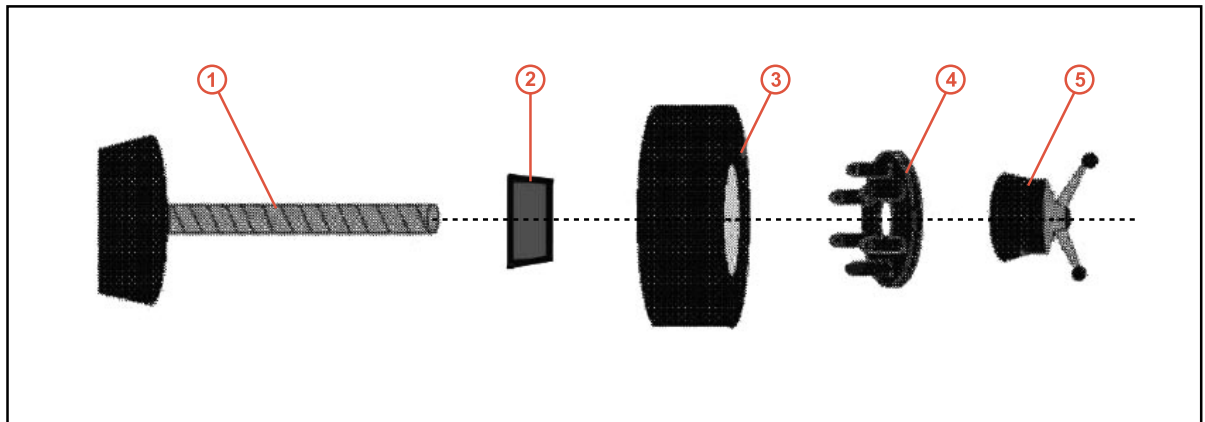
HINT
 When using the balance machine, turn OFF the Weight Miser®, SmartWeight®, or other similar features for better accuracy.

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Repair Procedure

Preparation: Measuring Balance and RFV (Continued)

Figure 2.



1	Balancer
2	Low Taper Balancer Cone
3	Outside of Wheel

4	Haweka Adapter
5	Balancer Clamp

Is RFV within acceptable levels?

NOTE

RFV limit is 26 lbs. Please be aware that this limit is based on recommendations from automotive industry standards and tire manufacturers. Do not use this limit as the only basis for tire replacement.

- **YES** — Continue to next step.
- **NO** — Phase match tires until within acceptable levels.

NOTE

If root cause was a balance or RFV out of range, use the Op Code listed in the Warranty Information section for wheel balance adjustment. Do NOT use the Op Code listed if steering control valve preset spring is NOT replaced.

- B. Test drive the vehicle again. If a vibration remains, is the vibration/flutter felt primarily through the steering wheel?
- **YES** — Proceed to next section to replace the power steering control valve preset spring.
 - **NO** — Vibration source may be coming from elsewhere. Refer to the Repair Manual to diagnose source of vibration.

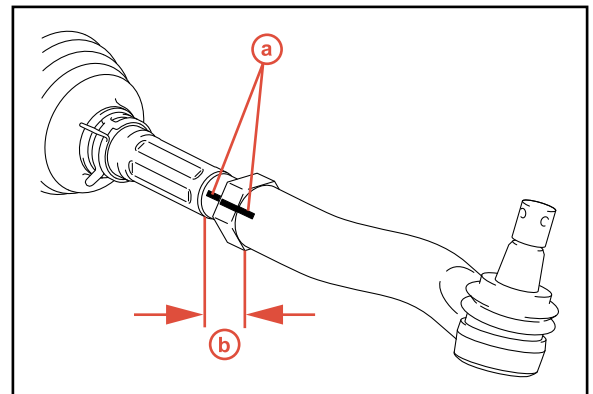
Steering Wheel Flutter at Highway Speeds

Repair Procedure (Continued)

Power Steering Rack Removal

1. Place the front wheels in a straight ahead position.
2. Use a steering wheel holder to prevent steering wheel from turning.
3. Remove the front wheels.
4. Remove the No. 1 engine under cover sub-assembly.
5. Remove the rear engine under cover assembly.
6. Drain the front differential oil.
7. Remove the tie rod end sub-assembly.
 - A. Put matchmarks on the tie rod end and steering rack end.
 - B. Measure the length b and record the data to aid in reassembly.
 - C. Remove the tie rod end.

Figure 3.



a	Matchmarks
b	Measure this Length

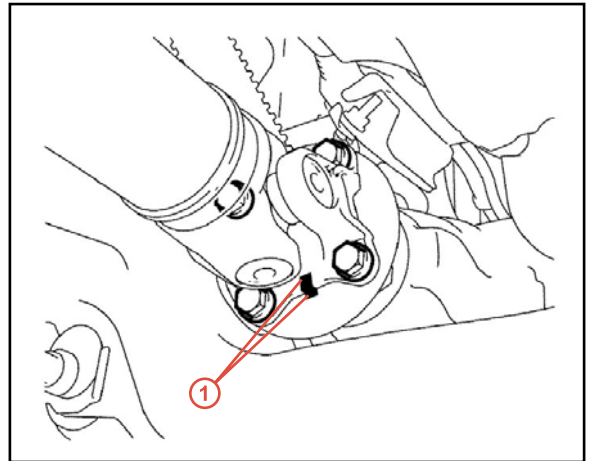
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Repair Procedure

Power Steering Rack Removal (Continued)

8. Remove the front propeller shaft.
 - A. Put matchmarks on the propeller shaft flange and the differential.
 - B. Remove the 4 nuts, washers, and bolts attaching the propeller shaft to the front differential.

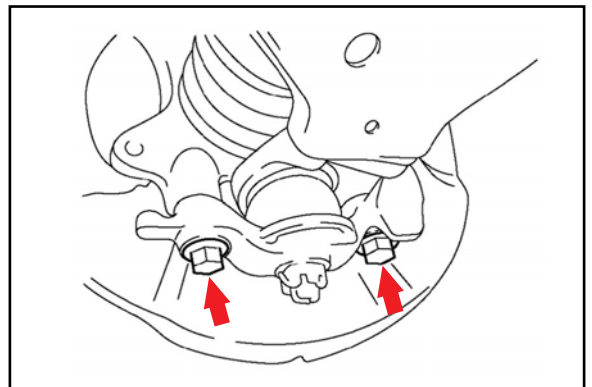
Figure 4.



1	Matchmarks
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9. Remove the 2 bolts that attach the front lower control arm and repeat for the opposite side.

Figure 5.



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Repair Procedure

Power Steering Rack Removal (Continued)

10. Remove the driveshaft using the SSTs.

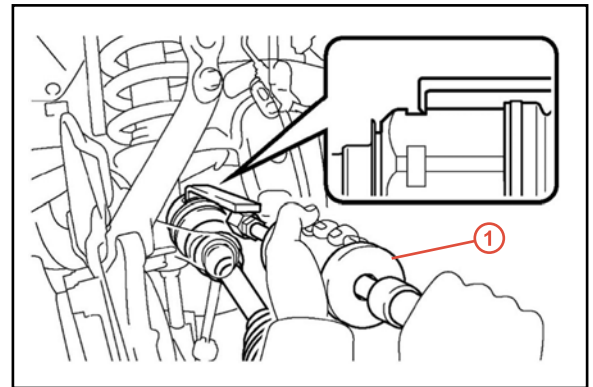
SST: 09520-01010-02, 09520-32040

NOTICE

- Be careful not to damage the dust cover or the oil seal.
- Keep the drive shaft level while handling it.

Repeat for the opposite side.

Figure 6.



1 SST

11. Disconnect the front differential breather tube bracket and hose.

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Repair Procedure

Power Steering Rack Removal (Continued)

12. Support the front differential with a high lift transmission jack.

Figure 7.



Steering Wheel Flutter at Highway Speeds

Repair Procedure

Power Steering Rack Removal (Continued)

13. Remove the two front differential mounting nuts and bolts.

Figure 8.



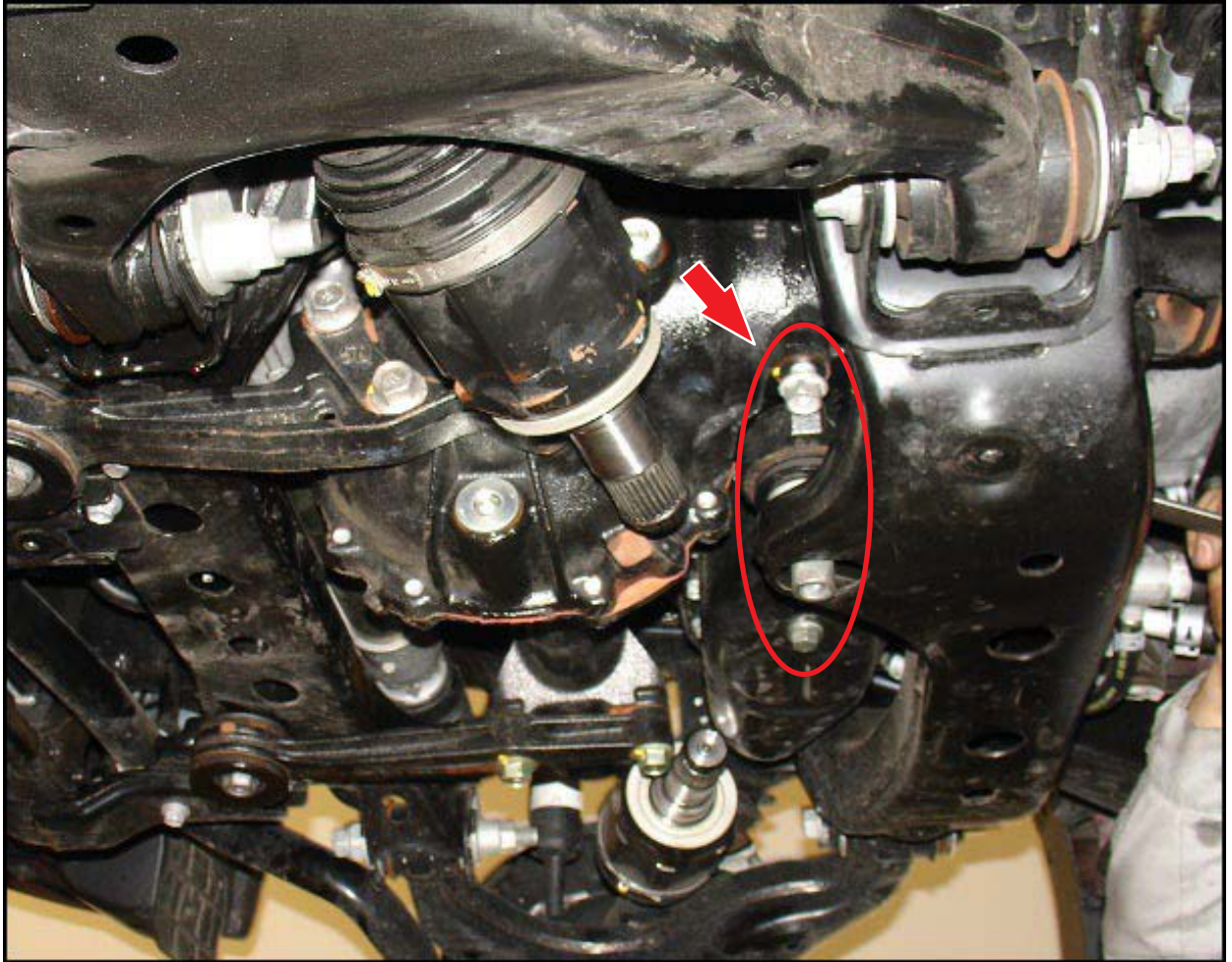
Steering Wheel Flutter at Highway Speeds

Repair Procedure

Power Steering Rack Removal (Continued)

14. Remove the No. 3 front differential mounting nut and bolt.

Figure 9.



15. Disconnect the actuator connector.
16. Lower the jack and remove the front differential.
17. Put matchmarks on the No. 2 steering intermediate shaft and power steering gear to aid during reassembly.

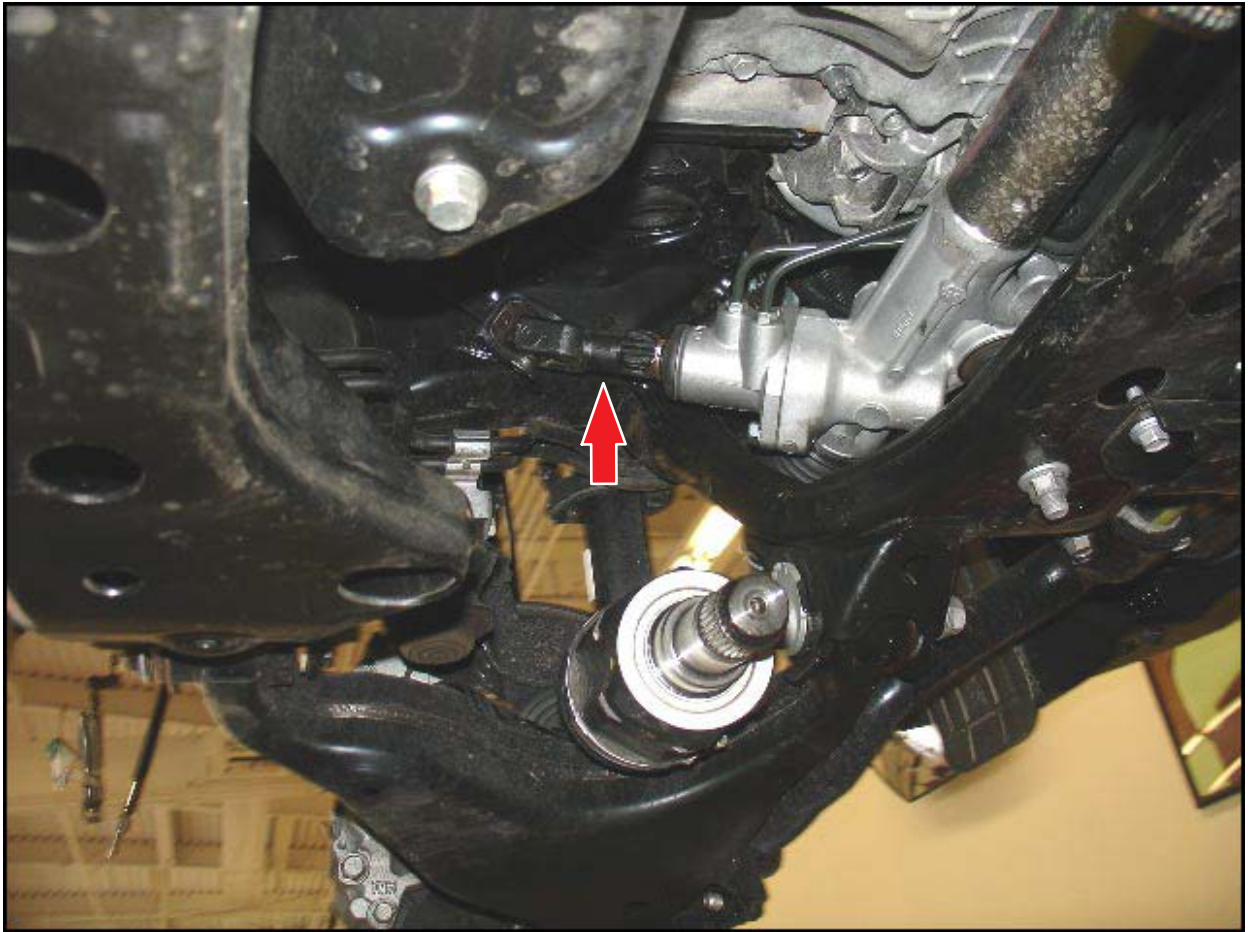
Steering Wheel Flutter at Highway Speeds

Repair Procedure

Power Steering Rack Removal (Continued)

18. Remove the pinch bolt that attaches the intermediate shaft to the input shaft of the power steering gear.

Figure 10.



19. Remove the power steering hoses from the power steering gear.
20. Loosen the two nuts and two bolts that attach the power steering rack.

NOTE

At this time bolts cannot be removed due to clearance.

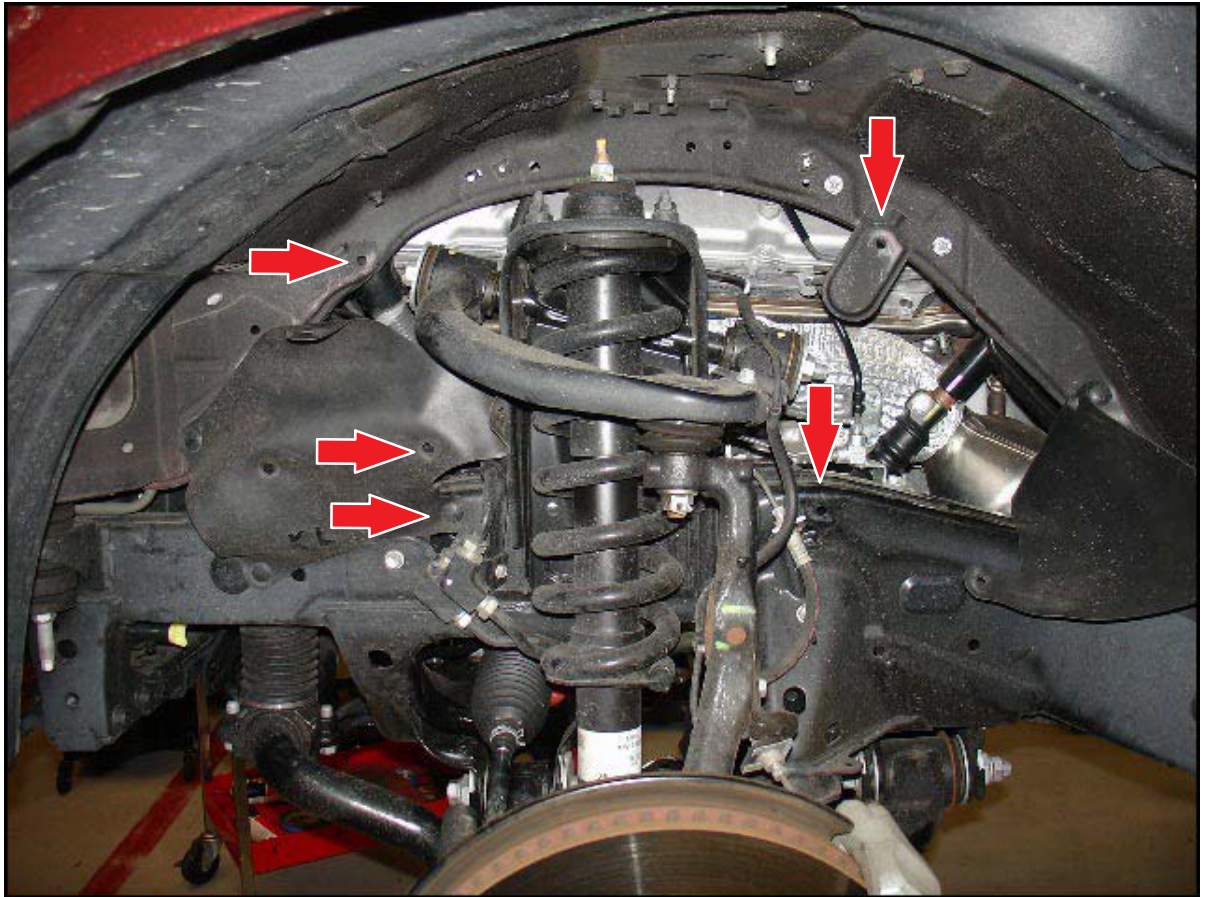
Steering Wheel Flutter at Highway Speeds

Repair Procedure

Power Steering Rack Removal (Continued)

21. Raise the engine assembly to gain enough clearance to remove bolts.
 - A. Remove the clips to gain access into the engine area.

Figure 11.



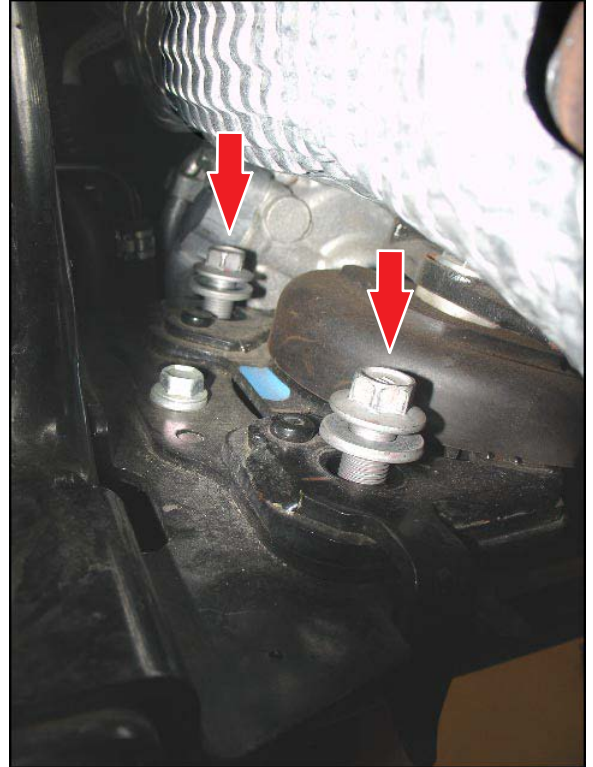
Steering Wheel Flutter at Highway Speeds

Repair Procedure

Power Steering Rack Removal (Continued)

- B. Remove the two engine mount bolts. Repeat for the opposite side.

Figure 12.



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Repair Procedure

Power Steering Rack Removal (Continued)

- C. Use a utility stand and a wooden block to raise the engine to aid in removing the power steering rack bolt.

Figure 13.



Steering Wheel Flutter at Highway Speeds

Repair Procedure

Power Steering Rack Removal (Continued)

22. Remove the two 10 mm bolts that attach the wire harness to the engine to increase clearance to remove the power steering gear.

Figure 14.



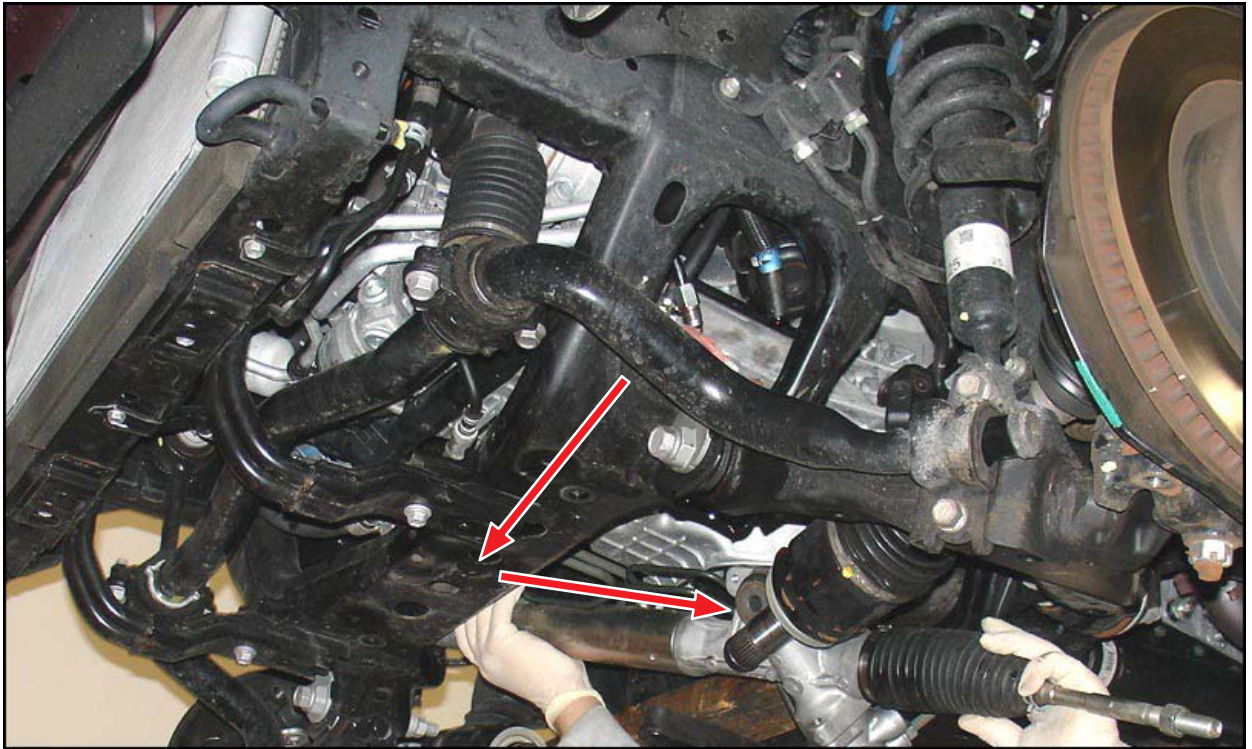
Steering Wheel Flutter at Highway Speeds

Repair Procedure

Power Steering Rack Removal (Continued)

23. Remove the power steering gear by sliding toward the passenger side first, then down toward the driver side.

Figure 15.



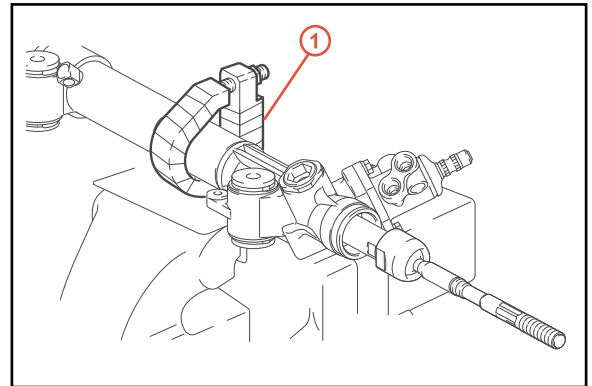
Steering Wheel Flutter at Highway Speeds

Repair Procedure (Continued)

Preload Spring Installation

1. Secure the power steering rack using the SST.
SST: 09612-00012-01

Figure 16.

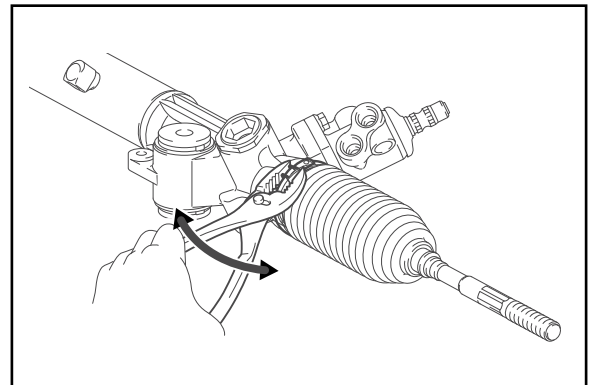


1	SST: 09612-00012-01
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2. Remove the power steering clamp and clip and remove the boot. Repeat for the other side.

NOTE
Boot must be removed to get most consistent steering rack turning force measurement.

Figure 17.



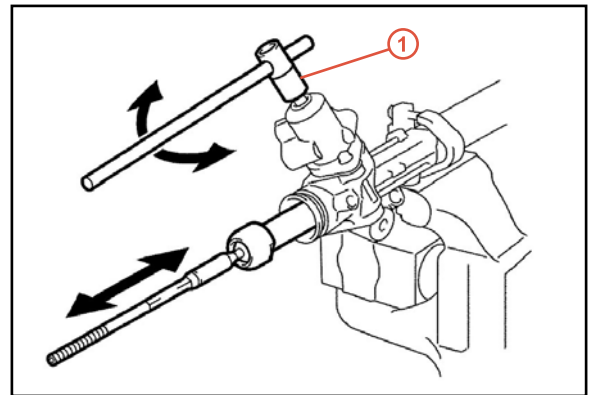
Steering Wheel Flutter at Highway Speeds

Repair Procedure

Preload Spring Installation (Continued)

3. Remove any remaining power steering fluid by turning the input shaft right and left 10 times.

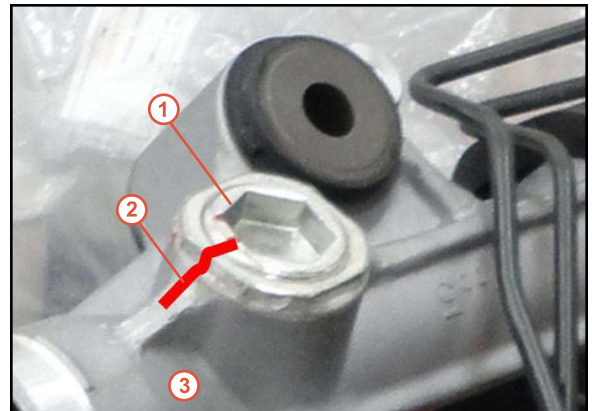
Figure 18.



1	SST: 09612-00012-01
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4. Put matchmarks on the rack guide spring cap and gear box to aid in reinstallation.

Figure 19.



1	Rack Guide Spring Cap
2	Matchmark
3	Gear Box Housing

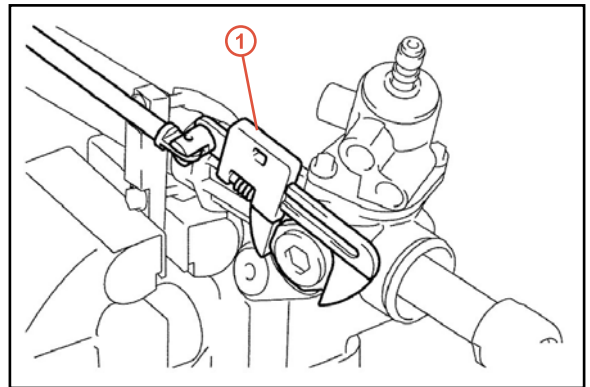
Steering Wheel Flutter at Highway Speeds

Repair Procedure

Preload Spring Installation (Continued)

5. Using the SST, remove the lock nut.
SST: 09922-10010

Figure 20.

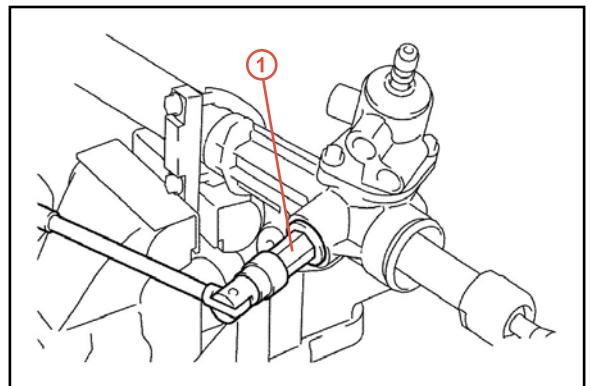


1	SST: 09922-10010
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6. Using a hexagon wrench, remove the rack guide spring cap.

NOTE
 Do not remove the guide.

Figure 21.



1	Hexagon Wrench
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7. Remove the old rack guide spring.

Steering Wheel Flutter at Highway Speeds

Repair Procedure


Preload Spring Installation (Continued)

8. Install the purple spring.

NOTE

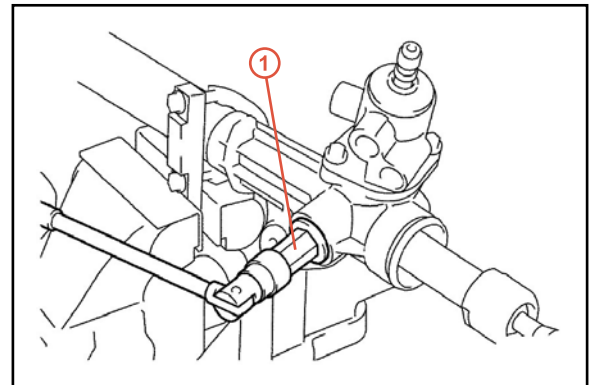
Several springs may need to be tried before the desired preload is achieved.

Use the table below to help select a spring.

PART NUMBER	COLOR IDENTIFICATION	PRELOAD SPRING RATE
OEM	–	Soft  Hard
44215-60010	White	
44215-60020	Purple	
44215-60030	Orange	
44215-60040	Yellow	

9. Apply sealant to 2 – 3 threads of the rack guide spring cap.
Toyota Genuine Adhesive 1344, Three Bond 1344, Loctite® 242, or Equivalent
10. Apply grease to the spring side of the cap.
11. Temporarily install the cap.

Figure 22.



1	Hexagon Wrench
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12. Turn the power steering gear input shaft right and left 1 – 2 times.
13. Using the hexagon wrench, tighten the rack guide spring cap until the matchmarks line up.
14. Apply sealant to 2 – 3 threads of the lock nut.
Toyota Genuine Adhesive 1344, Three Bond 1344, Loctite® 242, or Equivalent

Steering Wheel Flutter at Highway Speeds

Repair Procedure

Preload Spring Installation (Continued)

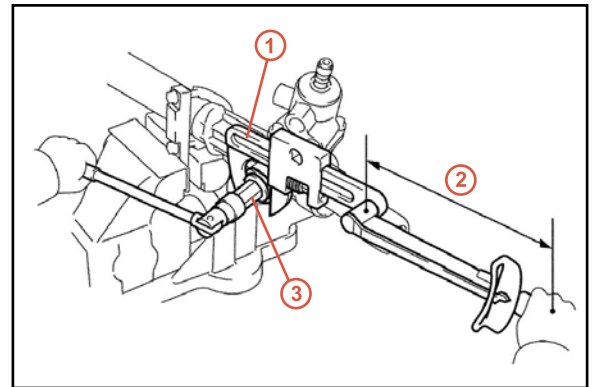
15. Using the hexagon wrench, hold the rack guide spring cap and tighten the lock nut.

Torque: 69 N*m (700 kgf*cm, 51 ft*lbf)

NOTE

The matchmarks on the lock nut **DO NOT** necessarily have to line up.

Figure 23.



1	SST
2	Fulcrum Length
3	Hexagon Wrench

16. Inspect the preload. Using the SSTs 09616-00010-02 (steering adapter) and 00002-02955 (beam type torque wrench), turn the input shaft.

SST: 09616-00010-02, 00002-02955

NOTE

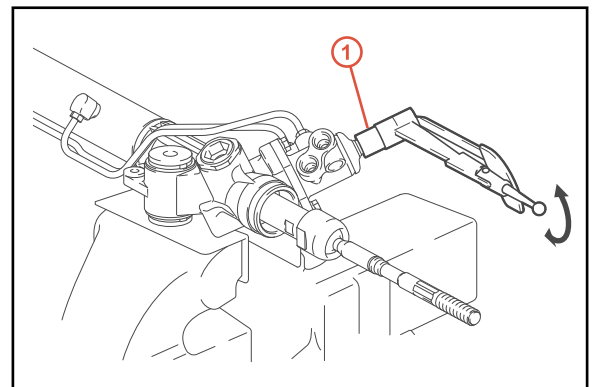
- Measure the preload at the same steering rack center point.
- Make sure that the oil ports are not plugged with caps. A plugged oil port will affect the preload torque measurement.

Torque: 2.45 +/- 0.2 N*m (25 kgf*cm, 22 in*lbf)

NOTE

If torque is **NOT** at the specified range, please select another preload spring.

Figure 24.



1	SST
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17. Reinstall the steering rack boot.

Steering Wheel Flutter at Highway Speeds

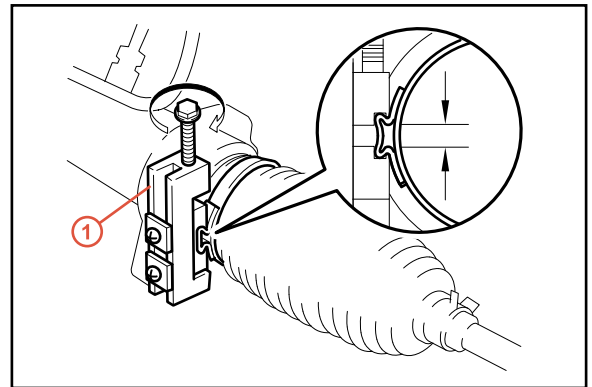
Repair Procedure

Preload Spring Installation (Continued)

18. Using SST 09521-24010 (Drive Shaft Boot Clamping Tool) or equivalent, install the NEW boot clamp.

SST: 09521-24010 (or equivalent)

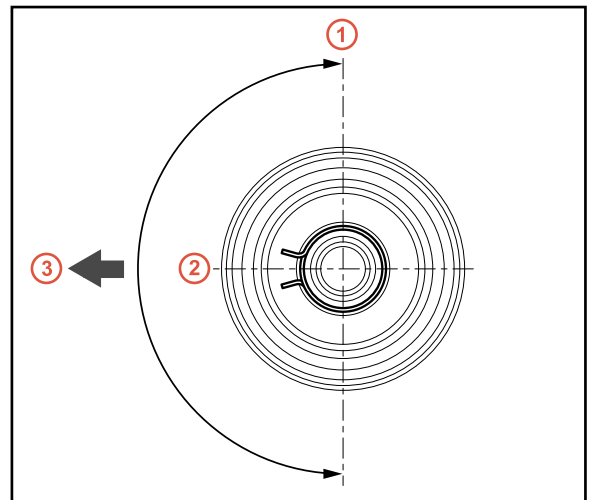
Figure 25.



1	SST: 09521-24010 (or equivalent)
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19. Using pliers, install the boot clips with proper orientation.

Figure 26.



1	Upward
2	180°
3	Front of Vehicle

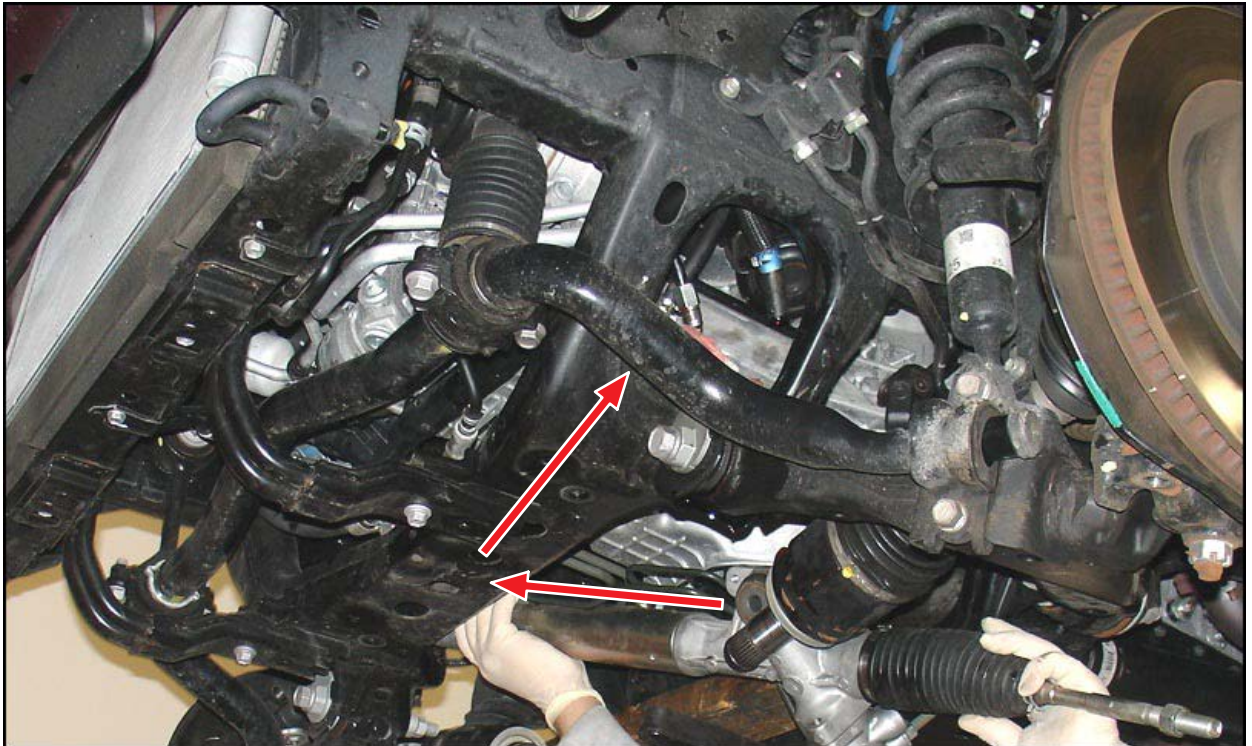
Steering Wheel Flutter at Highway Speeds

Repair Procedure (Continued)

Power Steering Gear Linkage Reinstallation

1. Reinstall the steering gear by sliding up toward the passenger side first, then slide toward the driver side.

Figure 27.



2. Reinstall the 2 nuts and bolts that attach the steering gear to the sub-frame.
Torque: 120 N*m (1,224 kgf*cm, 89 ft*lbf)
3. Align the matchmarks on the No. 2 intermediate shaft and power steering gear, and install the bolt.
Torque: 36 N*m (367 kgf*cm, 27 ft*lbf)

Steering Wheel Flutter at Highway Speeds

Repair Procedure

Power Steering Gear Linkage Reinstallation (Continued)

4. Reinstall the two 10 mm bolts that attach the wire harness.

Figure 28.



5. Reconnect the pressure feed tubes on the steering gear linkage.

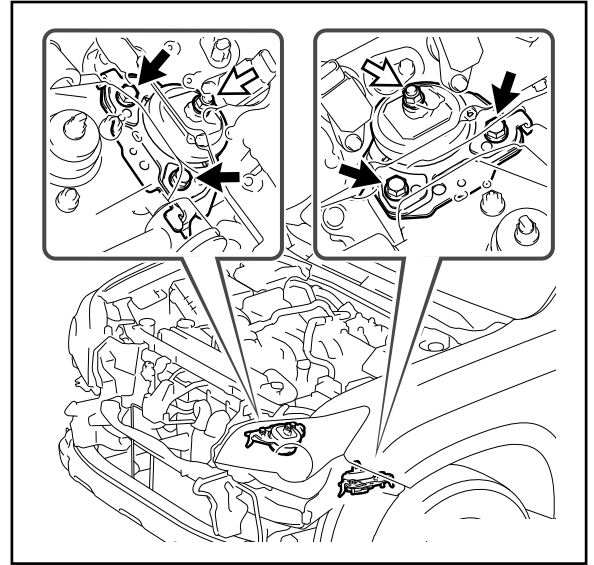
Steering Wheel Flutter at Highway Speeds

Repair Procedure

Power Steering Gear Linkage Reinstallation (Continued)

6. Lower the engine and reinstall the engine mount bolts.

Figure 29.



7. Tighten the two engine mount bolts.
Torque: 57 N*m (581 kgf*cm, 42 ft*lbf)

Steering Wheel Flutter at Highway Speeds

Repair Procedure

Power Steering Gear Linkage Reinstallation (Continued)

8. Using the high lift transmission jack, position the differential near the mounting bolt holes.

Figure 30.



9. Reconnect the differential breather tube.

Steering Wheel Flutter at Highway Speeds

Repair Procedure

Power Steering Gear Linkage Reinstallation (Continued)

10. Install the front differential.

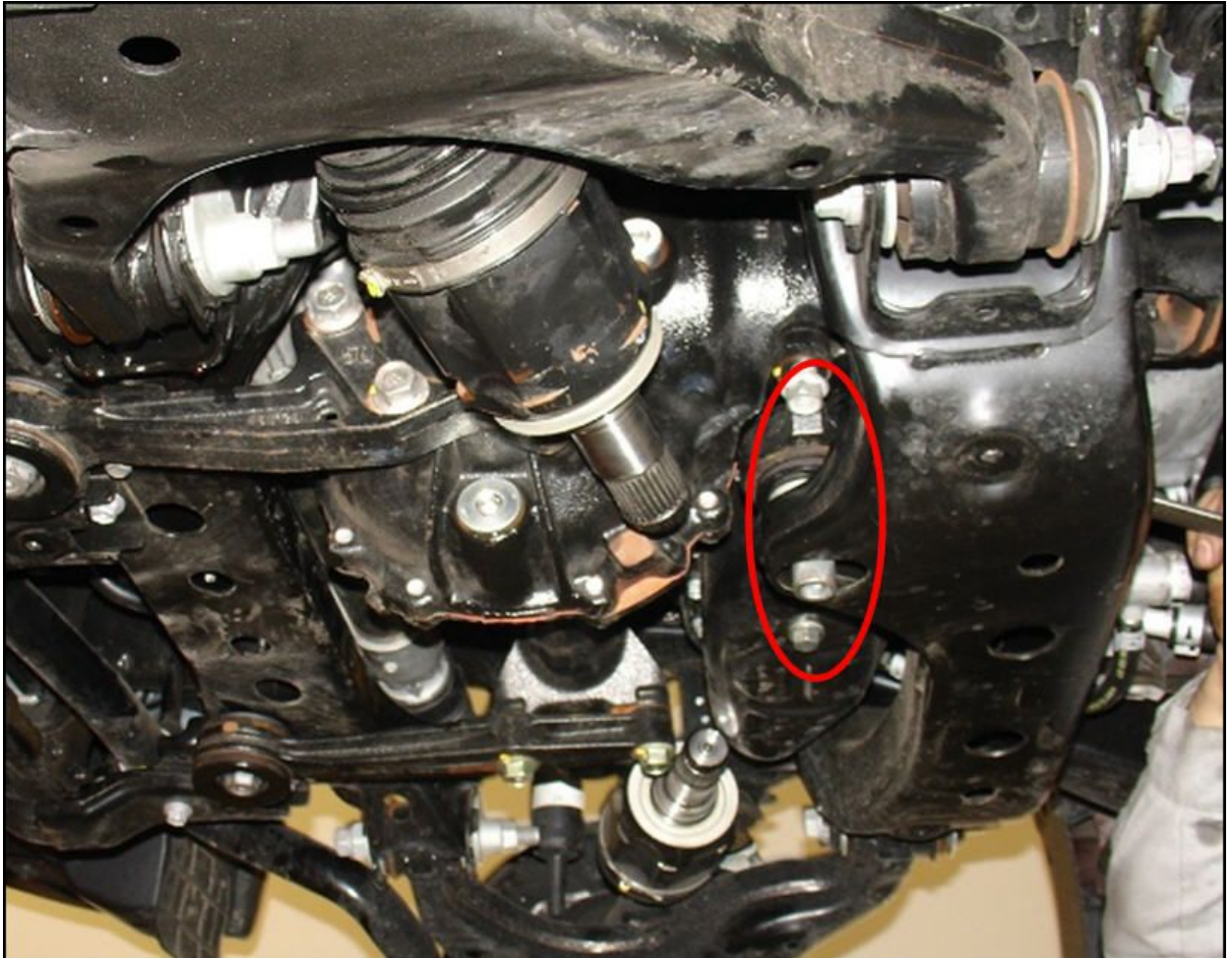
Bolt:

Torque: 108 N*m (1,101 kgf*cm, 80 ft*lbf)

Hexagon Nut:

Torque: 87 N*m (889 kgf*cm, 64 ft*lbf)

Figure 31.



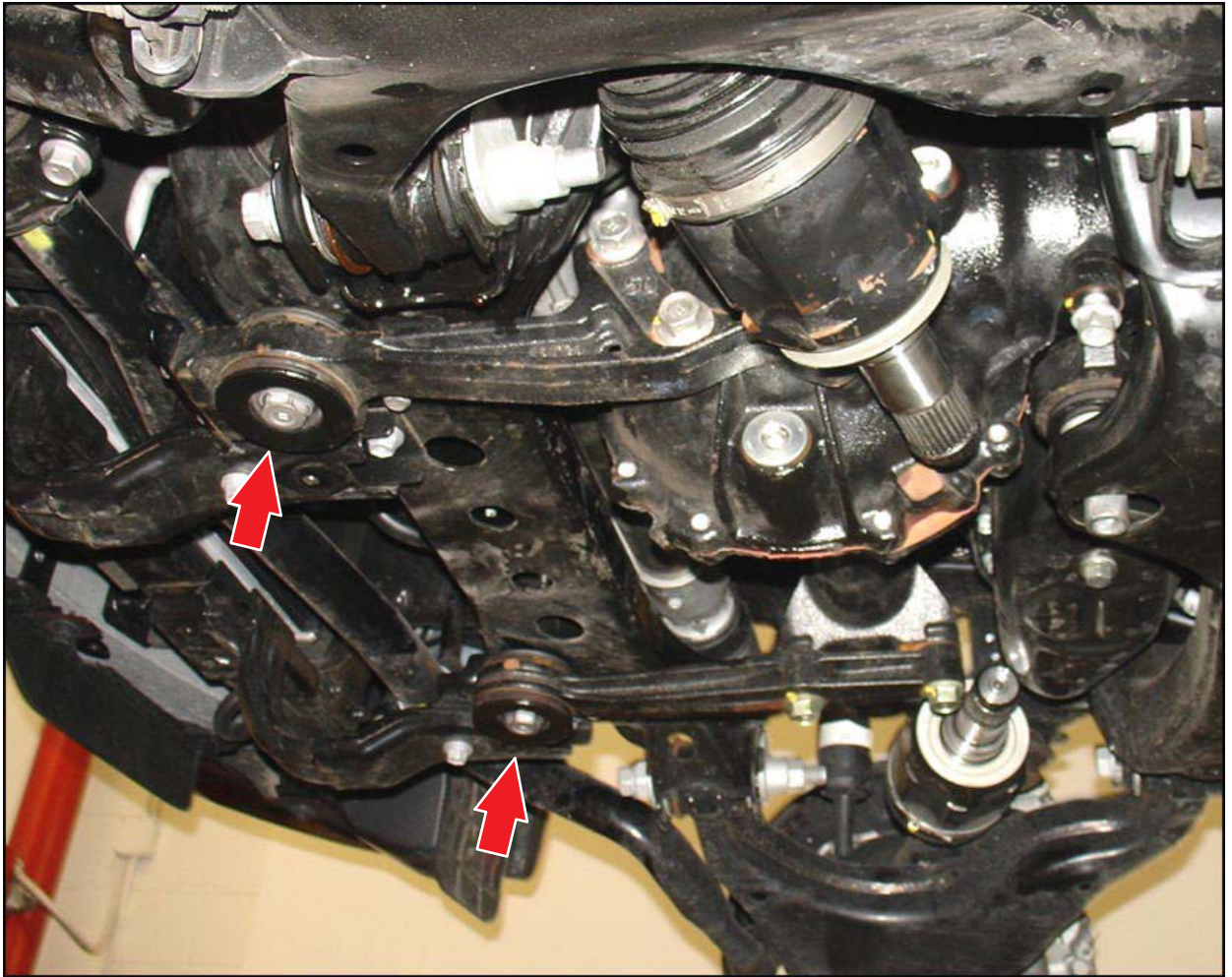
Steering Wheel Flutter at Highway Speeds

Repair Procedure

Power Steering Gear Linkage Reinstallation (Continued)

11. Tighten the front differential mounting bolt.
Torque: 137 N*m (1,400 kgf*cm, 101 ft*lbf)

Figure 32.



Steering Wheel Flutter at Highway Speeds

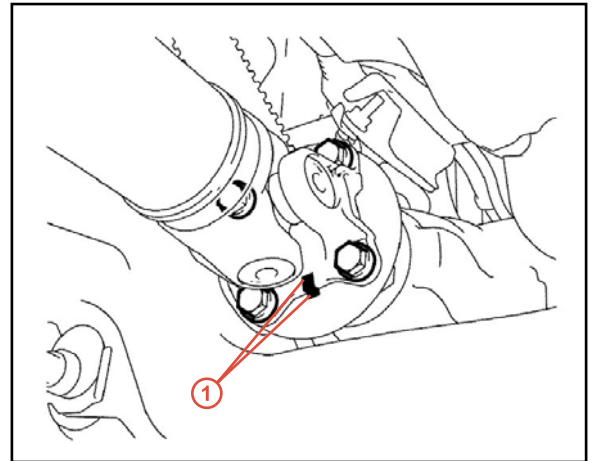
Repair Procedure

Power Steering Gear Linkage Reinstallation (Continued)

12. Align the matchmarks for the front propeller shaft and install the 4 nuts, bolts, and washers.

Torque: 88 N*m (899 kgf*cm, 65 ft*lbf)

Figure 33.

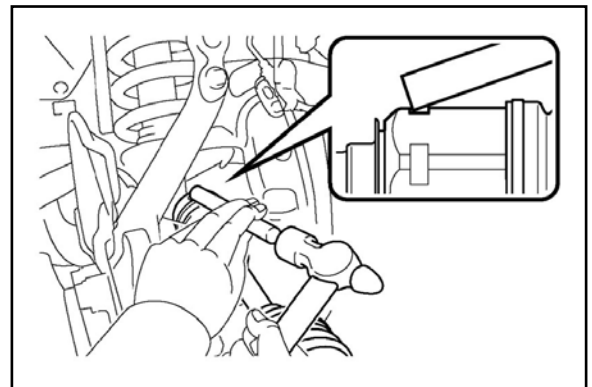


1	Matchmarks
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13. Reinstall the front driveshaft assembly into the housing.

Align the splines and drive the shaft in with a brass drift punch and hammer.

Figure 34.



NOTICE

- Coat the splines with ATF fluid.
- Set the snap ring so that the opening is facing downward.
- Be careful NOT to damage the oil seal, boot, and dust cover.

14. Reattach the inner tie rods and align matchmarks.

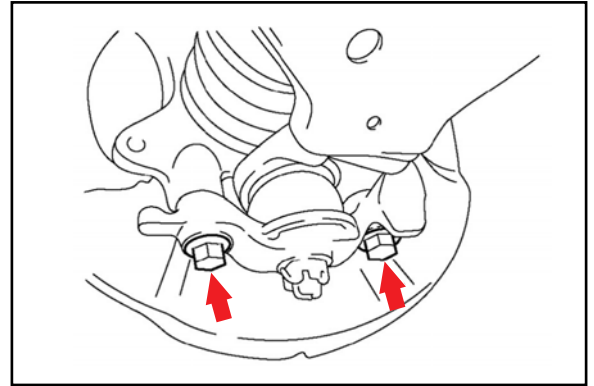
Steering Wheel Flutter at Highway Speeds

Repair Procedure

Power Steering Gear Linkage Reinstallation (Continued)

15. Reinstall the 2 lower control arm bolts.
Torque: 160 N*m (1,632 kgf*cm, 118 ft*lbf)

Figure 35.



16. Refill the front differential with gear oil.
Toyota Genuine Differential Gear Oil LT SAE 75W-85 API GL-5 or equivalent.

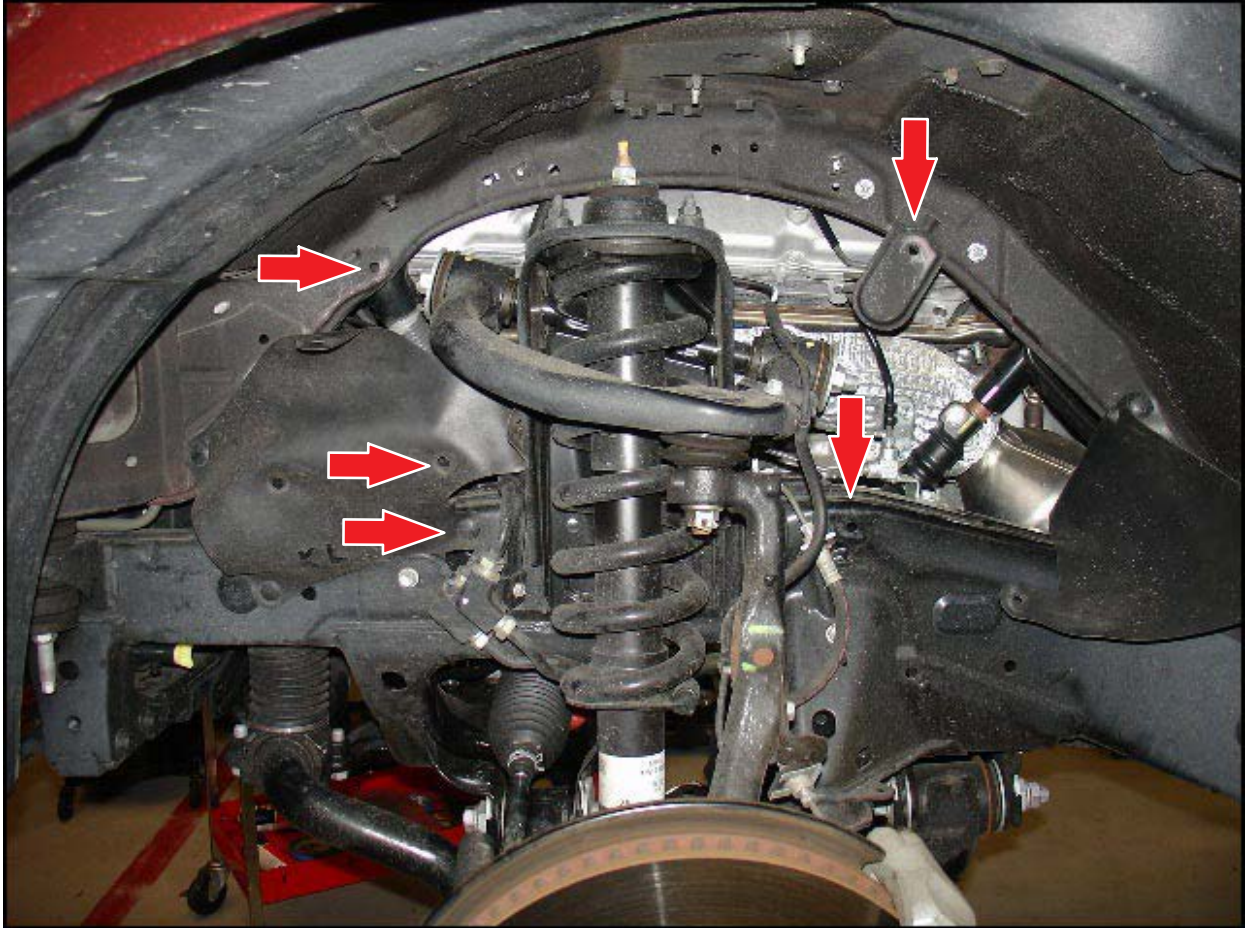
Steering Wheel Flutter at Highway Speeds

Repair Procedure

Power Steering Gear Linkage Reinstallation (Continued)

17. Reattach the engine side cover clips and repeat for the other side.

Figure 36.



18. Reinstall the front wheels.
Torque: 112 N*m (1,137 kgf*cm, 82 ft*lbf)
19. Reinstall the rear engine under cover assembly.
20. Reinstall the No. 1 engine under cover sub-assembly.
21. Refill the power steering gear oil and bleed as necessary.
Power Steering Oil, Dextron II, III, or equivalent

Steering Wheel Flutter at Highway Speeds

Repair Procedure

Power Steering Gear Linkage Reinstallation (Continued)

22. Perform power steering bleed procedure.
 - A. Check the steering gear fluid level.
 - B. Make sure that the front tires are off the ground.
 - C. With the engine OFF, turn the steering wheel from lock to lock several times.
 - D. Lower the vehicle.
 - E. Start the engine and let it idle for a few minutes.
 - F. Turn the steering wheel from lock to lock holding it at the lock position for 2-3 seconds each time.
 - G. Stop the engine and verify that there are no air bubbles in the power steering fluid reservoir.
23. Perform alignment.
24. Test drive vehicle to confirm that the flutter condition has been reduced.