SPECIFICATIONS

Alignment Specifications

Item	LH	RH	Total/ Split
Front			
Camber	-0.75° ± 0.75°	-0.75° ± 0.75°	0° ± 0.75°
Caster	7.1° ± 0.75°	7.1° ± 0.75°	0° ± 0.75°
Toe (positive value is toe-in, negative value is toe-out)	—	—	0.10 ± 0.20°

General Specifications

Item	Specification
Ball Joint Deflection	
Lower ball joint	0-0.3 mm (0-0.012 in)
Dogtracking	
Clear vision (negative value is counterclockwise)	0° ± 3°
Maximum	13 mm (0.5 in)
Front Ride Height	
Mustang — Front	37 mm ± 8 mm (1.5 in ± 0.3 in)
Shelby GT 500 Coupe — Front	34 mm ± 8 mm (1.3 in ± 0.3 in)

General Specifications (Continued)

Item	Specification
Shelby GT 500 Convertible — Front	35 mm ± 8 mm (1.4 in ± 0.3 in)
Rear Ride Height	
Mustang Convertible — Rear	118 mm ± 8 mm (4.6 in ± 0.3 in)
Mustang Coupe — Rear	115 mm ± 8 mm (4.5 in ± 0.3 in)
Shelby GT 500 Coupe — Rear	112 mm ± 8 mm (4.4 in ± 0.3 in)
Shelby GT 500 Convertible — Rear	116 mm ± 8 mm (4.6 in ± 0.3 in)

Torque Specifications

Description	Nm	lb-ft
Brake line bracket bolt	20	15
Lower control arm rear inboard cam nut	185	136
Strut-to-wheel spindle cam nut	200	148
Strut-to-wheel spindle upper bolt	200	148
Tie-rod jam nut	55	41
Wheel speed sensor bolt	15	11

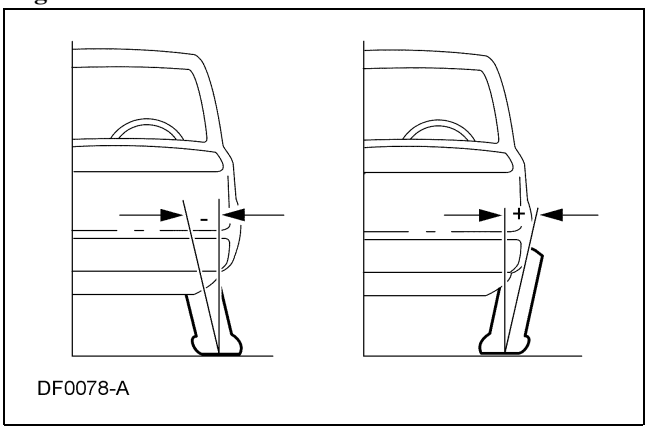
DESCRIPTION AND OPERATION

Wheel Alignment Angles

Camber and toe are adjustable on the front suspension systems. Front camber is adjusted through the use of a service repair kit (3C396). Caster is preset at the factory and should only be adjusted, through the use of a service repair kit (3C396), after all other possible sources have been inspected and corrected as necessary. Front toe is adjusted by the use of the front wheel spindle tie rod.

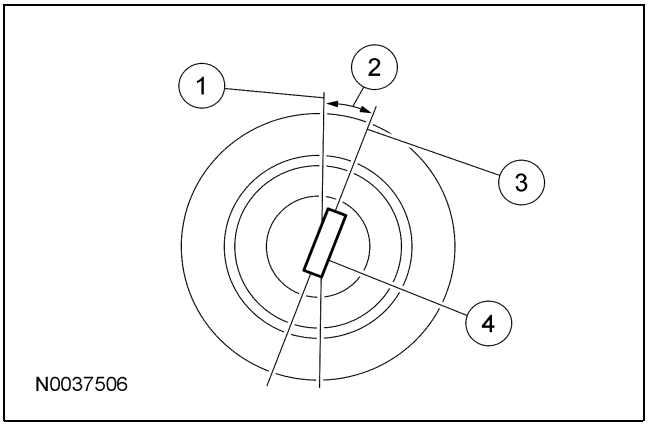
Camber

Negative and Positive Camber



Camber is the vertical tilt of the wheel when viewed from the front. Camber can be positive or negative and has a direct effect on tire wear.

Caster

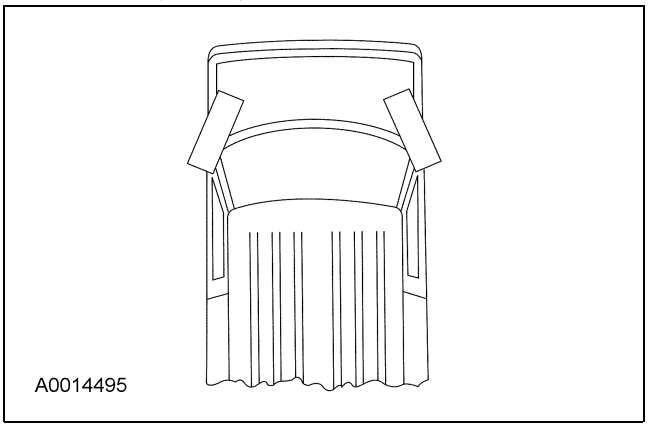


Item	Description
1	True vertical
2	Positive caster angle
3	Strut centerline
4	Pivot centerline

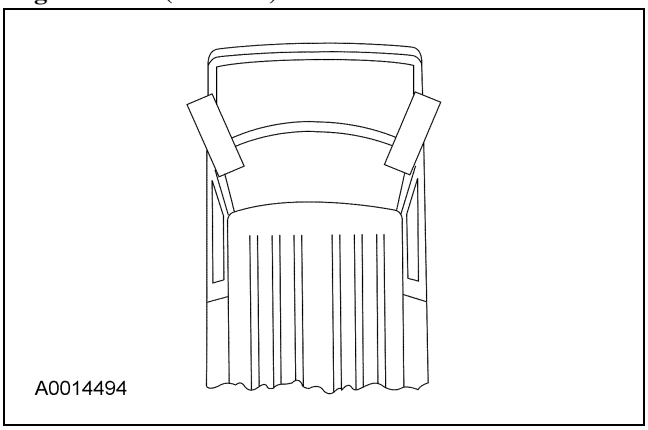
Caster is the deviation from vertical of an imaginary line drawn through the pivot points (top of strut and lower ball joint), when viewed from the side. The caster specifications in this section will give the vehicle the best directional stability characteristics when loaded and driven. The caster setting is not related to tire wear.

Toe

Positive Toe (Toe In)



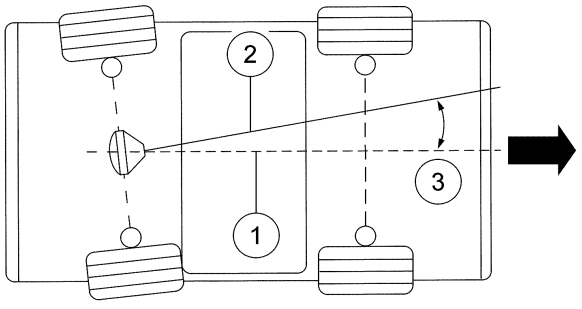
Negative Toe (Toe Out)



The vehicle toe setting affects tire wear and directional stability.

DESCRIPTION AND OPERATION (Continued)

Incorrect Thrust Angle (Dogtracking)



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Item	Description
1	Vehicle centerline
2	Axle centerline
3	Thrust angle

Incorrect thrust angle (also known as dogtracking) is the condition in which the rear axle is not square to the chassis. Heavily crowned roads can give the illusion of dogtracking.

Wander

Wander is the tendency of the vehicle to require frequent, random left and right steering wheel corrections to maintain a straight path down a level road.

Shimmy

Shimmy, as observed by the driver, is large, consistent, rotational oscillations of the steering wheel resulting from large, side-to-side (lateral) tire/wheel movements.

Shimmy is usually experienced near 64 km/h (40 mph), and can begin or be amplified when the tire contacts pot holes or irregularities in the road surface.

Nibble

Sometimes confused with shimmy, nibble is a condition resulting from tire interaction with various road surfaces and observed by the driver as small rotational oscillations of the steering wheel. For wheel and tire diagnosis, refer to Section 204-04.

Poor Returnability/Sticky Steering

Poor returnability and sticky steering is used to describe the poor return of the steering wheel to center after a turn or steering correction is completed.

Drift/Pull

Pull is a tugging sensation, felt in the steering wheel, that must be overcome to keep the vehicle going straight.

Drift describes what a vehicle with this condition does with hands off the steering wheel.

- Drift/pull may be induced by conditions external to the vehicle (that is, wind, road camber).

Poor Groove Feel

Poor groove feel is characterized by little or no buildup of turning effort felt in the steering wheel as the wheel is rocked slowly left and right within very small turns around center or straight-ahead (under 20 degrees of steering wheel turn). Efforts may be said to be ‘‘flat on center.’’

- Under 20 degrees of turn, most of the turning effort that builds up comes from the mesh of gear teeth in the steering gear. In this range, the steering wheel is not yet turned enough to feel the effort from the self-aligning forces at the road wheel or tire patch.
- In the diagnosis of a handling problem, it is important to understand the difference between wander and poor groove feel.

DIAGNOSIS AND TESTING

Suspension System

Inspection and Verification

1. Road test the vehicle.
   - If any suspension alignment or ride height concerns are present, GO to Symptom Chart — Suspension System.
   - Verify the customer concern by carrying out a road test on a smooth road. If any vibrations are present, GO to Symptom Chart — NVH.
2. Inspect the tires.
   - Check the tire pressures with all normal loads in the vehicle and the tires cold. Refer to the Vehicle Certification (VC) label.
   - Verify that all tires are sized to specification. Refer to the VC label.
   - Inspect the tires for incorrect wear and damage. Install new tires as necessary.
3. Inspect the chassis and underbody.
   - Remove any excessive accumulation of mud, dirt or road deposits from the chassis and underbody.
4. Inspect for aftermarket equipment.
   - Check for aftermarket changes to the steering, suspension, and wheel and tire components (such as competition or heavy duty). The specifications shown in this manual do not apply to vehicles equipped with aftermarket equipment.

Visual Inspection Chart

Mechanical
• Front or rear suspension components • Suspension fastener(s) • Incorrect spring usage • Spring(s) • Shock absorber(s) • Strut(s) • Suspension bushing(s) • Steering system components • Wheel bearing(s) • Non-OEM parts or modifications

5. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the next step.
6. If the fault is not visually evident, GO to Symptom Chart — Suspension System or GO to Symptom Chart — NVH.

Symptom Chart — Suspension System

Symptom Chart — Suspension System

Condition	Possible Sources	Action
• Incorrect thrust angle (dogtracking)	• Rear suspension components	• INSPECT the rear suspension system. CHECK the rear alignment for the correct thrust angle. REPAIR or INSTALL new suspension components as necessary. REFER to Section 204-02.
• Vehicle drifts/pulls	• Unevenly loaded or overloaded vehicle • Tires/tire pressure • Alignment is not within specification • Brake drag • Steering components	• GO to Pinpoint Test A.

DIAGNOSIS AND TESTING (Continued)

Symptom Chart — Suspension System (Continued)

Condition	Possible Sources	Action
• Front bottoming or riding low	• Worn, damaged or incorrect springs • Worn front strut(s)	• MEASURE the ride height. REFER to Ride Height Measurement in this section. INSTALL new springs as necessary. REFER to Section 204-01. • If the ride height is OK, INSTALL new struts as necessary. REFER to Section 204-01.
• Abnormal/incorrect tire wear	• Incorrect tire pressure (rapid center rib or inner and outer edge wear) • Incorrect tire rotation intervals • High-speed cornering • Excessive front or rear toe (inner or outer edge wear) • Alignment out of specification (inner or outer edge wear) • Front or rear suspension components	• REFER to Section 204-04 Diagnosis and Testing for further tire wear diagnosis. • INSPECT the front and rear suspension system. REPAIR or INSTALL new suspension components as necessary. REFER to Section 204-01 for front suspension or Section 204-02 for rear suspension.
• Poor returnability/sticky steering	• Damaged or worn front strut mount bearing(s) • Binding ball joints • Steering components • Caster out of specification	• INSTALL a new front strut mount bearing(s) as necessary. REFER to Section 204-01. • REFER to the Ball Joint Inspection component test in this section. • INSPECT the steering system. INSTALL new components as necessary. REFER to Section 211-02. • CHECK the wheel alignment. REFER to Caster Adjustment — Front in this section. ADJUST as necessary.
• Steering wheel off-center	• Unequal front toe setting (side-to-side) • Steering components	• CHECK the wheel alignment. REFER to Toe Adjustment — Front in this section. ADJUST as necessary. • INSPECT the steering system. INSTALL new components as necessary. REFER to Component Tests in Section 211-00.

DIAGNOSIS AND TESTING (Continued)

Symptom Chart — Suspension System (Continued)

Condition	Possible Sources	Action
• Sway or roll	• Overloaded, unevenly or incorrectly loaded vehicle	• NOTIFY the customer of incorrect vehicle loading.
	• Loose wheel nut(s)	• TIGHTEN the wheel nut(s) to specification. REFER to Section 204-04.
	• Strut(s) or shock absorber(s)	• INSTALL new struts or shock absorbers as necessary. REFER to Section 204-01 for front suspension or Section 204-02 for rear suspension.
	• Loose stabilizer bracket-to-frame bolts	• TIGHTEN the bolts to specification. REFER to Section 204-01.
	• Worn stabilizer bar bushings or links	• INSTALL new stabilizer bar bushings or links as necessary. REFER to Section 204-01.
	• Damaged or broken stabilizer bar	• INSTALL a new stabilizer bar as necessary. REFER to Section 204-01.
		• MEASURE the ride height. REFER to Ride Height Measurement in this section.
	• Damaged spring(s)	• INSTALL new springs as necessary. REFER to Section 204-01 for front suspension or Section 204-02 for rear suspension.
• Vehicle leans to one side	• Unevenly loaded or overloaded vehicle	• NOTIFY the customer of incorrect vehicle loading.
	• Front or rear suspension components	• INSPECT the front and rear suspension systems. INSTALL new suspension components as necessary. REFER to Section 204-01 for front suspension or Section 204-02 for rear suspension.
	• Incorrect ride height. Side-to-side lean out of specification	• MEASURE the ride height. REFER to Ride Height Measurement in this section. INSPECT the front and rear suspension systems. REPAIR or INSTALL new components as necessary. REFER to Section 204-01 for front suspension or Section 204-02 for rear suspension.

DIAGNOSIS AND TESTING (Continued)

Symptom Chart — Suspension System (Continued)

Condition	Possible Sources	Action
• Wander	• Overloaded, unevenly or incorrectly loaded vehicle	• NOTIFY the customer of incorrect vehicle loading.
	• Ball joint(s)	• INSPECT the ball joints. REFER to the Ball Joint Inspection component test in this section.
	• Damaged or missing front strut mount bearing(s)	• INSTALL a new front strut mount bearing(s) as necessary. REFER to Section 204-01.
	• Loose, worn or damaged front wheel bearing(s)	• INSPECT the wheel bearings. INSTALL new wheel bearings as necessary.
	• Steering components	• INSPECT the steering system. INSTALL new components as necessary. REFER to Section 211-00.
	• Wheel alignment (excessive total front toe out)	• ADJUST as necessary. REFER to Toe Adjustment — Front in this section.

Symptom Chart — NVH

Symptom Chart — NVH

NOTE: NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04. Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to Section 100-04 for the next likely system and continue diagnosis.

Condition	Possible Sources	Action
• Squeak or grunt — noise from the front or rear suspension, occurs more in cold ambient temperatures. More noticeable over rough roads or when turning	• Front stabilizer bar insulators • Rear stabilizer bar insulators	• Under these conditions, the noise is acceptable. CHECK TSBs.
• Clunk — noise from the front suspension, occurs in and out of turns	• Loose front suspension	• INSPECT for loose nuts or bolts. TIGHTEN to specifications. REFER to Section 204-01 for front suspension.
• Clunk — noise from the rear suspension, occurs when shifting from REVERSE to drive	• Loose rear suspension components	• INSPECT for loose or damaged rear suspension components. REPAIR or INSTALL new components as necessary. REFER to Section 204-02.
• Click or pop — noise from the front suspension. More noticeable over rough roads or over bumps	• Worn or damaged ball joint(s)	• CARRY OUT a ball joint inspection. INSTALL new ball joint(s) or control arm(s) as necessary. REFER to Section 204-01.

DIAGNOSIS AND TESTING (Continued)

Symptom Chart — NVH (Continued)

Condition	Possible Sources	Action
• Squeak, creak or rattle noise. Occurs mostly over bumps or rough roads	• Front or rear suspension components • Loose or damaged front struts, shock absorber(s) or shock absorber bushing(s) • Damaged spring or spring mount(s) • Damaged or worn control/radius arm bushing(s) • Worn or damaged stabilizer bar bushings or link(s)	• INSPECT the front and rear suspension. INSTALL new components as necessary. REFER to Section 204-01 for front suspension or Section 204-02 for rear suspension.
• Shudder — occurs during acceleration from a slow speed or stop	• Incorrect ride height causing incorrect driveline angle	• REFER to Section 205-00 for driveline angle diagnosis.
• Shimmy	• Loose wheel nut(s) • Loose front suspension fastener(s) • Worn front wheel bearing(s) • Strut(s) or shock absorber(s)	• TIGHTEN the nut(s) to specification. REFER to Section 204-04. • TIGHTEN the fastener(s) to specification. REFER to Section 204-01. • INSPECT the front wheel bearing(s). INSTALL new bearing(s) as necessary. REFER to Section 204-01. • INSTALL new struts or shock absorbers as necessary. REFER to Section 204-01 for front suspension or Section 204-02 for rear suspension.
• Shimmy — most noticeable on coast/deceleration. Also hard steering condition	• Excessive positive caster	• CHECK the wheel alignment. REFER to Caster Adjustment — Front in this section. ADJUST as necessary.
• Rough/harsh ride	• Incorrect tire pressure • Strut(s) or shock absorber(s) • Spring(s) • Damaged suspension component(s)	• ADJUST the tire pressure. REFER to the Vehicle Certification (VC) label. • INSTALL new struts or shock absorbers as necessary. REFER to Section 204-01 for front suspension or Section 204-02 for rear suspension. • INSPECT for broken springs. MEASURE the ride height. REFER to Ride Height Measurement in this section. INSTALL new springs as necessary. REFER to Section 204-01 for front suspension or Section 204-02 for rear suspension. • INSTALL new suspension component(s) as necessary. REFER to Section 204-01 for front suspension or Section 204-02 for rear suspension.

DIAGNOSIS AND TESTING (Continued)

Pinpoint Tests

Pinpoint Test A: Vehicle Drifts/Pulls

This pinpoint test is intended to diagnose the following:

- Unevenly loaded vehicle
- Tire pressure
- Tire forces
- Brake drag
- Incorrect vehicle alignment
- Steering system

PINPOINT TEST A: VEHICLE DRIFTS/PULLS

Test Step		Result / Action to Take
A1	**CHECK FOR UNEVENLY LOADED VEHICLE**	
	• Visually check the vehicle for an uneven loading condition. • **Is the vehicle unevenly loaded?**	**Yes** ADVISE the customer of uneven loading condition. **No** GO to A2.
A2	**CHECK THE TIRE PRESSURES AND TIRE CONDITIONS**	
	• Check the tire pressures. Refer to the Vehicle Certification (VC) label located on the driver door jamb. Check the tires for uneven/abnormal wear. Refer to Diagnosis and Testing—Wheels and Tires in Section 204-04. • **Are the tire pressures and tire conditions OK?**	**Yes** GO to A3. **No** ADJUST the tire pressures to the specified pressure or INSTALL new tires as necessary.
A3	**ISOLATE TIRE DRIFT/PULL CONDITION**	
	• **NOTE:** It is important to determine if tire forces are the cause of a drift/pull condition. Changing the position of the wheel and tire assemblies on the vehicle may correct a pull/drift condition, however the tire drift/pull may return if the wheel and tire assemblies are repositioned during future service. A tire or tires that are causing a drift/pull should not be removed from service unless it has been determined that the tire(s) are worn beyond specification. Refer to Diagnosis and Testing — Wheels and Tires in Section 204-04. Cross the front wheel and tire assemblies from left-to-right. Refer to Section 204-04. • **Does the vehicle drift/pull?**	**Yes** If the vehicle drifts/pulls in the opposite direction, tire forces are causing the drift/pull. ROTATE the wheel and tire assemblies from front-to-rear. REFER to Section 204-04. If the vehicle drifts/pulls in the same direction, GO to A4. **No** Tire forces were causing the drift/pull and the concern has been corrected.
A4	**CHECK FOR BRAKE DRAG**	
	• Spin all 4 wheel and tire assemblies by hand and check for brake drag. • **Do the wheels spin freely?**	**Yes** GO to A5. **No** REFER to Section 206-00 to diagnose brake drag condition.
A5	**CHECK THE WHEEL ALIGNMENT**	
	• Using alignment equipment and the manufacturers instructions, check the wheel alignment. • **Is the wheel alignment out of specification?**	**Yes** ADJUST the alignment as necessary. REFER to General Procedures in this section. **No** REFER to Section 211-00 to diagnose steering system drift/pull/wander condition.

Component Tests

Ball Joint Inspection

1. Prior to inspecting the ball joints for wear, inspect the wheel bearings. Install a new wheel bearing as necessary. Refer to Section 204-01.
2. **NOTE:** In order to obtain accurate measurements, the suspension must be in full rebound with the weight of the vehicle supported by the frame.

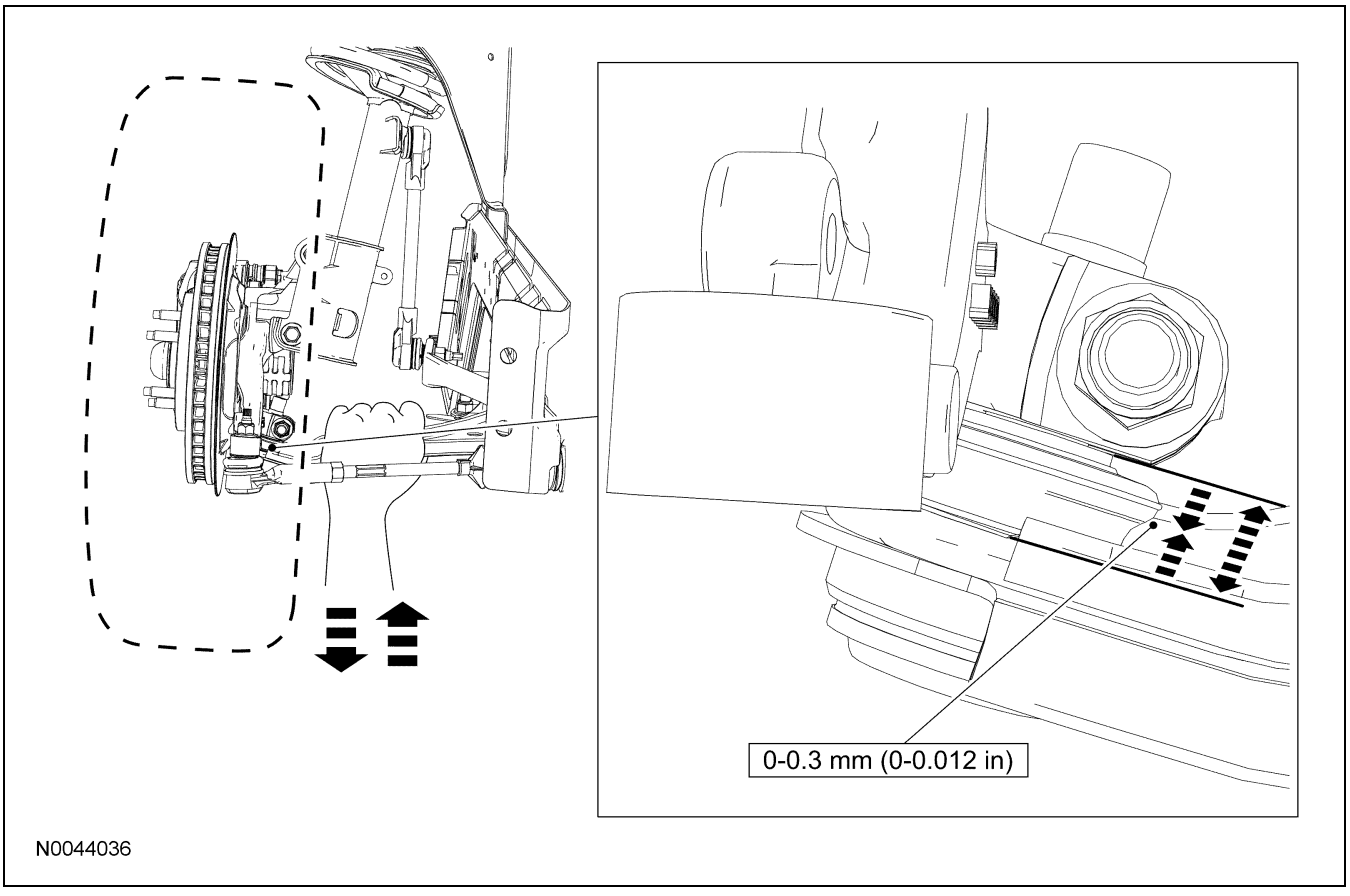
   Raise and support the vehicle by the frame to allow the wheels to hang in the rebound position.

DIAGNOSIS AND TESTING (Continued)

3. Inspect the ball joint and ball joint boot for damage.
   - If the ball joint or ball joint boot is damaged, install a new ball joint as necessary. Refer to Section 204-01.
4. *NOTICE:* **Do not use any tools or equipment to move the wheel and tire assembly or suspension components while checking for relative movement. Suspension damage may occur. The use of tools or equipment will also create relative movement that may not exist when using hand force. Relative movement must be measured using hand force only.**

   Inspect the ball joint for relative movement by alternately pulling downward and pushing upward on the lower control arm by hand. Note any relative vertical movement between the wheel knuckle and lower arm at the lower ball joint.
   - If relative movement is not felt or seen, the ball joint is OK. Do not install a new ball joint.
   - If relative movement is found, continue with Step 5.
5. **NOTE:** In order to obtain an accurate measurement, the dial indicator should be aligned as close as possible with the vertical axis (center line) of the ball joint.

   To measure ball joint deflection, attach a suitable dial indicator with a flexible arm between the lower control arm and the wheel knuckle or ball joint stud.



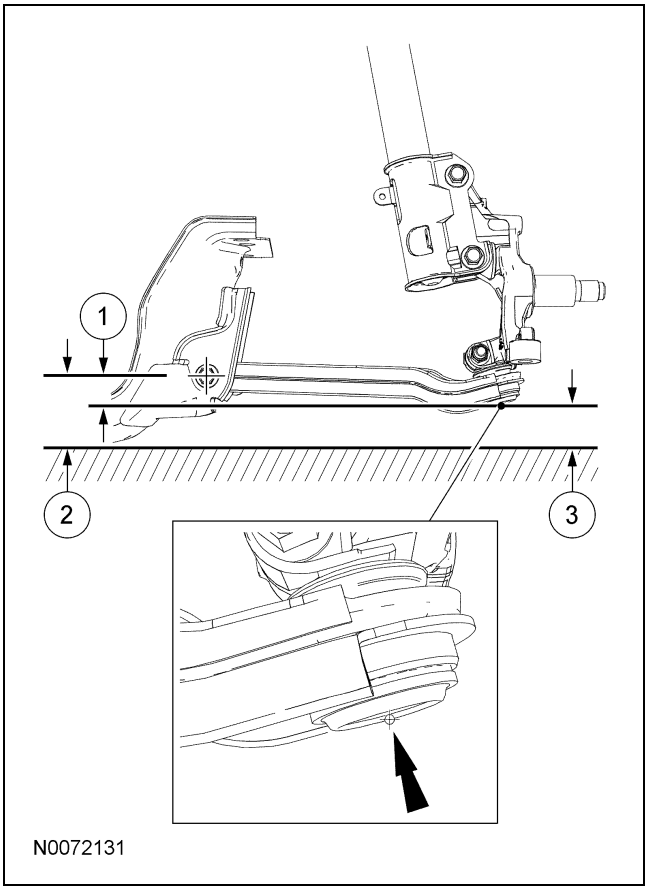
DIAGNOSIS AND TESTING (Continued)

6. Measure the ball joint deflection while an assistant pushes up and pulls down on the lower control arm, by hand.
   - If the deflection exceeds the specification, a new ball joint must be installed. Refer to Section 204-01.
   - If the deflection meets the specification, no further action is required.

GENERAL PROCEDURES

Ride Height Measurement

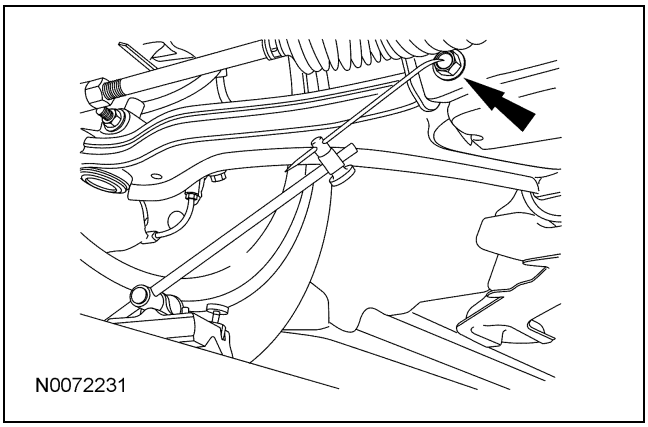
Front Ride Height Measurement



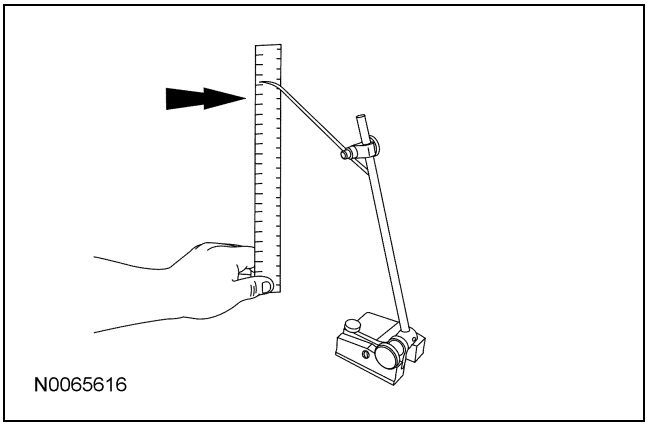
Item	Description
1	Ride height = 2 - 3
2	Measurement 2
3	Measurement 3

NOTE: Make sure that the vehicle is positioned on a flat, level surface and the tires are inflated to the correct pressure. Vehicle should have a full tank of fuel.

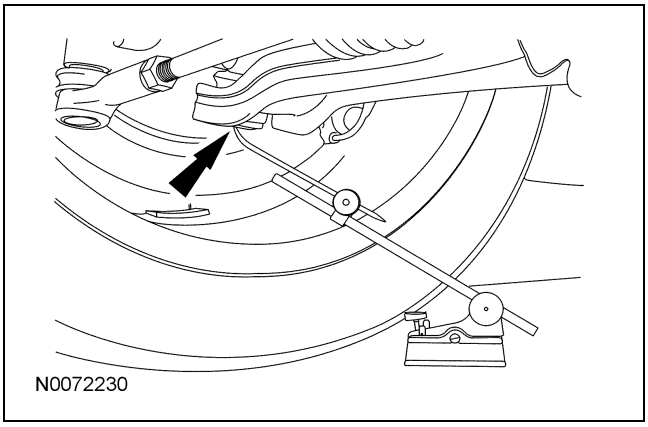
1. Position a suitable surface gauge (such as Starrett 57D Surface Gauge), on a flat, level surface and adjust the gauge's arm until the scriber point is located in the center of the lower control arm forward bolt.
   - Lock the surface gauge in this position.



2. With the surface gauge positioned on a flat, level surface, record the measurement of the surface gauge position (measurement 2).

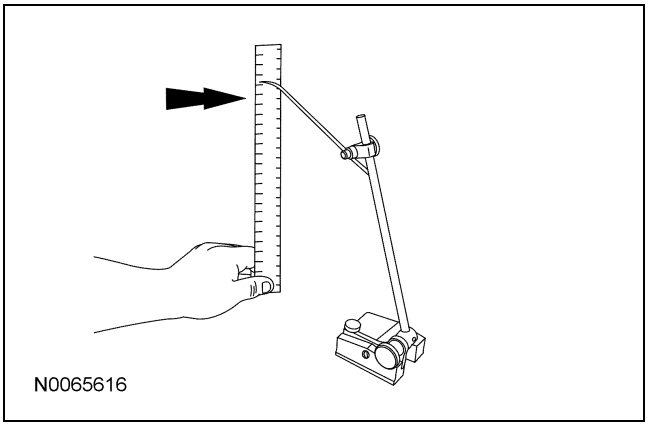


3. Position the surface gauge on the same flat, level surface as used in Step 1, adjust the gauge's arm until the scriber point is located in the center of the lower ball joint.
   - Lock the surface gauge in this position.



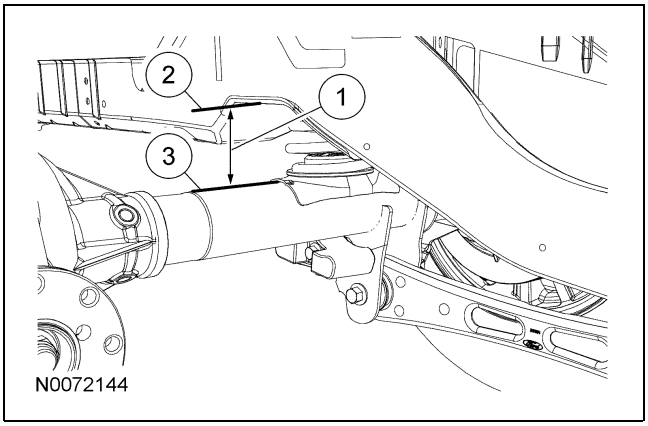
GENERAL PROCEDURES (Continued)

4. With the surface gauge positioned on a flat, level surface, record the measurement of the surface gauge position (measurement 3).



5. Subtract measurement 3 from measurement 2 to obtain the front ride height.
   - Refer to Specifications in this section.

Rear Ride Height Measurement



Item	Description
1	Ride height = 2 - 3
2	Measurement Point 2
3	Measurement Point 3

NOTE: Make sure that the vehicle is positioned on a flat, level surface and the tires are inflated to the correct pressure. Vehicle should have a full tank of fuel.

1. To obtain rear ride height, measure the distance between points 2 and 3. For additional information, refer to Specifications in this section.

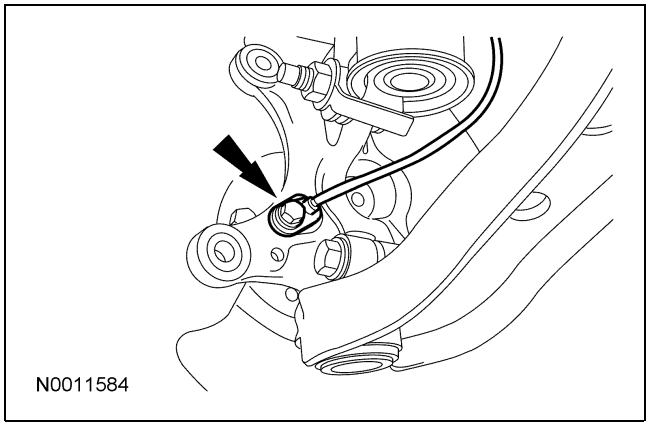
GENERAL PROCEDURES

Camber Adjustment — Front

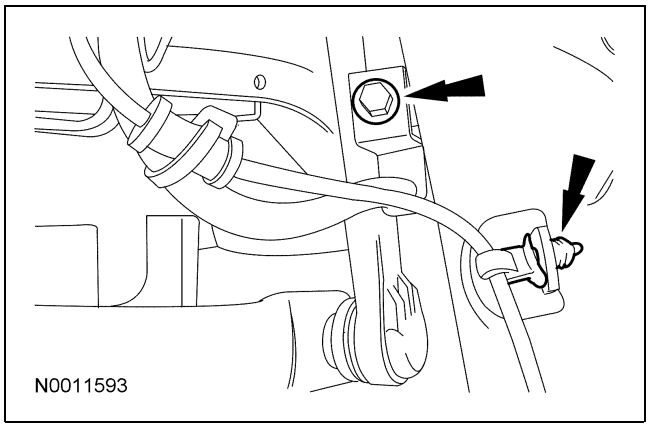
NOTE: If camber adjustment is necessary to resolve a vehicle alignment issue, then slotting the strut at the lower mounting plate and installing a cam bolt is an acceptable method. This procedure should not be routinely performed with all alignments and only after all other possible sources have been inspected and corrected as necessary.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

2. Remove the wheel speed sensor bolt and position the sensor aside.



3. Remove the brake line bracket bolt and disconnect the wheel speed sensor wire from the bracket.



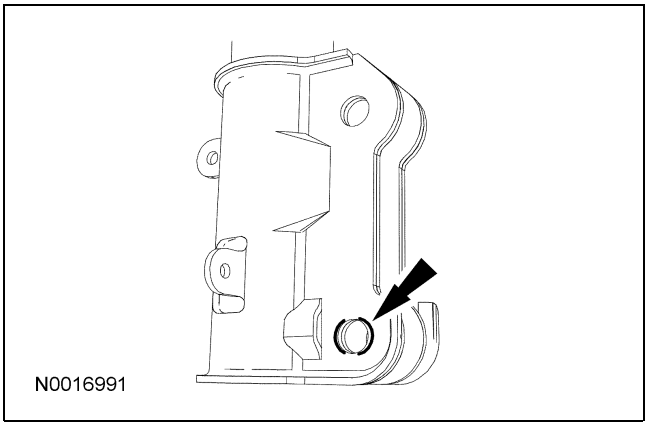
4. **NOTE:** Support the wheel spindle using mechanic's wire.

   Note the orientation of the strut-to-spindle bolts and flag nuts, then remove and discard the bolts and flag nuts.

5. ***NOTICE:*** **Do not enlarge the holes any more than indicated by the etchings on the strut mount or damage to the strut mount may occur.**

   Using a suitable grinding tool, enlarge the strut-to-wheel spindle lower mounting holes as indicated by the etchings in the strut lower mount.

   - Remove any burrs.
   - Clean and paint any exposed metal.



6. **NOTE:** Do not fully tighten the cam bolts until the alignment has been corrected.

   Position the wheel spindle and install a cam adjusting nut and bolt in the bottom location, using the opposite orientation noted in Step 4. Then install a new bolt and flag nut in the top location.

   - Tighten the upper bolt and cam nut until snug.

7. Position the brake line bracket and install the bolt, connect the wheel speed sensor wire to the bracket.

   - Tighten to 20 Nm (177 lb-in).

8. Position the wheel speed sensor and install the bolt.

   - Tighten to 15 Nm (133 lb-in).

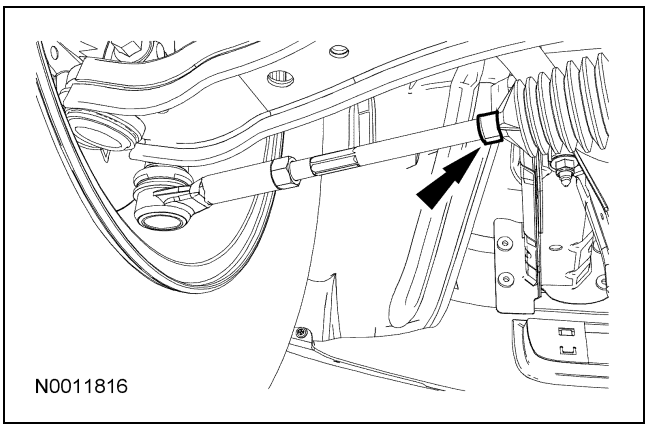
GENERAL PROCEDURES (Continued)

9. Using alignment equipment and the manufacturer's instructions, measure the front camber.
10. Using the cam bolt, adjust the front camber until it is within specifications.
    - Tighten the strut-to-wheel spindle cam nut to 200 Nm (148 lb-ft).
    - Tighten the strut-to-wheel spindle upper bolt to 200 Nm (148 lb-ft).
11. Recheck the front camber settings, adjust as necessary.

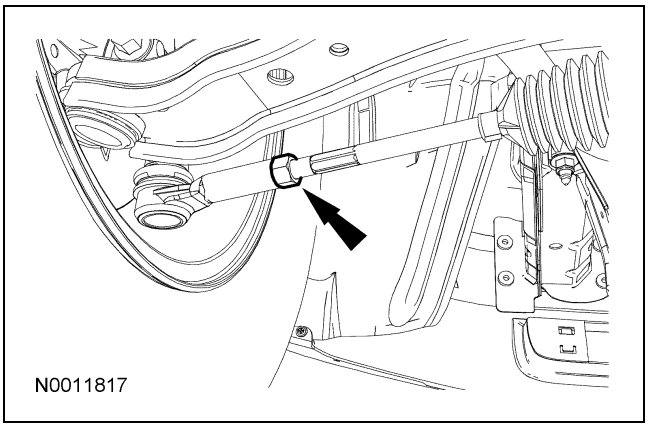
GENERAL PROCEDURES

Toe Adjustment — Front

1. Start the engine and center the steering wheel.
2. Turn the engine off and, using a suitable steering wheel holding device, lock the steering wheel in the straight ahead position.
3. Using alignment equipment and the manufacturer's instructions, measure the front toe.
4. Remove the clamps.

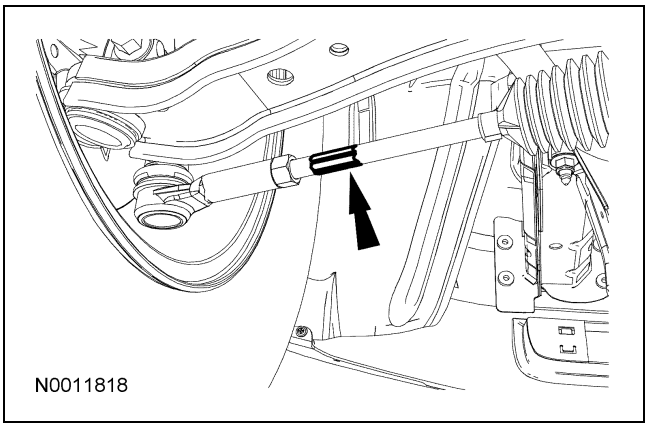


5. Loosen the tie-rod jam nuts.



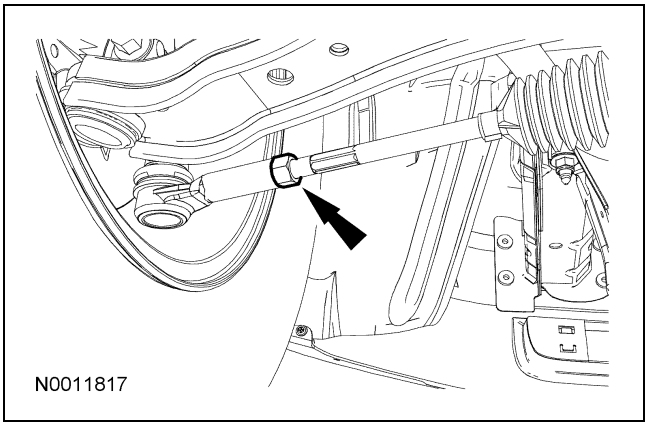
6. **NOTE:** Do not allow the steering gear bellows to twist when the inner tie rod is rotated.

   Rotate the inner tie rods until the toe reading is within specifications.

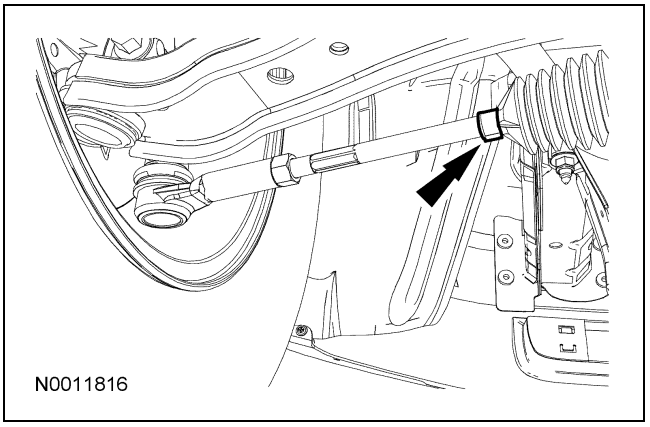


7. **NOTE:** Do not allow the inner tie rods to rotate while tightening the tie-rod jam nuts.

   Tighten the tie-rod jam nuts to 55 Nm (41 lb-ft).



8. Install the clamps.



9. Recheck the toe settings and adjust as necessary.

GENERAL PROCEDURES

Caster Adjustment — Front

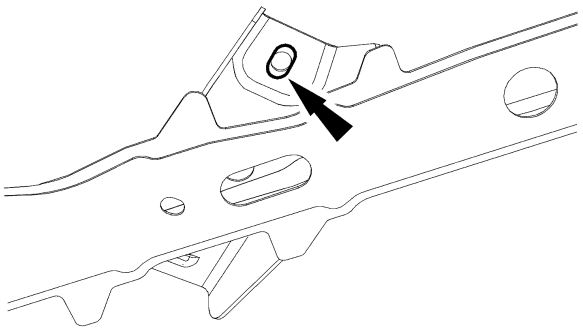
1. **NOTE:** If caster adjustment is necessary to resolve a vehicle alignment issue, then slotting the subframe and installing cam bolts is an acceptable method. This procedure should not be routinely performed with all alignments and only after all other possible sources have been inspected and corrected as necessary.

   Remove the front lower control arm. For additional information, refer to Section 204-01.

2. ***NOTICE:*** **Do not elongate the hole any more than indicated by the etchings on the subframe or damage to the subframe may occur.**

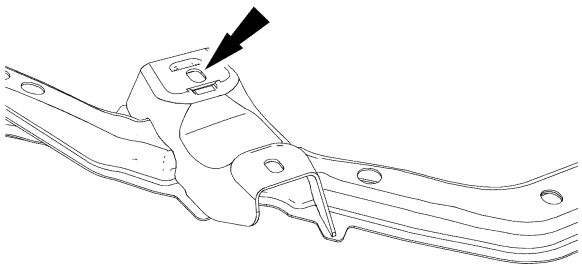
   Using a suitable grinding tool, elongate the lower control arm rear outboard mounting hole as indicated by the etchings in the subframe.

   - Remove any burrs.
   - Clean and paint any exposed metal.


N0016990

3. Install the front lower control arm using a cam bolt and a new nut in the rear inboard mounting hole. For additional information, refer to Section 204-01.

   - Do not tighten the cam bolt until the alignment has been corrected.


N0016992

4. Using alignment equipment and the manufacturer's instructions, measure the caster.

5. Using the cam bolt, adjust the front caster until it is within specifications.

   - Tighten the lower control arm rear inboard cam nut to 185 Nm (136 lb-ft).

6. Recheck the caster settings and adjust as necessary.

SPECIFICATIONS

Material

Item	Specification	Fill Capacity
Silicone Spray Lubricant XL-6	ESR-M13P4-A	—

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake caliper anchor plate bolts	115	85	—
Brake disc shield bolts	20	—	177
Brake hose bracket bolt	20	—	177
Lower arm forward bolt	175	129	—
Lower arm rearward nuts	185	136	—

Torque Specifications (Continued)

Description	Nm	lb-ft	lb-in
Lower ball joint nut	103	76	—
Stabilizer bar bracket nuts	70	52	—
Stabilizer bar link nuts	115	85	—
Steering gear bolts	115	85	—
Strut rod nut	80	59	—
Strut-to-spindle bolts	200	148	—
Strut upper mount nuts	35	26	—
Tie-rod end nuts	80	59	—
Wheel hub nut	300	221	—
Wheel speed sensor bolt	15	—	133

DESCRIPTION AND OPERATION

Front Suspension

The front suspension consists of the following components:

- Strut and spring assembly
- Wheel spindle
- Lower arm
- Wheel bearing and wheel hub
- Stabilizer bar and links

The front suspension system incorporates a strut assembly that takes the place of the upper arm and ball joint. The strut carries out the function of a shock absorber and is encompassed by a coil spring. The strut and spring assembly supports the weight of the vehicle and is also the pivot point for the steering spindle. This system uses a lower control arm and ball joint for the lower (unloaded) pivot point of the steering spindle.

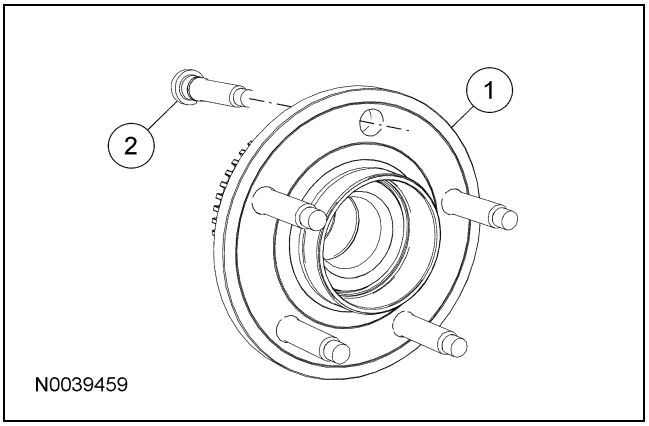
DIAGNOSIS AND TESTING

Front Suspension

Refer to Section 204-00.

REMOVAL AND INSTALLATION

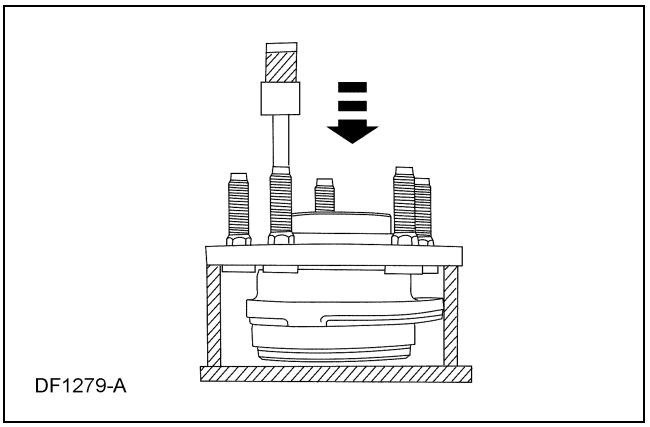
Wheel Studs



Item	Part Number	Description
1	2B663/2C300	Wheel hub assembly (ABS/non-ABS)
2	1107	Wheel stud

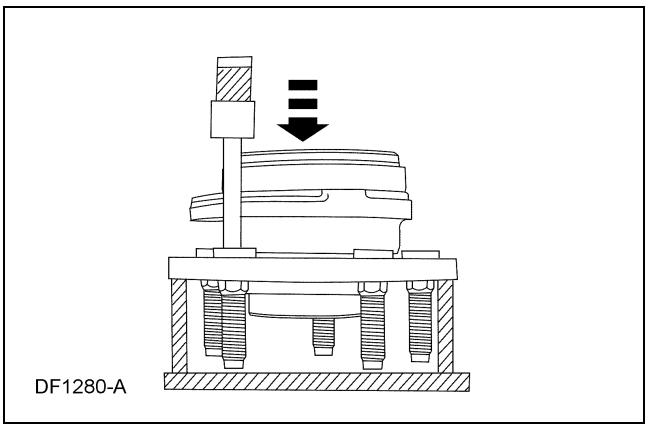
Removal

1. Remove the wheel bearing and hub assembly. For additional information, refer to Wheel Bearing and Wheel Hub in this section.
2. Using a press, remove the wheel stud from the wheel bearing and hub assembly.



Installation

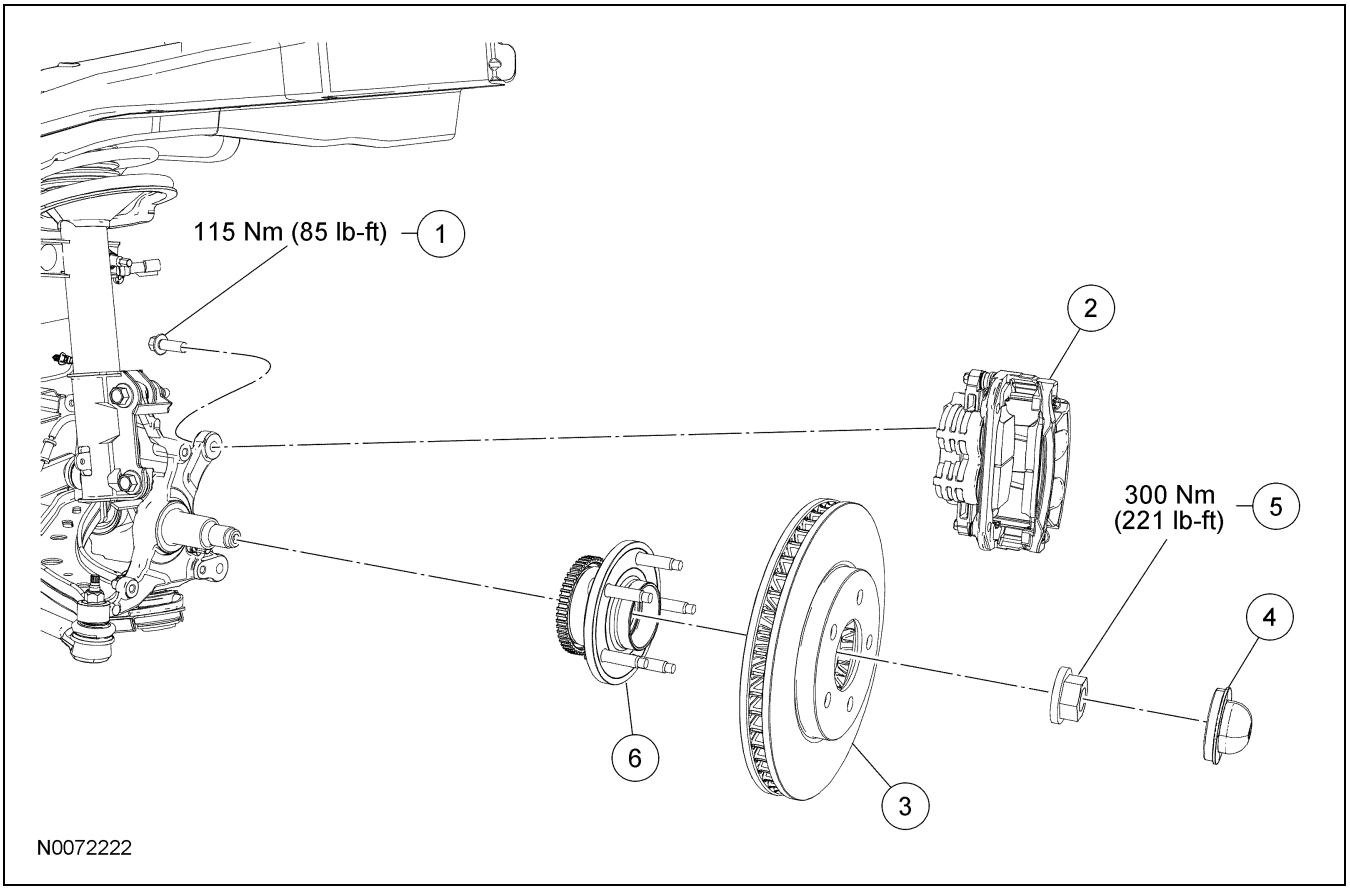
1. Using a press, install a new wheel stud.



2. Install the wheel bearing and hub assembly. For additional information, refer to Wheel Bearing and Wheel Hub in this section.

REMOVAL AND INSTALLATION

Wheel Bearing and Wheel Hub



Item	Part Number	Description
1	W710233	Brake caliper anchor plate bolt (2 required)
2	—	Brake caliper, pads and anchor plate assembly
3	1125	Brake disc
4	1N135	Wheel hub grease cap
5	3B477	Wheel hub nut
6	2B663/2C300	Wheel hub assembly (ABS/non-ABS)

Removal and Installation

NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part number or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

1. Remove the wheel and tire. For additional information, refer to Section 204-04.

REMOVAL AND INSTALLATION (Continued)

2. *NOTICE:* **Do not allow the caliper and anchor plate assembly to hang from the brake hose or damage to the hose can occur.**

   Remove the brake anchor plate bolts and position the brake caliper and anchor plate assembly aside.

   - Support the caliper and anchor plate assembly using mechanic's wire.
   - To install, tighten to 115 Nm (85 lb-ft).

3. Remove the brake disc.

4. Remove and discard the wheel hub grease cap.

5. ⚠ **WARNING: The wheel hub nut is a one-time use item and a new wheel hub nut must be installed. Failure to do so may result in hub separation from the vehicle and loss of vehicle control. Failure to follow this instruction may result in serious injury to vehicle occupant(s).**

   Remove and discard the wheel hub nut.

   - To install, tighten the new nut to 300 Nm (221 lb-ft).

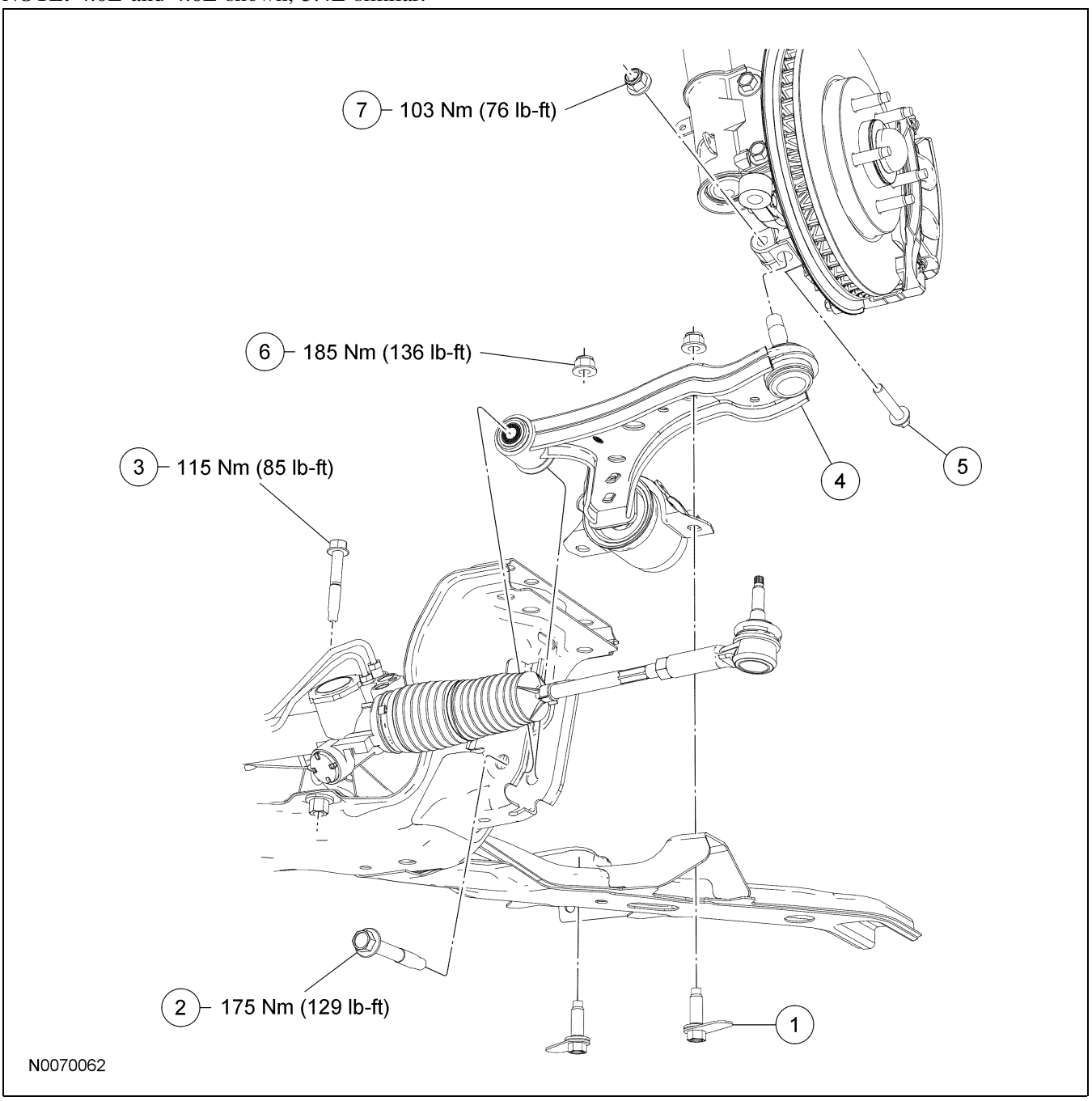
6. Remove the front wheel bearing and wheel hub.

7. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Lower Arm

NOTE: 4.0L and 4.6L shown, 5.4L similar.



Item	Part Number	Description
1	W710141	Lower arm rearward flag bolt (2 required)
2	W709865	Lower arm forward bolt
3	W710909	Steering gear bolt (2 required)
4	3079 LH/ 3078 RH	Lower arm

(Continued)

Item	Part Number	Description
5	W711123	Lower ball joint bolt
6	W520215	Lower arm rearward nut (2 required)
7	W520214	Lower ball joint nut

REMOVAL AND INSTALLATION (Continued)

Removal

NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part number or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

1. Remove the wheel and tire. For additional information, refer to Section 204-04.
2. ***NOTICE:*** **Note the orientation of the lower ball joint nut and bolt. They must be installed using the same orientation or damage to the steering gear bellows boot may occur.**

   Remove and discard the lower ball joint nut and bolt.
3. Separate the lower arm and the wheel spindle.
4. Remove the steering gear bolts. Position the steering gear to gain access to the lower control arm forward bolt.
5. ***NOTICE:*** **Use care not to damage the steering gear bellows boot while removing the lower arm forward bolt.**

   Remove and discard the lower arm forward bolt.
6. Remove and discard the lower control arm rearward nuts and flag bolts.
7. Remove the lower control arm and bracket assembly.

Installation

1. **NOTE:** To ease installation, the position of the lower control arm nut and flag bolt may be reversed to allow installation of the nut from underneath the vehicle.

   Install the lower arm and bracket assembly and the lower arm rearward nuts and flag bolts.
   - Tighten the new nuts to 185 Nm (136 lb-ft).
2. ***NOTICE:*** **Use care not to damage the steering gear bellows boot while installing the lower arm forward bolt.**

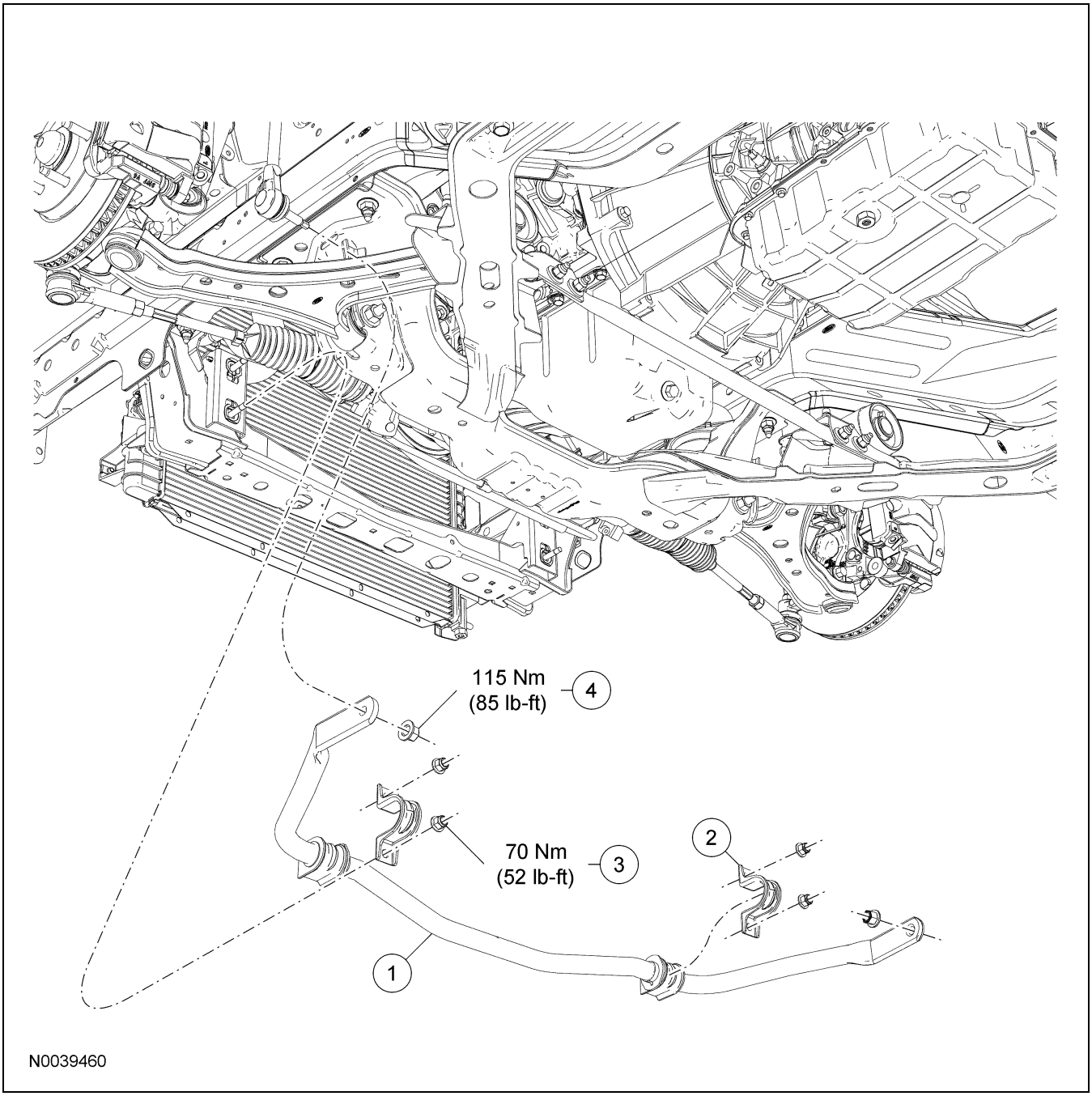
   NOTE: Do not tighten the lower arm forward bolt at this time.

   Loosely install the lower arm forward bolt.
3. Position the steering gear and install the steering gear bolts.
   - Tighten to 115 Nm (85 lb-ft).
4. ***NOTICE:*** **The lower ball joint seal must be fully seated against the wheel spindle or damage to the ball joint may occur.**

   Position the lower ball joint into the wheel spindle and install the new lower ball joint nut and bolt.
   - Tighten the nut to 103 Nm (76 lb-ft).
5. Install the wheel and tire. For additional information, refer to Section 204-04.
6. Lower the vehicle so the weight of the vehicle is resting on the wheel and tires.
7. Tighten the new lower arm forward bolt to 175 Nm (129 lb-ft).

REMOVAL AND INSTALLATION

Stabilizer Bar



Item	Part Number	Description
1	5482	Stabilizer bar
2	5486	Stabilizer bar bracket (2 required)

Item	Part Number	Description
3	W520213	Bracket nut (4 required)
4	N807114	Stabilizer bar link lower nut (2 required)

(Continued)

REMOVAL AND INSTALLATION (Continued)

Removal and Installation

NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part number or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. ***NOTICE:*** **Use the hex-holding feature to prevent the studs from turning while removing or installing the stabilizer bar link nuts. The boot seal must not be allowed to twist at all while tightening the nut or damage to the boot seal may occur.**

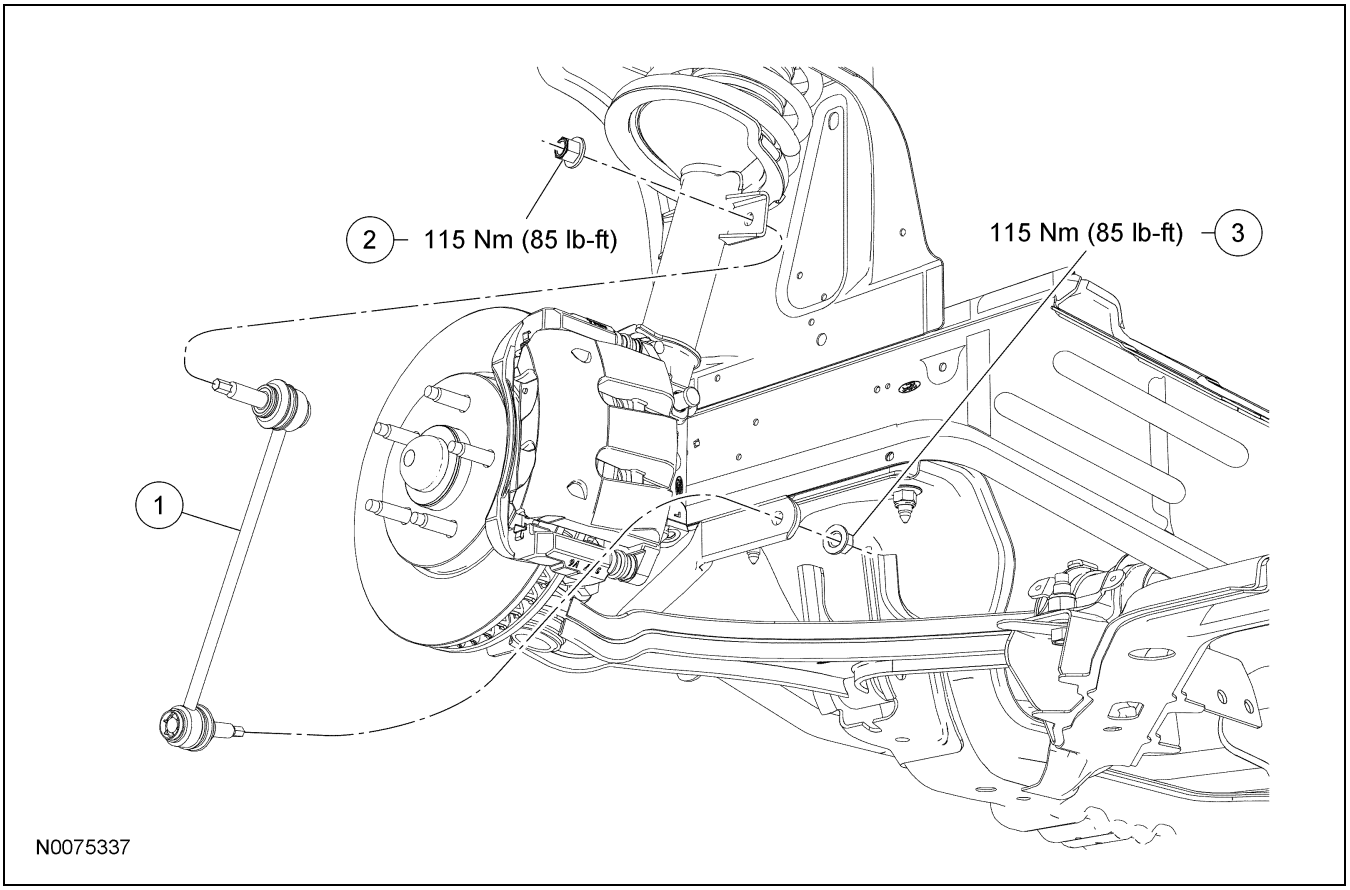
   Remove and discard both stabilizer bar link lower nuts.

   - To install, tighten the new nuts to 115 Nm (85 lb-ft).
3. Disconnect both links from the stabilizer bar.
4. Remove and discard the 4 stabilizer bracket nuts, then remove the stabilizer bar brackets and the stabilizer bar.

   - To install, tighten the new nuts to 70 Nm (52 lb-ft).
5. If necessary, remove the stabilizer bar bushings. For additional information, refer to Stabilizer Bar Bushing in this section.
6. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Stabilizer Bar Link



Item	Part Number	Description
1	5K483	Stabilizer bar link
2	W712836	Stabilizer bar link upper nut
3	N807114	Stabilizer bar link lower nut

Removal and Installation

NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part number or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. ***NOTICE:*** **Use the hex-holding feature to prevent the studs from turning while removing or installing the stabilizer bar link nuts. The boot seal must not be allowed to twist at all while tightening the nuts or damage to the boot seal may occur.**

   Remove and discard the stabilizer bar link lower nut.

   - To install, tighten the new nut to 115 Nm (85 lb-ft).
3. Disconnect the link from the stabilizer bar.

REMOVAL AND INSTALLATION (Continued)

4. *NOTICE:* **Use the hex-holding feature to prevent the studs from turning while removing or installing the stabilizer bar link nuts. The boot seal must not be allowed to twist at all while tightening the nuts or damage to the boot seal may occur.**

   Remove and discard the stabilizer bar link upper nut.

   - To install, tighten the new nut to 115 Nm (85 lb-ft).

5. Disconnect the link from the strut.

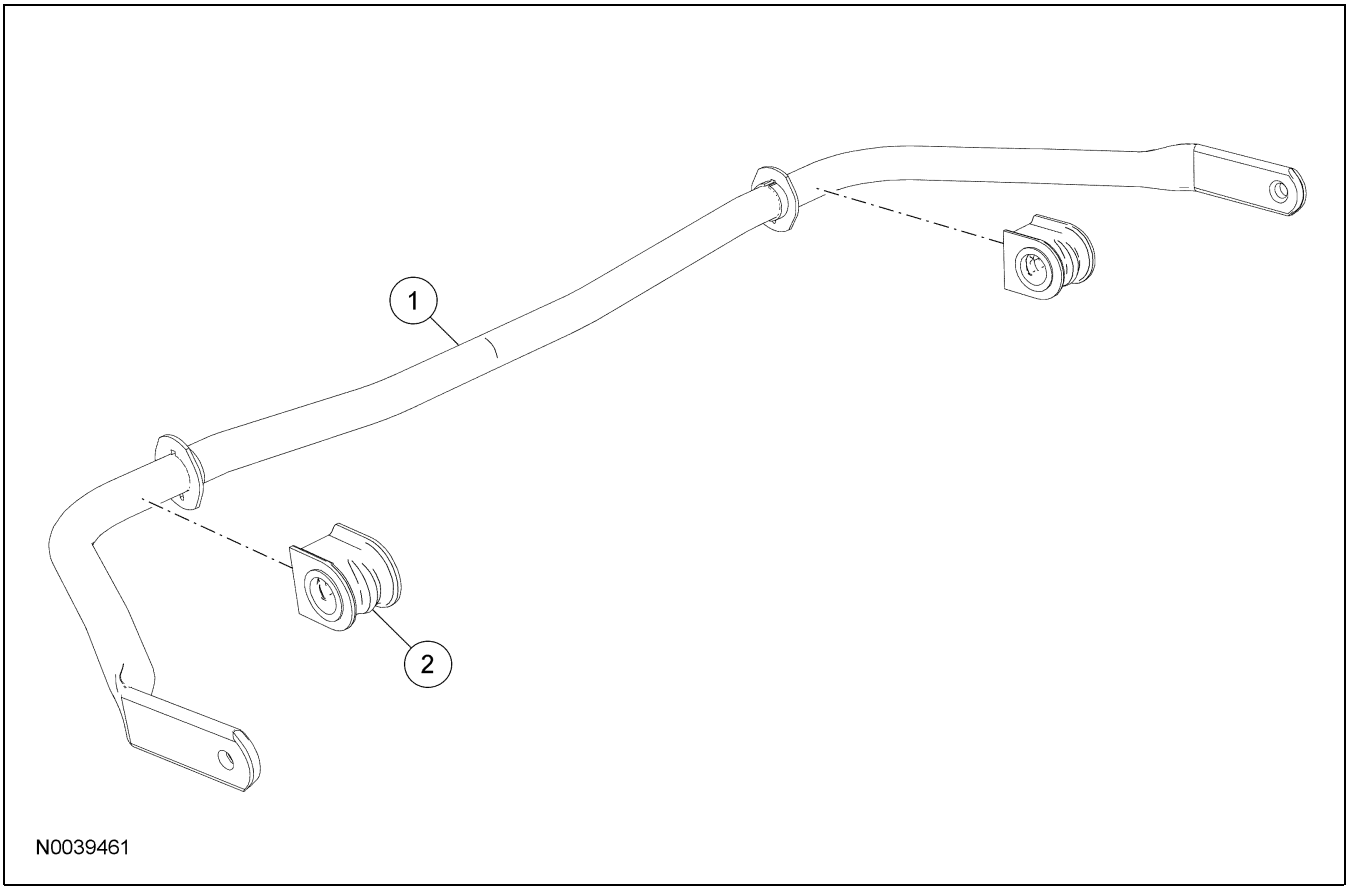
6. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

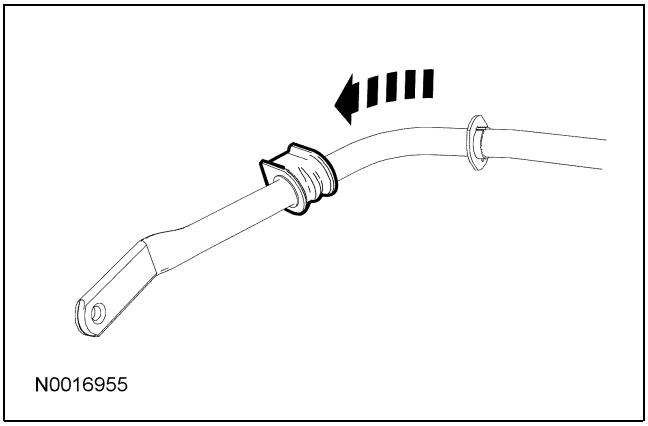
Stabilizer Bar Bushing

Material

Item	Specification
Silicone Spray Lubricant XL-6	ESR-M13P4-A



Item	Part Number	Description
1	5482	Stabilizer bar
2	5484	Stabilizer bar bushing



Removal and Installation

1. Remove the stabilizer bar. For additional information, refer to Stabilizer Bar in this section.

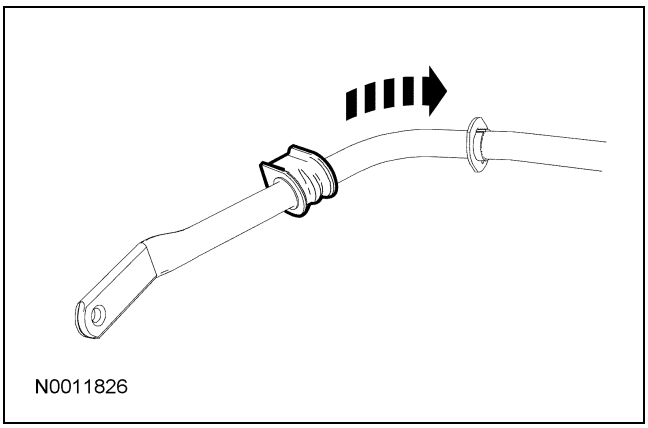
2. **NOTE:** To aid removal, apply a light coat of lubricant to the necessary parts of the front stabilizer bar.

   Remove the stabilizer bar bushing by sliding it off the stabilizer bar.

REMOVAL AND INSTALLATION (Continued)

3. **NOTE:** To aid installation, apply a light coat of lubricant to the necessary parts of the front stabilizer bar and the inside diameter of the stabilizer bar bushing.

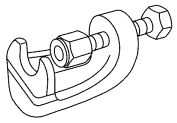
   To install, reverse the removal procedure.



REMOVAL AND INSTALLATION

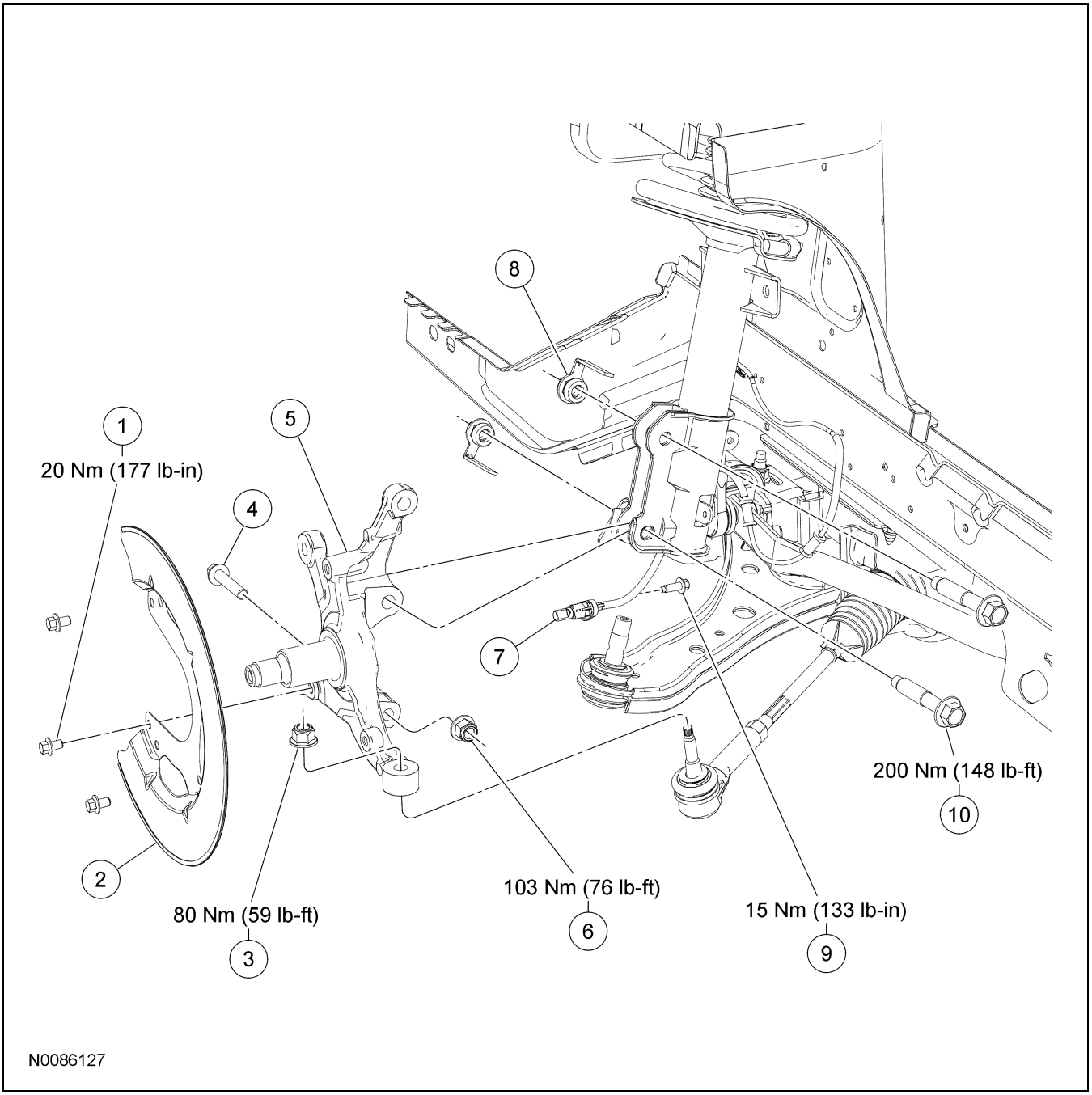
Wheel Spindle

Special Tool(s)

 ST1106-A	Tie-Rod End Remover 211-001 (TOOL-3290-D) or equivalent

REMOVAL AND INSTALLATION (Continued)

NOTE: 4.0L and 4.6L shown, 5.4L similar.



Item	Part Number	Description
1	W500020	Brake disc shield bolt (3 required)
2	2K004	Brake disc shield
3	W705606	Tie-rod end nut
4	W711123	Lower ball joint bolt
5	3107 LH/3108 RH	Wheel spindle

(Continued)

Item	Part Number	Description
6	W520214	Lower ball joint nut
7	2C204	Wheel speed sensor
8	W711091	Strut-to-wheel spindle flagnut (2 required)
9	7960825	Wheel speed sensor bolt
10	W709870	Strut-to-wheel spindle bolt (2 required)

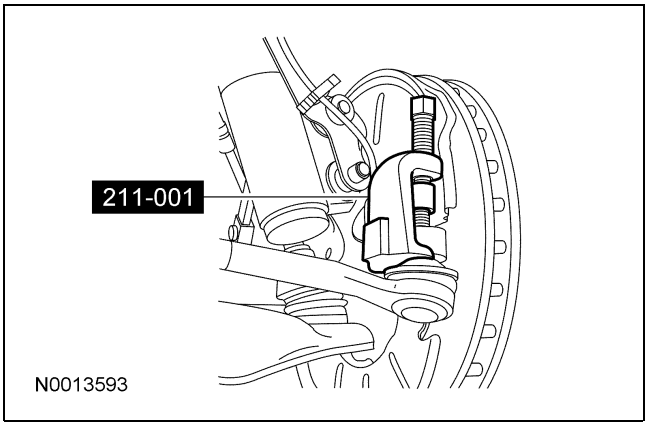
REMOVAL AND INSTALLATION (Continued)

Removal and Installation

NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part number or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

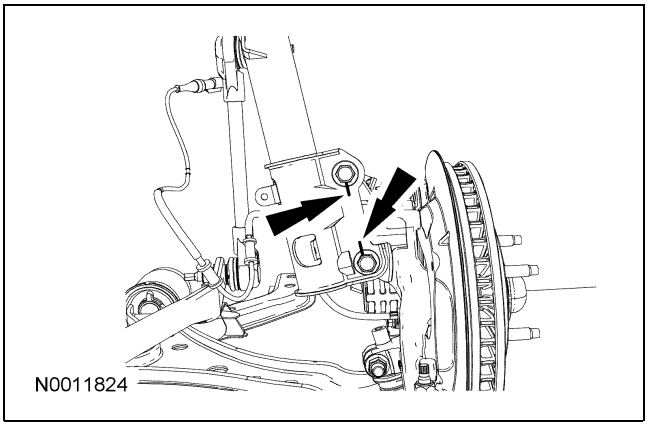
1. Remove the wheel bearing and hub assembly. For additional information, refer to Wheel Bearing and Wheel Hub in this section.
2. Remove the 3 bolts and the brake disc shield.
   - To install, tighten to 20 Nm (177 lb-in).
3. Remove the wheel speed sensor bolt and position the sensor aside.
   - To install, tighten to 15 Nm (133 lb-in).
4. Remove and discard the tie-rod end nut.
   - To install, tighten the new nut to 80 Nm (59 lb-ft).
5. ***NOTICE:*** **Use care not to damage the tie-rod end dust boot when using the special tool.**

   Using the Tie-Rod End Remover, disconnect the tie-rod end from the front wheel spindle.



6. Support the front suspension lower arm with a jackstand.
7. Remove and discard the lower ball joint nut and bolt.
   - To install, tighten the new nut to 103 Nm (76 lb-ft).
8. ***NOTICE:*** **Use care not to damage the lower ball joint boot while separating the lower control arm and the wheel spindle.**

   Separate the lower control arm and the wheel spindle.
9. If equipped, index-mark the 2 strut-to-spindle cam bolts.



10. ⚠ **WARNING: Do not apply heat or flame to the shock absorber or strut tube. The shock absorber and strut tube are gas pressurized and could explode if heated. Failure to follow this instruction may result in serious personal injury.**

    ⚠ **WARNING: Keep all body parts clear of shock absorbers or strut rods. Shock absorbers or struts can extend unassisted. Failure to follow this instruction may result in serious personal injury.**

    NOTE: If equipped, **do not** discard the strut-to-spindle cam nuts and bolts.

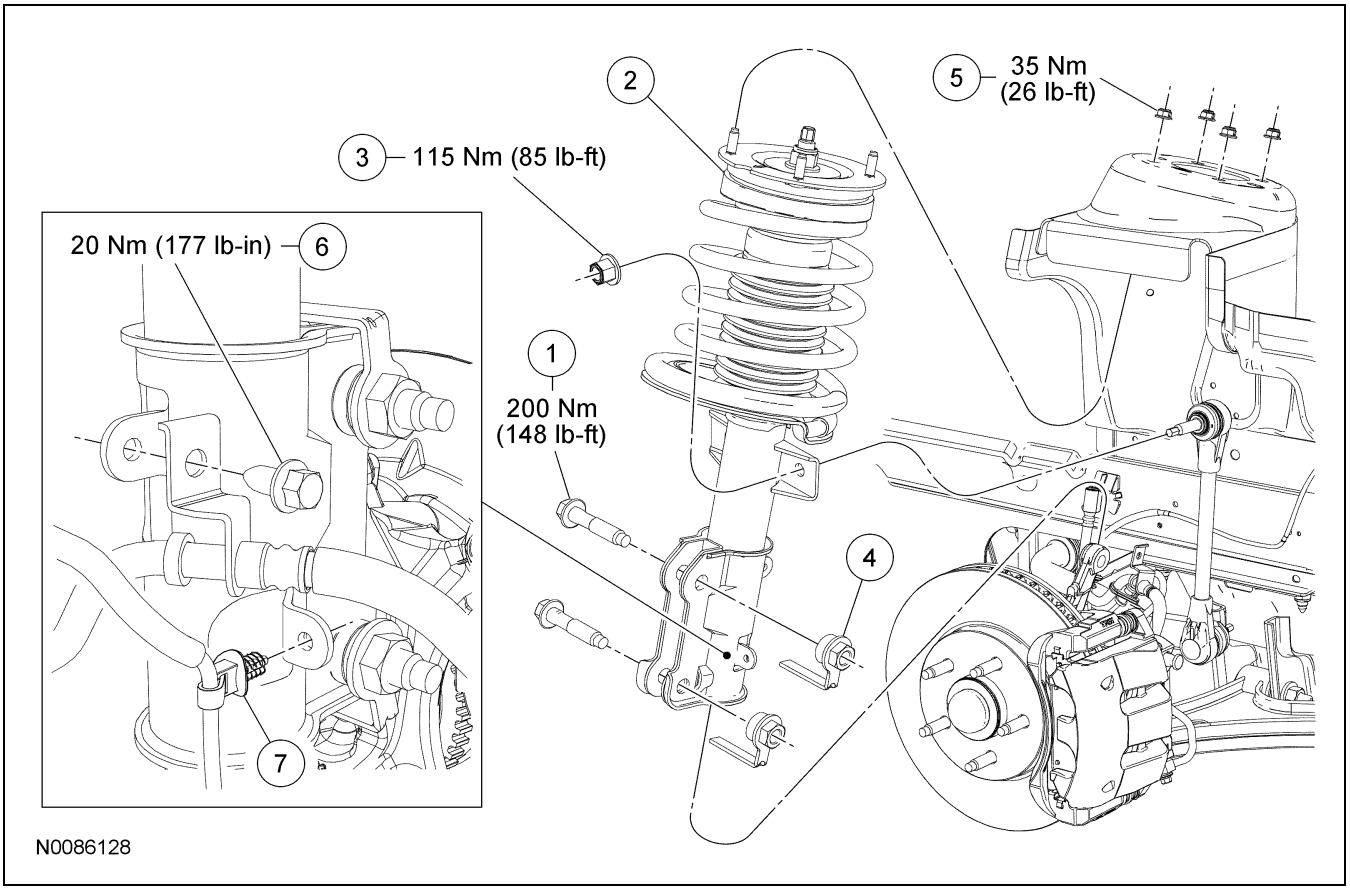
    Remove and discard the strut-to-spindle bolts and flagnuts.
    - To install, tighten the new bolts to 200 Nm (148 lb-ft).
11. Remove the wheel spindle.
12. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION (Continued)

13. Check and, if necessary, align the front end. For additional information, refer to Section 204-00.

REMOVAL AND INSTALLATION

Strut and Spring Assembly



Item	Part Number	Description
1	W709870	Strut-to-wheel spindle bolt (2 required)
2	—	Strut and spring assembly
3	W712836	Stabilizer bar link upper nut
4	W711091	Strut-to-wheel spindle flagnut (2 required)

(Continued)

Item	Part Number	Description
5	W520112	Strut upper mount nut (4 required)
6	N802191	Brake hose bracket bolt
7	—	Wheel speed sensor harness retainer (part of 2C204)

REMOVAL AND INSTALLATION (Continued)

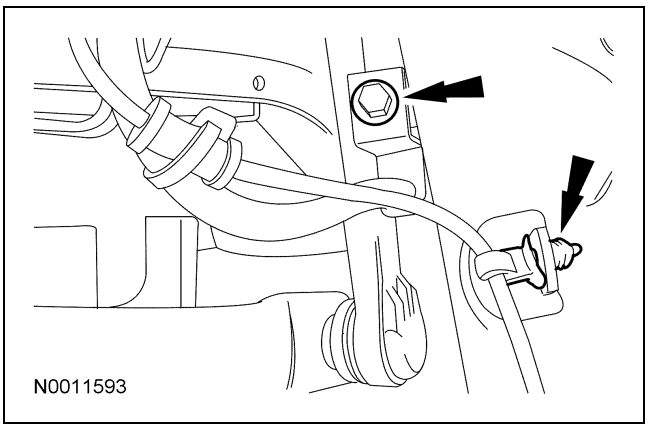
Removal and Installation

⚠ WARNING: Do not apply heat or flame to the shock absorber or strut tube. The shock absorber and strut tube are gas pressurized and could explode if heated. Failure to follow this instruction may result in serious personal injury.

⚠ WARNING: Keep all body parts clear of shock absorbers or strut rods. Shock absorbers or struts can extend unassisted. Failure to follow this instruction may result in serious personal injury.

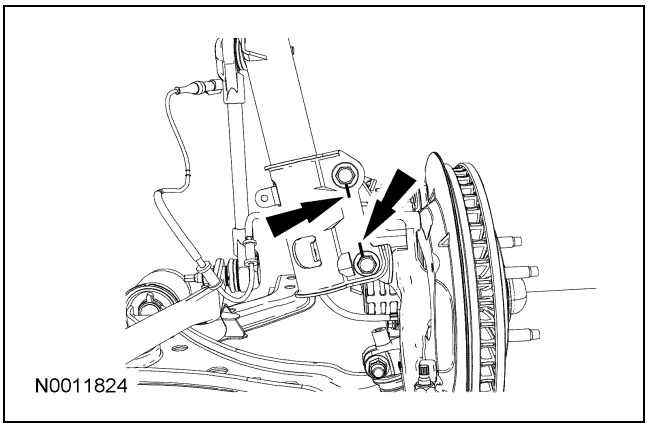
NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part number or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

1. Remove and discard the 4 strut upper mount nuts.
   - To install, tighten the new nuts to 35 Nm (26 lb-ft).
2. Remove the wheel and tire. For additional information, refer to Section 204-04.
3. Remove the wheel speed sensor bolt and position the sensor aside.
   - To install, tighten to 15 Nm (133 lb-in).
4. Remove the brake hose bracket bolt and disconnect the wheel speed sensor wire from the bracket.
   - To install, tighten to 20 Nm (177 lb-in).



5. ***NOTICE:*** **Use the hex-holding feature to prevent the studs from turning while removing or installing the stabilizer bar link nuts. The boot seal must not be allowed to twist at all while tightening the nuts or damage to the boot seal may occur.**

   Remove and discard the stabilizer bar link upper nut and disconnect the link from the strut.
   - To install, tighten the new nut to 115 Nm (85 lb-ft).
6. Using a suitable jackstand, support the lower control arm.
7. If equipped, index-mark the 2 strut-to-spindle cam bolts.



REMOVAL AND INSTALLATION (Continued)

8. **⚠ WARNING: Do not apply heat or flame to the shock absorber or strut tube. The shock absorber and strut tube are gas pressurized and could explode if heated. Failure to follow this instruction may result in serious personal injury.**

   ⚠ WARNING: Keep all body parts clear of shock absorbers or strut rods. Shock absorbers or struts can extend unassisted. Failure to follow this instruction may result in serious personal injury.

   NOTE: If equipped, **do not** discard the strut-to-spindle cam nuts and bolts.

   Remove and discard the strut-to-spindle bolts and flagnuts.

   - To install, tighten to 200 Nm (148 lb-ft).

9. ***NOTICE:*** **Damage to the lower control arm bushings may occur if the lower control arm is not supported.**

   Carefully lower the lower control arm and remove the strut and spring assembly.

   - To install, the notch and the arrow etched into the upper bearing assembly must face the outboard side of the vehicle.

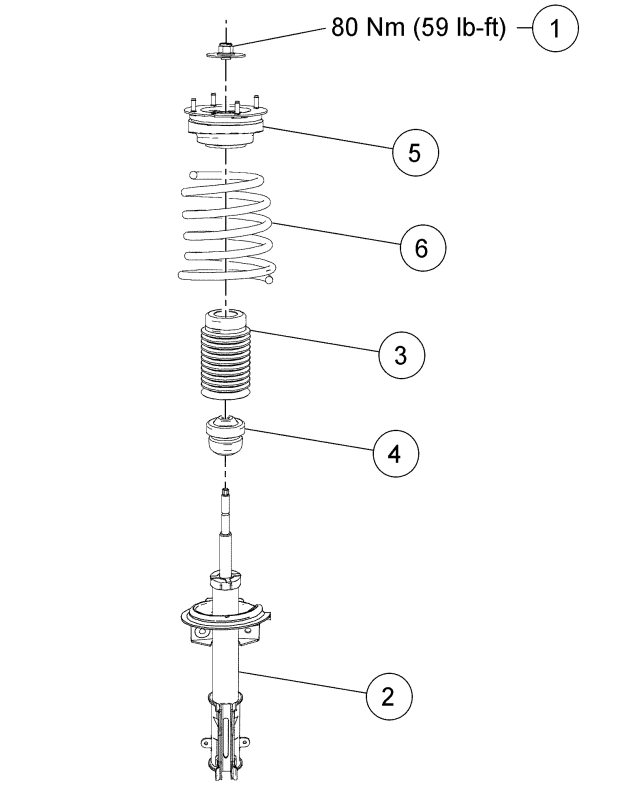
10. If necessary, disassemble the strut and spring assembly. For additional information, refer to Strut and Spring Assembly in this section.

11. To install, reverse the removal procedure.

12. Check and, if necessary, adjust the front end alignment. For additional information, refer to Section 204-00.

DISASSEMBLY AND ASSEMBLY

Strut and Spring Assembly



Item	Part Number	Description
1	W520215	Strut rod nut and washer
2	18045	Strut
3	—	Dust boot (part of 18045)
4	—	Jounce bumper (part of 18045)
5	18183	Upper mount assembly
6	5310	Spring

Disassembly and Assembly

⚠ WARNING: Do not apply heat or flame to the shock absorber or strut tube. The shock absorber and strut tube are gas pressurized and could explode if heated. Failure to follow this instruction may result in serious personal injury.

⚠ WARNING: Keep all body parts clear of shock absorbers or strut rods. Shock absorbers or struts can extend unassisted. Failure to follow this instruction may result in serious personal injury.

⚠ WARNING: Do not attempt to disassemble the shock absorber and spring assembly without using a spring compressor. Assemblies are under extreme load. Failure to follow this instruction may result in serious personal injury.

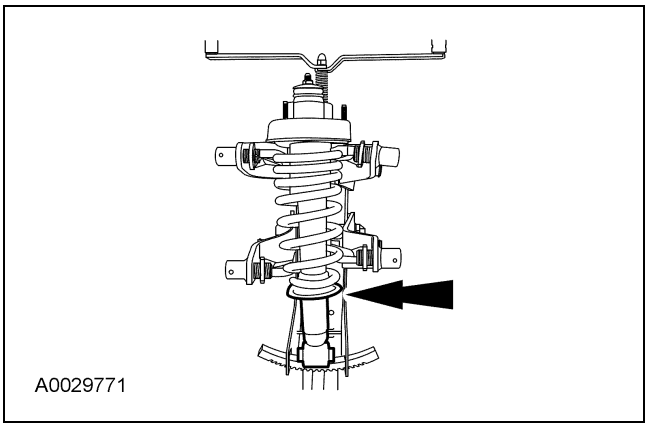
NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part number or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

1. Remove the strut and spring assembly. For additional information, refer to Strut and Spring Assembly in this section.

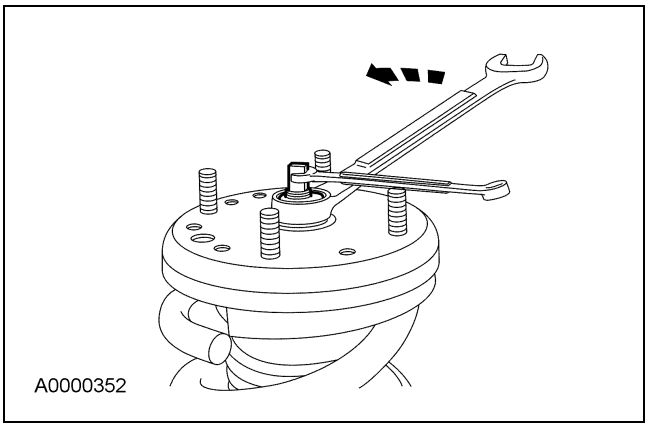
DISASSEMBLY AND ASSEMBLY (Continued)

2. **NOTE:** If installing a new spring, make sure the part number is correct. Refer to the Vehicle Certification (VC) label for the correct spring code. Refer to Section 100-01 to convert the spring code to a part number.

   Using a suitable spring compressor, compress the spring until the tension is released from the strut.



3. While holding the strut rod, remove and discard the strut rod nut and washer and remove the strut.
   - To install, tighten the new nut to 80 Nm (59 lb-ft).

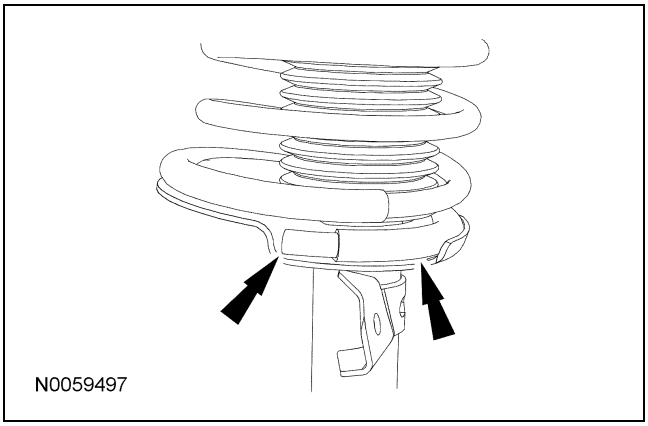


4. If necessary, remove the dust boot and jounce bumper.

5. Remove the upper mount assembly.

6. Carefully release the tension on the spring compressor and remove the spring.

7. When installing the spring onto the strut, make sure the spring end is positioned against the seat stop and is resting in the spring seat pocket.



8. To assemble, reverse the disassembly procedure.
   - Align the notch on the upper bearing assembly with the clevis at the bottom of the strut.

SPECIFICATIONS

Material

Item	Specification	Fill Capacity
Silicone Spray Lubricant XL-6	ESR-M13P4-A	—

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake caliper anchor plate bolts	103	76	—
Brake hose bracket bolt	20	—	177
Fuel tank strap bolt	52	38	—
Lateral stiffener bar nut	115	85	—
Lateral stiffener bar-to-body bolts	62	46	—
Lower arm bolts	175	129	—
Panhard rod bolts	175	129	—

Torque Specifications (Continued)

Description	Nm	lb-ft	lb-in
Parking brake cable bracket bolt	27	20	—
Shock absorber lower bolt	115	85	—
Shock absorber upper nut	40	30	—
Stabilizer bar bracket nuts	70	52	—
Stabilizer bar link bolts	115	85	—
Upper arm bracket forward bolt	175	129	—
Upper arm bracket rearward bolts	115	85	—
Upper arm-to-upper arm bushing nut	175	129	—

DESCRIPTION AND OPERATION

Rear Suspension

The rear suspension consists of the following components:

- Panhard rod and bushings
- Lower arms
- Stabilizer bar and links
- Coil springs
- Shock absorbers
- Lateral stiffener bar
- Upper arm and bushing

The rear suspension system is a solid axle type. The solid drive axle is supported by coil springs and uses shock absorbers to help dampen out the vertical movement of the vehicle. A lateral stiffener bar is used to strengthen the body with the panhard rod providing lateral stability for the axle. The upper arm and the lower arm provide longitudinal stability for the axle. The stabilizer bar and links are included to control lean/sway during turns.

DIAGNOSIS AND TESTING

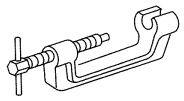
Rear Suspension

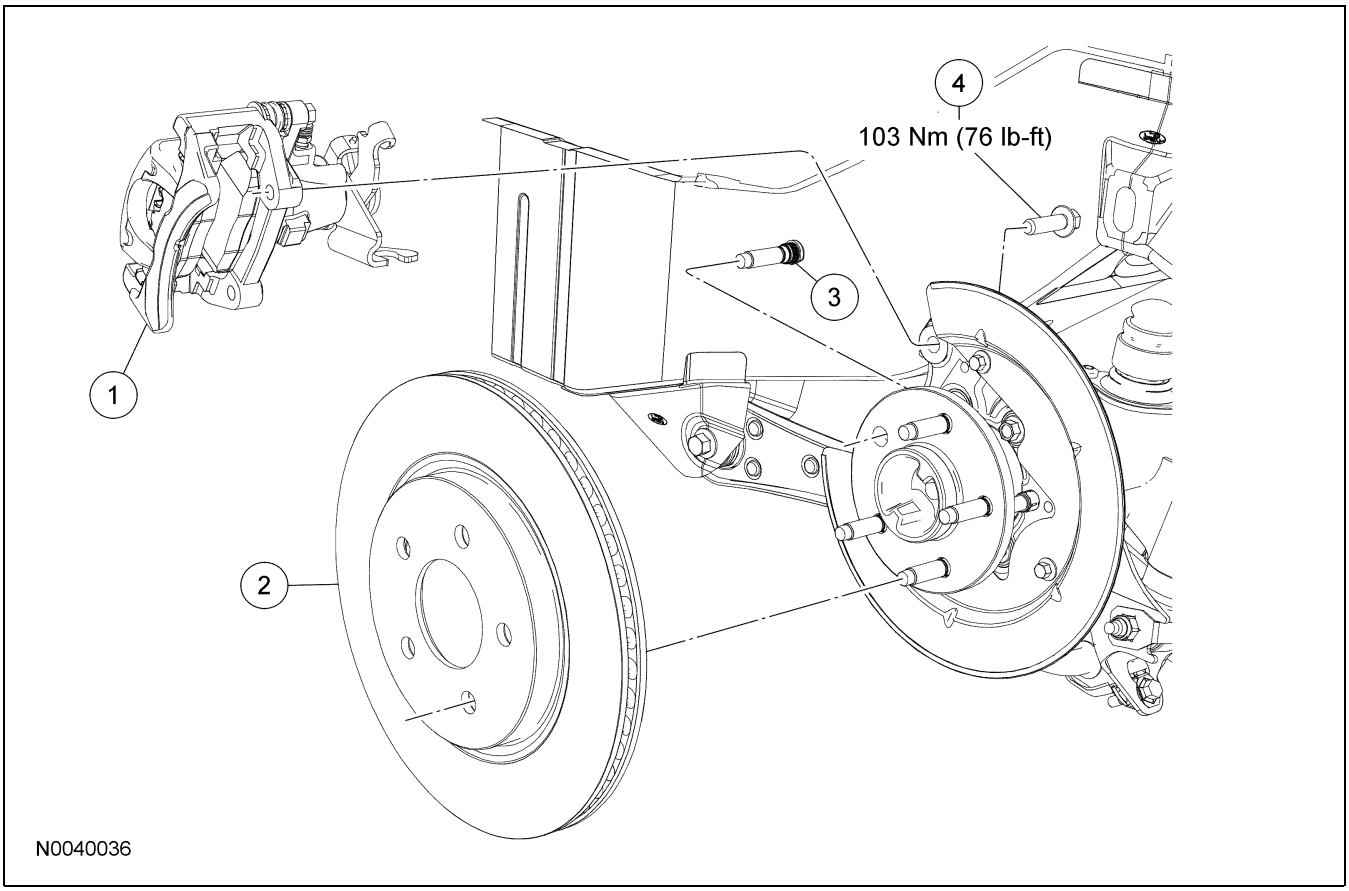
Refer to Section 204-00.

REMOVAL AND INSTALLATION

Wheel Studs

Special Tool(s)

 ST1494-A	C-Frame and Clamp Assembly 211-023 (T74P-3044-A1)



Item	Part Number	Description
1	2553 LH/ 2552 RH	Brake caliper and anchor plate assembly
2	2C026	Brake disc

(Continued)

Item	Part Number	Description
3	1107	Wheel stud
4	W704797	Anchor plate bolt (2 required)

REMOVAL AND INSTALLATION (Continued)

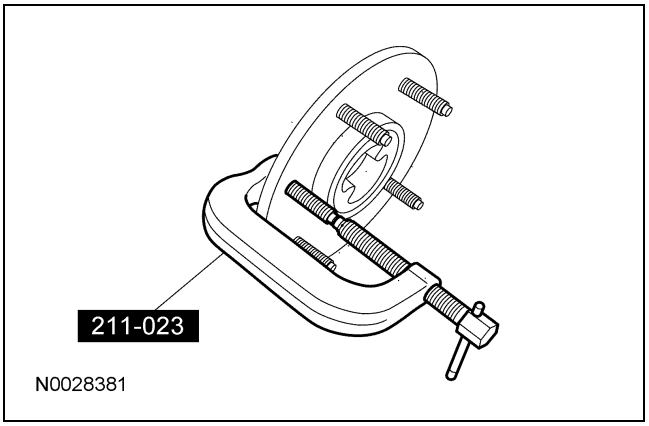
Removal

NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. ***NOTICE:*** **Care must be used when servicing rear brake components without disconnecting the parking brake cable from the brake caliper lever. Carefully position the caliper aside using a suitable support or damage to the parking brake cable end fittings may occur.**

   NOTICE: **Do not allow the caliper and anchor plate assembly to hang from the brake hose or damage to the hose may occur.**

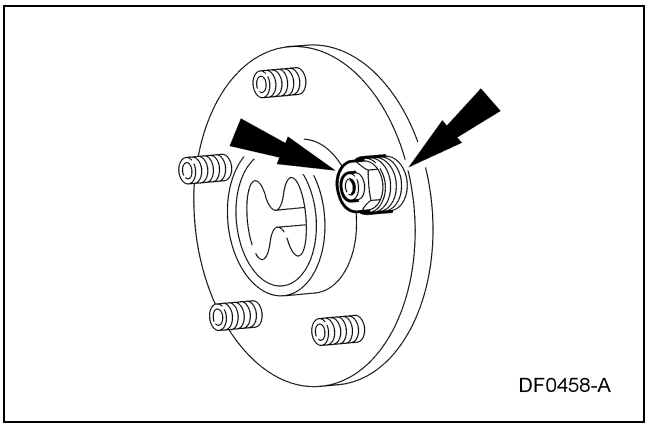
   Remove the bolts and position the caliper and anchor plate assembly aside.
   - Support the caliper and anchor plate assembly using mechanic's wire.
3. Remove the rear brake disc.
4. Using the C-Frame and Clamp Assembly, remove and discard the wheel stud.



Installation

NOTICE: **Do not use air tools to install the wheel stud. The serrations in the hub flange may be stripped.**

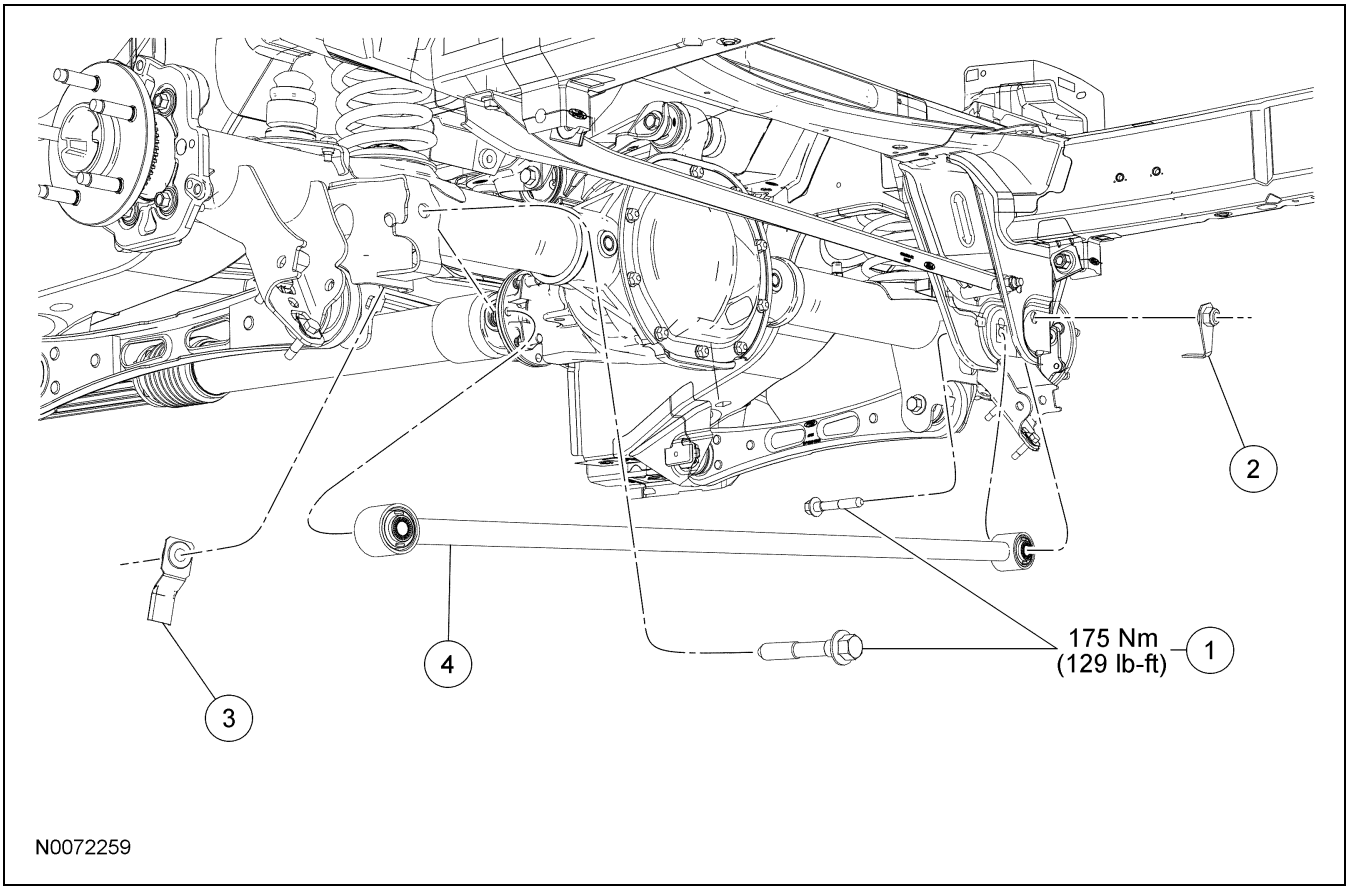
1. Position the wheel stud in the axle flange, making sure that the serrations are aligned with those made by the original wheel stud.
2. Position washers and a reversed wheel nut on the wheel stud and tighten the wheel nut until the stud seats on the back of the axle flange.



3. Remove the wheel nut and washers.
   - Discard the nut.
4. Install the rear brake disc.
5. Position the brake caliper and anchor plate assembly and install the bolts.
   - Tighten to 103 Nm (76 lb-ft).

REMOVAL AND INSTALLATION

Panhard Rod



Item	Part Number	Description
1	W704886	Panhard rod bolts (2 required)
2	W710022	Panhard rod flagnut (RH)

(Continued)

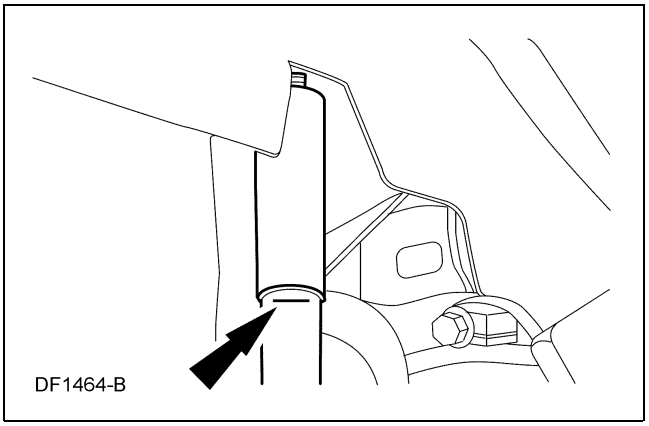
Item	Part Number	Description
3	W710689	Panhard rod flagnut (LH)
4	4264	Panhard rod

REMOVAL AND INSTALLATION (Continued)

Removal and Installation

NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

1. To aid in installation, mark the rear shock absorber relative to the protective sleeve with the vehicle in a static, level ground position (curb height).

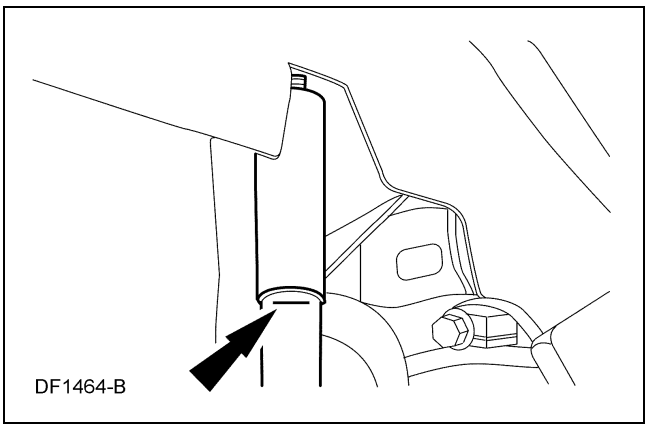


2. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

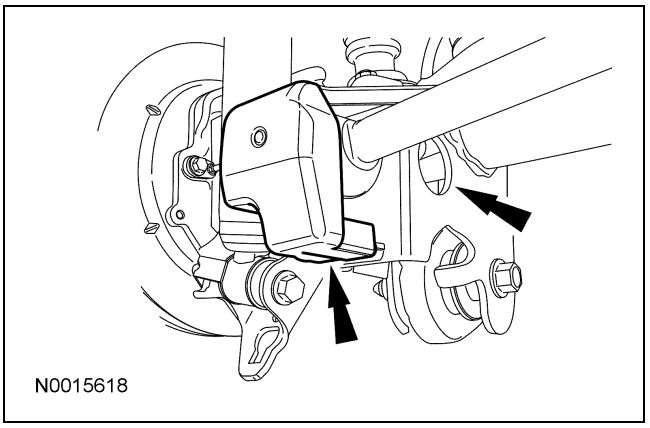
3. *NOTICE:* **Do not support the rear axle at the differential housing or damage to the housing may occur.**

   Using 2 suitable jackstands, support the rear axle.

4. Raise the rear axle so the mark made on the rear shock absorber in Step 1 lines up with the protective sleeve.



5. Using 2 screwdrivers inserted through the access hole, depress the tabs of the panhard rod bolt cover retaining clip and remove the cover.



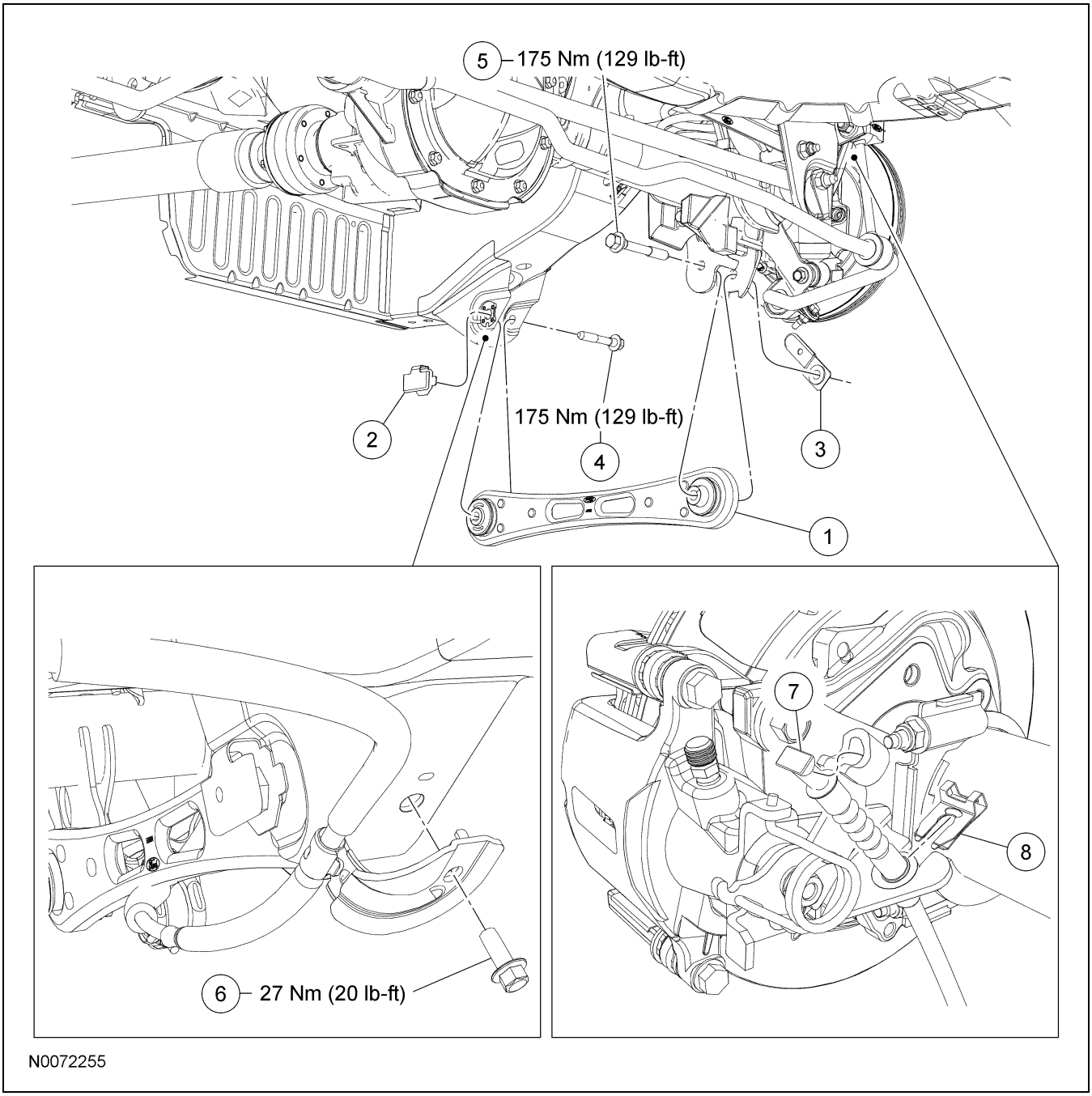
6. Remove and discard the panhard rod bolts and flagnuts.
   - To install, tighten the new bolts to 175 Nm (129 lb-ft).

7. *NOTICE:* **Tighten the LH and RH panhard rod bolts with the suspension at curb height or damage may occur.**

   To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Lower Arm



Item	Part Number	Description
1	5538	Lower arm
2	W710089	Lower arm front nut
3	W704991	Lower arm rear nut
4	W704886	Lower arm front bolt
5	W704888	Lower arm rear bolt

(Continued)

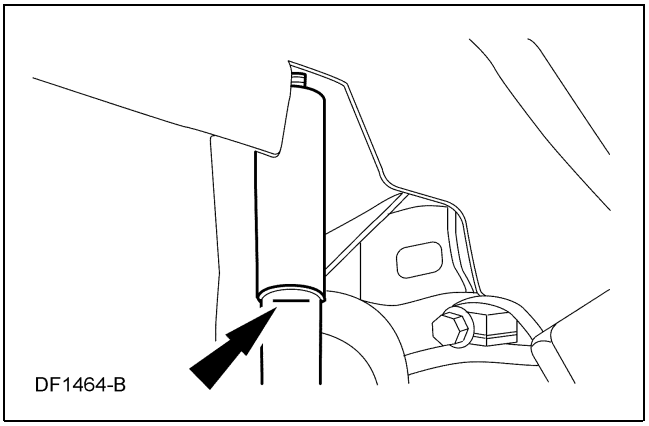
Item	Part Number	Description
6	W505263	Parking brake cable bracket bolt
7	2A635 RH/ 2A823 LH	Parking brake cable
8	2860	Parking brake cable retaining clip

REMOVAL AND INSTALLATION (Continued)

Removal and Installation

NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

1. To aid in installation, mark the rear shock absorber relative to the protective sleeve with the vehicle in a static, level ground position (curb height).

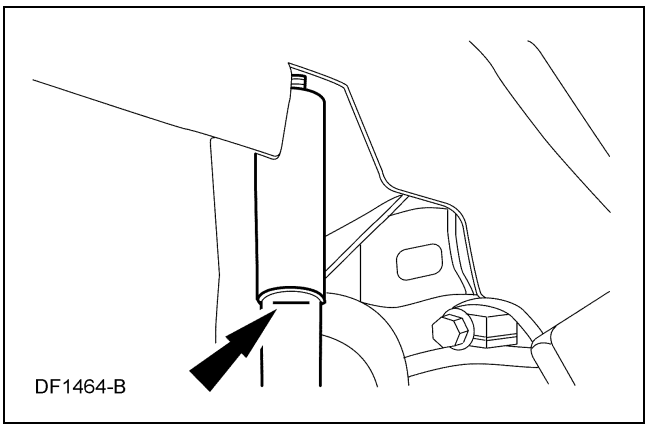


2. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

3. ***NOTICE:*** **Do not support the rear axle at the differential housing or damage to the housing may occur.**

   Using 2 suitable jackstands, support the rear axle.

4. Raise the rear axle so the mark made on the rear shock absorber in Step 1 lines up with the protective sleeve.

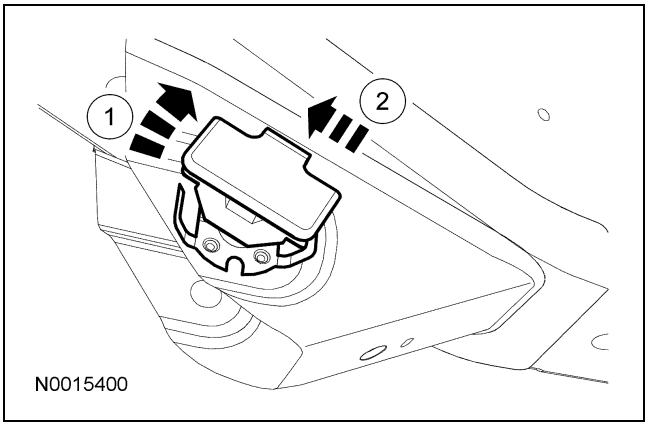


5. Remove the clip and disconnect the parking brake cable from the rear caliper.

6. Remove the parking brake cable bracket bolt.
   - To install, tighten the new bolt to 27 Nm (20 lb-ft).

7. Remove and discard the lower arm front bolt.
   - To install, tighten the new bolt to 175 Nm (129 lb-ft).

8. Remove and discard the lower arm front nut.
   1 Rotate the nut clockwise.
   2 Remove and discard the nut.



9. Remove and discard the lower arm rear bolt and flagnut and then remove the lower arm.
   - To install, tighten the new bolt to 175 Nm (129 lb-ft).

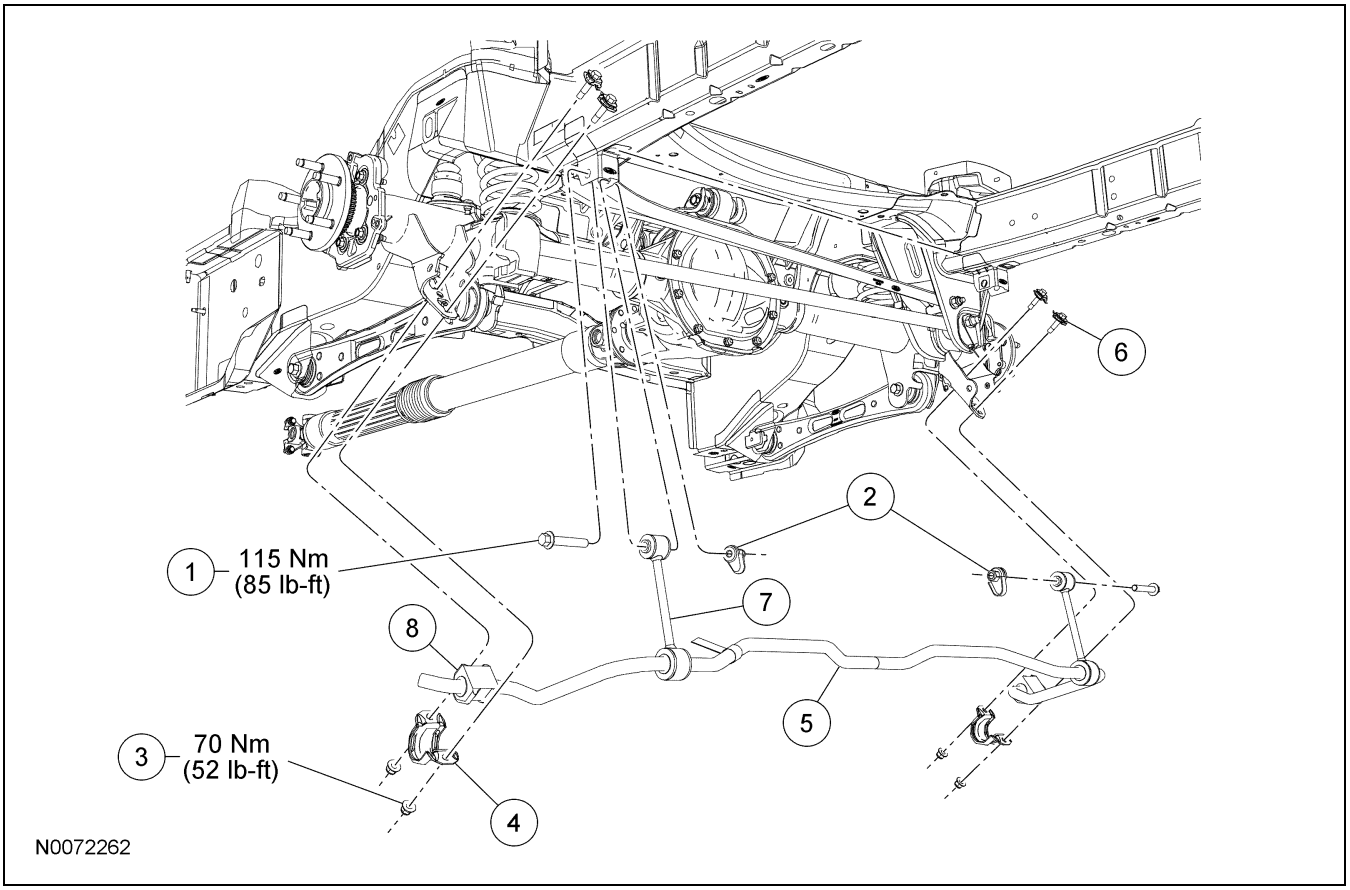
REMOVAL AND INSTALLATION (Continued)

10. ***NOTICE:*** **Tighten the lower arm bolts while the suspension is at curb height or bushing damage and incorrect clamp load may occur.**

    To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Stabilizer Bar



Item	Part Number	Description
1	W708737	Stabilizer bar link bolt (2 required)
2	W712385	Stabilizer bar link flagnuts (2 required)
3	W520213	Stabilizer bar bracket nut (4 required)
4	5486	Stabilizer bar bracket (2 required)
5	5A771	Stabilizer bar
6	W711368	Stabilizer bar bracket clip stud (4 required)
7	5C488	Stabilizer bar link (2 required) (also part of 5A771)
8	4A037	Stabilizer bar bushing (2 required) (also part of 5A771)

Removal and Installation

NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

2. Remove and discard the stabilizer bar link bolts and clip nuts.
   - To install, tighten the new bolt to 115 Nm (85 lb-ft).

REMOVAL AND INSTALLATION (Continued)

3. Remove the stabilizer bar bracket nuts, studs, brackets and stabilizer bar.
   - Discard the stabilizer bar bracket nuts and studs.
   - To install, tighten the new nuts to 70 Nm (52 lb-ft).
4. If necessary, remove the stabilizer bar bushings and links. For additional information, refer to Stabilizer Bar Link in this section.
5. *NOTICE:* **The stabilizer bar is equipped with a tag. This tag indicates the LH side of the stabilizer bar. When installing a new stabilizer bar, make sure the tag is on the LH side of the vehicle or damage to the stabilizer bar may occur.**

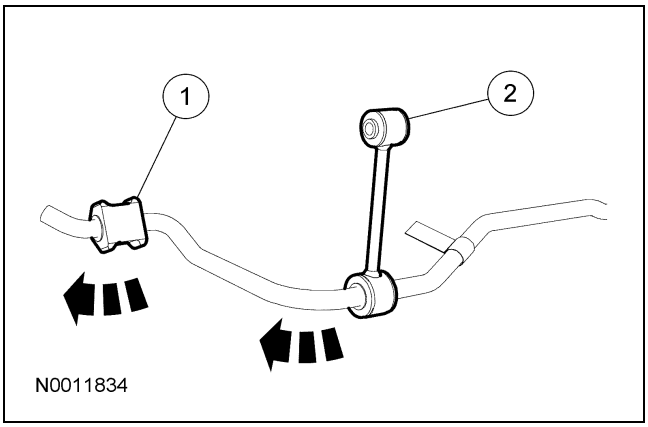
   NOTE: The stabilizer bar is vehicle specific (convertible and coupe). Make sure the correct stabilizer bar goes on the correct vehicle.

   Make sure that a new stabilizer bar has the same tag color as the one being replaced. If the stabilizer bar being replaced does not have a tag, it will be necessary to inspect the stabilizer bar link coating color to determine the proper replacement stabilizer bar.
   - Black-coated stabilizer bar link will require a yellow tag stabilizer bar with the suffix ''A'' in the part number.
   - White-coated stabilizer bar link will require a green tag stabilizer bar with the suffix ''B'' in the part number.
   - Blue/gray-coated stabilizer bar link will require an orange tag stabilizer bar with the suffix ''C'' in the part number.

   To install, reverse the removal procedure.

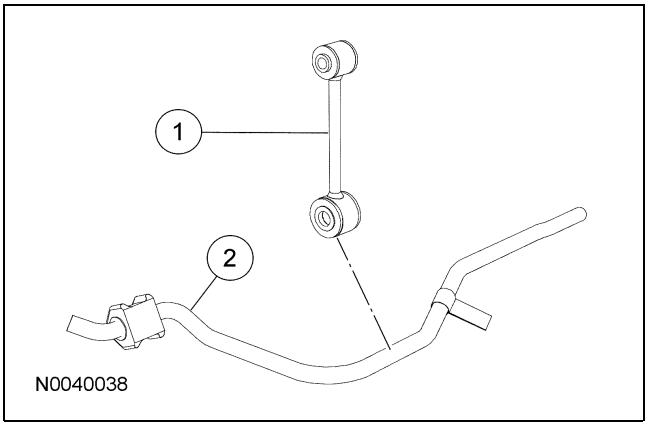
REMOVAL AND INSTALLATION

Stabilizer Bar Link



Material

Item	Specification
Silicone Spray Lubricant XL-6	ESR-M13P4-A



Item	Part Number	Description
1	5C488	Stabilizer bar link (2 required) (also part of 5A771)
2	5A771	Stabilizer bar

Removal and Installation

1. Remove the stabilizer bar. For additional information, refer to Stabilizer Bar in this section.

2. **NOTE:** To aid removal, apply a light coat of silicone lubricant to the necessary parts of the rear stabilizer bar and the inside diameter of the stabilizer bar bushing and link.

   Remove the stabilizer bar bushing and link.

   1 Slide the bushing off of the stabilizer bar.

   2 Slide the link off of the stabilizer bar.

REMOVAL AND INSTALLATION (Continued)

3. **NOTE:** The stabilizer bar links and bushings are vehicle specific (convertible and coupe). Make sure the correct link and bushing go on the correct vehicle.

   The link for the convertible GT and V6 Pony package will have a ''B'' suffix in the part number and it will be colored white. The bushing for the convertible will have a ''B'' suffix in the part number.

   The link for the GT coupe and Shelby GT 500 convertible will have an ''A'' suffix in the part number and it will be colored black. The bushing will have an ''A'' suffix in the part number.

   NOTE: To aid installation, apply a light coat of silicone lubricant to the necessary parts of the rear stabilizer bar and the inside diameter of the stabilizer bar bushing and link.

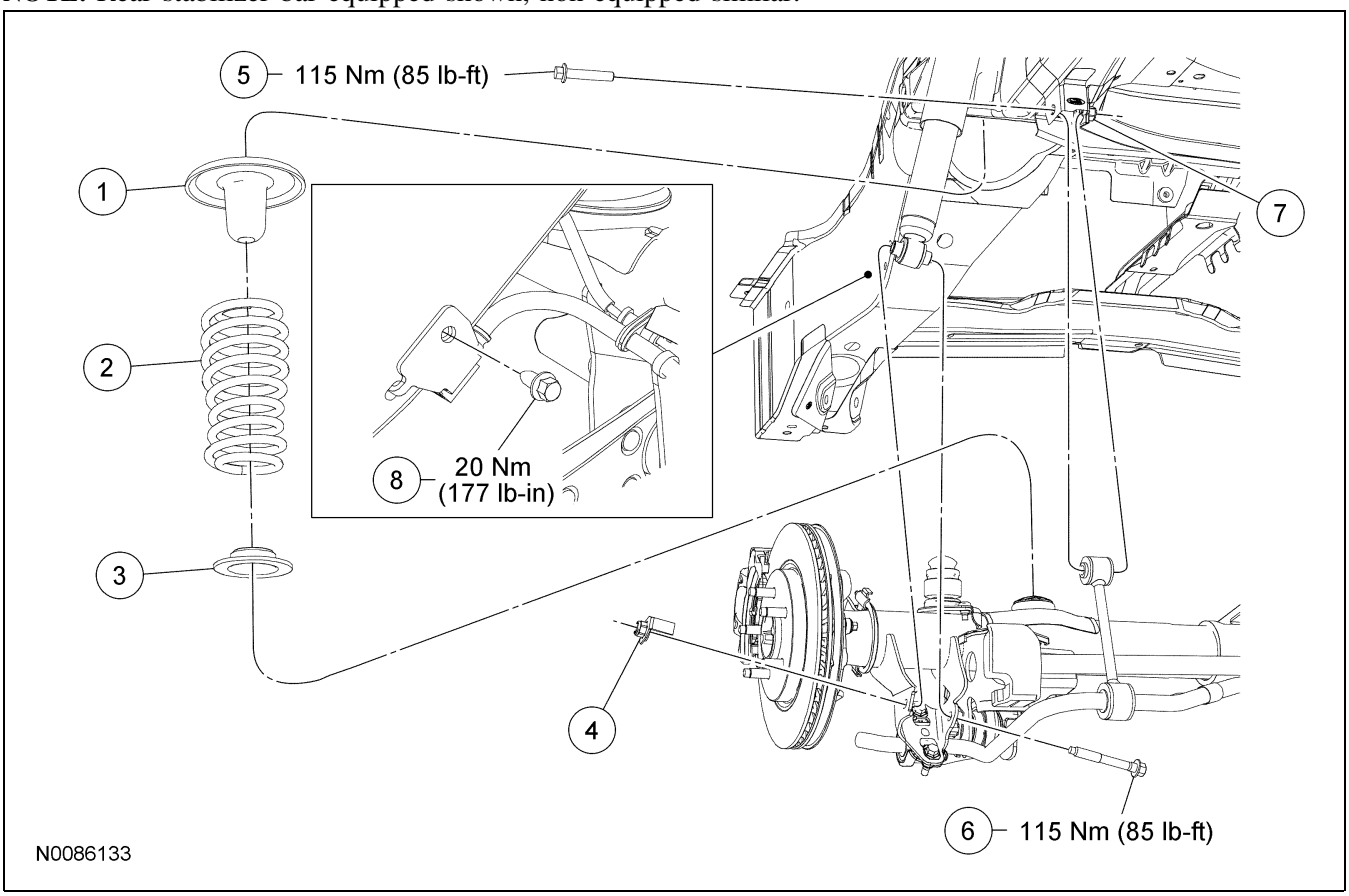
   NOTE: The stabilizer bar link for the Shelby GT 500 convertible will have a ''C'' suffix in the part number and it will be blue/gray in color. The bushing will have a ''C'' suffix in the part number.

   To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Spring — Coil

NOTE: Rear stabilizer bar equipped shown, non-equipped similar.



Item	Part Number	Description
1	5599	Upper spring insulator
2	5560	Spring
3	5536	Lower spring insulator
4	—	Shock absorber lower nut (part of service kit 18008)

(Continued)

Item	Part Number	Description
5	W708737	Stabilizer bar link bolt
6	—	Shock absorber lower bolt (part of service kit 18008)
7	W712385	Stabilizer bar link nut
8	N802191	Brake hose bracket bolt

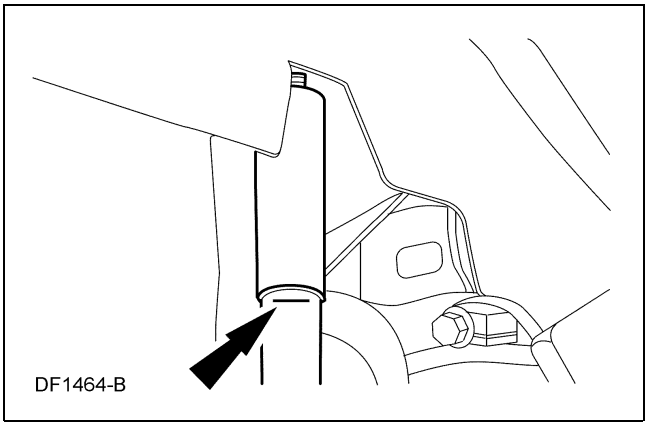
REMOVAL AND INSTALLATION (Continued)

Removal

NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

All vehicles

1. To aid in installation, mark the rear shock absorber relative to the protective sleeve with the vehicle in a static, level ground position (curb height).



2. Remove the wheel and tire. For additional information, refer to Section 204-04.

Convertible vehicles

3. Remove the rear support braces. For additional information, refer to Section 502-00.

All vehicles

4. *NOTICE:* **Do not support the rear axle at the differential housing or damage to the housing may occur.**

   Using 2 suitable jackstands, support the rear axle.

Vehicles with a rear stabilizer bar

5. Remove and discard both stabilizer bar link bolts and clip nuts.

6. Position the stabilizer bar to gain access to the shock absorber lower bolt.

All vehicles

7. Remove and discard the shock absorber lower bolt and nut.

8. Remove the brake hose bracket bolt.

9. Lower the rear axle and remove the spring.

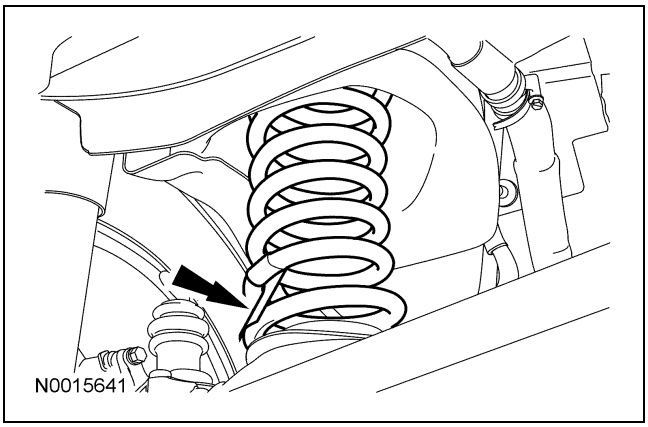
10. Inspect the upper and lower spring insulators for wear or damage. Install new insulators if necessary.

Installation

All vehicles

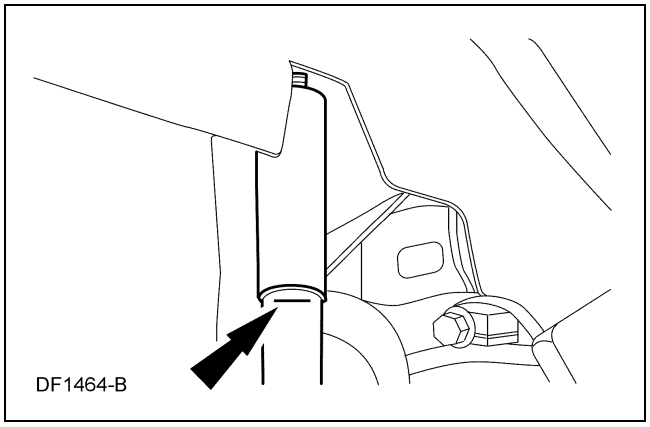
1. **NOTE:** The springs are vehicle specific and are marked with a tag indicating the spring code. Make sure the new spring has the same spring code as the one being replaced. If the tag is not on the spring being replaced, look on the vehicle information label located on the driver's door for the spring code and compare that to the new spring code.

   Position the spring onto the axle with the tag toward the axle assembly.



REMOVAL AND INSTALLATION (Continued)

2. Raise the rear axle so the mark made on the rear shock absorber in Removal Step 1 lines up with the protective sleeve.



3. ***NOTICE:*** **Tighten the shock absorber lower bolt while the suspension is at curb height or bushing damage and incorrect clamp load may occur.**

   Install a new shock absorber lower bolt and nut.

   - Tighten to 115 Nm (85 lb-ft).

4. Install the brake hose bracket bolt.

   - Tighten to 20 Nm (177 lb-in).

Convertible vehicles

5. Install the rear support braces. For additional information, refer to Section 502-00.

Vehicles with a rear stabilizer bar

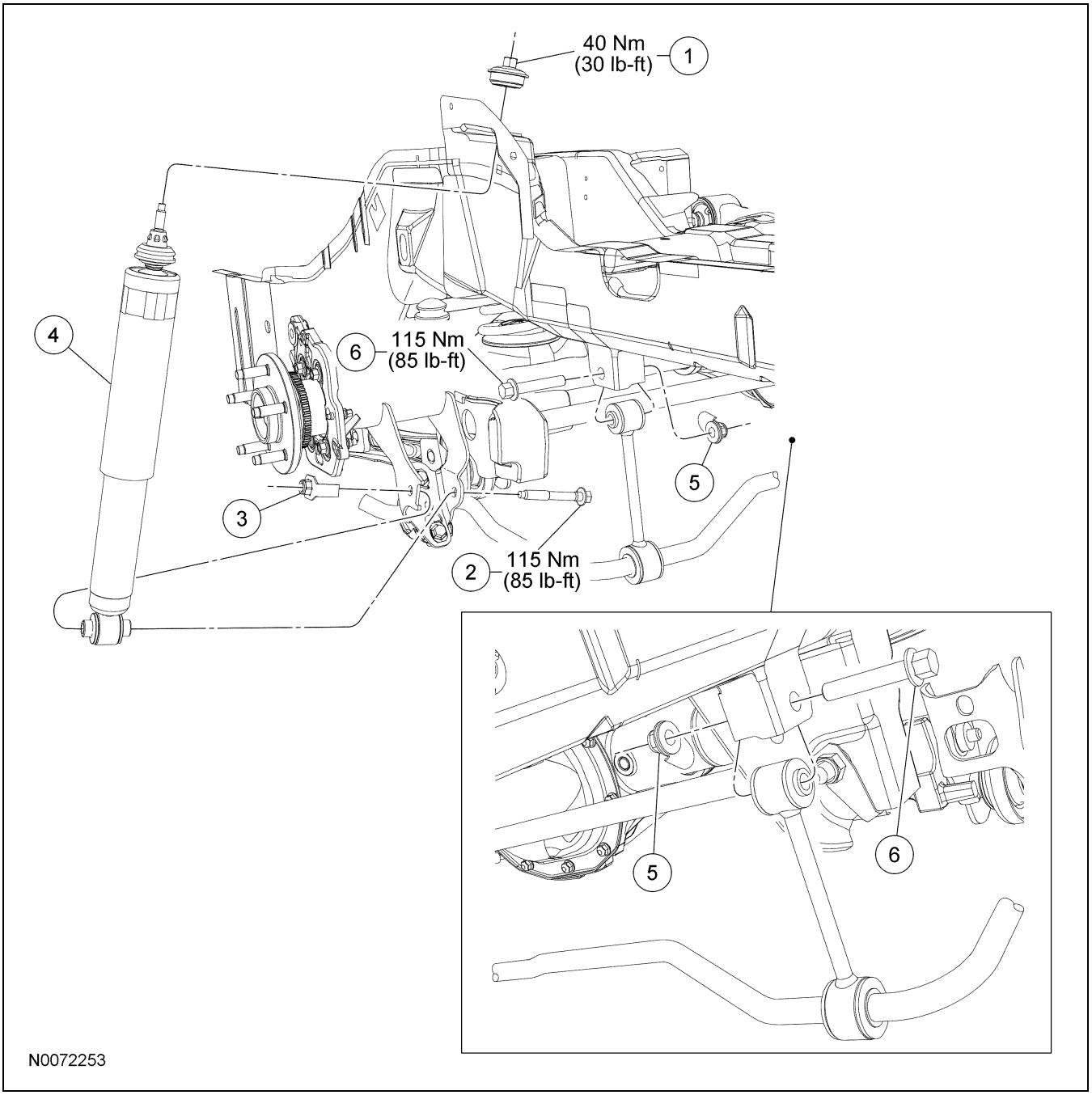
NOTICE: **The stabilizer bar is equipped with a tag. This tag indicates the LH side of the stabilizer bar. When installing a new stabilizer bar, make sure the tag is on the LH side of the vehicle or damage to the stabilizer bar may occur.**

6. Position the stabilizer bar and links and install new stabilizer bar link bolts and clip nuts.

   - Tighten to 115 Nm (85 lb-ft).

REMOVAL AND INSTALLATION

Shock Absorber



Item	Part Number	Description
1	—	Shock absorber upper nut, washer and insulator (part of service kit 18008)
2	—	Shock absorber lower bolt (part of service kit 18008)
3	—	Shock absorber flagnut (part of service kit 18008)

(Continued)

Item	Part Number	Description
4	—	Shock absorber (part of service kit 18008)
5	W712385	Stabilizer bar link nuts (2 required)
6	W708737	Stabilizer bar link bolts (2 required)

REMOVAL AND INSTALLATION (Continued)

Removal and Installation

⚠ **WARNING: Do not apply heat or flame to the shock absorber or strut tube. The shock absorber and strut tube are gas pressurized and could explode if heated. Failure to follow this instruction may result in serious personal injury.**

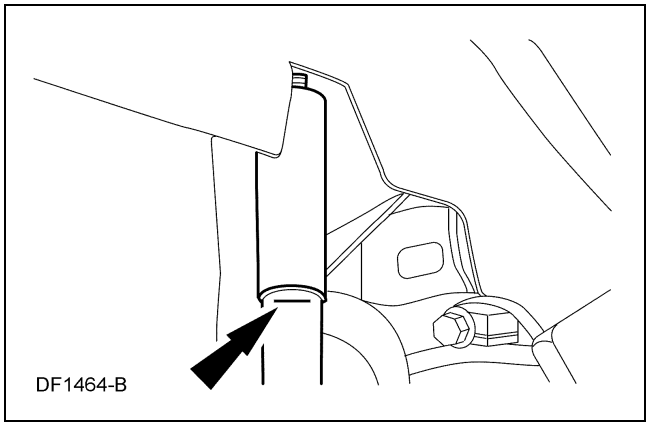
⚠ **WARNING: Keep all body parts clear of shock absorbers or strut rods. Shock absorbers or struts can extend unassisted. Failure to follow this instruction may result in serious personal injury.**

NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

NOTICE: **When using a hoist that lifts the vehicle by the frame, install new shock absorbers one at a time. If the rear axle is allowed to hang unsupported by the control arms, damage to the control arm bushings may result. A drive-on type hoist is the preferred hoist to use for this procedure.**

1. Open the luggage compartment and position the carpet aside.

2. Mark the rear shock absorber that is not being removed relative to the protective sleeve with the vehicle in a static, level ground position (curb height).



3. Remove the wheel and tire. For additional information, refer to Section 204-04.

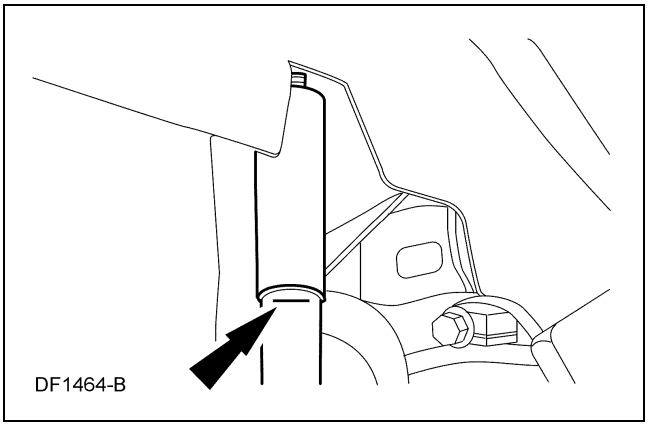
4. ***NOTICE:*** **Do not support the rear axle at the differential housing or damage to the housing may occur.**

   NOTICE: **Do not allow the axle assembly to hang supported only by the upper control arm or lower control arms. This could damage the control arm bushings.**

   Using 2 suitable jackstands, support the rear axle.

5. Remove and discard the shock absorber upper nut, washer and insulator assembly.
   - To install, tighten the new nut to 40 Nm (30 lb-ft).

6. Raise the rear axle so the mark made on the rear shock absorber in Step 2 lines up with the protective sleeve.



7. Remove and discard the shock absorber lower bolt and nut and remove the shock absorber.
   - To install, tighten the new bolt to 115 Nm (85 lb-ft).

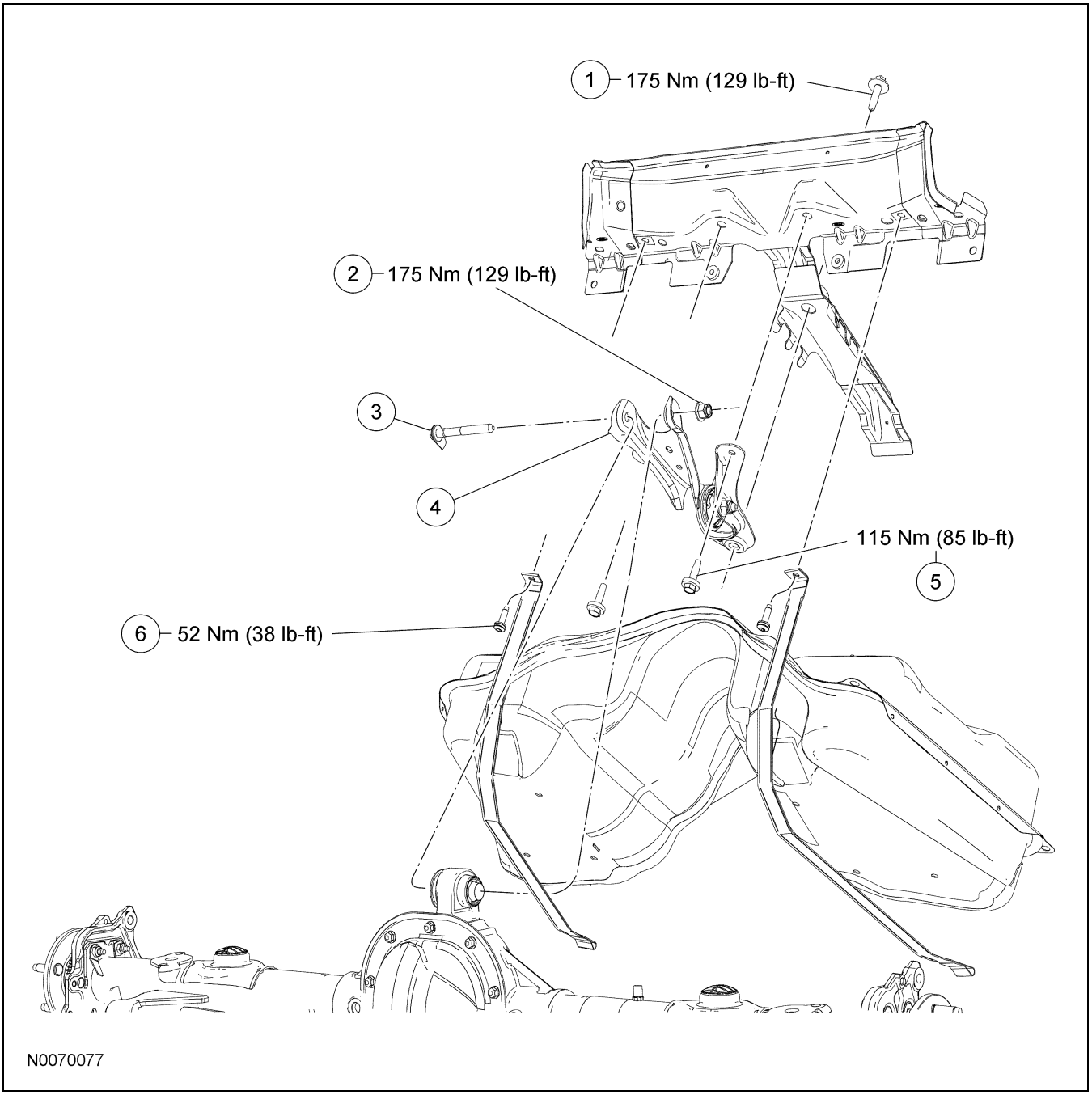
REMOVAL AND INSTALLATION (Continued)

8. *NOTICE:* **Tighten the shock absorber lower bolt while the suspension is at curb height or bushing damage and incorrect clamp load may occur.**

   To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Upper Arm



Item	Part Number	Description
1	W708795	Upper arm bracket forward bolt
2	W520215	Upper arm-to-upper arm bushing nut
3	W710443	Upper arm-to-upper arm bushing bolt

(Continued)

Item	Part Number	Description
4	5K671	Upper arm assembly
5	W711075	Upper arm bracket rearward bolt (2 required)
6	W710947	Fuel tank strap bolt (2 required)

REMOVAL AND INSTALLATION (Continued)

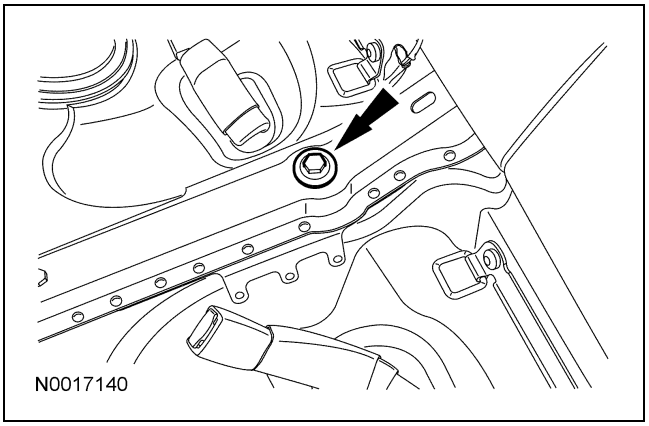
Removal and Installation

NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

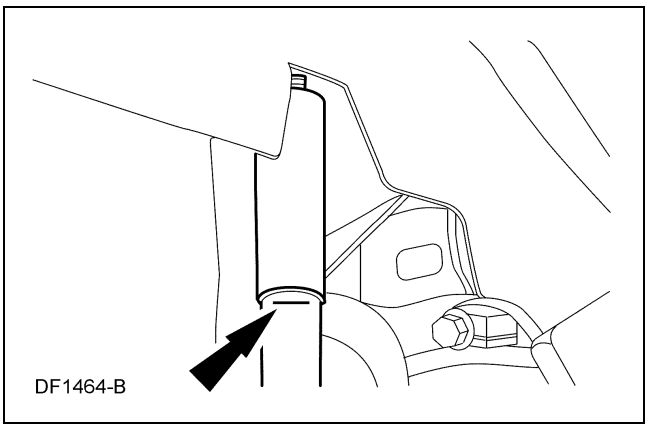
NOTICE: **The upper arm is a 2-piece design and is replaced as an assembly. Do not remove or loosen the nut and bolt that joins the 2 pieces together. The assembly is set at ride height during production, loosening the nut and bolt will disturb this setting.**

1. Remove the rear seat cushion. For additional information, refer to Section 501-10.

2. Remove and discard the upper arm bracket forward bolt.
   - To install, tighten the new bolt to 175 Nm (129 lb-ft).

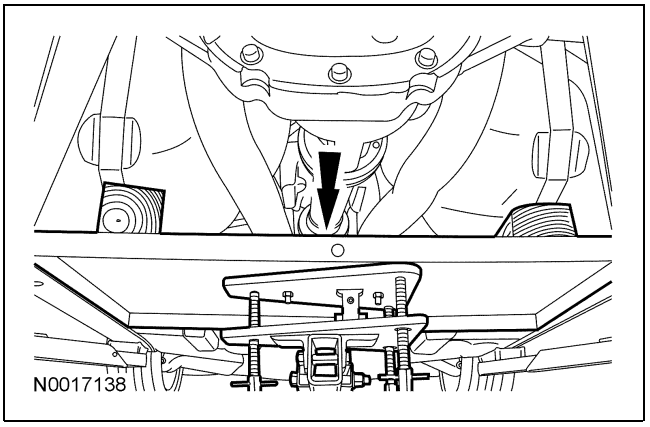


3. To aid in installation, mark the rear shock absorber relative to the protective sleeve with the vehicle in a static, level ground position (curb height).

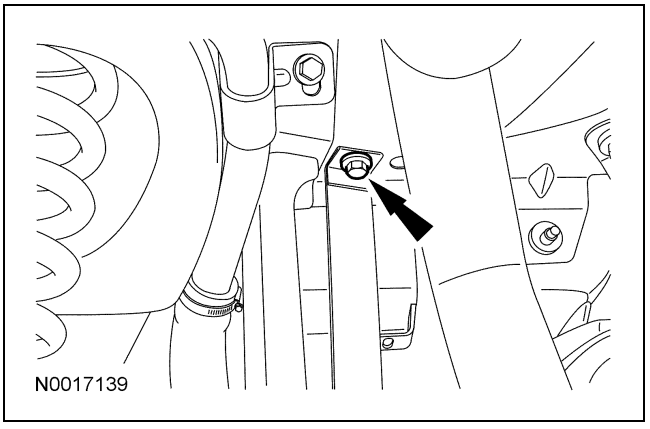


4. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

5. Place a safety support under the fuel tank.



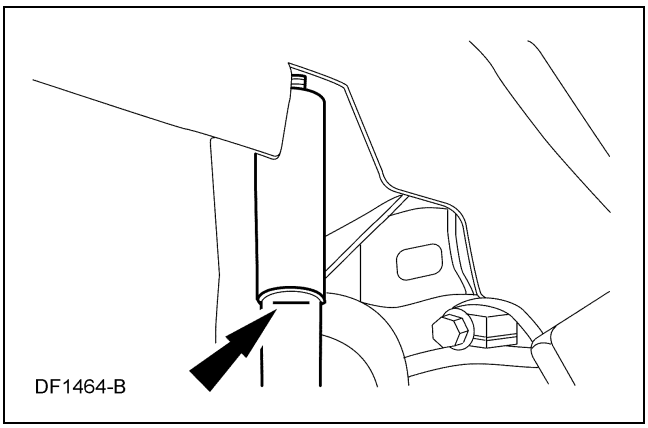
6. Remove the rear bolts from the 2 fuel tank support straps and position both straps aside.
   - To install, tighten to 52 Nm (38 lb-ft)



7. Partially lower the fuel tank to gain access to the upper control arm.

REMOVAL AND INSTALLATION (Continued)

8. Remove and discard the 2 upper arm bracket rearward bolts.
   - To install, tighten the new bolts to 115 Nm (85 lb-ft).
9. Remove and discard the upper arm-to-upper arm bushing flag bolt and nut.
   - To install, tighten the new nut to 175 Nm (129 lb-ft).
10. Remove the upper arm assembly.
11. Raise the rear axle so the mark made in Step 3 lines up with the protective sleeve.



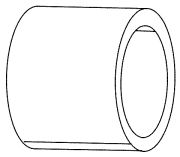
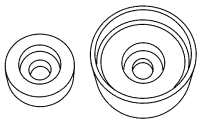
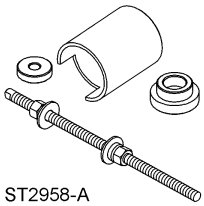
12. ***NOTICE:*** **Tighten the upper arm fasteners while the suspension is at curb height or bushing damage and incorrect clamp load may occur.**

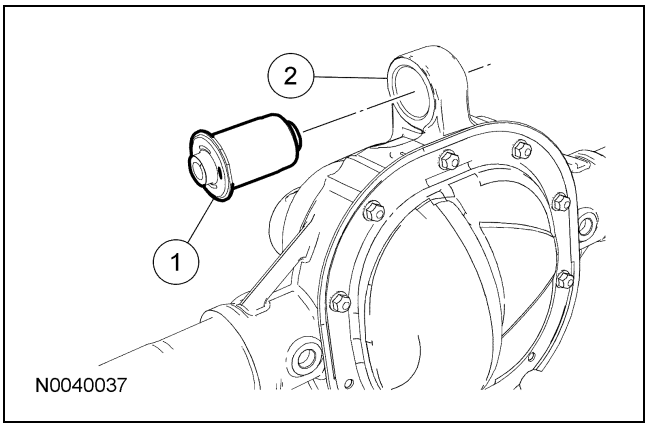
    To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Upper Arm Bushing

Special Tool(s)

 ST1535-A	Adapter 204-034 (T78P-5638-A4)
 ST2942-A	Remover/Installer, Axle Bushing 204-590/1 and 204-590/2
 ST2958-A	Remover/Installer, Rear Drive Unit Bushing 205-813

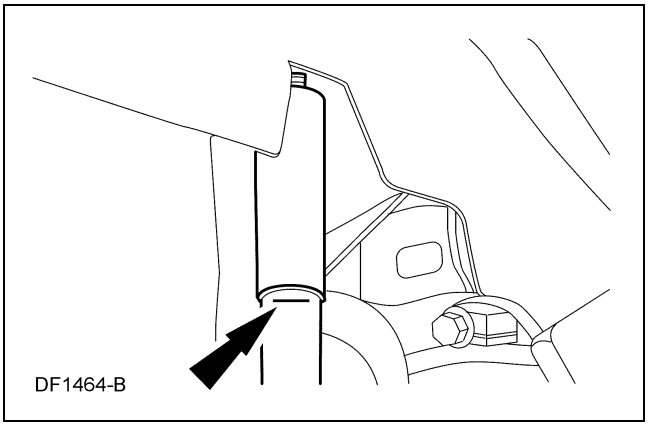


Item	Part Number	Description
1	5A638	Upper control arm bushing
2	4001	Rear drive axle

Removal

NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

1. Mark the rear shock absorber relative to the protective sleeve with the vehicle in a static, level ground position (curb height).



2. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

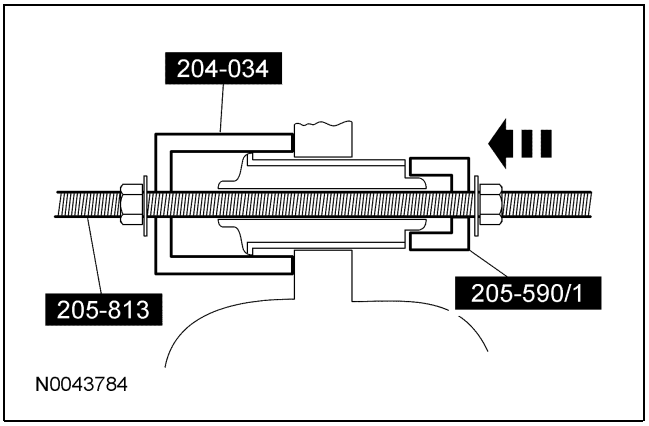
3. ***NOTICE:*** **Do not support the rear axle at the differential housing or damage to the housing may occur.**

   Using 2 suitable jackstands, support the rear axle.

4. Remove and discard the upper arm-to-upper arm bushing nut and flag bolt.

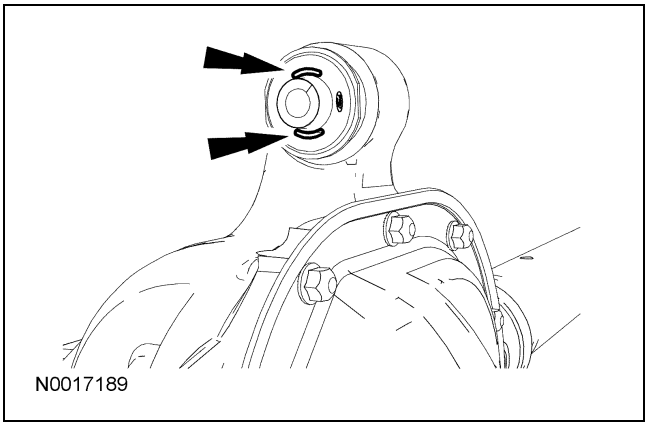
REMOVAL AND INSTALLATION (Continued)

5. Partially lower the rear axle and, using the Rear Drive Unit Bushing Remover/Installer, Axle Bushing Remover/Installer and Adapter, remove the upper control arm bushing.

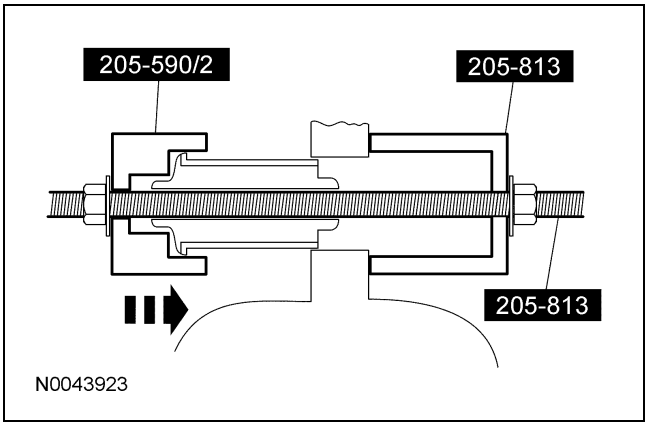


Installation

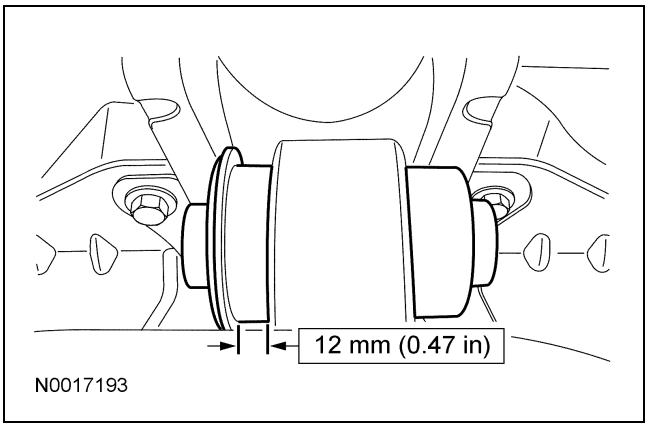
1. Position the new bushing into the rear axle bracket with the voids in the rubber positioned at the top and bottom of the bushing.



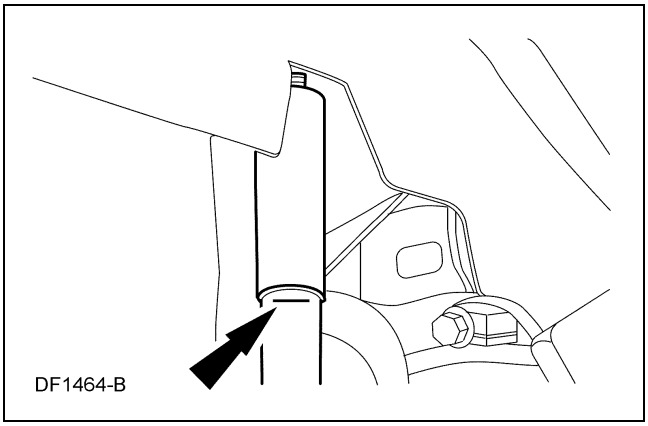
2. Using the Rear Drive Unit Bushing Remover/Installer and Axle Bushing Remover/Installer, install the upper control arm bushing.



3. Install the bushing so there is a 12 mm (0.47 in) gap between the bushing flange and the rear axle bracket.



4. Raise the rear axle so the mark made on the rear shock absorber in Removal Step 1 lines up with the protective sleeve.



REMOVAL AND INSTALLATION (Continued)

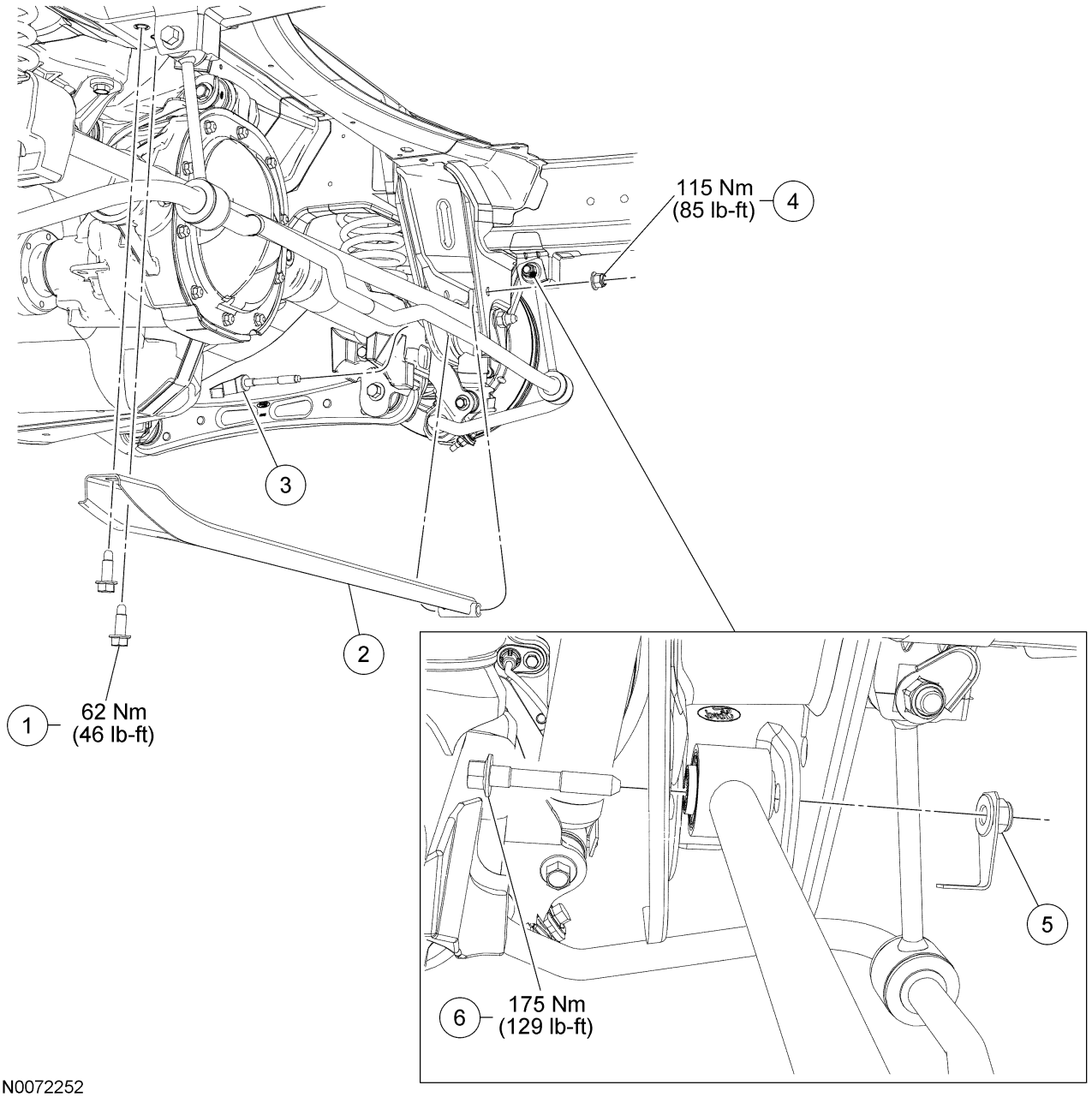
5. *NOTICE:* **Tighten the upper control arm rear nut with the suspension at curb height or bushing damage and incorrect clamp load may occur.**

   Install a new upper arm-to-upper arm bushing nut and flag bolt.

   - Tighten to 175 Nm (129 lb-ft).

REMOVAL AND INSTALLATION

Lateral Stiffener Bar



Item	Part Number	Description
1	W711331	Lateral stiffener bar-to-body bolt (2 required)
2	3424	Lateral stiffener bar
3	W710693	Lateral stiffener bar flag bolt

Item	Part Number	Description
4	W520214	Lateral stiffener bar nut
5	W710022	Panhard rod flagnut (RH)
6	W704886	Panhard rod bolt

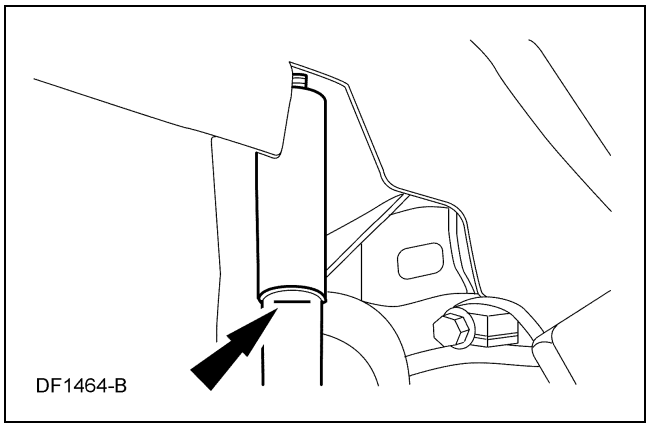
(Continued)

REMOVAL AND INSTALLATION (Continued)

Removal and Installation

NOTICE: **Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.**

1. Mark the rear shock absorber relative to the protective sleeve with the vehicle in a static, level ground position (curb height).

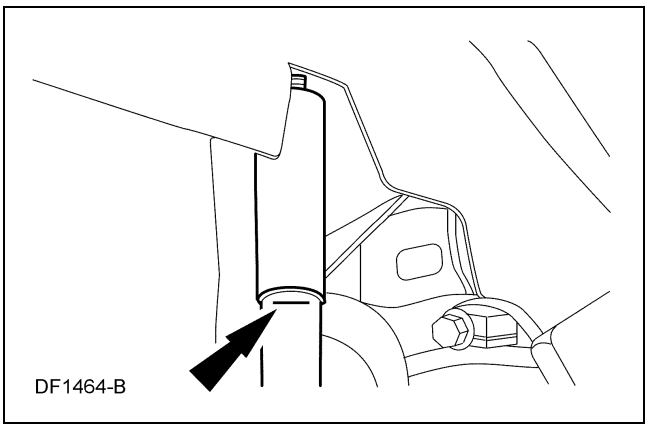


2. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

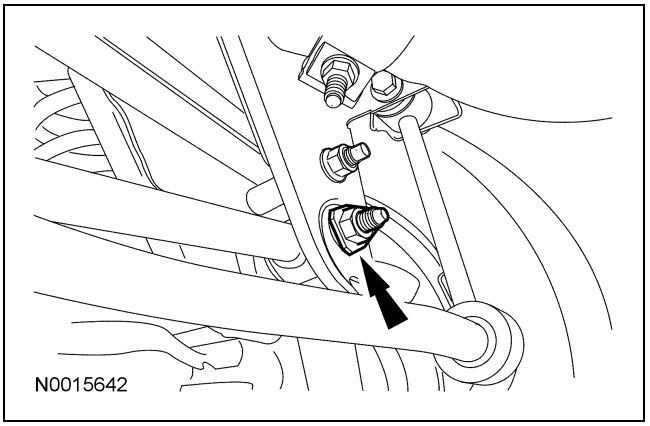
3. ***NOTICE:*** **Do not support the rear axle at the differential housing or damage to the housing may occur.**

   Using 2 suitable jackstands, support the rear axle.

4. Raise the rear axle so the mark made on the rear shock absorber in Step 1 lines up with the protective sleeve.



5. Remove and discard the RH panhard rod bolt, then remove and discard the lateral stiffener bar-to-body mount nut and flag bolt.
   - To install:
     - Tighten the new RH panhard rod bolt to 175 Nm (129 lb-ft).
     - Tighten the new lateral stiffener bar-to-body mount nut to 115 Nm (85 lb-ft).



6. Remove and discard the lateral stiffener bar-to-body bolts.
   - To install, tighten the new bolts to 62 Nm (46 lb-ft).

7. Remove the lateral stiffener bar.

8. ***NOTICE:*** **Tighten the new RH panhard rod bolt while the suspension is at curb height or bushing damage and incorrect clamp load may occur.**

   To install, reverse the removal procedure.

SPECIFICATIONS

Material

Item	Specification	Fill Capacity
Wheel and Tire Cleaner ZC-37-A	—	—

General Specifications

Item	Specification
Tire Balance Weight	
Max tire balance weight	140g (5 oz) per wheel, 70g (2.5 oz) per flange

General Specifications (Continued)

Item	Specification
Tire Inflation	
Tires	See safety certification sticker located inside glove compartment door

NOTE: Use only Digital Tire Pressure Gauge 204-354 any time tire pressures are measured to be sure that accurate values are obtained.

For accuracy, Ford recommends the use of a digital or dial-type tire pressure gauge rather than a stick-type pressure gauge.

Inflate the tire to the pressure specified on the safety certification sticker located on the driver door or door pillar.

Torque Specifications

Description	Nm	lb-ft	lb-in
Sensor strap (worm gear)	3	—	27
Wheel nuts	133	98	—

DESCRIPTION AND OPERATION

Wheels And Tires

Safety Precautions

⚠ WARNING: Vehicle may have multiple drive wheels. Do not use engine to power the driveline unless all drive wheels are elevated off the ground. Drive wheels in contact with ground could cause unexpected vehicle movement. Failure to follow this instruction may result in serious personal injury.

⚠ WARNING: Always match the tire size to the wheel size during assembly. Incorrect matching can result in tire bead damage or tire separation from the wheel. Failure to follow this instruction may result in serious personal injury to technician or vehicle occupant(s).

⚠ WARNING: Before servicing any tire, ask the customer if anyone injected a tire sealant into the tire. Tire sealants may be flammable and can burn or explode if exposed to an ignition source. Failure to follow this instruction may result in serious personal injury.

⚠ WARNING: Replacement wheels must be equivalent to the original equipment wheels in:

- **load carrying capacity.**
- **diameter, width and offset.**
- **pilot hole and bolt circle.**

Combined load carrying capacity of replacement wheels for a given axle, must be equal to or greater than that axle's gross axle weight rating (GAWR) identified on the vehicle's Safety Compliance Certification label. All other specifications should be evaluated by measurement of both the original wheel and the replacement wheel. If specifications are not equivalent, the safety and handling of the vehicle may be degraded, which may result in serious injury to the vehicle occupant(s).

⚠ WARNING: Never use wheels different than the original equipment. Additionally, never use wheel nuts different than the original equipment. Failure to follow these instructions may result in damage to the wheel or mounting system. This damage could cause the wheel to come off while the vehicle is being driven, which could result in serious personal injury or death to vehicle occupant(s).

⚠ WARNING: Always wear eye protection when servicing a vehicle. Failure to follow this instruction may result in serious personal injury.

⚠ WARNING: Keep eyes away from valve stem when deflating tires. Reduce air pressure in tire as much as possible by pushing in valve core plunger prior to removing the core. Escaping air can carry particles that can injure the eyes. Failure to follow these instructions may result in serious personal injury.

⚠ WARNING: Only use replacement tires that are the same size, load index, speed rating and type (such as P-metric versus LT-metric or all-season versus all-terrain) as those originally provided by Ford. The recommended tire and wheel size may be found on either the Safety Compliance Certification Label or the Tire Label, which is located on the B-pillar or edge of the driver's door. If the information is not found on these labels, consult a Ford dealer. Use of any tire or wheel not recommended by Ford can affect the safety and performance of the vehicle, which could result in an increased risk of loss of vehicle control, vehicle rollover, personal injury and death. Additionally, the use of non-recommended tires and wheels could cause steering, suspension, axle or transfer case/power transfer unit failure.

NOTICE: **Do not clean aluminum wheels with steel wool, abrasive-type cleaners or strong detergents or damage to the wheel finish may occur. Use Wheel and Tire Cleaner ZC-27-A or -B or equivalent.**

Factory-installed tires and wheels are designed to operate satisfactorily with loads up to and including full-rated load capacity when inflated to recommended inflation pressures.

DESCRIPTION AND OPERATION (Continued)

Correct tire pressure and driving techniques have an important influence on tire life. Heavy cornering, excessively rapid acceleration and unnecessary sharp braking increase tire wear.

To equalize tire wear, the tires should be rotated at recommended intervals.

Tire Pressure Monitoring System (TPMS)

NOTE: The Smart Junction Box (SJB) is also identified as the Generic Electronic Module (GEM).

The Tire Pressure Monitoring System (TPMS) includes:

- the SJB, TPMS functionality is integrated within the SJB.
- four tire pressure sensors.
- four tire pressure sensor cradles.
- four tire pressure sensor straps.
- an instrument cluster indicator.
- a message center (if equipped).

Tire Pressure Monitoring System (TPMS) Module

The SJB contains the TPMS functionality. Refer to Tire Pressure Monitoring System in Diagnosis and Testing for TPMS fault diagnosis and repair.

The SJB compares the information of each tire pressure sensor transmission against a pressure limit. If the SJB determines that the tire pressure has fallen below the low limit, the SJB communicates this to the instrument cluster on the vehicle communication bus.

Tire Pressure Monitoring System (TPMS) Pressure Sensor

The SJB monitors the air pressure in the 4 road tires with tire pressure sensors. The sensors transmit radio frequency signals to the SJB approximately every 60 seconds when the vehicle speed exceeds 32 km/h (20 mph).

The tire pressure sensors are battery operated and are mounted to metal brackets (called cradles) on the wheels inside the tires. The sensors are mounted 180 degrees from the valve stem.

The tire pressure sensor can be serviced separately from the cradle and the strap.

Tire Pressure Monitoring System (TPMS) Pressure Sensor Cradle

The tire pressure sensor cradles are mounted to the wheels with metal straps and have an adhesive strip to aid in their retention to the wheel.

The sensor cradle is available with the strap in a kit. To service the sensor cradle, the strap must be removed and discarded.

Tire Pressure Monitoring System (TPMS) Pressure Sensor Strap

The sensor strap keeps the sensor and the cradle retained to the wheel. A factory-installed strap is joined together with a one-time-use buckle and a dealer-installed strap is joined together with a worm gear (similar to a radiator hose clamp). Both straps should be discarded after removal and should not be reused.

The cradle and strap are available as a strap kit. There are several different strap kits available based on wheel diameter.

Instrument Cluster and Message Center

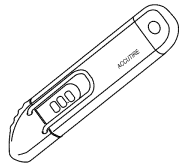
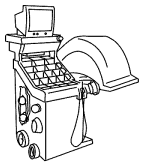
The instrument cluster illuminates the TPMS indicator when it receives a message from the SJB to do so and displays the appropriate message(s) in the message center (if equipped).

The instrument cluster and message center are diagnosed and serviced in their own respective workshop manual sections. Refer to the appropriate section in Group 413 for the procedure.

DIAGNOSIS AND TESTING

Wheels And Tires

Special Tool(s)

 ST2869-A	Digital Tire Gauge 204-354
 ST3058-A	Hunter Rod Force® Wheel Balancer GSP9700 Series

Inspection and Verification

⚠ **WARNING: Vehicle may have multiple drive wheels. Do not use engine to power the driveline unless all drive wheels are elevated off the ground. Drive wheels in contact with ground could cause unexpected vehicle movement. Failure to follow this instruction may result in serious personal injury.**

Verify the customer concern by carrying out a road test on a smooth road. If any vibrations are apparent, GO to Symptom Chart — NVH.

To maximize tire performance, inspect for signs of incorrect inflation and uneven wear, which may indicate a need for balancing, rotation or front suspension alignment.

Correct tire pressure and driving techniques have an important influence on tire life. Heavy cornering, excessively rapid acceleration and unnecessary sharp braking increase tire wear.

Replacement tires must follow the recommended:

- tire sizes.
- speed rating.
- load range.
- tire construction type.

The use of any other tire/wheel size, load range or type can seriously affect:

- ride.
- handling.
- speedometer/odometer calibration.
- vehicle ground clearance.
- tire clearance between the body and chassis.
- wheel bearing life.
- braking performance.

New wheels need to be installed when the vehicle wheels:

- are bent.
- are cracked.
- are dented.
- are heavily corroded.
- are leaking.
- have elongated wheel hub bolt holes.
- have excessive lateral or radial runout.

It is mandatory to use only the tire sizes recommended on the tire label located on the driver door or door pillar attached to the vehicle. Larger or smaller tires can damage the vehicle, affect durability and require changing the speedometer calibration. Make sure wheel size and offsets match those recommended for the tire in use.

1. Inspect the tires for signs of uneven wear. Refer to the following descriptions to identify the type of wear and GO to Symptom Chart — Tire Wear for the appropriate repair action to be carried out.
2. Check the tires for:
   - cuts.
   - stone bruises.
   - abrasions.
   - blisters.
   - embedded objects.
3. Tread wear indicators are molded into the bottom of the tread grooves. Install a new tire when the indicator bands become less than 2/32 in.

DIAGNOSIS AND TESTING (Continued)

Tire Wear

Tire wear is commonly defined as a loss of tread depth. Tire tread wear occurs due to friction with the contact surface (road/pavement). The tread should wear down uniformly all the way around the circumference of the tire and all the way across the tread face. When this does not occur, the tire may have abnormal/incorrect wear.

Normal Tire Wear

Normal tire wear is identified as even wear around and across the tread. Because there are many factors (driving style, road surfaces, type of vehicle, type of tire) that can affect tire wear, there is no absolute mileage expectation for a normal wear condition. A tire is considered worn-out when the tread has worn to the level of the tread-wear indicators.

Abnormal/Incorrect Tire Wear

Abnormal/incorrect tire wear is identified as tire wear that is not even around or across the tread and that creates performance-related issues.

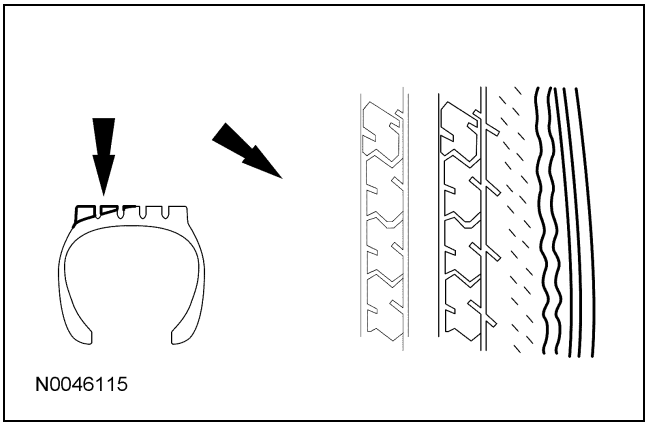
Abnormal/incorrect wear can be caused by numerous factors, some of which include driving style (aggressive, passive), climate (hot, cold), road conditions, vehicle loading and maintenance (correct tire pressure, rotation intervals and balance). It is important to determine the root cause of wear on a vehicle before carrying out repair. Tires exhibiting abnormal/incorrect tire wear may still be serviceable provided that the minimum tread depth is greater than 2/32 in and the tire is not causing a vehicle performance (noise/vibration) concern.

Some abnormal/incorrect wear patterns look the same all the way around the tread of the tire, other wear patterns are not consistent and can occur in various spots on the tread area. The underlying causes of the 6 wear categories are different. Refer to the following descriptions to identify the type of wear and GO to Symptom Chart — Tire Wear for the appropriate repair action to be carried out.

Inner Edge/Shoulder Wear

Inner edge (or shoulder) wear occurs on the inside edge of the tire and is usually caused by excessive toe-out and/or excessive negative camber. If the tread depth of the outer shoulder is at least 50% greater than the tread depth of the inner shoulder, the tire is experiencing inner edge/shoulder wear. To determine whether tires have this type of wear, visually inspect the tires. In some instances, it may be necessary to measure the tread depth of each rib and compare it to that of the shoulder.

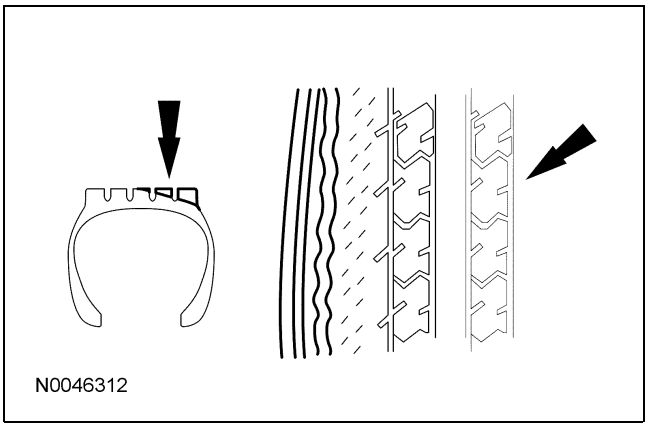
NOTE: RF tire shown, others similar.



Outer Edge/Shoulder Wear

Outer edge (or shoulder) wear occurs on the outside edge of the tire and is usually caused by excessive toe-in and/or excessive positive camber. If the tread depth of the inner shoulder is at least 50% greater than the tread depth of the outer shoulder, the tire is experiencing outer edge/shoulder wear. To determine whether tires have this type of wear, visually inspect the tires. In some instances, it may be necessary to measure the tread depth of each rib and compare it to that of the shoulder.

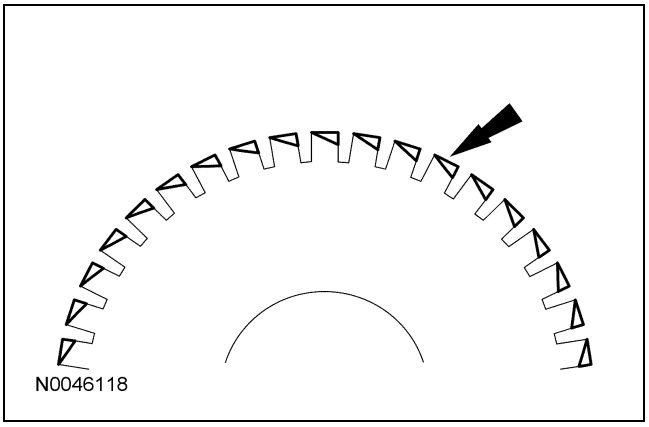
NOTE: RF tire shown, others similar.



DIAGNOSIS AND TESTING (Continued)

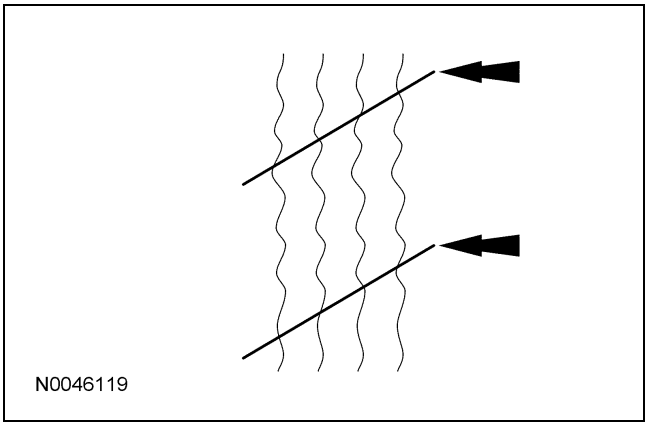
Heel/Toe Wear

Heel/toe wear (also known as feathering) occurs along the outside or inside edge/shoulder of the tire. To determine whether tires have this type of wear, visually inspect the tires in both the inside and outside shoulder ribs. In some instances, it may be necessary to measure the difference in tread depth of leading versus trailing edge of each lug in the inside and outside shoulder rib.



Diagonal Wear

Diagonal wear occurs diagonally across the tread area and around the circumference of the tire. To determine whether tires have this type of wear, visually inspect the tires to determine if the wear pattern runs diagonally across the tread and around the circumference of the tire. In some instances, the difference in tread depth along the diagonal wear pattern may need to be measured.



Symptom Chart — Tire Wear

Symptom Chart — Tire Wear

NOTE: For suspension system and additional alignment diagnosis, refer to Section 204-00.

Condition	Possible Sources	Action
• Inner edge/shoulder wear	• Excessive toe out and/or negative camber • Incorrect wheel and tire assembly rotation intervals • High-speed cornering	• GO to Pinpoint Test A. • GO to Pinpoint Test A. • GO to Pinpoint Test A.
• Outer edge/shoulder wear	• Excessive toe in and/or positive camber • Incorrect wheel and tire assembly rotation intervals • High-speed cornering	• GO to Pinpoint Test B. • GO to Pinpoint Test B. • GO to Pinpoint Test B.
• Heel/toe wear	• Excessive toe in/out • Incorrect wheel and tire assembly rotation intervals	• ROTATE the wheel and tire assemblies. CHECK the alignment, ADJUST as necessary.
• Diagonal wear	• Excessive toe in/out • Incorrect tire rotation intervals • Loose, worn or damaged suspension components	• GO to Pinpoint Test C. • GO to Pinpoint Test C. • REFER to Section 204-00.

DIAGNOSIS AND TESTING (Continued)

Symptom Chart — NVH

Symptom Chart — NVH

NOTE: NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04. Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to Section 100-04 for the next likely system and continue diagnosis.

Condition	Possible Sources	Action
• Wobble or shimmy	• Bent wheel • Damaged tire • Loose wheel nuts	• INSTALL a new wheel as necessary. • INSTALL a new tire as necessary. • TIGHTEN to specification.
• High-speed shake	• Tires/wheels	• REFER to Wheel and Tire Runout Component Tests in this section.
• Vehicle vibration	• Tires/wheels	• REFER to Wheel and Tire Runout Component Tests in this section.

Pinpoint Tests

For a description of the various tire wear patterns, refer to Inspection and Verification.

Pinpoint Test A: Inner Edge/Shoulder Wear

This pinpoint test is intended to diagnose the following:

- Excessive toe out
- Incorrect wheel and tire rotation

PINPOINT TEST A: INNER EDGE/SHOULDER WEAR

Test Step		Result / Action to Take
A1	**MEASURE THE TREAD DEPTH**	
	• Using a tread depth gauge or similar tool, measure the inside edge/shoulder tread depth. • **Is the tread depth greater than 2/32 in?**	**Yes** ROTATE the wheel and tire assemblies. CHECK and ADJUST the toe to nominal +0.15 degrees (toe in). CHECK and ADJUST caster and camber to nominal. REFER to Section 204-00. **No** INSTALL a new tire(s). CHECK and ADJUST the toe to nominal. CHECK and ADJUST caster and camber to nominal. REFER to Section 204-00.

Pinpoint Test B: Outer Edge/Shoulder Wear

This pinpoint test is intended to diagnose the following:

- Excessive toe in
- Incorrect wheel and tire rotation

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B: OUTER EDGE/SHOULDER WEAR

Test Step		Result / Action to Take
B1	**MEASURE THE TREAD DEPTH**	
	• Using a tread depth gauge or similar tool, measure the outside edge/shoulder tread depth. • **Is the tread depth greater than 2/32 in?**	**Yes** ROTATE the wheel and tire assemblies. CHECK and ADJUST the toe to nominal -0.15 degrees (toe out). CHECK and ADJUST caster and camber to nominal. REFER to Section 204-00. **No** INSTALL a new tire(s). CHECK and ADJUST the toe to nominal. CHECK and ADJUST caster and camber to nominal. REFER to Section 204-00.

Pinpoint Test C: Diagonal Wear

This pinpoint test is intended to diagnose the following:

- Incorrect wheel and tire rotation
- Excessive toe in/out
- Incorrect tire inflation
- Loose, worn or damaged suspension components

PINPOINT TEST C: DIAGONAL WEAR

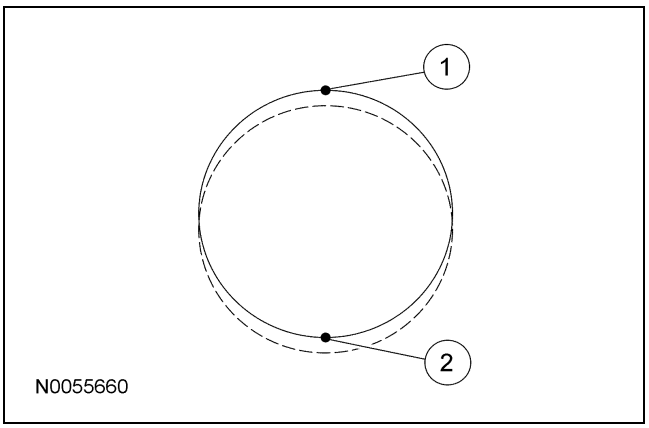
Test Step		Result / Action to Take
C1	**MEASURE THE TREAD DEPTH**	
	• Using a tread depth gauge or similar tool, measure the tread depth of the wear pattern. • **Is the tread depth greater than 2/32 in?**	**Yes** If no performance concerns (noise/vibration) are present, the tire can remain in service. CHECK the air pressure in the tires, ADJUST as necessary. ROTATE the wheel and tire assemblies. INSPECT for loose, worn or damaged suspension components. INSTALL new components as necessary. CHECK the alignment and ADJUST as necessary. REFER to Section 204-00. **No** INSTALL a new tire(s). CHECK the air pressure in the tires, ADJUST as necessary. ROTATE the wheel and tire assemblies. INSPECT for loose, worn or damaged suspension components. INSTALL new components as necessary. CHECK the alignment and ADJUST as necessary. REFER to Section 204-00.

Component Tests

Radial Runout

Radial runout is the egg-shaped deviation from a perfect circle and is measured perpendicular to the circumference. On a wheel and tire assembly, this means measuring the center tire tread rib. The center rib is indicative of the condition of the tire as a whole. Total runout is the difference between the maximum-to-minimum gauge reading. The high spot is the location of maximum runout.

DIAGNOSIS AND TESTING (Continued)



Item	Description
1	High spot
2	Low spot

Loaded Runout Measurement (Hunter Road Force® 9700 Series Wheel Balancer)

NOTE: Diagnosis of tire/wheel vibration should not be performed on tires with less than 320 km (200 mi). Some initial tire/wheel vibration issues (such as flat spotting) will correct themselves after the tires have been in service for 320 km (200 mi).

This procedure is intended to assist with the diagnosis of wheel and tire assembly runout and/or force variation issues.

The Hunter Road Force® 9700 Series Wheel Balancer measures the wheel and tire assembly's loaded runout and the tire's radial spring rate. The balancer then converts the runout into pounds of force (termed as Road Force®). Measuring loaded runout (Road Force®) is more effective than measuring unloaded runout using a dial indicator.

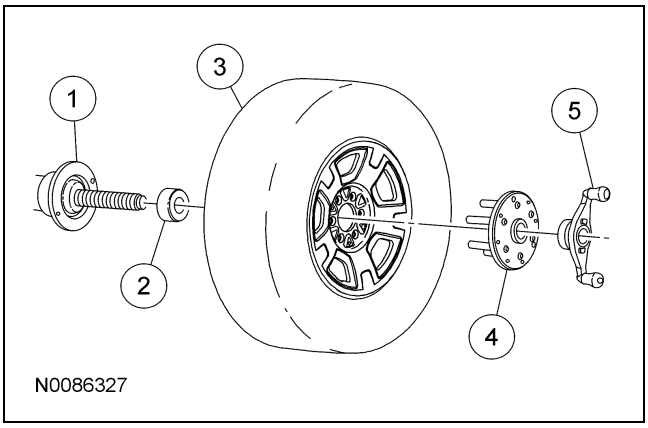
1. Using a tire crayon, record the vehicle position on the inward sidewall of all 4 tires.
2. Remove the wheel and tire assemblies. For additional information, refer to Wheel and Tire in this section.
3. **NOTE:** Use only the Digital Tire Gauge any time tire pressures are measured to be sure that accurate values are obtained.

   Make sure that the tire pressures are set to the correct pressure as indicated on the Vehicle Certification (VC) label.
4. ***NOTICE:*** **Make sure that the correct wheel balancer adapters are used when mounting the assembly to the wheel balancer or damage to the wheel may occur.**

   NOTE: Make sure that the wheel and tire assembly is clean and free of foreign material prior to installation on the balancer.

   NOTE: The wheel balancer inflation station must be turned OFF for tires with inflation pressures of 414 kPa (60 psi) or above.

   Mount the wheel and tire assembly on a suitable wheel balancer using the correct wheel balancer adapters as shown. Refer to the list of recommended wheel balancer adapters on the PTS website.



Item	Description
1	Wheel balancer
2	Cone
3	Wheel and tire assembly
4	Finger plate
5	Balancer wing nut

5. Measure the Road Force®.
   - Temporarily mark the high spot and the Road Force® value on the sidewall of the tire. If the wheel and tire assembly Road Force® value is not within 9 kg (20 lb), carry out the Match Mounting procedure to optimize the wheel and tire assembly.

DIAGNOSIS AND TESTING (Continued)

- If the wheel and tire assembly Road Force® value is within 9 kg (20 lb), permanently mark the high spot and the Road Force® value on the inward sidewall of the tire for reference during future wheel and tire service. Balance the assembly and install the wheel and tire on the vehicle using the Wheel-to-Hub Optimization procedure.

Runout Measurement (Dial Indicator)

NOTE: Diagnosis of tire/wheel vibration should not be performed on tires with less than 320 km (200 mi). Some initial tire/wheel vibration issues (such as flat spotting) will correct themselves after the tires have been in service for 320 km (200 mi).

NOTE: Loaded run-out measurements are the preferred method for verifying tire serviceability. While a dial indicator can be used to optimize the position of the tire on the wheel the unloaded run-out measurement cannot accurately determine if the tire should be removed from service.

The following procedures should be used if normal diagnostics leads to a potential runout issue.

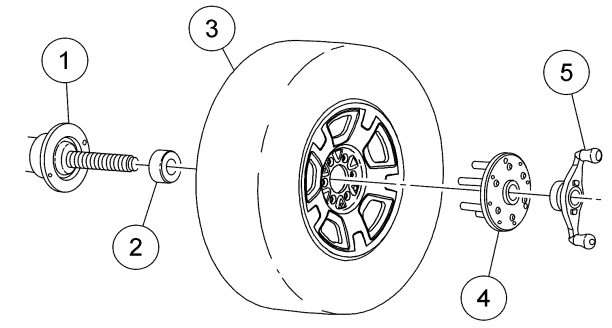
Some vehicles may exhibit a wheel and tire vibration caused by excessive runout. Radial runout measurements can be taken using a dial indicator and should be measured with the wheel and tire assembly mounted on a suitable wheel balancer. The dial indicator should be mounted securely to eliminate gauge movement when measuring runout.

1. **NOTE:** Use only the Digital Tire Gauge any time tire pressures are measured to be sure that accurate values are obtained.

   Make sure that the tire pressures are set to the correct pressure as indicated on the VC label.
2. Using a tire crayon, record the vehicle position on the inward sidewall of all 4 tires.
3. Remove the wheel and tire assemblies. Refer to Wheel and Tire in this section.
4. ***NOTICE:*** **Make sure that the correct wheel balancer adapters are used when mounting the assembly to the wheel balancer or damage to the wheel may occur.**

   NOTE: Make sure that the wheel and tire assembly is clean and free of foreign material prior to installation on the balancer.

   Mount the wheel and tire assembly on a suitable wheel balancer using the correct wheel balancer adapters as shown. Refer to the list of recommended wheel balancer adapters on the PTS website.



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Item	Description
1	Wheel balancer
2	Cone
3	Wheel and tire assembly
4	Finger plate
5	Balancer wing nut

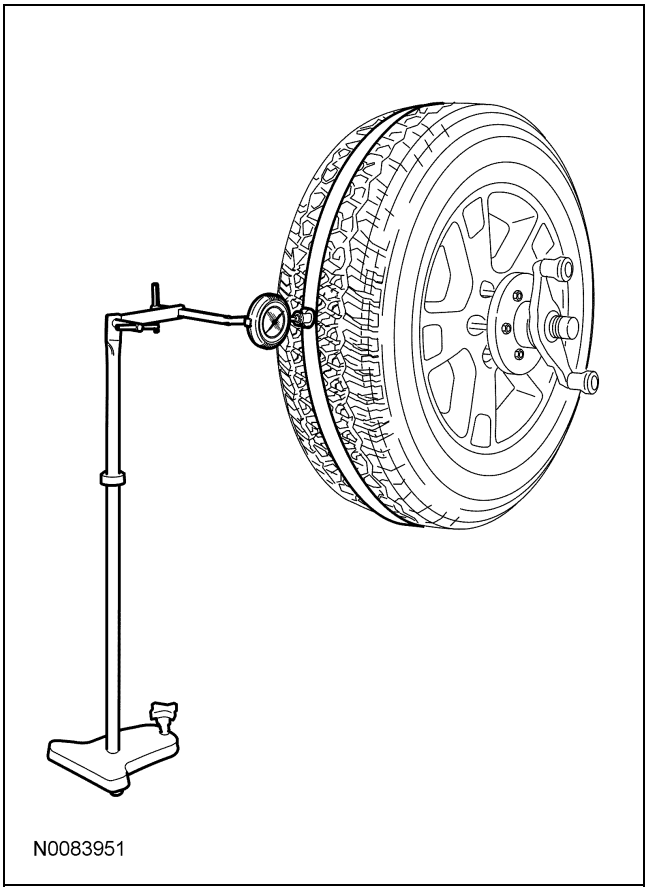
5. **NOTE:** Masking tape can be applied on the center tread rib to allow for a smoother measuring surface. Some fluctuation of the gauge reading is expected. Observe the overall sweep of the gauge from the highest to the lowest spot on the tire.

   Position the Dial Indicator and stand with the Dial Indicator on the center tread rib.

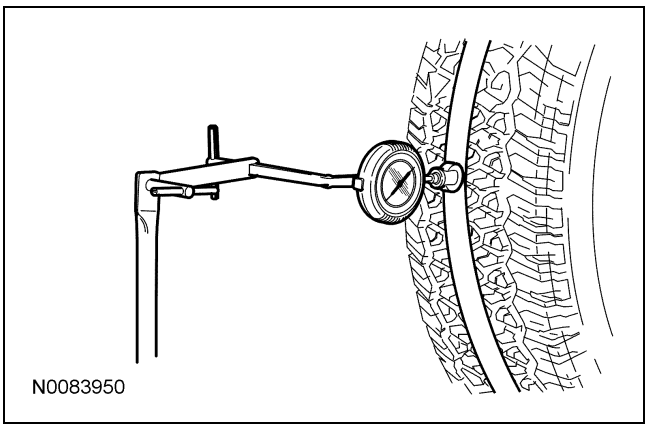
   - Rotate the wheel and tire assembly (or wheel) to locate the low spot.
   - Adjust the runout gauge to read 0.

DIAGNOSIS AND TESTING (Continued)

- Rotate the wheel and tire assembly one complete revolution to make sure that the low spot has been found and that the dial indicator returns to a 0 reading.


N0083951

6. While slowly and constantly rotating the wheel and tire assembly (or wheel), measure the radial runout.
   - Note the variance (runout) from 0 on the dial of the gauge.
   - If the runout reading of a wheel and tire assembly is not within 1.14 mm (0.045 in), locate and temporarily mark the high spot and runout reading on the sidewall of the tire and carry out the Match Mounting procedure to optimize the wheel and tire assembly.
   - If the runout reading of a wheel and tire assembly is within 1.14 mm (0.045 in), permanently mark the high spot and the runout reading on the inward sidewall of the tire for reference during future wheel and tire service. Balance the assembly and install the wheel and tire on the vehicle using the Wheel-to-Hub Optimization procedure.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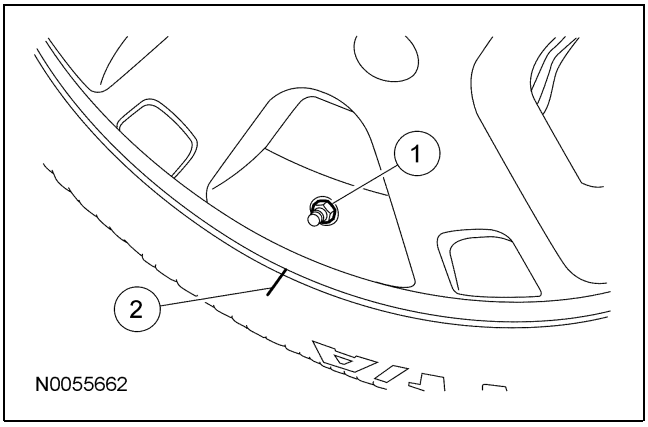
Match Mounting

NOTE: Road Force® values in illustrations are shown in pounds.

Match mounting is a technique used to reduce radial runout or road force on wheel and tire assemblies. Excessive runout is a source of ride quality complaints and match mounting can be used to minimize the runout. Match mounting can be accomplished by changing the position of the tire on the wheel.

1. Position the wheel and tire assembly on a tire machine and put a reference mark on the tire sidewall at the valve stem position.



N0055662

Item	Description
1	Valve stem
2	Reference mark

DIAGNOSIS AND TESTING (Continued)

2. *NOTICE:* **For tires equipped with a Tire Pressure Monitoring System (TPMS), the sensor, cradle and strap may be damaged by incorrect tire mounting or dismounting. Dismount the tire from the wheel as instructed in the Disassembly and Assembly procedure. Failure to follow these instructions may result in TPMS component damage.**

   NOTE: Always make sure that the final high spot and measurement values are permanently marked on the inward sidewall of the tire for reference during future wheel and tire service.

   Using a suitable tire machine, separate the tire beads from the wheel.

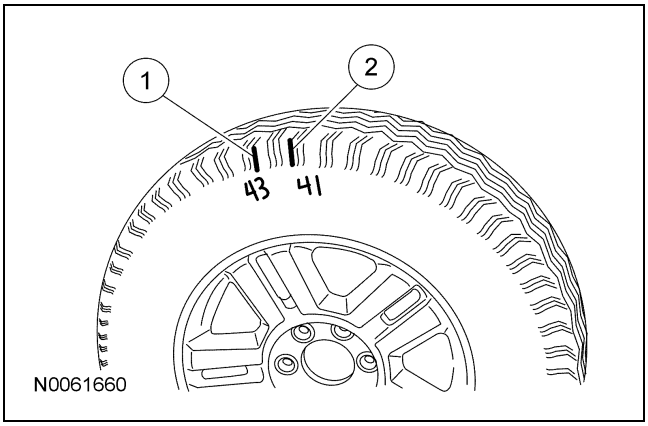
   - Lubricate the tire beads using a suitable fast drying, corrosion inhibiting tire bead lubricant.
   - Position the tire 180 degrees (half-way around) on the rim so the valve stem reference mark is now opposite the valve stem.

3. Re-inflate the wheel and tire assembly to the specified air pressure and measure the assembly again using the Dial Indicator or Hunter Road Force® 9700 Series Wheel Balancer. Mark the second high spot on the tire.

   - If the runout or Road Force® is reduced to within specifications, the concern has been resolved. Balance the assembly and install on the vehicle using the Wheel-to-Hub Optimization procedure.

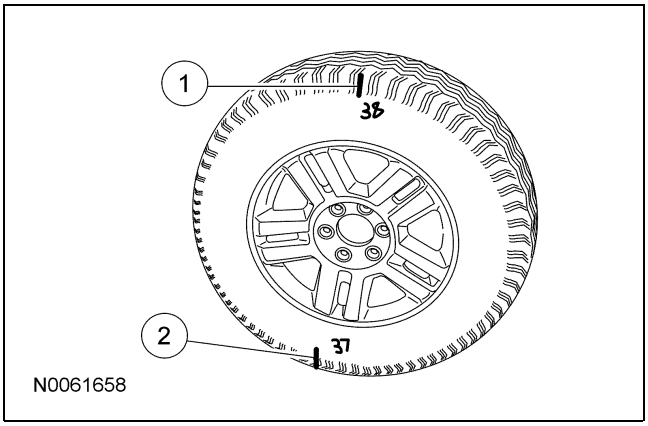
4. If the second runout or Road Force® measurement is still not within specification and both high spots are close to each other (within 101.6 mm [4 in]), the root cause is probably the tire (the high spot followed the tire).

   - To be **SURE** that the tire is causing the high runout, it is necessary to have 2 runout or Road Force® measurements that are not within specification and the high spots must be in approximately the same location on the tire's sidewall. If the tire is the cause, install a new tire, balance the assembly and install on the vehicle using the Wheel-to-Hub Optimization procedure.
   - If the second high spot is not within 101.6 mm (4 in) of the first high spot, proceed to the next step.



Item	Description
1	First high spot on the tire
2	Second high spot on the tire

5. If the second high spot is still above specification and is within 101.6 mm (4 in) of being opposite the first high spot on the wheel, the root cause is probably the wheel (the high spot followed the wheel). Dismount the tire from the wheel, mount the wheel on a balancer and check the wheel runout. If the wheel runout exceeds 1.14 mm (0.045 in), install a new wheel, balance the assembly and install on the vehicle using the Wheel-to-Hub Optimization procedure.



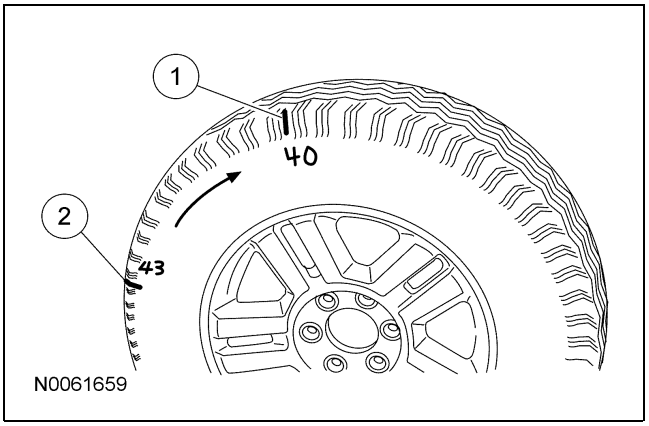
Item	Description
1	First high spot on the tire
2	Second high spot on the tire

DIAGNOSIS AND TESTING (Continued)

6. **NOTE:** If the second high spot did not follow the wheel or the tire and the runout is still not within specification, improvements may be made by rotating the tire 90 degrees (one-quarter of a turn).

   Draw an arrow on the tire sidewall from the second high spot towards the first high spot (in the shortest direction).

   - Separate the tire beads from the wheel and rotate the tire 90 degrees (one-quarter of a turn) in the direction of the arrow.

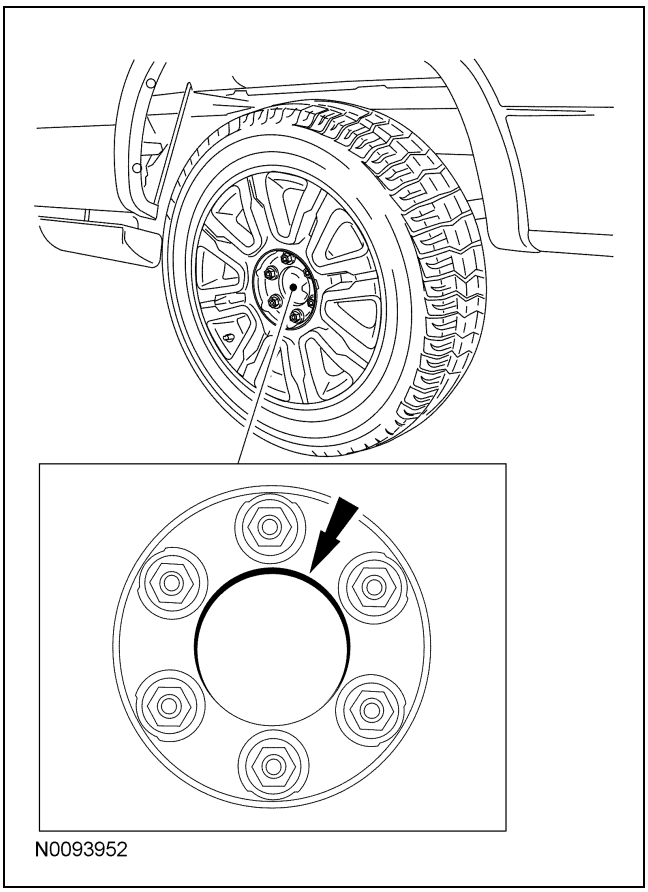


Item	Description
1	First high spot on the tire
2	Second high spot on the tire

Wheel-to-Hub Optimization

Wheel-to-hub optimization is important. Clearance between the wheel and hub can be used to offset or neutralize the Road Force® or run-out of the wheel and tire assembly. For every 0.001 inch of wheel-to-hub clearance, the Road Force® can be affected between 1 and 3 pounds depending on the tire stiffness.

NOTE: The example below illustrates how the clearance between the wheel and the hub can be used to offset the high spot of radial run-out or Road Force®. Following the procedure will make sure of the best optimization.



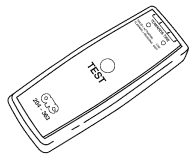
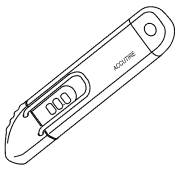
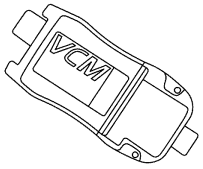
1. Position the wheel and tire assembly on the vehicle so that the high spot location is at the 6 o'clock position and install the wheel nuts by hand until snug.
2. **NOTE:** Do not allow the full weight of the vehicle to rest on the tires while tightening the wheel nuts.

   Lower the vehicle until the tires make contact with the ground, slightly loading the suspension. Tighten the wheel nuts as described in Wheel and Tire in this section.

DIAGNOSIS AND TESTING

Tire Pressure Monitoring System

Special Tool(s)

 ST2941-A	Activation Tool, Tire Pressure Monitor 204-363
 ST2869-A	Digital Tire Gauge 204-354
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Principles of Operation

NOTE: The Smart Junction Box (SJB) is also referred to as the Generic Electronic Module (GEM).

The Tire Pressure Monitoring System (TPMS) monitors the air pressure of all 4 road tires. The wheel-mounted tire pressure sensors transmit via radio frequency signals, to the SJB. TPMS functionality is integral to the SJB. These transmissions are sent approximately every 60 seconds when the vehicle speed exceeds 32 km/h (20 mph). The TPMS function compares each tire pressure sensor transmission against a low-pressure limit. If it has been determined that the tire pressure has fallen below this limit, the SJB communicates this on the vehicle communication bus to the instrument cluster. The instrument cluster then illuminates the TPMS indicator and displays the appropriate message(s) in the message center (if equipped).

For vehicles with different front and rear tire pressures (such as the E-Series and certain F-Series), the tire pressures must be adjusted and the tire pressure sensors must be trained following a tire rotation. Failure to train the sensors will cause the TPMS indicator to illuminate.

For vehicles with the same tire pressures for front and rear tires, tire rotation will not affect the system.

Ambient Temperature Change and Tire Pressure

⚠ WARNING: The tire pressure monitoring system (TPMS) sensor battery may release hazardous chemicals if exposed to extreme mechanical damage. If these chemicals contact the skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If any part of the battery is swallowed, contact a physician immediately. When disposing of TPMS sensors, follow the correct procedures for hazardous material disposal. Failure to follow these instructions may result in serious personal injury.

Tire pressures fluctuate with temperature changes. For this reason, tire pressure must be set to specification when tires are at outdoor ambient temperatures. If the vehicle is allowed to warm up to shop temperatures, and the outside temperature is less than shop temperature, the tire inflation pressure must be adjusted accordingly.

If the tires are inflated to specification at shop temperatures, and the vehicle is moved outdoors when the outdoor ambient temperature is significantly lower, the tire pressure may drop enough to be detected by the TPMS and activate the TPMS warning lamp.

DIAGNOSIS AND TESTING (Continued)

As the ambient temperature decreases by 6°C (10°F), tire pressure decreases 7 kPa (1 psi). Adjust the tire pressure by 7 kPa (1 psi) for each 6°C (10°F) ambient temperature drop as necessary to keep the tire at the specified Vehicle Certification (VC) label pressure. Refer to the following tables to adjust the tire pressure indoors for colder outside temperatures.

Table 1. Use Table to Adjust Tire Pressure Inside Garage for Colder Outside Temperature[1]

**** Do Not Inflate Tire Higher than Maximum Pressure Stamped on Tire Sidewall. ****

Table is based on a Garage Temperature of 70˚F. Max Pressure Adjustment is 7 psi.																		
	◄ Tire Placard Pressure (PSI) ►																	
Outside Temperature (˚F)	30	32	34	35	38	40	41	42	45	50	55	60	65	70	75	80	85	90
70	30	32	34	35	38	40	41	42	45	50	55	60	65	70	75	80	85	90
60	31	33	35	36	39	41	42	43	46	51	56	61	67	72	77	82	87	92
50	32	34	36	37	40	42	43	44	47	53	58	63	68	73	79	84	89	94
40	33	35	37	38	41	43	44	45	49	54	59	64	70	75	80	86	91	96
30	34	36	38	39	42	44	46	47	50	55	61	66	72	77	82	87	92	97
20	35	37	39	40	43	46	47	48	51	57	62	67	72	77	82	87	92	97
10	36	38	40	41	45	47	48	49	52	57	62	67	72	77	82	87	92	97
0	37	39	41	42	45	47	48	49	52	57	62	67	72	77	82	87	92	97
-10	37	39	41	42	45	47	48	49	52	57	62	67	72	77	82	87	92	97
-20	37	39	41	42	45	47	48	49	52	57	62	67	72	77	82	87	92	97
-30	37	39	41	42	45	47	48	49	52	57	62	67	72	77	82	87	92	97
-40	37	39	41	42	45	47	48	49	52	57	62	67	72	77	82	87	92	97

Table 2. Use Table to Adjust Tire Pressure Inside Garage for Colder Outside Temperature (Metric Units)[1]

**** Do Not Inflate Tire Higher than Maximum Pressure Stamped on Tire Sidewall. ****

Table is based on a Garage Temperature of 21˚C. Max Pressure Adjustment is 50 kPa.																		
	◄ Tire Placard Pressure (kPa) ►																	
Outside Temperature (˚C)	205	220	235	240	260	275	285	290	310	345	380	415	450	485	515	550	585	620
21	205	220	235	240	260	275	285	290	310	345	380	415	450	485	515	550	585	620
16	215	230	240	250	270	285	290	295	315	350	385	420	460	495	530	565	600	635
10	220	235	250	255	275	290	295	305	325	365	400	435	470	505	545	580	615	650
4	230	240	255	260	285	295	305	310	340	370	405	440	485	515	550	595	625	660
-1	235	250	260	270	290	305	315	325	345	380	420	455	495	530	565	600	635	670
-7	240	255	270	275	295	315	325	330	350	395	425	460	495	530	565	600	635	670
-12	250	260	275	285	310	325	330	340	360	395	425	460	495	530	565	600	635	670
-18	255	270	285	290	310	325	330	340	360	395	425	460	495	530	565	600	635	670
-23	255	270	285	290	310	325	330	340	360	395	425	460	495	530	565	600	635	670
-29	255	270	285	290	310	325	330	340	360	395	425	460	495	530	565	600	635	670
-34	255	270	285	290	310	325	330	340	360	395	425	460	495	530	565	600	635	670
-40	255	270	285	290	310	325	330	340	360	395	425	460	495	530	565	600	635	670

[1]When Outside (Ambient) Temperature is greater than 21˚C (70˚F), Inflate tires to placard pressure.
[1]Use the table to adjust tire pressure for P-metric and LT tires only.
[1]Do NOT use table for Commercial Truck Tires (i.e. 19.5 inch tires for F450 & F550). See F-Super Duty Service Manual for tire inflation procedure.

N0057700

DIAGNOSIS AND TESTING (Continued)

Tire Pressure Monitoring System (TPMS) Indicator and Message Center Messages

The TPMS indicator and vehicle message center (if equipped) sometimes displays faults that cannot be resolved by the customer. Treat these messages as TPMS faults that must be serviced.

Tire Pressure Monitoring System (TPMS) Indicator Illuminates Continuously

NOTE: If the spare tire is in use, the damaged road tire must be repaired and installed on the vehicle to restore complete TPMS functionality before carrying out any diagnosis.

NOTE: For vehicles with different front and rear tire pressures (such as E-Series and certain F-Series), the tire pressure sensors must be trained following a tire rotation. Failure to train the sensors will result in a false low tire pressure event, which will cause the TPMS indicator to illuminate.

1. The TPMS indicator remains on continuously for the following condition:
   - Low Tire Pressure — The TPMS indicator is illuminated solid and the message center displays LOW TIRE PRESSURE (if equipped). This is displayed when any of the tire pressures are low. When this condition exists, the tire pressure must be adjusted to the recommended cold pressure as indicated on the VC label.
2. **NOTE:** The TPMS sensors do not transmit when the vehicle is stationary. If the vehicle has been stationary for more than 30 minutes, it will be necessary to wake up the sensors so they will transmit the latest tire pressure information to the SJB.

   If the vehicle has been stationary for more than 30 minutes, carry out the Tire Pressure Monitoring System (TPMS) Sensor Activation procedure in this section.

Tire Pressure Monitoring System (TPMS) Indicator Flashes

The TPMS indicator flashes for 70 seconds, then remains ON solid when the ignition switch is turned to the ON position, for the following conditions:

1. Tire Pressure Sensor Fault — If equipped, the message center will display TIRE PRESSURE SENSOR FAULT when a tire pressure sensor is malfunctioning. GO to Symptom Chart.
2. No communication with the SJB (TPMS is integral to the SJB) — The TPMS indicator is illuminated when the instrument cluster has not received any signals from the SJB for more than 5 seconds. If equipped, the message center displays TIRE PRESSURE MONITOR FAULT. GO to Symptom Chart.
3. Tire Pressure Monitor Fault — If equipped, the message center will display TIRE PRESSURE MONITOR FAULT when the tire pressure monitoring system is malfunctioning or communication with the instrument cluster has been lost. GO to Symptom Chart.

Inspection and Verification

1. **NOTE:** The tire pressure sensors are not designed to be used with aftermarket wheels.

   NOTE: The use of run-flat tires (tires with steel body cord plies in the tire sidewall) where not originally equipped, may cause the TPMS to malfunction and is therefore not recommended.

   Verify the customer concern by inspecting the vehicle and observing the message center (if equipped) and the TPMS indicator.
2. **NOTE:** The valve-mounted TPMS sensors and the strap-mounted TPMS sensors are not compatible. Swapping wheels from one vehicle to another with the different systems will set a TPMS fault.

   NOTE: Swapping wheels between vehicles with the same TPMS will cause a TPMS fault to be set if the sensors are not trained. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.

   NOTE: Non-OEM modifications made to the vehicle may result in false TPMS warnings.

   Inspect to determine if one of the following mechanical or electrical concerns apply:

DIAGNOSIS AND TESTING (Continued)

Visual Inspection Chart

Mechanical	Electrical
• Low tire pressure • Tire Pressure Monitoring System (TPMS) sensor damaged or missing • Spare tire installed as a road wheel • Incorrect TPMS sensor installed • TPMS sensor installed incorrectly • Sensors not trained after a tire rotation on vehicles with different front and rear tire pressures • Non-OEM wheels installed (aftermarket rims) • Non-OEM equipped run-flat tires installed • Other non-OEM modifications (roll cages, service barriers, part racks, ladder racks)	• Wiring, terminals or connectors • Smart Junction Box (SJB) damaged • Aftermarket electronic accessories

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **NOTE:** Make sure to use the latest scan tool software release.

   If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).
5. **NOTE:** The Vehicle Communication Module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM.

   If the scan tool does not communicate with the VCM:

   - check the VCM connection to the vehicle.
   - check the scan tool connection to the VCM.
   - refer to Section 418-00, No Power To The Scan Tool, to diagnose no power to the scan tool.
6. If the scan tool does not communicate with the vehicle:
   - verify the ignition key is in the ON position.
   - verify the scan tool operation with a known good vehicle.
   - refer to Section 418-00 to diagnose no response from the PCM.
7. Carry out the network test.
   - If the scan tool responds with no communication for one or more modules, refer to Section 418-00.
   - If the network test passes, retrieve and record continuous memory DTCs.
8. Clear the continuous DTCs and carry out the self test diagnostics for the SJB (the TPMS is part of the SJB).
9. If the DTCs retrieved are related to the concern, go to the Tire Pressure Monitoring System (TPMS) DTC Chart. For all other DTCs, refer to the Master DTC Chart in Section 419-10.
10. If no DTCs related to the concern are retrieved, GO to Symptom Chart.

DTC Charts

Tire Pressure Monitoring System (TPMS) DTC Chart

DTC	Description	Source	Action
B106A	Pressure Sensor Range Bit Incorrect State	Smart Junction Box (SJB)	GO to Pinpoint Test G.
B106B	Tire Pressure Sensor Low Battery	SJB	DTC B106B can be set during SJB configuration. GO to Pinpoint Test H.

DIAGNOSIS AND TESTING (Continued)

Tire Pressure Monitoring System (TPMS) DTC Chart (Continued)

DTC	Description	Source	Action
B106D	Tire Pressure Monitoring System (TPMS) Initiators Not Configured	SJB	DTC B106D is only present when a new SJB is installed, the SJB is incorrectly flashed or the SJB is incorrectly configured. Successfully configuring the SJB is the only way to clear this DTC. VERIFY the SJB is correctly configured. If DTC B106D is still present, REFER to Section 418-01.
B2477	Module Configuration Failure/Mismatch	SJB	DTC B2477 is only present when a new SJB is installed, the SJB is incorrectly flashed or the SJB is incorrectly configured. Successfully configuring the SJB is the only way to clear this DTC. MAKE SURE the SJB is configured correctly. If DTC B2477 is still present, REFER to Section 418-01.
B2868	LF Tire Pressure Sensor Fault	SJB	DTC B2868 is only present when a new SJB is installed, the SJB is flashed or the SJB is reconfigured. TRAIN the tire pressure sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.
B2869	RF Tire Pressure Sensor Fault	SJB	DTC B2869 is only present when a new SJB is installed, the SJB is flashed or the SJB is reconfigured. TRAIN the tire pressure sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.
B2870	RR Tire Pressure Sensor Fault	SJB	DTC B2870 is only present when a new SJB is installed, the SJB is flashed or the SJB is reconfigured. TRAIN the tire pressure sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.
B2871	LR Tire Pressure Sensor Fault	SJB	DTC B2871 is only present when a new SJB is installed, the SJB is flashed or the SJB is reconfigured. TRAIN the tire pressure sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.
B2872	Tire Pressure Sensor Fault	SJB	**NOTE:** If the vehicle has been stationary for more than 30 minutes, the sensors will go into a ‘‘sleep mode’’ to conserve battery power. It will be necessary to wake them up so they will transmit the latest tire pressure information to the SJB. ACTIVATE the TPMS sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Activation in this section. GO to Pinpoint Test F.
B287A	Tire Pressure System Fault	SJB	GO to Pinpoint Test F.

DIAGNOSIS AND TESTING (Continued)

Tire Pressure Monitoring System (TPMS) DTC Chart (Continued)

DTC	Description	Source	Action
C2780	ECU in Manufacturing Mode	SJB	DTC C2780 is only present when a new SJB is installed, the SJB is flashed or the SJB is reconfigured. TRAIN the tire pressure sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.
U0155	Lost Communication with Instrument Cluster	SJB	REFER to Section 418-00 to diagnose the no communication problem.
All other SJB DTCs	—	SJB	REFER to the Master DTC Chart in Section 419-10.

Symptom Chart

Symptom Chart

NOTE: For vehicles with different front and rear tire pressure (such as E-Series and certain F-Series), the tire pressures must be adjusted and the tire pressure sensors must be trained following a tire rotation. Failure to train the sensors will result in a false low tire pressure event, which will cause the Tire Pressure Monitoring System (TPMS) indicator to illuminate.

For vehicles with the same tire pressure for front and rear tires, tire rotation will not affect the system.

Failure of a TPMS component may not cause the message center to display a fault message or a DTC to be stored. The Symptom Chart is a starting point to begin diagnosis of these concerns.

Condition	Possible Sources	Action
• Tire Pressure Monitoring System (TPMS) indicator ON solid and message center (if equipped) displays LOW TIRE PRESSURE	• Spare tire currently in use	• INSTALL the repaired road wheel/tire in place of the spare tire.
	• Air pressure not set to specifications listed on the Vehicle Certification (VC) label	• GO to Pinpoint Test D.
	• Sensors not trained following tire rotation	• ADVISE customer that on vehicles with different front and rear tire pressure, the sensors must be trained as directed in their Owner's Literature.
• Smart Junction Box (SJB) will not enter sensor training mode when using the TPMS sensor training procedure	• Brake ON/OFF switch • Ignition switch • Vehicle communication bus • SJB	• GO to Pinpoint Test E.

DIAGNOSIS AND TESTING (Continued)

Symptom Chart (Continued)

Condition	Possible Sources	Action
• TPMS indicator FLASHES for 70 seconds and then remains ON solid when the ignition key is turned to the ON position, the message center (if equipped) displays TIRE PRESSURE SENSOR FAULT and DTC B2872 is present	• TPMS sensor(s) • TPMS sensor(s) not trained to the SJB • SJB	• **NOTE:** If the vehicle has been stationary for more than 30 minutes, the sensors will go into a ‘‘sleep mode’’ to conserve battery power. It will be necessary to wake them up so they will transmit the latest tire pressure information to the SJB. ACTIVATE the TPMS sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Activation in this section. GO to Pinpoint Test F.
• Tire Pressure Monitoring System (TPMS) indicator FLASHES for 70 seconds and then remains ON solid when the ignition key is turned to the ON position, the message center (if equipped) displays TIRE PRESSURE MONITOR FAULT and DTC B287A is present	• All TPMS sensors not trained to the SJB or all TPMS sensors are not installed	• **NOTE:** If the vehicle has been stationary for more than 30 minutes, the sensors will go into a ‘‘sleep mode’’ to conserve battery power. It will be necessary to wake them up so they will transmit the latest tire pressure information to the SJB. ACTIVATE the TPMS sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Activation in this section. GO to Pinpoint Test F.
• TPMS indicator FLASHES for 70 seconds and then remains ON solid when the ignition key is turned to the ON position, the message center (if equipped) displays TIRE PRESSURE MONITOR FAULT and there are no DTCs present	• Vehicle communication issue between the SJB and the instrument cluster • SJB	• REFER to Section 418-00 to diagnose the no communication concern. • REFER to Section 419-10 to diagnose the SJB.
• One or more sensors will not train	• TPMS sensor(s) • Vehicle communication issue • SJB	• RETRIEVE and RECORD DTCs. REFER to Tire Pressure Monitoring System (TPMS) DTC Chart.

DIAGNOSIS AND TESTING (Continued)

Symptom Chart (Continued)

Condition	Possible Sources	Action
• One or more sensors will not train and no DTCs are present	• TPMS sensor(s)	• TRAIN all 4 tire pressure sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. • For any sensor(s) that did not train, ATTEMPT to activate the same sensor with the activation tool. If the sensor still does not respond, MOVE the vehicle to rotate the wheels at least one-fourth turn and ATTEMPT to activate the same sensor again. • If the sensor(s) fail to train a second time, INSTALL a new sensor(s). REFER to Tire Pressure Monitoring System (TPMS) Sensor in this section.

Pinpoint Tests

Pinpoint Test D: Tire Pressure Monitoring System (TPMS) Indicator ON Solid and Message Center (if equipped) Displays LOW TIRE PRESSURE

Normal Operation

The Tire Pressure Monitoring System (TPMS) monitors the air pressure of all 4 road tires. The wheel-mounted tire pressure sensors transmit via radio frequency signals, to the Smart Junction Box (SJB). TPMS functionality is integral to the SJB. These transmissions are sent approximately every 60 seconds when the vehicle speed exceeds 32 km/h (20 mph). The TPMS function (integral to the SJB) compares each tire pressure sensor transmission against a low-pressure limit. If it has been determined that the tire pressure has fallen below this limit, the SJB communicates this on the vehicle communication bus to the instrument cluster. The instrument cluster then illuminates the TPMS indicator and displays the appropriate message(s) in the message center (if equipped).

This symptom can also be caused by a spare tire currently being used in place of a road tire. Make sure that the spare tire is not currently in use. On vehicles with different front and rear tire pressures, if the sensors are not trained following a tire rotation, this symptom will also be present. Advise the customer that on vehicles with different front and rear tire pressures, the sensors must be trained as directed in the Owner's Literature.

This pinpoint test is intended to diagnose the following:

- Low air pressure in tire(s)
- Tire pressure sensor(s)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST D: Tire Pressure Monitoring System (TPMS) INDICATOR ON SOLID AND MESSAGE CENTER (IF EQUIPPED) DISPLAYS LOW TIRE PRESSURE

NOTE: Use only the Digital Tire Gauge any time tire pressures are measured to be sure that accurate values are obtained.

NOTE: If a warranty case is opened for an actual TPMS fault, document and include the actual tire pressure data in all warranty communications.

Test Step		Result / Action to Take
D1	**CHECK THE TIRE PRESSURE**	
	• Measure and record the air pressure in all 4 road tires. • Adjust the air pressure for those found to be below the specification listed on the Vehicle Certification (VC) label. • **NOTE:** If the vehicle has been stationary for more than 30 minutes, activate each TPMS sensor. Refer to Tire Pressure Monitoring System (TPMS) Sensor Activation in this section. The TPMS sensor does not transmit when the vehicle is stationary. Verify system operation. • **Have the TPMS indicator and the message center (if equipped) warnings gone out?**	**Yes** The system is functioning normally, diagnosis is complete. INFORM the customer of correct tire pressure maintenance as instructed in the scheduled maintenance guide and the Owner's Literature. **No** GO to D2.
D2	**CHECK THE SYSTEM COMPONENTS**	
	• Train all 4 tire pressure sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. • Connect the scan tool. • Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger SJB. • Read and record the following PIDs: — Left Front Tire Pressure (LF__PRES) — Right Front Tire Pressure (RF__PRES) — Left Rear Outer Tire Pressure (LRO__PRES) — Right Rear Outer Tire Pressure (RRO__PRES) • Compare the air pressure readings recorded from the function test to those recorded in D1. • **Do the compared tire pressure values match within ±5 psi, and have the TPMS indicator and the message center (if equipped) warnings gone out?**	**Yes** The system is functioning normally, diagnosis complete. **No** **Before installing a new sensor(s):** If a sensor(s) does not respond to the Tire Pressure Monitor Activation Tool, ATTEMPT to activate the same sensor(s) with the Tire Pressure Monitor Activation Tool. If the sensor(s) still does not respond, MOVE the vehicle to rotate the wheels at least one-fourth turn and ATTEMPT to activate the same sensor(s) again. INSTALL new tire pressure sensors for those with discrepancies or those that fail to activate. REFER to Tire Pressure Monitoring System (TPMS) Sensor in this section.

Pinpoint Test E: Smart Junction Box (SJB) Will Not Enter Sensor Training Mode When Using the TPMS Sensor Training Procedure

Normal Operation

For the Smart Junction Box (SJB) to enter Tire Pressure Monitoring System (TPMS) sensor training mode, the SJB must receive valid inputs from the Brake Pedal Position (BPP) switch (OFF-ON-OFF) and ignition switch (both OFF and RUN), and it must receive valid vehicle speed sensor input (0 km/h [0 mph]). Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section for the complete sensor training procedure.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Brake ON/OFF switch
- Ignition switch
- SJB

PINPOINT TEST E: Smart Junction Box (SJB) WILL NOT ENTER SENSOR TRAINING MODE WHEN USING THE TPMS SENSOR TRAINING PROCEDURE

Test Step		Result / Action to Take
E1	**CHECK THE SJB BRAKE ON/OFF (GEM__BOO) PID**	
	• Connect the scan tool. • Ignition ON.	

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E: Smart Junction Box (SJB) WILL NOT ENTER SENSOR TRAINING MODE WHEN USING THE TPMS SENSOR TRAINING PROCEDURE (Continued)

Test Step		Result / Action to Take
E1	**CHECK THE SJB BRAKE ON/OFF (GEM__BOO) PID (Continued)**	
	• Enter the following diagnostic mode on the scan tool: DataLogger SJB. • Monitor the GEM__BOO PID (SJB reads the brake switch directly). • Press and release the brake pedal while monitoring the PID. • **Do the brake pedal PID values match the brake pedal positions?**	**Yes** GO to **E2**. **No** REFER to Section 417-01 to continue diagnosis of the stoplamp switch.
E2	**CHECK THE SJB IGNITION SWITCH PIDs**	
	• Monitor the following ignition switch PIDs: — Ignition Switch Off (IGN__O__ECU) — Ignition Switch RUN (IGN__R__ECU) • Cycle the ignition switch to the RUN and OFF position while monitoring the PIDs (SJB reads the ignition switch directly). • **Do the ignition switch status PID values match the ignition switch positions?**	**Yes** GO to **E3**. **No** REFER to Section 211-05 to continue diagnosis of the ignition switch.
E3	**CHECK THE SJB VEHICLE SPEED (VSS__GEM) PID**	
	• Monitor the VSS__GEM PID (SJB receives vehicle speed from the instrument cluster). • **Does the vehicle speed PID value match the speed of the vehicle?**	**Yes** GO to **E4**. **No** REFER to Section 413-01 to diagnosis of the instrument cluster/vehicle speed concern.
E4	**CHECK FOR CORRECT SJB OPERATION**	
	• Disconnect all the SJB connectors. • Check the connectors for: — corrosion. — pushed-out pins. — spread terminals. • Connect all the SJB connectors and make sure that they are seated correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** INSTALL a new SJB. REFER to Section 419-10. CLEAR the DTCs. REPEAT the self test. **No** The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self test.

Pinpoint Test F: TPMS Indicator FLASHES for 70 Seconds and Then Remains ON Solid When the Ignition Key is Turned to the ON Position, the Message Center (if equipped) Displays TIRE PRESSURE SENSOR or MONITOR FAULT and DTC B2872 or B287A is Present

Normal Operation

If there is a fault with 1, 2 or 3 of the Tire Pressure Monitoring System (TPMS) sensors, DTC B2872 will be set, the TPMS warning indicator will flash for 70 seconds and then remain ON solid when the ignition switch is turned to the ON position and the message center (if equipped) will display TIRE PRESSURE SENSOR FAULT.

If the Smart Junction Box (SJB) does not get a response from all 4 of the TPMS sensors, DTC B287A will be set and the message center (if equipped) will display TIRE PRESSURE MONITOR FAULT.

- B2872 Tire Pressure Sensor Fault — When 1, 2 or 3 of the tire pressure sensors are faulted or not responding, the SJB will set DTC B2872.
- B287A Tire Pressure Monitor Fault — When **all** 4 of the tire pressure sensors are faulted, not responding or not heard by the SJB, the SJB will set DTC B287A.

This pinpoint test is intended to diagnose the following:

- TPMS sensor(s) missing
- TPMS sensor(s) not trained to the vehicle
- TPMS sensor(s) swapped due to wheel swap

DIAGNOSIS AND TESTING (Continued)

- TPMS sensor(s) damaged
- Vehicle communication issue
- SJB

PINPOINT TEST F: TPMS INDICATOR FLASHES FOR 70 SECONDS AND THEN REMAINS ON SOLID WHEN THE IGNITION KEY IS TURNED TO THE ON POSITION, THE MESSAGE CENTER (IF EQUIPPED) DISPLAYS TIRE PRESSURE SENSOR OR MONITOR FAULT AND DTC B2872 OR B287A IS PRESENT

NOTE: If a warranty case is opened for an actual TPMS fault, document and include the actual tire pressure data in all warranty communications.

Test Step		Result / Action to Take
F1	**CHECK THE SENSOR IDENTIFIERS AND SYSTEM STATUS PIDs**	
	• Connect the scan tool. • Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger SJB. • Read and record the following PIDs: — Left Front Tire Transmitter Identifier (LF__ID) — Right Front Tire Transmitter Identifier (RF__ID) — Left Rear Tire Transmitter Identifier (LR__ID) — Right Rear Tire Transmitter Identifier (RR__ID) • Monitor the TPMS system status (TP__STAT) PID. • **Does the TP__STAT PID display SENSOR FAULT?**	**Yes** GO to **F2**. **No** If the TP__STAT PID displays SYSTEM FAULT, GO to **F3**.
F2	**CARRY OUT THE SENSOR TRAINING PROCEDURE**	
	• Train all 4 tire pressure sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. • **Did all of the tire pressure sensors transmit correctly and did the horn sound when each tire pressure sensor transmitted to the SJB?**	**Yes** Using the scan tool, LOCATE the updated TPMS sensor identifiers trained to the SJB module. COMPARE these values to those recorded prior to the TPMS sensor training procedure. Disregarding sensor position, any sensor identifiers that do not match those retrieved from the module were changed, but not retrained. The sensors are now trained to the vehicle, diagnosis is complete. DOCUMENT all TPMS sensor identifiers on the applicable warranty claim. VERIFY system operation. **No** **Before installing a new sensor(s)**: If a sensor(s) does not respond to the Tire Pressure Monitor Activation Tool, ATTEMPT to activate the same sensor(s) with the Tire Pressure Monitor Activation Tool. If the sensor(s) still does not respond, MOVE the vehicle to rotate the wheels at least one-fourth of a turn and ATTEMPT to activate the same sensor(s) again. If the sensor(s) fails to train a second time, INSTALL a new tire pressure sensor(s). REFER to Tire Pressure Monitoring System (TPMS) Sensor in this section.

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST F: TPMS INDICATOR FLASHES FOR 70 SECONDS AND THEN REMAINS ON SOLID WHEN THE IGNITION KEY IS TURNED TO THE ON POSITION, THE MESSAGE CENTER (IF EQUIPPED) DISPLAYS TIRE PRESSURE SENSOR OR MONITOR FAULT AND DTC B2872 OR B287A IS PRESENT (Continued)

Test Step		Result / Action to Take
F3	**TP__STAT PID EQUALS SYSTEM FAULT WITH DTC B287A PRESENT**	
	• Train all 4 tire pressure sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. • **Did all of the tire pressure sensors transmit correctly and did the horn sound when each tire pressure sensor transmitted to the SJB?**	**Yes** Using the scan tool, LOCATE the updated TPMS sensor identifiers trained to the SJB module. COMPARE these values to those recorded prior to the TPMS sensor training procedure. Disregarding sensor position, any sensor identifiers that do not match those retrieved from the module were changed, but not retrained. The sensors are now trained to the vehicle, diagnosis is complete. DOCUMENT all TPMS sensor identifiers on the applicable warranty claim. VERIFY system operation. **No** **Before diagnosing the SJB**: If the sensors do not respond to the Tire Pressure Monitor Activation Tool, ATTEMPT to activate the same sensors with the Tire Pressure Monitor Activation Tool a second time. If the sensors still do not respond, MOVE the vehicle to rotate the wheels at least one-fourth of a turn and ATTEMPT to activate the same sensors again. If the sensors fail to train a second time, GO to **F4**.
F4	**CHECK FOR CORRECT SJB OPERATION**	
	• Disconnect all the SJB electrical connectors. • Check the connectors for: — corrosion. — pushed-out pins. — spread terminals. • Connect all the SJB connectors and make sure that they are seated correctly. • Operate the system and verify the concern is still present. • **Is the concern still present?**	**Yes** **NOTE:** The sensors may not be present. DISMOUNT the tire. REFER to Wheel and Tire in this section. VERIFY that the sensors are present and mounted to the wheels. If missing, INSTALL new sensors. If the sensors are present, INSTALL a new SJB module. REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test. **No** The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

DIAGNOSIS AND TESTING (Continued)

Pinpoint Test G: DTC B106A

Normal Operation

This DTC may be encountered if a sensor designed for a different application is installed. Low pressure applications utilize a black- or blue-colored sensor, while heavy duty applications utilize a green-colored sensor. The Smart Junction Box (SJB) will only allow one type of sensor to be trained using the Tire Pressure Monitoring System (TPMS) sensor training procedure. Make sure the correct sensors are used to avoid compatibility issues.

- B106A Pressure Sensor Range Bit Incorrect State — When an attempt has been made to train a non-compatible sensor, the SJB will set DTC B106A.

This pinpoint test is intended to diagnose the following:

- Incorrect tire pressure sensor(s) installed

PINPOINT TEST G: DTC B106A

Test Step		Result / Action to Take
G1	**DETERMINE IF THE VEHICLE IS EQUIPPED WITH AN INCORRECT SENSOR**	
	• Train all 4 tire pressure sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. • **Did all of the tire pressure sensors transmit correctly and did the horn sound when each tire pressure sensor transmitted to the SJB?**	**Yes** CLEAR the DTCs. REPEAT the self test. VERIFY system operation. **No** **Before installing a new sensor(s)**: If a sensor(s) does not respond to the Tire Pressure Monitor Activation Tool, ATTEMPT to activate the same sensor(s) with the Tire Pressure Monitor Activation Tool. If the sensor(s) still does not respond, MOVE the vehicle to rotate the wheels at least one-fourth of a turn and ATTEMPT to activate the same sensor(s) again. If the sensor(s) fails to train a second time, INSTALL a new tire pressure sensor(s). REFER to Tire Pressure Monitoring System (TPMS) Sensor in this section.

Pinpoint Test H: DTC B106B

Normal Operation

If there is a fault in the Tire Pressure Monitoring System (TPMS), such as a damaged or missing sensor(s), damaged module or a communication issue within the vehicle, DTCs are set in the Smart Junction Box (SJB), the TPMS warning indicator will flash for 70 seconds and then remain ON solid when the ignition switch is turned to the ON position and the message center (if equipped) will display TIRE PRESSURE SENSOR FAULT.

The tire pressure sensor is battery powered.

This DTC may be set when attempting to train a tire pressure sensor(s) with a low battery.

This pinpoint test is intended to diagnose the following:

- Tire pressure sensor battery
- Tire pressure sensor(s)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST H: DTC B106B

Test Step		Result / Action to Take
H1	**DETERMINE WHICH SENSOR HAS A LOW BATTERY**	
	• Train all 4 tire pressure sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. • **Did all of the tire pressure sensors transmit correctly and did the horn sound when each tire pressure sensor transmitted to the SJB?**	**Yes** CLEAR the DTCs. REPEAT the self test. VERIFY system operation. **No** **Before installing a new sensor(s)**: If a sensor(s) does not respond to the Tire Pressure Monitor Activation Tool, ATTEMPT to activate the same sensor(s) with the Tire Pressure Monitor Activation Tool. If the sensor(s) still does not respond, MOVE the vehicle to rotate the wheels at least one-fourth of a turn and ATTEMPT to activate the same sensor(s) again. If the sensor(s) fails to train a second time, INSTALL a new tire pressure sensor(s). REFER to Tire Pressure Monitoring System (TPMS) Sensor in this section.

GENERAL PROCEDURES

Wheel Leaks

⚠ WARNING: Do not weld or peen wheels. A wheel needing such repairs must have a new wheel installed. Failure to follow these instructions may result in wheel failure and serious personal injury.

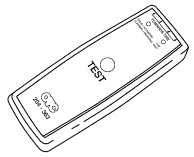
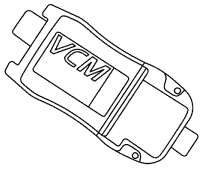
⚠ WARNING: Do not mount tube-type tires on tubeless wheels or tubeless tires on tube-type wheels. Incorrect combinations could result in tire separation from wheel and may result in serious injury to vehicle occupant(s).

1. Remove the tire and wheel assembly and inspect the wheel for structural damage. If the wheel is damaged, install a new wheel.

GENERAL PROCEDURES

Tire Pressure Monitoring System (TPMS) Sensor Training

Special Tool(s)

 ST2941-A	Activation Tool, Tire Pressure Monitor 204-363
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

NOTE: If the vehicle has been stationary for more than 30 minutes, the sensors will go into a ‘‘sleep mode’’ to conserve battery power. It will be necessary to wake them up so they will transmit the latest tire pressure information to the Smart Junction Box (SJB). For additional information, refer to Tire Pressure Monitoring System (TPMS) Sensor Activation in this section.

NOTE: The tire pressure sensor training procedure must be done on a single vehicle, in an area without radio frequency noise and at least 1 m (3 ft) away from other vehicles equipped with a Tire Pressure Monitoring System (TPMS).

Radio frequency noise is generated by electrical motors and appliance operation, cellular telephones, remote transmitters, power inverters and portable entertainment equipment.

NOTE: If a sensor does not respond to the Tire Pressure Monitor Activation Tool, attempt to activate the same sensor with the Tire Pressure Monitor Activation Tool. If the sensor still does not respond, move the vehicle to rotate the wheels at least one-fourth of a turn and attempt to activate the same sensor again.

NOTE: The SJB has a 2-minute time limit between sensor responses. If the SJB does not recognize any 1 of the 4 tire pressure sensors during this time limit, the horn will sound twice and the message center (if equipped) will display TIRE NOT TRAINED REPEAT and the entire procedure must be repeated.

NOTE: For vehicles with different front and rear tire pressures (such as the E-Series and certain F-Series), the tire pressure sensors must be trained following a tire rotation. Failure to train the sensors will cause the TPMS indicator to illuminate. For vehicles with the same tire pressure for front and rear tires, tire rotation will not affect the system.

1. **NOTE:** Click here to view an animated version of this procedure.

   Turn the ignition switch to the OFF position, then press and release the brake pedal.

2. Cycle the ignition switch from the OFF position to the RUN position 3 times, ending in the RUN position.

3. Press and release the brake pedal.

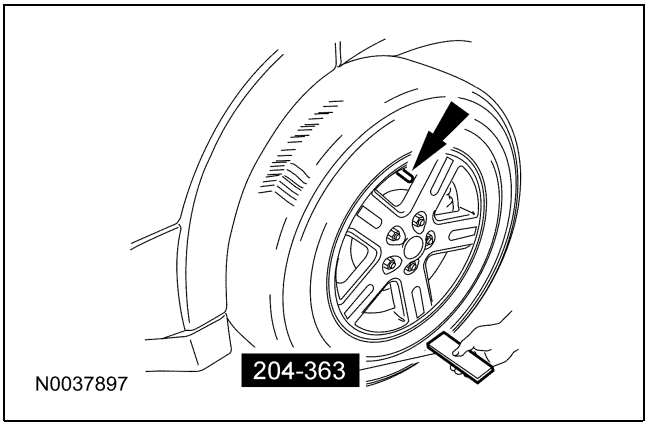
4. Turn the ignition switch to the OFF position.

5. Turn the ignition switch from the OFF position to the RUN position 3 times, ending in the RUN position.
   - The horn will sound once and the TPMS indicator will flash if the training mode has been entered successfully. If equipped, the message center will display TRAIN LF TIRE.

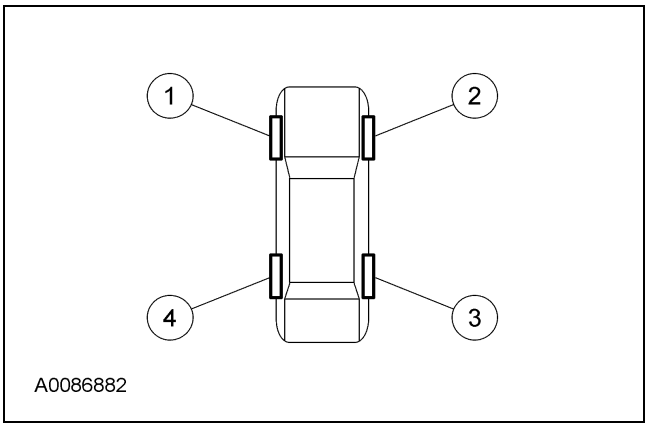
GENERAL PROCEDURES (Continued)

6. **NOTE:** It may take up to 6 seconds to activate a tire pressure sensor. During this time, the Tire Pressure Monitor Activation Tool must remain in place 180 degrees from the valve stem.

   Place the Tire Pressure Monitor Activation Tool on the LF tire sidewall opposite (180 degrees) from the valve stem. Press and release the test button on the Tire Pressure Monitor Activation Tool. The horn will sound briefly to indicate that the tire pressure sensor has been recognized by the SJB. Click here to view an animated version of this procedure.



7. Within 2 minutes of the horn sounding, place the Tire Pressure Monitor Activation Tool on the RF tire sidewall opposite (180 degrees) from the valve stem and press and release the test button to train the RF tire pressure sensor.



8. **NOTE:** Do not wait more than 2 minutes between training each sensor or the SJB will time out and the entire procedure must be repeated.

   Repeat Step 7 for the RR and LR tires.

   The procedure is completed after the last tire has been trained. When the training procedure is complete, the message center (if equipped) will display TIRE TRAINING COMPLETE.

   For vehicles not equipped with a message center, successful completion of the training procedure will be verified by turning the ignition switch to the OFF position without the horn sounding. If the horn sounds twice when the switch is turned to the OFF position, the training procedure was not successful.

9. Using the scan tool, locate the updated TPMS sensor identifiers trained to the SJB and document them on the applicable warranty claim.

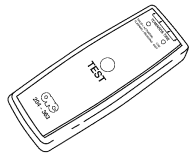
10. **NOTE:** This step is required to clear DTC C2780, cause the SJB to exit the manufacturing mode and to make sure there are no other concerns with a newly programmed SJB.

    If the sensors are being trained due to the installation of a new SJB, clear any DTCs and carry out the SJB On-Demand Self Test.

GENERAL PROCEDURES

Tire Pressure Monitoring System (TPMS) Sensor Activation

Special Tool(s)

 ST2941-A	Activation Tool, Tire Pressure Monitor 204-363

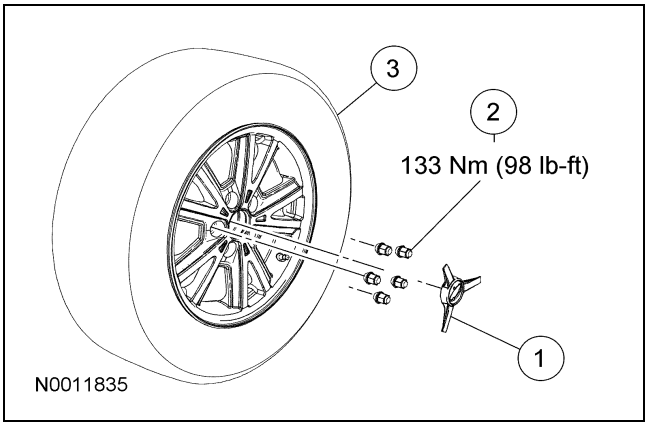
NOTE: The tire pressure sensors will go into a ‘‘sleep mode’’ after 30 minutes of inactivity to conserve battery power. The sensors do not transmit information while in sleep mode. It will be necessary to wake them up so they will transmit the latest tire pressure information.

1. Turn the ignition switch to the ON position.
2. Position the Tire Pressure Monitor Activation Tool against the LF tire sidewall, 180 degrees from the tire valve stem.
3. **NOTE:** The Tire Pressure Monitor Activation Tool will provide feedback in the form of a flashing green light and a beep sound for each successful response from a tire pressure sensor.

   Press the test button on the Tire Pressure Monitor Activation Tool to activate the sensor, activate the sensor at least 2 times.
4. Repeat Steps 2 and 3 for the remaining tires.
5. If the Tire Pressure Monitoring System (TPMS) indicator remains illuminated after adjusting and activating each sensor, refer to the Symptom Chart in Diagnosis and Testing in this section.

REMOVAL AND INSTALLATION

Wheel and Tire



Item	Part Number	Description
1	1130	Center cap
2	1012	Wheel nut (5 required)
3	—	Wheel and tire assembly (1007 wheel) (1508 tire)

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

2. ***NOTICE:*** **Do not use heat to loosen a seized wheel nut. Heat can damage the wheel and wheel bearings.**

   NOTE: Place the center cap face up after removal to avoid damage.

   If equipped, remove the center cap.

3. ***NOTICE:*** **Do not use heat to loosen a seized wheel because heat can damage the wheel and the wheel bearings. If the wheel cannot be removed by hand, use a wheel puller to remove the seized wheel.**

   Remove the wheel nuts and the wheel and tire assembly.

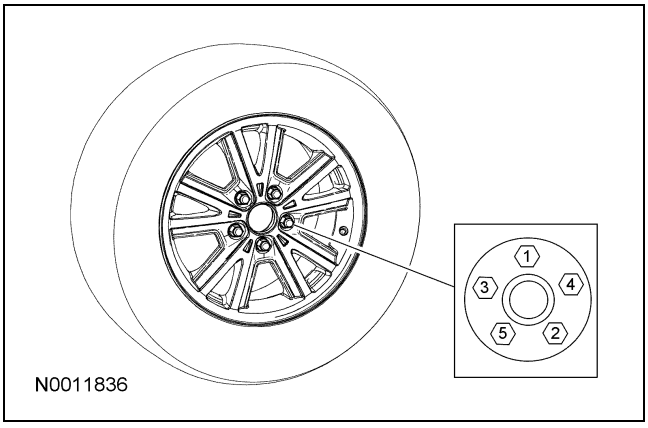
Installation

1. ⚠ **WARNING: When a wheel is installed, always remove any corrosion, dirt or foreign material present on the mounting surface of the wheel and the mounting surface of the wheel hub, brake drum or brake disc. Make sure that any fasteners that attach the rotor to the hub are secured so they do not interfere with the mounting surfaces of the wheel. Failure to follow these instructions when installing wheels may result in the wheel nuts loosening and the wheel coming off while the vehicle is in motion, which could result in loss of control, leading to serious injury or death to vehicle occupant(s).**

   Position the wheel and tire assembly on the vehicle.

2. ***NOTICE:*** **Failure to tighten the wheel nuts in the pattern indicated can result in high brake disc runout, which will speed up the development of brake roughness, shudder and vibration.**

   Install the wheel nuts and tighten to 133 Nm (98 lb-ft) in the sequence shown.

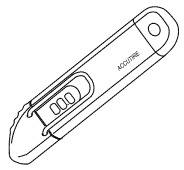


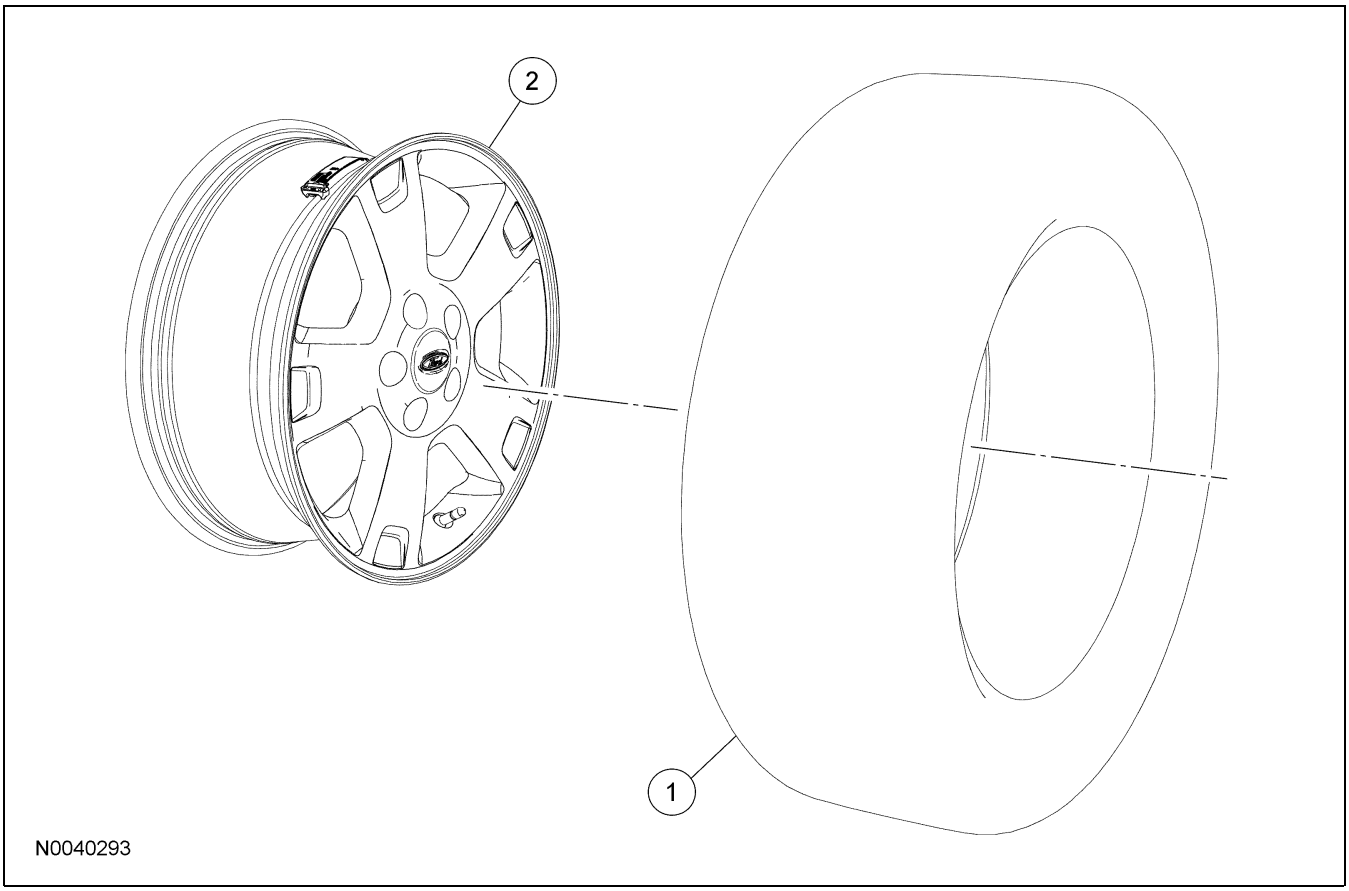
3. If removed, install the center cap.

DISASSEMBLY AND ASSEMBLY

Wheel and Tire

Special Tool(s)

 ST2869-A	Digital Tire Gauge 204-354



Item	Part Number	Description
1	1508	Tire
2	1007	Wheel

DISASSEMBLY AND ASSEMBLY (Continued)

Disassembly

NOTICE: **Failure to follow the instructions below may result in damage to the Tire Pressure Monitoring System (TPMS) sensor.**

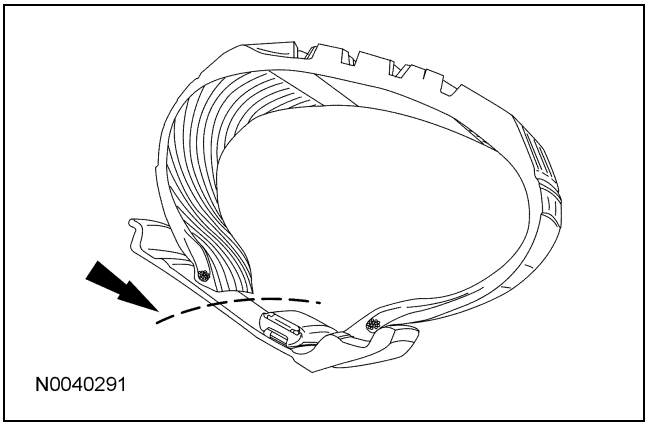
NOTE: Use only the Digital Tire Gauge any time tire pressures are measured to be sure that accurate values are obtained.

NOTE: A wheel and tire equipped with a Tire Pressure Monitoring System (TPMS) sensor will have the following verbiage stamped or cast on the wheel: SENSOR MAY BE INSIDE. Click here to view an animated version of this procedure.

NOTE: The TPMS sensor is mounted to the wheel 180 degrees opposite of the valve stem and is held in place by a stainless steel strap. The sensor is not mounted to the valve stem.

1. Remove the wheel and tire. For additional information, refer to Wheel and Tire in this section.

NOTICE: **Do not allow the tire beads to move beyond the wheel mid-plane (middle of the wheel) when separating the beads from the wheels, damage to the Tire Pressure Monitoring System (TPMS) sensor may occur.**

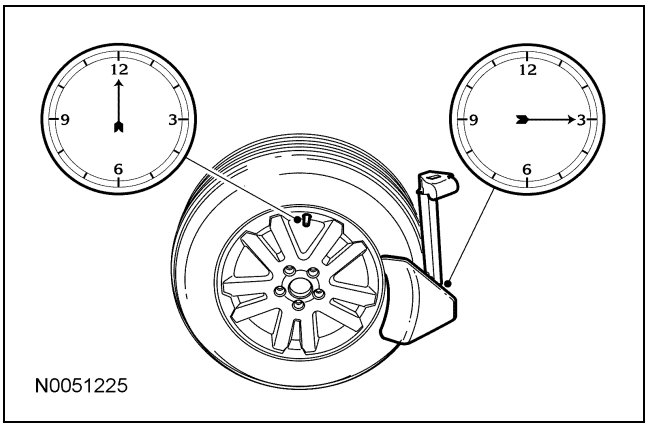

N0040291

2. ***NOTICE:*** **Tire and valve stem position is critical to prevent damage to the Tire Pressure Monitoring System (TPMS) sensor when using a paddle-type bead separator. Click here to view an animated version of this procedure.**

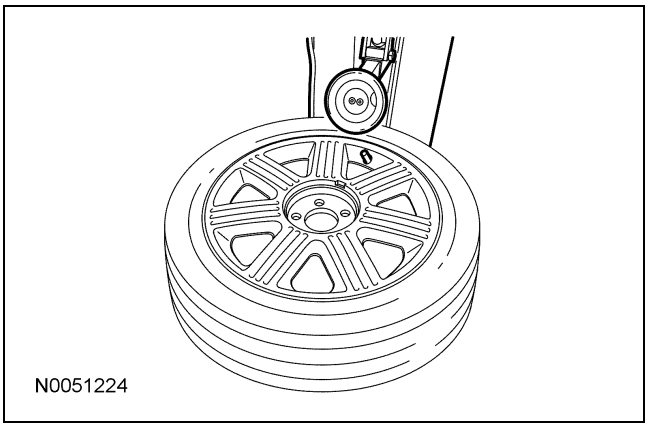
   NOTE: Some machines may have a nylon roller bead separator at the 12 o'clock position instead of the paddle-type bead separator at the 3 o'clock position. Click here to view an animated version of this procedure.

   Position the wheel and tire assembly on a suitable tire machine and separate both beads of the tire from the wheel.

   - For a paddle-type tire machine, position the valve stem at the 12 o'clock or 6 o'clock position and the paddle at the 3 o'clock position.
   - For a roller-type tire machine, align the valve stem with the roller at any position.



N0051225

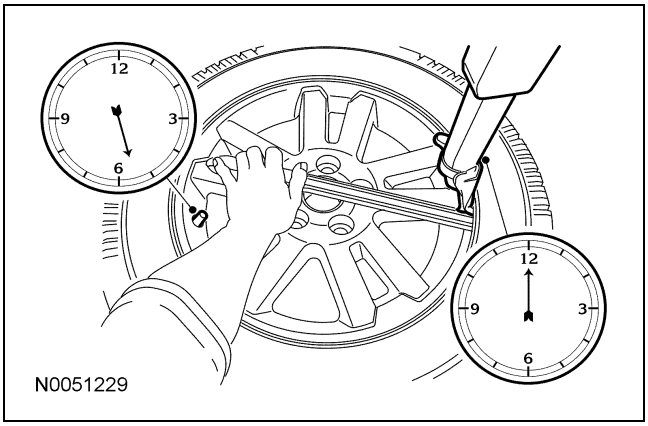

N0051224

DISASSEMBLY AND ASSEMBLY (Continued)

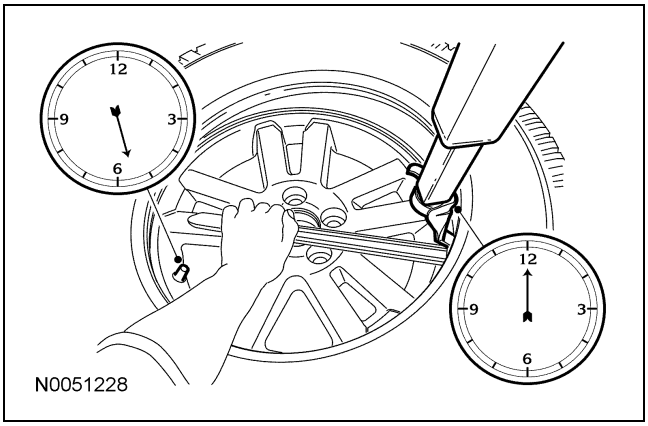
3. **NOTE:** Click here to view a video version of this procedure.

   NOTE: Index-mark the valve stem and wheel weight positions on the tire.

   Place the wheel and tire assembly on the turntable of the tire machine with the valve stem between the 5 o'clock and 6 o'clock positions and the machine arm at the 12 o'clock position and dismount the outer bead from the wheel.



4. Reset the wheel and tire assembly on the turntable of the tire machine with the valve stem between the 5 o'clock and 6 o'clock positions and the machine arm at the 12 o'clock position and dismount the inner bead from the wheel.



5. Inspect the TPMS sensor, cradle and strap for damage. Install new parts as necessary.
   - For information on removal and installation of the TPMS sensor, refer to Tire Pressure Monitoring System (TPMS) Sensor in this section.
   - When installing a new wheel, reuse the TPMS sensor from the previous wheel if possible. The TPMS will not have to be trained if the sensor is reused. The new wheel will not come with a sensor strap. A sensor strap kit will need to be ordered with the new wheel.

Assembly

NOTICE: **Damage to the Tire Pressure Monitoring System (TPMS) sensor may result if the tire mounting is not carried out as instructed.**

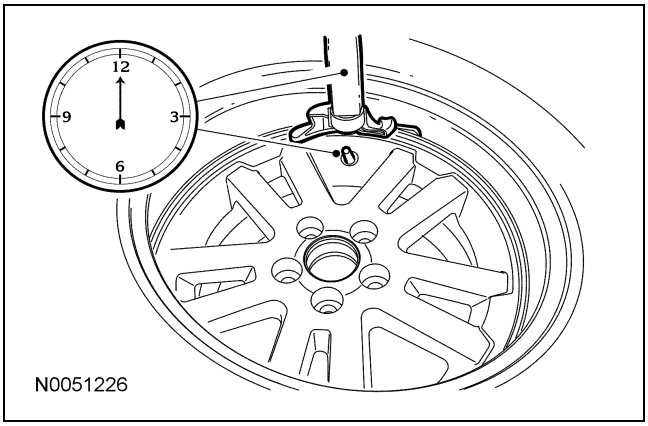
1. ***NOTICE:*** **Use only a soap and water solution to lubricate the tire. Use of anything other than soap and water may result in damage to the Tire Pressure Monitoring System (TPMS) sensor.**

   NOTE: Do not mount the tire at this time.

   NOTE: Click here to view a video version of this procedure.

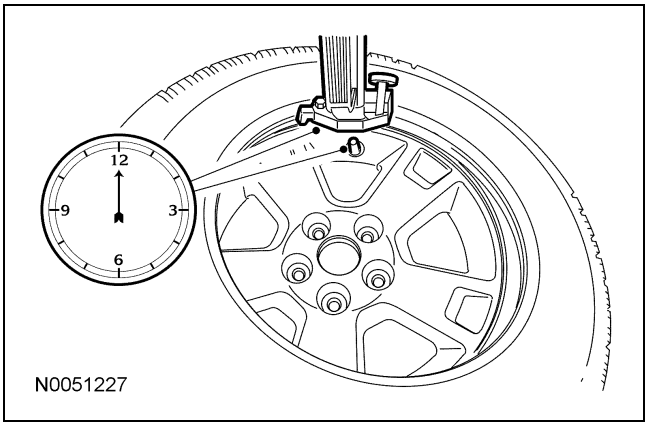
   Position the wheel on the turntable of the tire machine, then lubricate and position the bottom bead of the tire on the wheel.

2. Position the wheel to align the valve stem with the machine arm at the 12 o'clock position and mount the bottom bead of the tire. Click here to view a video version of this procedure.



DISASSEMBLY AND ASSEMBLY (Continued)

3. Reposition the wheel to align the valve stem with the machine arm at the 12 o'clock position and mount the top bead of the tire.



4. **NOTE:** Use only the Digital Tire Gauge any time tire pressures are measured to make sure that accurate values are obtained.

   Using the Digital Tire Gauge, inflate the tire to the pressure specified on the Vehicle Certification (VC) label located on the driver door or door pillar.

   - Proceed to Step 5 if the tire beads do not seat at the specified inflation pressure.

5. ⚠ **WARNING: If there is a need to exceed the maximum pressure indicated on the sidewall of the tire, in order to seat the beads, follow ALL the steps listed below. Failure to follow these steps may result in serious personal injury.**

   The following steps should only be carried out if the tire beads cannot be seated by inflating the tire up to the maximum inflation pressure listed on the tire sidewall.

   1 Relubricate the tire bead and wheel bead seat area.

   2 Install a remote valve and pressure gauge.

   3 Wear eye and ear protection and stand at a minimum of 3.65 m (12 ft) away from the wheel and tire assembly.

   4 Inflate tire using the remote valve and pressure gauge until the beads have seated or until the pressure gauge is 138 kPa (20 psi) more than maximum inflation pressure on tire sidewall. If beads have not seated, deflate the tire and proceed to the next step.

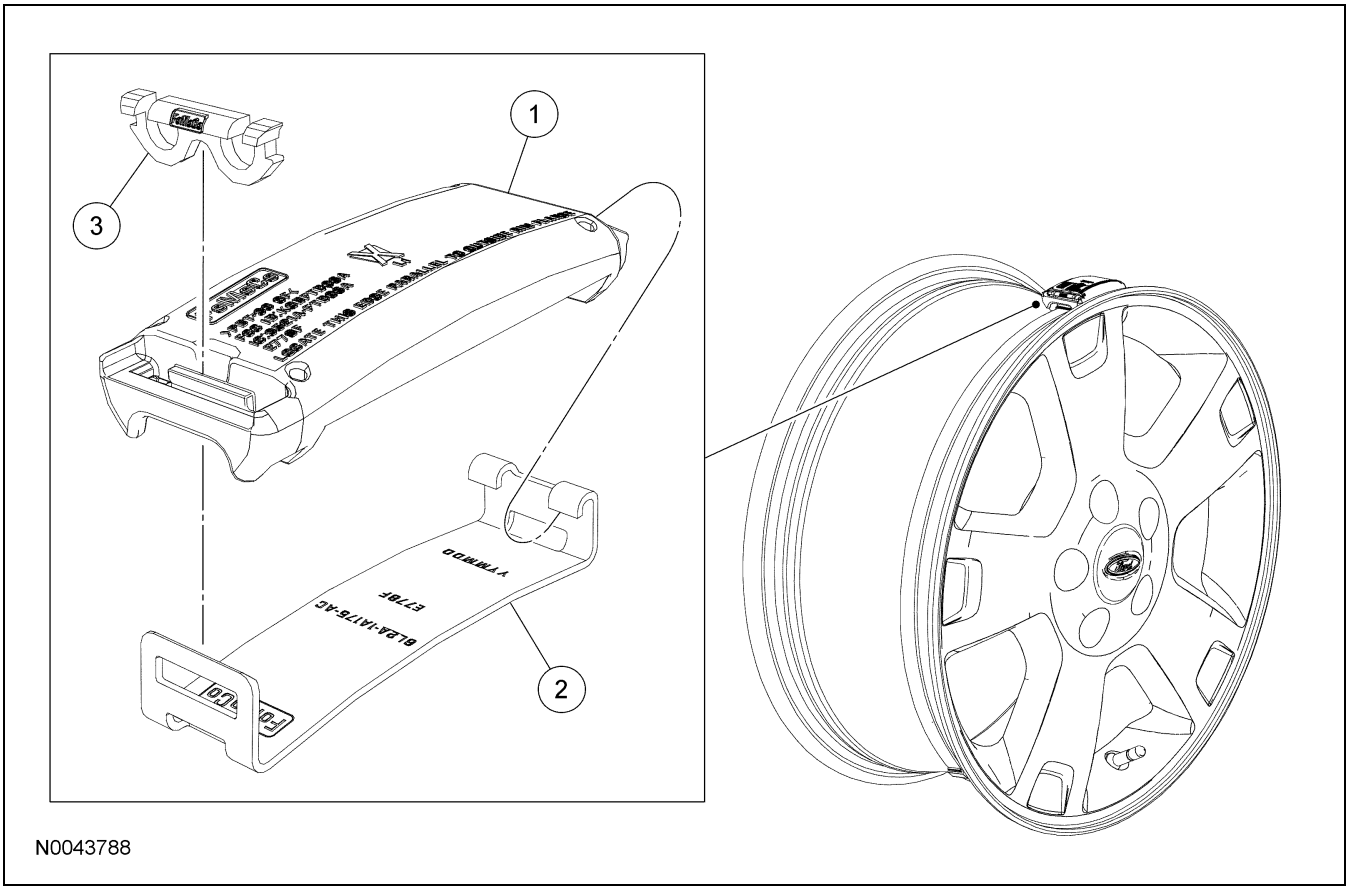
   5 Place the wheel and tire assembly in an OSHA-approved tire safety cage.

   6 Inflate the tire using the remote valve and pressure gauge until the beads have seated or until the pressure gauge is 276 kPa (40 psi) more than maximum inflation pressure on the tire sidewall. **Do not exceed 276 kPa (40 psi) above the maximum pressure on tire sidewall. Install a new tire if the beads do not seat at this pressure.**

6. Install the wheel and tire. For additional information, refer to Wheel and Tire in this section.

DISASSEMBLY AND ASSEMBLY

Tire Pressure Monitoring System (TPMS) Sensor



Item	Part Number	Description
1	1A150/1A189	Tire pressure sensor/sensor kit
2	1A175	Sensor cradle

(Continued)

Item	Part Number	Description
3	14C202	Locking clip (also part of 1A189)

DISASSEMBLY AND ASSEMBLY (Continued)

Disassembly

⚠ **WARNING: The tire pressure monitoring system (TPMS) sensor battery may release hazardous chemicals if exposed to extreme mechanical damage. If these chemicals contact the skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If any part of the battery is swallowed, contact a physician immediately. When disposing of TPMS sensors, follow the correct procedures for hazardous material disposal. Failure to follow these instructions may result in serious personal injury.**

NOTE: Tire pressure sensors are equipped with Lithium-ion batteries and must be disposed of accordingly.

NOTE: Tire pressure sensors are manufactured in multiple colors based on their application. When installing a new sensor, make sure the color of the sensor being installed matches the color of the sensor that was removed. The different colored sensors are **not** interchangeable.

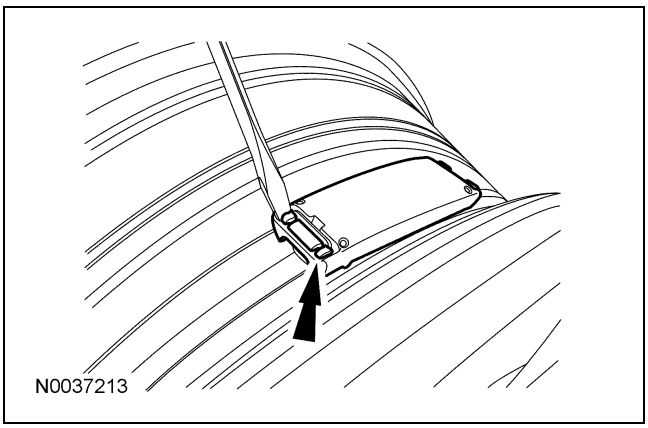
NOTE: The sensor can be removed and installed without removing the strap or the cradle.

1. ***NOTICE:*** **The sensor, cradle and strap may be damaged by incorrect tire mounting or dismounting. Dismount the tire only as instructed.**

   Remove the tire from the wheel. For additional information, refer to Wheel and Tire in this section.

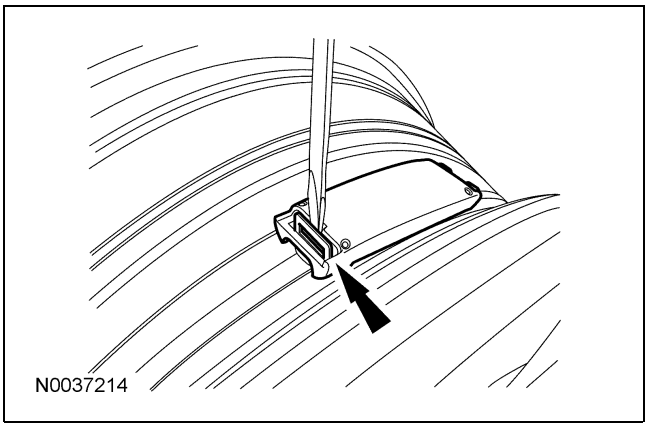
2. ***NOTICE:*** **Do not use a large screwdriver. Apply minimum force during removal or damage to the sensor locking clip may occur.**

   Using a pocket screwdriver or similar tool, remove the sensor locking clip. Click here to view an animated version of this procedure.



3. ***NOTICE:*** **Do not use a large screwdriver. Apply minimum force during removal or damage to the sensor may occur.**

   Using a pocket screwdriver or similar tool, detach the sensor from the cradle. Click here to view an animated version of this procedure.



4. Remove the sensor.

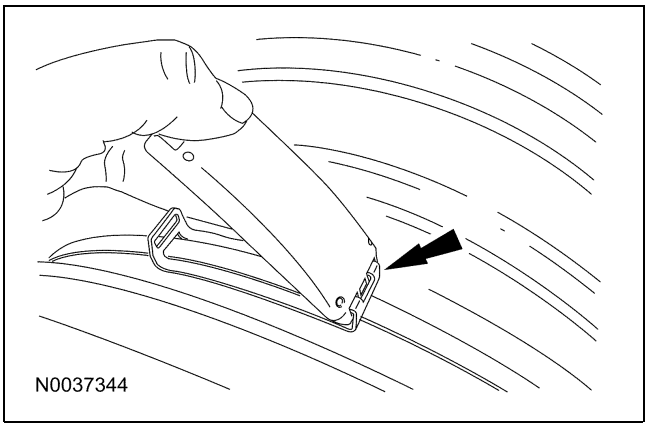
DISASSEMBLY AND ASSEMBLY (Continued)

Assembly

1. *NOTICE:* **Damage to the sensor may occur if excessive force is applied during sensor installation.**

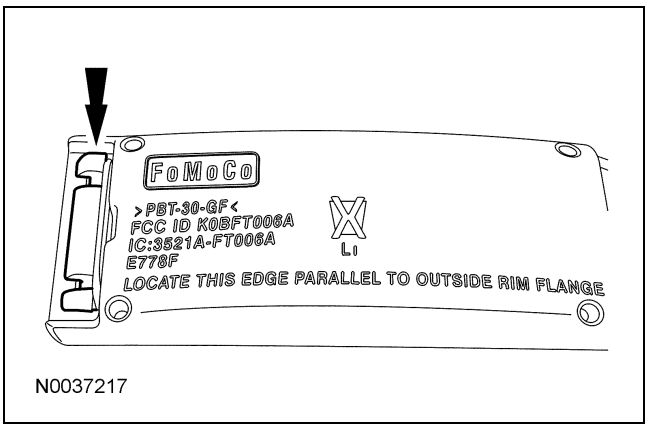
   NOTE: Make sure the sensor is fully seated into the cradle. The sensor will make a ‘‘click’’ noise when correctly seated.

   Position the sensor into the cradle by inserting the hinge end of the sensor into the hook end of the cradle and pushing the opposite end of the sensor down onto the cradle.


N0037344

2. **NOTE:** The locking clip can only be fully seated when installed in the correct orientation. If the sensor locking clip cannot be fully inserted, then the sensor may not be fully seated on the cradle or the locking clip may be inserted backward.

   Insert a new locking clip into the sensor.



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3. *NOTICE:* **The sensor, cradle and strap may be damaged by incorrect tire mounting or dismounting. Mount the tire only as instructed.**

   Install the tire onto the wheel. For additional information, refer to Wheel and Tire in this section.

4. **NOTE:** A new tire pressure sensor is shipped in an off mode (or battery saver mode) and must be turned on before it can be trained. To turn the sensor on, install it on a wheel, mount the tire and inflate the tire to the recommended inflation pressure. Wait at least 2 minutes, then continue with the sensor training procedure.

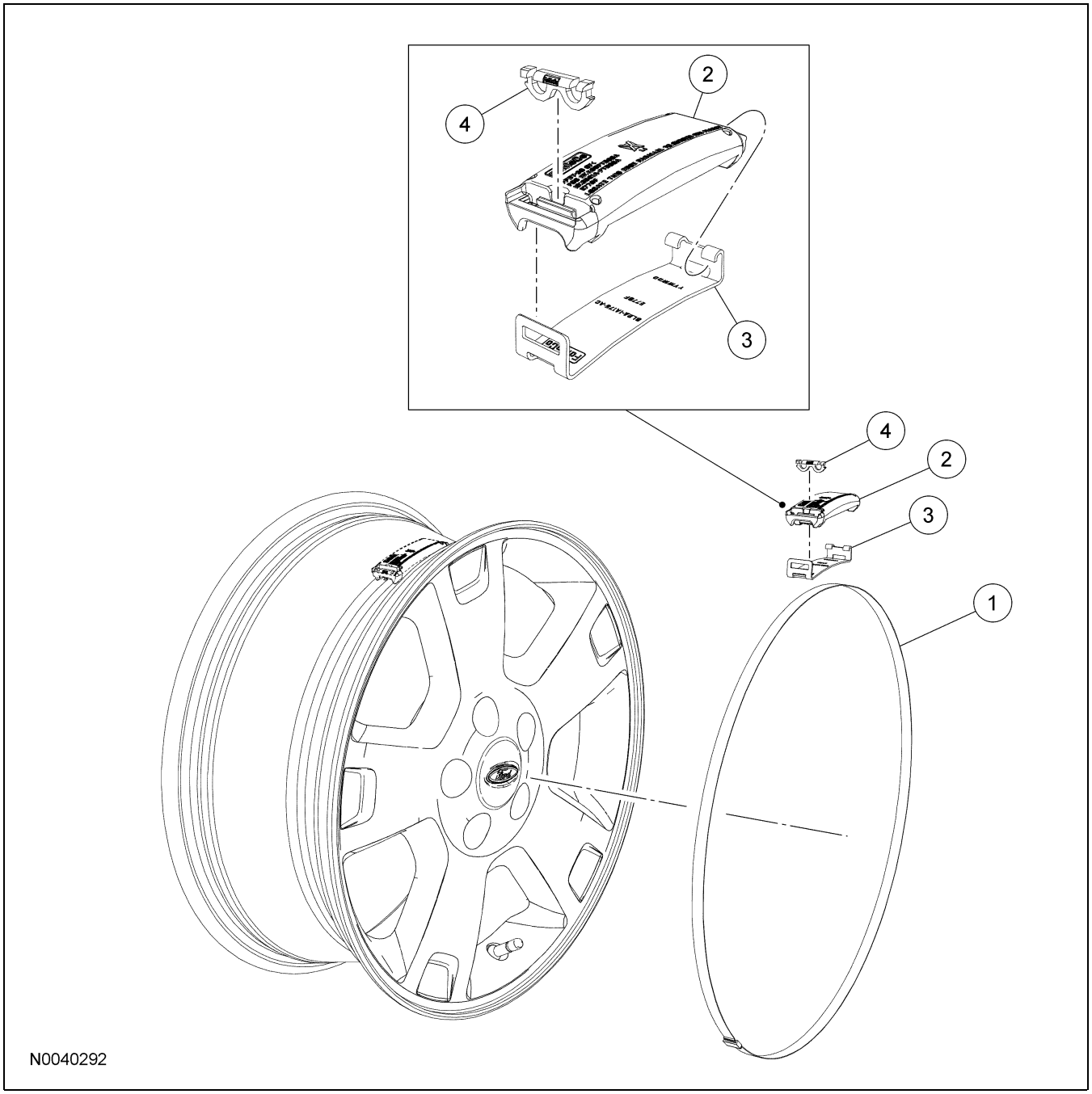
   Train the tire pressure sensor(s). For additional information, refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.

DISASSEMBLY AND ASSEMBLY

Tire Pressure Monitoring System (TPMS) Strap and Cradle

Material

Item	Specification
Wheel and Tire Cleaner ZC-37-A	—



DISASSEMBLY AND ASSEMBLY (Continued)

Item	Part Number	Description
1	1A177/1A193	Strap/strap kit
2	1A150/1A189	Tire pressure sensor/sensor kit
3	1A175	Sensor cradle (also part of 1A193)
4	14C202	Locking clip (also part of 1A189)

Disassembly

⚠ WARNING: The tire pressure monitoring system (TPMS) sensor battery may release hazardous chemicals if exposed to extreme mechanical damage. If these chemicals contact the skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If any part of the battery is swallowed, contact a physician immediately. When disposing of TPMS sensors, follow the correct procedures for hazardous material disposal. Failure to follow these instructions may result in serious personal injury.

NOTE: Tire pressure sensors are equipped with Lithium-ion batteries and must be disposed of accordingly.

NOTE: Tire pressure sensors are manufactured in multiple colors based on their application. When installing a new sensor, make sure the color of the sensor being installed matches the color of the sensor that was removed. The different colored sensors are **not** interchangeable.

NOTE: The sensor is available separately, the cradle and strap are available as a strap kit. There are several different strap kits available based on wheel diameter, but all strap kits share the same base part number.

1. Remove the Tire Pressure Monitoring System (TPMS) sensor. For additional information, refer to Tire Pressure Monitoring System (TPMS) Sensor in this section.

2. **⚠ WARNING: Always wear eye protection when servicing a vehicle. Failure to follow this instruction may result in serious personal injury.**

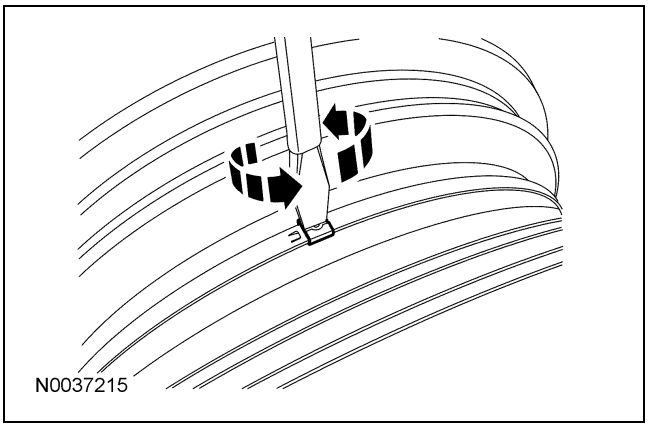
   ⚠ WARNING: Wear protective gloves when handling components or parts that have pointed or sharp edges. Failure to follow this instruction may result in serious personal injury.

   Remove a factory-installed strap in the following sequence:

   1 Locate the strap buckle and secure the strap to the wheel using duct tape or a similar item on both sides of the buckle, approximately 25 mm (0.98 in) from the buckle.

   2 Using a large screwdriver and a twisting motion, unbuckle the strap.

   3 Discard the strap.



3. To remove a dealer-installed strap, turn the worm gear screw until the strap is fully released from the worm gear.
   - Discard the strap.

4. **NOTE:** To aid assembly, mark the location of the cradle prior to disassembly.

   Using a screwdriver, or similar tool, remove the cradle by inserting the screwdriver under the cradle and prying up. Click here to view an animated version of this procedure.

DISASSEMBLY AND ASSEMBLY (Continued)

Assembly

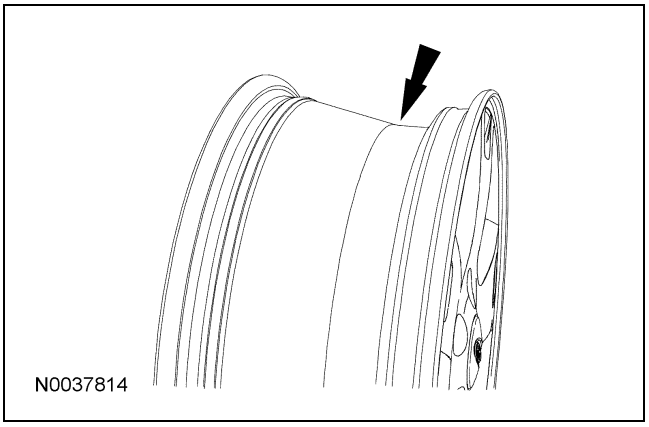
1. **NOTE:** Make sure the sensor is fully seated into the new cradle. The sensor will make a ‘‘click’’ noise when fully seated.

   Position the sensor into the new cradle by inserting the hinge end of the sensor into the hook end of the cradle and pushing the opposite end of the sensor down onto the cradle.

2. ***NOTICE:*** **Metal scrapers may damage the wheel. Use only plastic or non-metallic scrapers to remove the cradle adhesive strip residue.**

   NOTE: The sensor and cradle must be installed in the drop well of the wheel, 180 degrees from the valve stem.

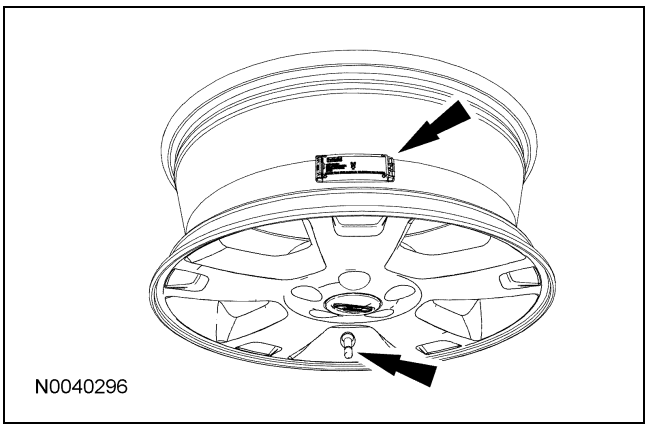
   Using wheel and tire cleaner, clean the area where the sensor and cradle are to be installed.



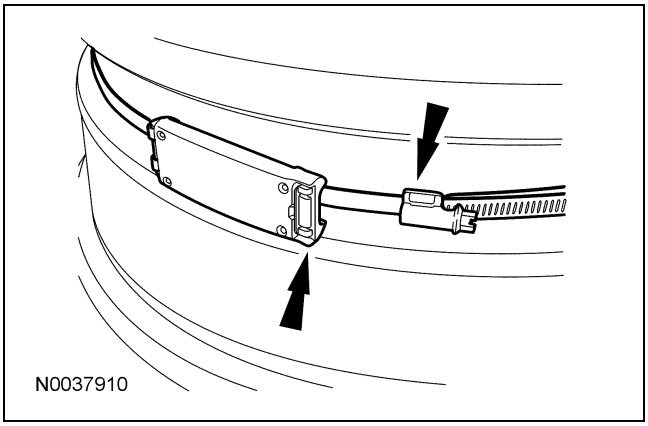
3. **NOTE:** The sensor and cradle must be positioned with the hinge side of the sensor on the RH side when viewed from the curb side (beauty side) of the wheel.

   NOTE: The sensor has raised markings indicating how to position the sensor.

   Remove the adhesive tape liner from the cradle and position the sensor and cradle into the wheel drop well 180 degrees from the valve stem. Click here to view a video version of this procedure.



4. Install the tapered end of the strap through the opening of the cradle on the hinge side of the sensor. This will position the worm gear on the locking clip side of the sensor. Click here to view an animated version of this procedure.



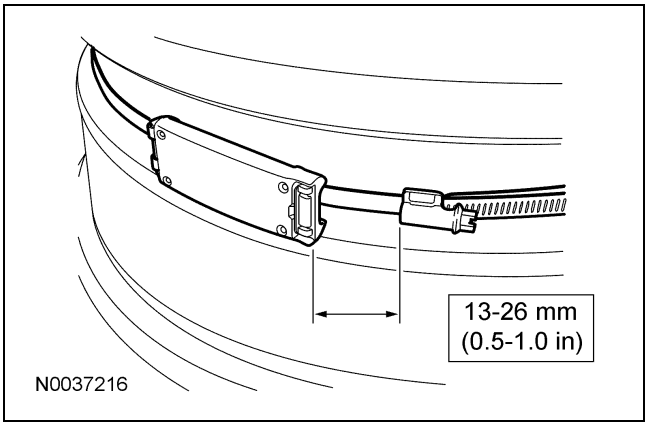
DISASSEMBLY AND ASSEMBLY (Continued)

5. *NOTICE:* **Steel wheels have a ''high spot'' along their circumference. Make sure the strap and sensor are mounted at the lowest spot possible to avoid damaging the sensor during wheel and tire disassembly and assembly.**

   NOTE: Keep the strap parallel with the wheel flange while tightening the worm gear.

   Position the worm gear 13-26 mm (0.5-1.0 in) away from the sensor and tighten the worm gear.

   - Tighten to 3 Nm (27 lb-in).



6. *NOTICE:* **The sensor, cradle and strap may be damaged by incorrect tire mounting or dismounting. Mount the tire only as instructed.**

   Install the tire onto the wheel. For additional information, refer to Wheel and Tire in this section.

7. **NOTE:** A new tire pressure sensor is shipped in an off mode (or battery saver mode) and must be turned on before it can be trained. To turn the sensor on, install it on a wheel, mount the tire and inflate the tire to the recommended inflation pressure. Wait at least 2 minutes, then continue with the sensor training procedure.

   Train the tire pressure sensor(s). For additional information, refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.