SERVICE MANUAL SECTION

CF 500, CF 600 Suspension

Truck Model: CF 500
Truck Model: CF 600
Unit Code: 03AGN
Unit Code: 03GAP
Unit Code: 14VAK
Unit Code: 14VAL
Unit Code: 14VAP
Unit Code: 14VAR

S03014

11/01/2005

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Safety Information

NOTE: Read the following before starting the service procedure.

The information contained in this International Service Manual Section was current at the time of printing and is subject to change without notice or liability.

You must follow your company safety procedures when you service or repair equipment. Be sure to understand all of the procedures and instructions before you begin work on the unit.

International uses the following types of notations to give warning of possible safety problems and to give information that will prevent damage to the equipment being serviced or repaired.

WARNING: A warning indicates procedures that must be followed exactly. Personal injury or possible death can occur if the procedure is not followed.

CAUTION: A caution indicates procedures that must be followed exactly. If the procedure is not followed, damage to equipment or components can occur.

NOTE: A note indicates an operation, procedure or instruction that is important for correct service.

Some procedures require the use of special tools for safe and correct service. Failure to use these special tools when required can cause injury to service personnel or damage to vehicle components.

This service manual section is intended for use by professional technicians, NOT a "**do-it-yourselfer**." It is written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the service section applies to your vehicle. See your International Truck Dealer for information on whether this service section applies to your vehicle.

Suspension System — General Information

Specifications

Table 1 Alignment Specifications

Item	LH	RH	Total/ Split
Camber	1.0° ± 0.375°	1.0° ± 0.375°	0° ± 0.375°
Caster	4.63° ± 0.5°	4.63° ± 0.5°	0° ± 0.25°
Toe @ curb ride height (positive value is toe-in, negative value is toe-out)	—	—	1/16 In ± 1/32 In
Steering axis inclination (SAI)	—	—	5.52°

Table 2 General Specifications

Item	Specification
Vehicle Lean (Side-to-Side Differences)	
Front — maximum	15 mm (0.59 in.)
Rear — maximum	20 mm (0.78 in.)
Dogtracking	
Dogtracking — maximum (centerline of front tires compared to centerline of rear tires)	30 mm (1.2 in.)

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Table 3 Torque Specifications

Description	Nm	lbf-ft
Adjusting sleeve clamp nuts	80	60
Front spring U-bolt nut	380	280
Rear spring U-bolt nut	380	280
1/4-inch diameter bolts and nuts — Grade 5	12	9
5/16-inch diameter bolts and nuts — Grade 5	20	15
3/8-inch diameter bolts, U-bolts and nuts — Grade 8	50	37
7/16-inch diameter bolts, U-bolts and nuts — Grade 8	82	61
1/2-inch diameter bolts, U-bolts and nuts — Grade 8	122	90
9/16-inch diameter bolts, U-bolts and nuts — Grade 8	176	130
5/8-inch diameter bolts, U-bolts and nuts — Grade 8	240	178
3/4-inch diameter bolts, U-bolts and nuts — Grade 8	380	280
7/8-inch diameter bolts, U-bolts and nuts — Grade 8	570	420
1-inch diameter bolts, U-bolts and nuts — Grade 5	860	634

Description and Operation

Caster and camber correction requirements are factory-determined. Adjusters are available to correct a caster measurement that does not meet specification. Before adjusting the caster, thoroughly inspect the suspension system to locate worn or damaged components that may have caused the setting to change.

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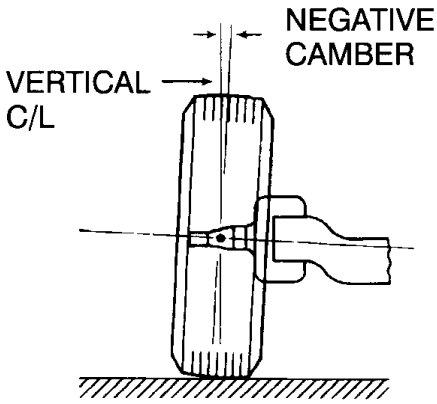
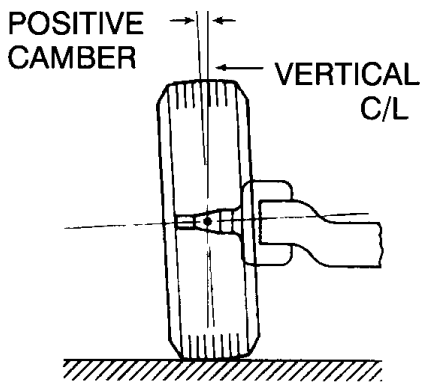
Wheel Alignment Angles — Camber

Negative and Positive Camber

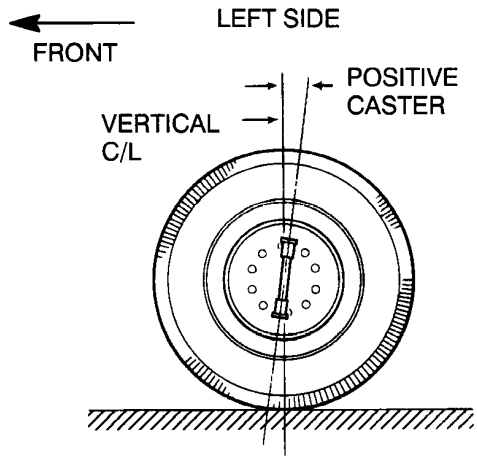


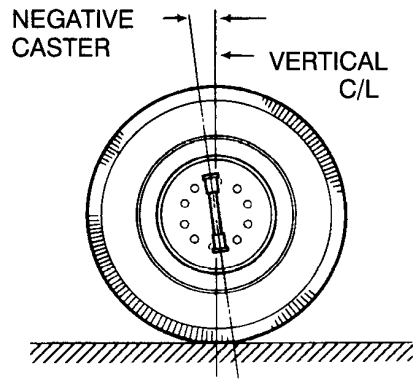


Camber is the vertical tilt of the wheel when viewed from the front. Camber can be positive or negative and has a direct effect on tire wear.

Wheel Alignment Angles — Caster

Caster and Frame Angle





Caster is the deviation from vertical of an imaginary line drawn through the ball joints 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.

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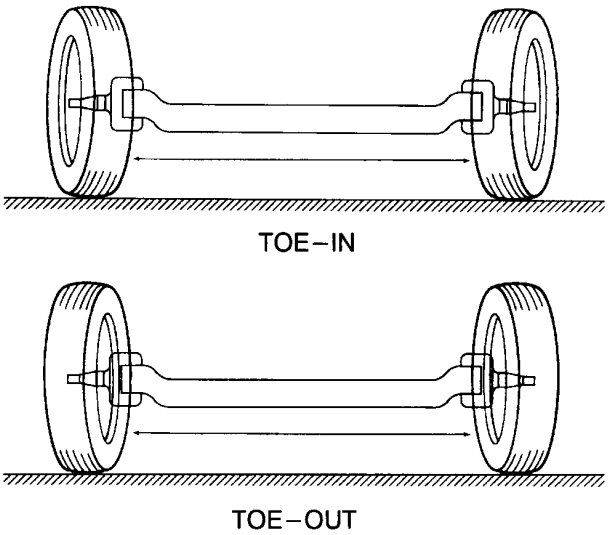
Wheel Alignment Angles — Toe

Positive Toe (Toe In) and Negative Toe (Toe Out)



The vehicle toe setting:

- affects tire wear and directional stability.
- must be checked after adding aftermarket equipment, such as a snowplow or body.

Wheel Alignment Angles — Wheel Track

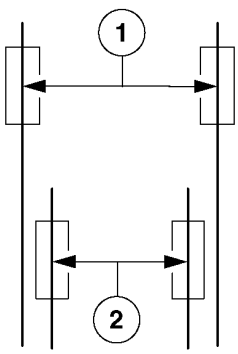


Figure 4
1. Front Track
2. Rear Track

Wheel Alignment Angles — Dogtracking

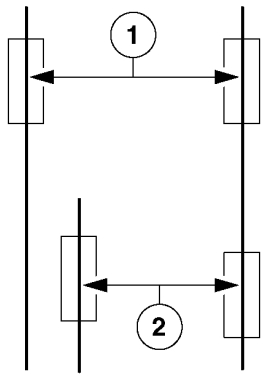


Figure 5
1. Front Track
2. Rear track dogtracking

Dogtracking is the condition in which the rear axle is not square to the chassis. Heavily crowned roads can give the illusion of dogtracking.

Wheel Alignment Angles — 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.

Wheel Alignment Angles — 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.

Wheel Alignment Angles — 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.

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Wheel Alignment Angles — Poor Returnability/ Sticky Steering

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

Wheel Alignment Angles — Drift/Pull

Pull is a tugging sensation, felt by the hands on 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.

- A vehicle-related drift/pull, on a flat road, will cause a consistent deviation from the straight-ahead path and require constant steering input in the opposite direction to counteract the effect.
- Drift/pull may be induced by conditions external to the vehicle (for example, wind or road camber).

Wheel Alignment Angles — 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 roadability problem, it is important to understand the difference between wander and poor groove feel.

Suspension Diagnosis and Testing

Inspection and Verification

1. Road test.

   • Verify the customer’s concern by performing a road test on a smooth road. If any vibrations are apparent, refer to Noise, Vibration and Harshness in S10019.

2. Inspect tires.

   • Check the tire pressure 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 Wheels and Tires in S17002.

   • Inspect the tires for incorrect wear and damage. Refer to Wheels and Tires in S17002.

3. Inspect 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, wheel and tire components (such as competition, heavy duty, etc.) The specifications shown in this manual do not apply to vehicles equipped with aftermarket equipment.

Table 4 Visual Inspection Chart

Mechanical
• Front wheel bearing(s)
• Loose or damaged front or rear suspension components
• Loose, damaged or missing suspension fastener(s)
• Loose or damaged shackle(s)
• Restricted intake or exhaust
• Incorrect spring usage
• Damaged or sagging spring(s)
• Damaged or leaking shock absorber(s)
• Worn or damaged suspension bushing(s)
• Loose, worn or damaged steering system components
• Damaged axle components
• Damaged or loose kingpins (spindle pins)

5. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the next step.

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6. If the fault is not visually evident, determine the symptom. Go to the Symptom Chart below.

Symptom Chart

Table 5

Condition	Possible Sources	Action
Dogtracking	A. Excessive rear thrust angle. B. Front or rear suspension components. C. Drive axle damaged.	A. ADJUST as necessary. B. INSPECT the front and rear suspension systems. REPAIR or INSTALL new components as necessary. REFER to Front Suspension or Rear Suspension. C. REPAIR as necessary. REFER to Rear Drive Axle/Differential in S14020.
Drift/pull	A. Unequal tire pressure. B. Excessive side-to-side difference in caster or camber. C. Tire forces. D. Unevenly loaded or overloaded vehicle. E. Steering components. F. Brake drag.	A. ADJUST tire pressure. B. ADJUST as necessary. C. ROTATE tires front to rear. D. NOTIFY the customer of incorrect vehicle loading. E. REFER to Steering System in S05017.. F. REFER to Brake System in S04049..
Front bottoming or riding low	A. Front spring(s). B. Jounce bumper bracket or Front suspension bumper(s).	A. INSTALL new front spring(s) as necessary. REFER to Front Suspension. B. INSTALL new components as necessary. REFER to Front Suspension.

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Incorrect tire wear	A. Incorrect tire pressure (rapid center rib or inner and outer edge wear). B. Excessive front or rear toe (rapid inner or outer edge wear) or Excessive negative or positive camber (rapid inner or outer edge wear). C. Tires out of balance (tires cupped or dished). D. Kingpin (spindle pin) damaged.	A. ADJUST tire pressure. B. ADJUST as necessary. C. BALANCE tires. D. REPAIR as necessary. REFER to Front Suspension.
Rear spring squeak	A. Rear spring(s). B. Shackle bushing(s).	A. INSTALL new rear spring anti-squeak inserts. B. INSTALL new components as necessary.
Rough ride	A. Shock absorber(s). B. Spring(s).	A. INSTALL new components as necessary. B. INSTALL new components as necessary. REFER to Front Suspension or Rear Suspension.
Shimmy or wheel tramp	A. Loose wheel nut(s). B. Loose front suspension fasteners. C. Front wheel bearing adjustment. D. Wheel or tire concerns. E. Springs or Kingpin (spindle pin) shims missing. F. Loose, worn or damaged steering components. G. Front wheel alignment.	A. TIGHTEN to specification. REFER to Wheels and Tires in S17002 B. TIGHTEN to specification. REFER to Front Suspension. C. REFER to Noise, Vibration and Harshness in S10019. D. REFER to Wheels and Tires in S17002 E. INSTALL new components as necessary. REFER to Front Suspension or Rear Suspension. F. REFER to Steering System in S05017. G. ADJUST as necessary.
Sticky steering, poor returnability	A. Steering components. B. Front wheel alignment.	A. REFER to Steering System in S05017. B. ADJUST as necessary.

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Steering wheel off-center	A. Unequal front or rear toe settings (side-to-side). B. Steering components.	A. ADJUST as necessary. B. REFER to Steering System in S05017.
Sway or roll	A. Overloaded, unevenly or incorrectly loaded vehicle. B. Loose wheel nut(s). C. Shock absorber(s). D. Loose stabilizer assembly. E. Worn stabilizer assembly bushing(s) or Worn spring(s).	A. NOTIFY the customer of incorrect vehicle loading. B. TIGHTEN to specification. REFER to Wheels and Tires in S17002 C. INSTALL new components as necessary. D. TIGHTEN to specification. REFER to Front Suspension or Rear Suspension. E. INSTALL new components as necessary. REFER to Front Suspension or Rear Suspension.
Vehicle leans to one side	A. Unevenly loaded or overloaded vehicle. B. Front or rear suspension components. C. Spring(s). D. Incorrect ride height. Lateral tilt out of specification.	A. NOTIFY the customer of incorrect vehicle loading. B. INSPECT the front and rear suspension systems. REPAIR or INSTALL new components as necessary. REFER to Front Suspension or Rear Suspension. C. INSTALL new components as necessary. REFER to Front Suspension or Rear Suspension. D. INSPECT the rear suspension system. REPAIR or INSTALL new rear suspension components as necessary. REFER to Front Suspension or Rear Suspension.

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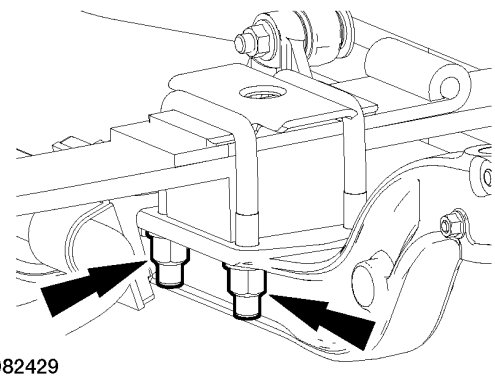
Vibration/noise	A. Tires and wheel concerns, Wheel bearings, Wheel hubs, Brake components, Suspension components, or Steering components.	A. REFER to Noise, Vibration and Harshness in S10019.
Wander	A. Unevenly loaded or overloaded vehicle. B. Loose, worn or damaged front wheel bearing(s). C. Loose, worn or damaged suspension component(s). D. Loose suspension fasteners. E. Steering components. F. Wheel alignment (excessive total front toe out).	A. NOTIFY the customer of incorrect vehicle loading. B. REFER to Noise, Vibration and Harshness in S10019. C. INSTALL new components as necessary. REFER to Front Suspension. D. TIGHTEN to specification. REFER to Front Suspension or Rear Suspension. E. REFER to Steering System in S05017. F. ADJUST as necessary.

General Procedures

Caster Adjustment

1. Raise and support the vehicle. For additional information, refer to Jacking and Lifting in S10019.
2. Support the axle and the chassis independently.
3. Remove the front spring U-bolt nuts. Discard the U-bolts and nuts.



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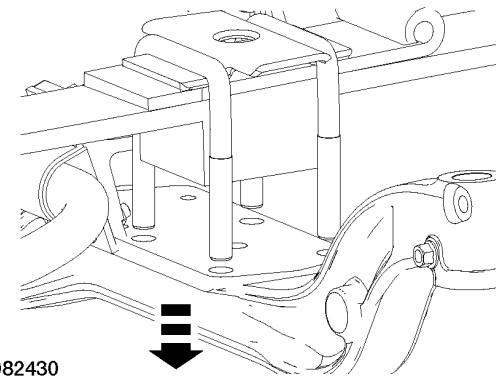
4. Lower the axle enough to insert the adjustment wedge.



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5. Insert the caster adjustment wedge.
6. Install new U-bolts and front spring U-bolt nuts.

   • Note the U-bolt size and tighten to specification. For additional information, refer to Specifications in this section.

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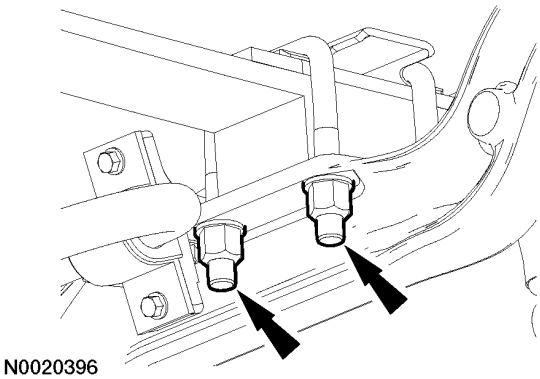
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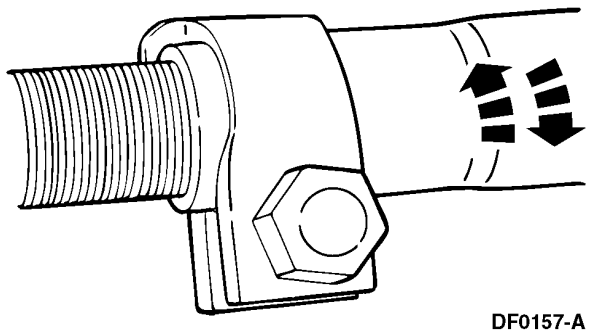
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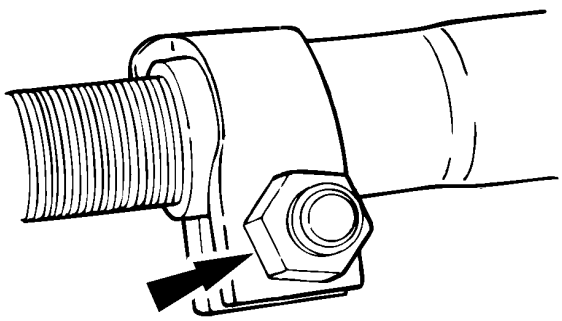
7. Lower the vehicle. For additional information, refer to Jacking and Lifting in S10019.
8. Recheck the caster.

Toe Adjustment

1. Loosen the clamp at both ends of the tie rod.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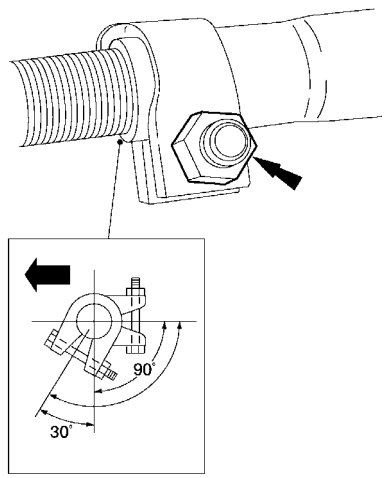
2. Rotate the tie rod to bring the toe into specification.

NOTE: For movable tie-rod clamps, make sure the tab is against the end of the tie rod.

NOTE: Note the specification for the tie-rod clamp orientation.

3. Tighten to 80 Nm (60 lbf-ft).



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4. Recheck the toe.

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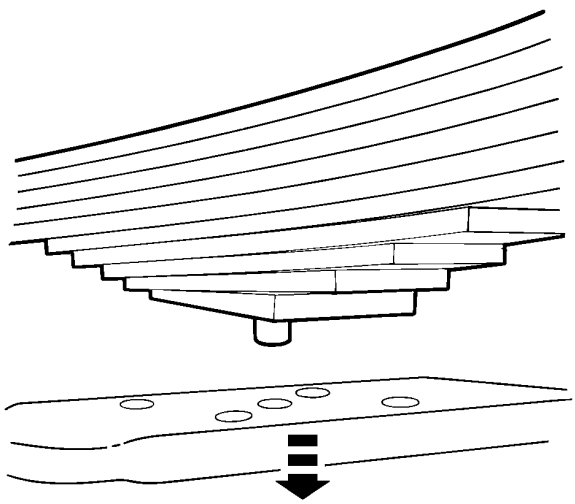
Lean Correction

CAUTION: Corrections should not be attempted on vehicles with a bumper-to-ground height right-to-left variation of 25.4 mm (1 inch) or less. Corrections should not be made if the ride height variation is 12.7 mm (1/2 inch or less).

1. Raise and support the vehicle. For additional information, refer to Jacking and Lifting in S10019.
2. Position a separate support for the front axle.
3. Raise the front axle to relieve front spring tension.
4. Remove the front spring U-bolt nuts, the U-bolts and the upper spacer. Discard the nuts and U-bolts.
5. Lower the front axle enough to insert the spacer.



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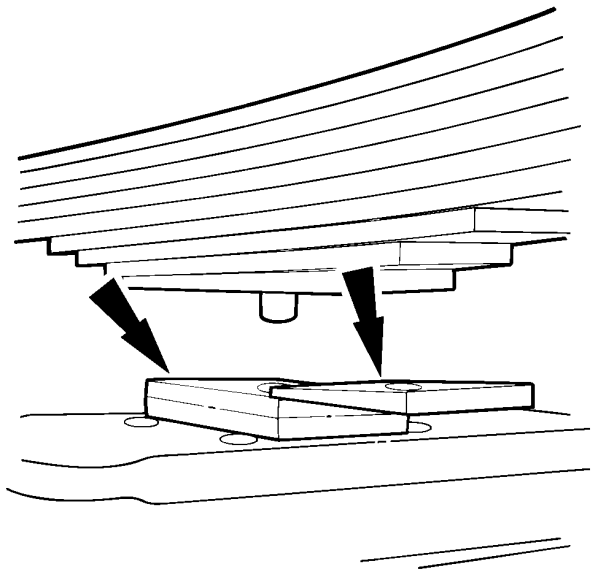
NOTE: Make sure the locator pin on the bottom of the spacer is in the locator hole in the spring pad.

6. Position the spacer and caster adjustment wedge, if required, on the spring pad.



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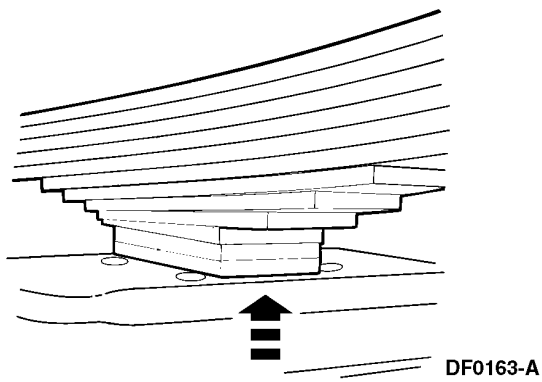
7. Raise the axle.



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8. Install the upper spacer, new U-bolts and new front spring U-bolt nuts.
   - Tighten to specification.

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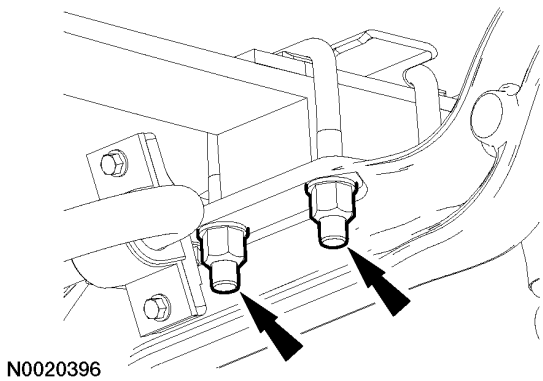

9. Remove the support from the axle.
10. Lower the vehicle. For additional information, refer to Jacking and Lifting in S10019.

Front Suspension

Specifications

Table 6 Torque Specifications

Description	Nm	lbf-ft	lb-in
Front spring hanger nut	246	181	—
Front spring hanger bracket nut-to-frame	90	66	—
Front spring shackle nut	125	92	—
U-bolt nut	380	280	—
Lower shock absorber nut	353	260	—
Upper shock absorber nut	353	260	—
Upper stabilizer bar link nut-to-frame	90	66	—
Drag link nut	90	66	—
Tie-rod nut	90	66	—
Spindle pin adjustment bolt	8	—	71

Table 6 Torque Specifications (cont.)

Description	Nm	lbf-ft	lb-in
Spindle pin cap bolt	16	12	—
Lock pin nut	24	18	—
Castellated nut	30	22	—
Stabilizer bar clamp-to-axle bracket	90	66	—
Spindle steering arm nut	575	424	—
Spindle lock pin nuts	81	60	—
Spindle pin cap	56	41	—
Tie-rod end castellated nut	89	66	—
Spindle adapter plate nut	90	66	—
ABS sensor bolt	11	8	—
ABS sensor harness bolt	11	8	—
Wheel bearing adjusting nut*	—	—	—
Track bar nuts	550	406	—
*Refer to the Wheel Bearing Adjustment procedure for specification.			

Description and Operation

Front Suspension

WARNING: All vehicles are equipped with gas-pressurized shock absorbers which will extend unassisted. Do not apply heat or flame to the shock absorbers during removal or component servicing. Failure to follow these instructions can result in personal injury.

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CAUTION: Suspension fasteners are critical parts because they affect performance of vital parts and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation becomes 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.

The front suspension system is a leaf spring and shock type design. The wheel spindles are attached to the front axle with spindle pins (king pins) instead of ball joints and the axle is a single I-Beam, non-driving type. The front suspension consists of the following additional components:

- Leaf springs and shackles
- Gas-pressurized shock absorbers
- Stabilizer bar and links

Diagnosis and Testing

Refer to Suspension System - General Information.

General Procedures

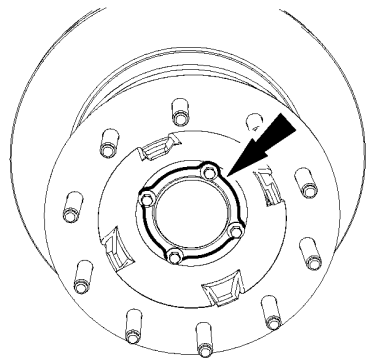
Wheel Bearing Adjustment

CAUTION: New wheel seals on the front axles must be installed any time the axle lubricants are changed from factory-installed mineral lube to synthetic lube or vice versa.

CAUTION: If bearings are adjusted too tightly, they will overheat and wear rapidly. An adjustment that is excessively loose can cause pounding and contribute to uneven tire wear, steering difficulties and inefficient brakes. Check bearing adjustment at regular inspection intervals. New wheel seals must be installed when the hub is removed. A damaged or worn seal can permit bearing lubricant to reach the brake linings, resulting in ineffective brake operation and necessitating premature replacement of linings.

NOTE: To check the wheel bearing adjustment, raise the front of the vehicle. Grasp the tire at the sides, and alternately push inward and pull outward on the tire. If any looseness is felt, adjust the front wheel bearings as follows.

1. Remove the hub cap and gasket from the hub.



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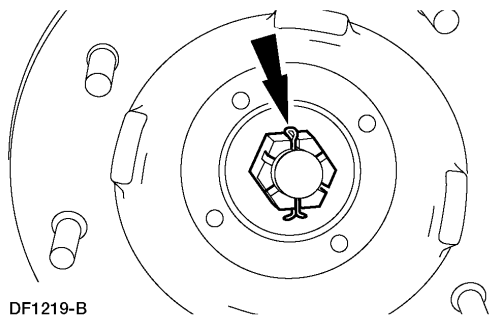
2. Remove and discard the cotter pin.



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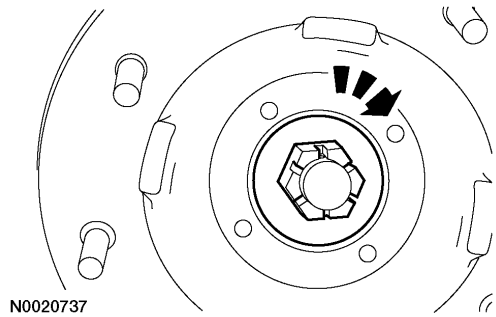
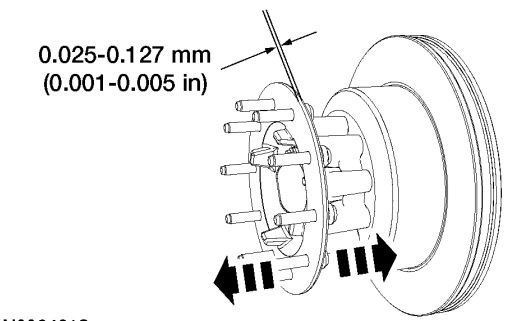
3. While rotating the wheel, tighten the wheel bearing adjusting nut to 271 Nm (200 lbf-ft) to seat the bearings.

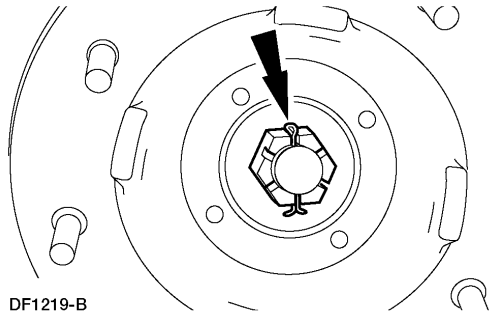

N0020737

4. Back off the wheel bearing adjusting nut one full turn.
5. While rotating the wheel, tighten the wheel bearing adjusting nut to 68 Nm (50 lb-in).
6. Loosen the wheel bearing adjusting nut 1/4 turn to achieve final bearing adjustment end play.
   - Final bearing adjustment end play must be within the specification.
   - The final adjustment must not result in a preloaded bearing.

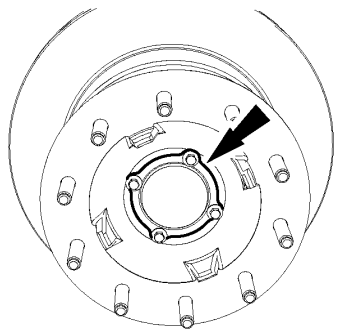


N0024618

7. If the cotter pin hole lines up with a slot in the nut, install a new cotter pin. If it does not, loosen the adjusting nut to align a slot with the first available cotter pin hole. Install a new cotter pin.


DF1219-B

8. Install the gasket and hub cap.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Removal and Installation

Front Suspension

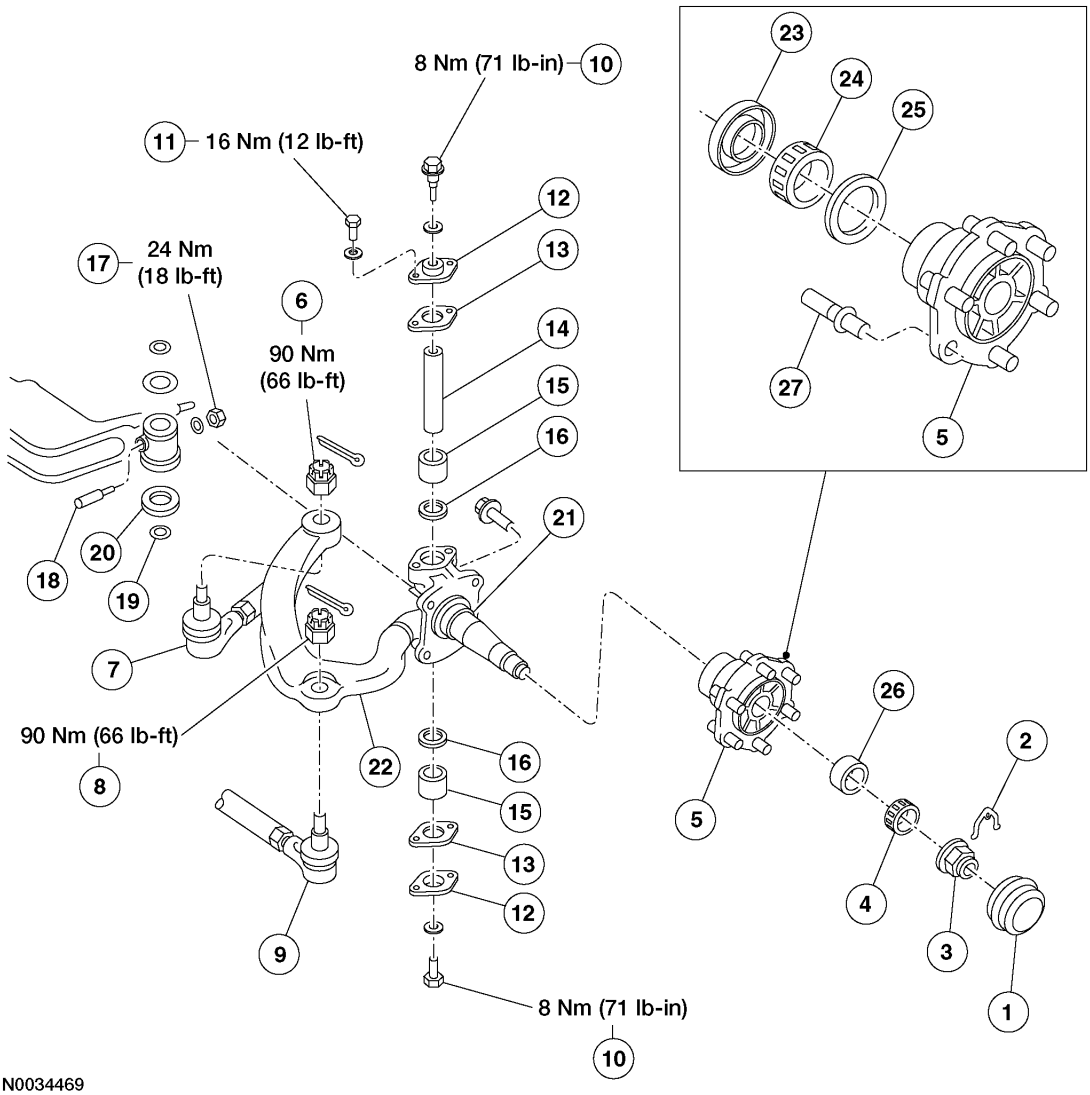

Figure 22

1. Hub cap (2 required)
2. Locking clip (2 required)
3. Nut (2 required)
4. Outer wheel bearing (2 required)
5. Wheel hub assembly (4 required)
6. Drag link nut
7. Drag link
8. Tie-rod nut (2 required)
9. Tie-rod end (2 required)
10. Spindle pin adjustment bolt (2 required)
11. Spindle pin cap bolt (4 required)
12. Spindle pin cap (4 required)
13. Spindle pin seal (4 required)
14. Spindle pin (2 required)
15. Spindle pin bushing (4 required)
16. Spindle pin O-ring (4 required)
17. Lock pin nut (2 required)
18. Lock pin (2 required)
19. Oil seal (2 required)
20. Thrust bearing (2 required)
21. Wheel spindle (2 required)
22. Drag link arm
23. Grease seal (2 required)
24. Inner wheel bearing (2 required)
25. Inner bearing race (2 required)
26. Outer bearing race (2 required)
27. Wheel stud (20 required)

Read all safety instructions in the "Safety Information" section of this manual before doing any procedures.
Follow all warnings, cautions, and notes.
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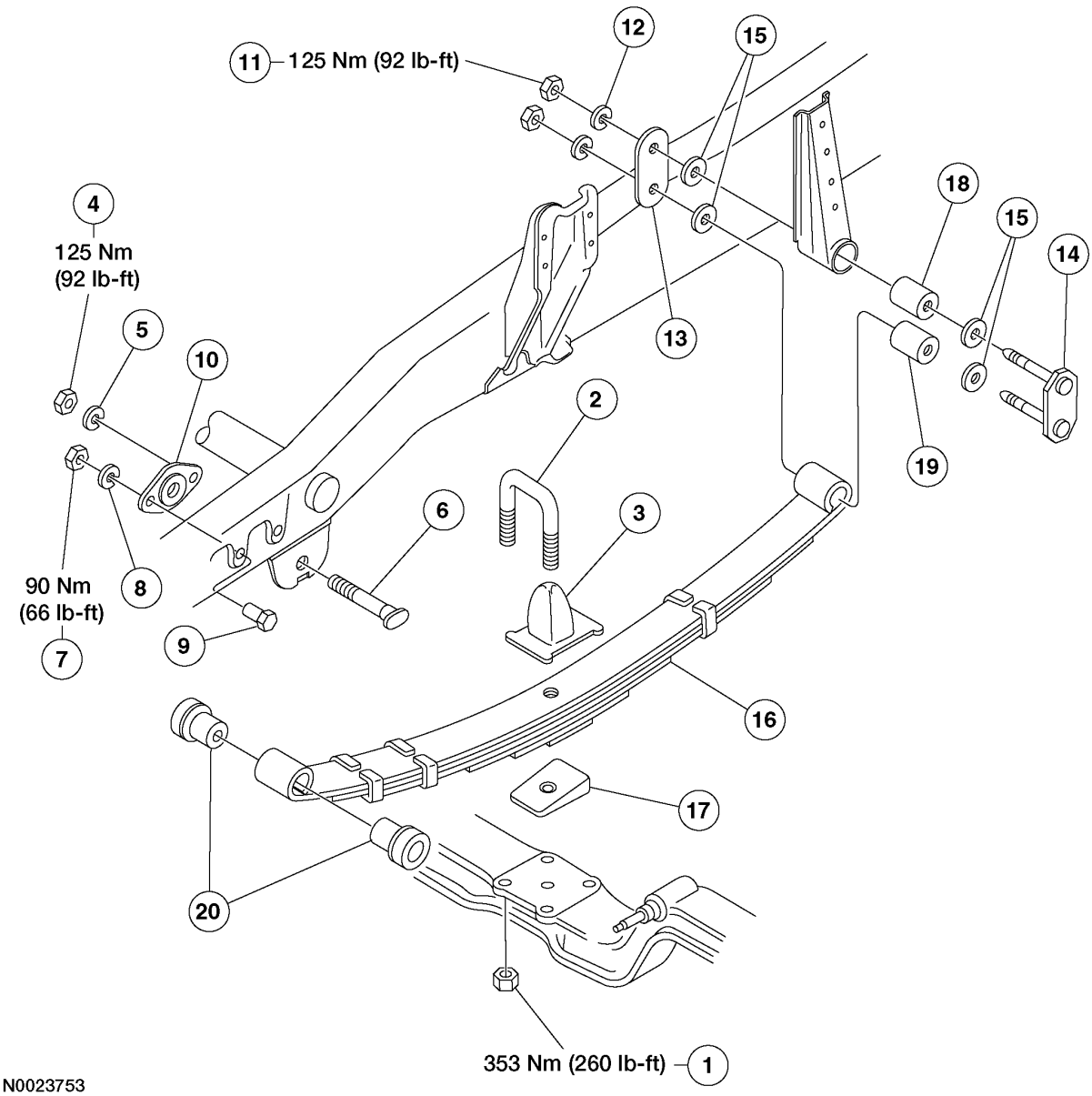

Figure 23

1. U-bolt nut (8 required)
2. U-bolt (4 required)
3. Jounce bumper (2 required)
4. Nut (2 required)
5. Washer (2 required)
6. Spring pin (2 required)
7. Nut (4 required)
8. Washer (4 required)
9. Bolt (4 required)
10. Spring pin plate (2 required)
11. Nut (4 required)
12. Washer (4 required)
13. Shackle plate (2 required)
14. Shackle pin (2 required)
15. Thrust washer (8 required)
16. Leaf spring assembly (2 required)
17. Caster wedge
18. Shackle pin bushing (2 required)
19. Spring bushing (2 required)
20. Spring bushing (4 required)

Read all safety instructions in the "Safety Information" section of this manual before doing any procedures.
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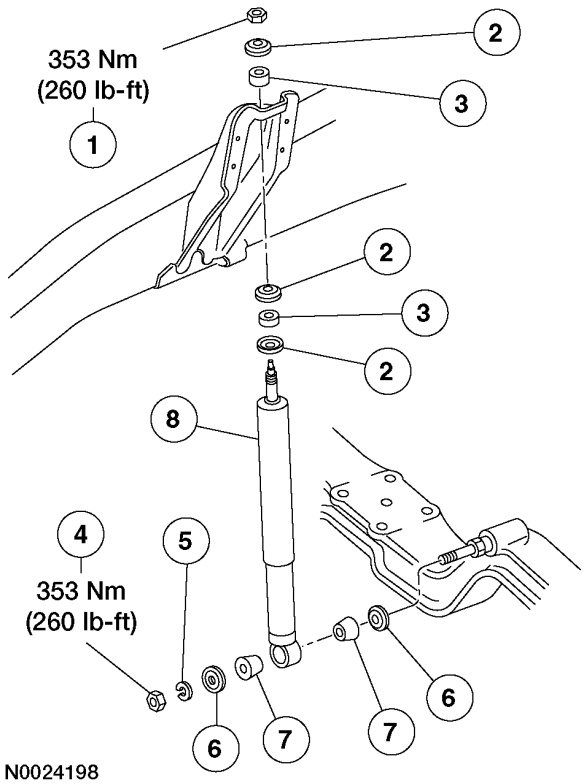

Figure 24

1. Upper shock absorber nut (2 required)
2. Upper shock absorber washer (4 required)
3. Upper shock absorber bushing (4 required)
4. Lower shock absorber nut (2 required)
5. Thrust washer (2 required)
6. Lower shock absorber washer (4 required)
7. Lower shock absorber bushing (4 required)
8. Shock absorber (2 required)

1. For additional information, refer to the procedures in this section.

Read all safety instructions in the "Safety Information" section of this manual before doing any procedures.
Follow all warnings, cautions, and notes.
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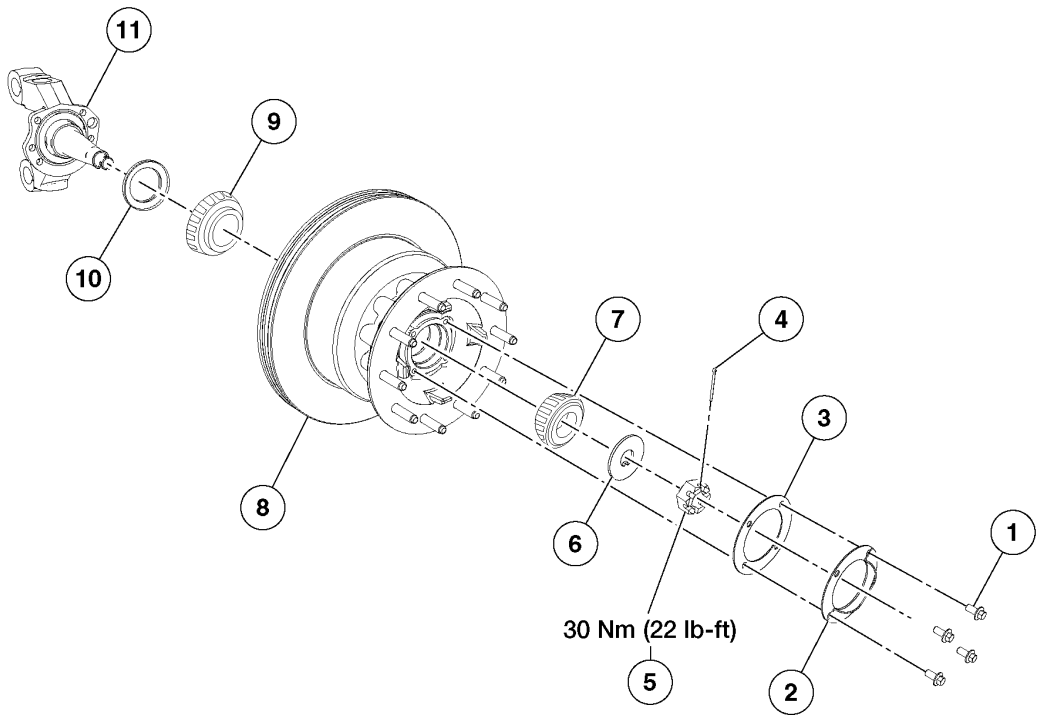
Wheel Bearing and Hub Removal

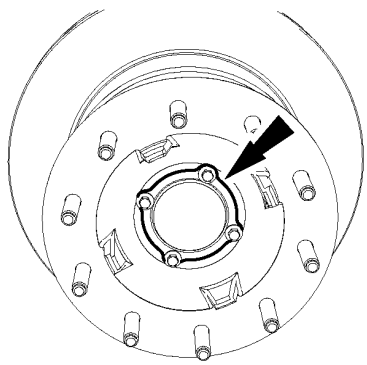


N0020763

Figure 25

1. Hub cap bolt (4 required)
2. Hub cap
3. Hub cap gasket
4. Cotter pin
5. Castellated nut
6. Washer
7. Outer bearing
8. Hub and brake disc assembly
9. Inner bearing
10. Grease seal
11. Wheel spindle

1. Remove the front brake disc. For additional information, refer to Front Disc Brake in S04049.
2. Remove the hub cap and gasket from the hub and rotor assembly.



N0020767

3. Remove the cotter pin, adjusting nut and flatwasher. Discard the cotter pin.

Read all safety instructions in the "Safety Information" section of this manual before doing any procedures.
Follow all warnings, cautions, and notes.
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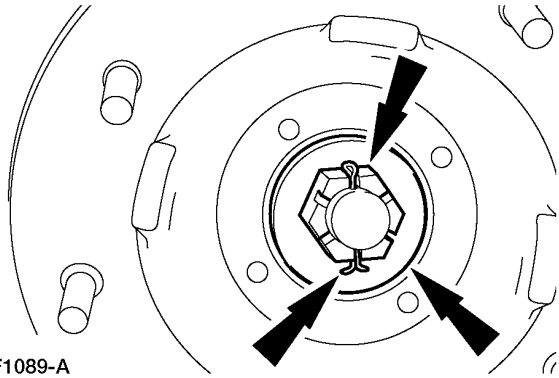
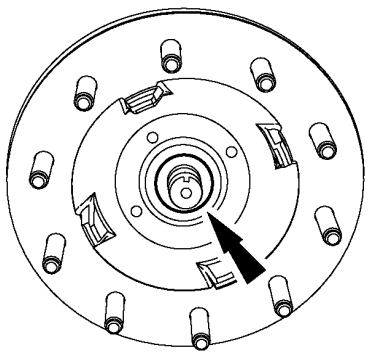
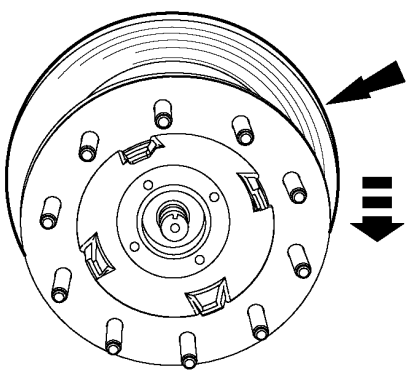

DF1089-A

NOTE: Inspect the condition of the spindle and nut threads to make sure of a free turning nut when reassembling.

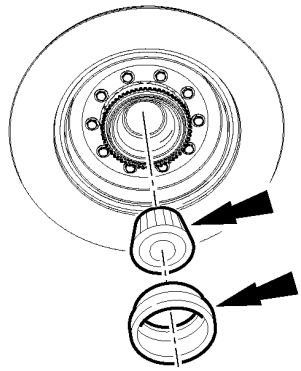
4. Remove the outer bearing cone and roller assembly.


N0020761

5. Pull the hub and rotor assembly from the spindle.


N0020760

6. Using care not to damage the bearing cage, use a suitable slide hammer and bearing seal remover to remove the inner bearing cone and bearing seal.


N0020769

Wheel Bearing and Hub Installation

CAUTION: Do not spin the bearing dry with compressed air.

NOTE: Remove all traces of old lubricant from the bearings, hub and axle spindle. Inspect bearings and bearing cups for pitting, spalling or unusual wear. If either bearings or bearing cups are worn or damaged, install new bearings and bearing cups.

NOTE: It is recommended that new bearings and bearing cups be installed in sets. If cups are worn or damaged, install the inner and outer bearing cups in the hub with an appropriate bearing cup driver tool. Check for correct seating of new bearing cups by trying to insert a 0.38 mm (0.00015 in) feeler gauge between the bottom face of the cup and wheel hub seat. You should not be able to insert the feeler gauge.

1. Remove all burrs, nicks or scratches from the shoulder of the spindle and seal bore in the hub with emery cloth.
2. Pack the inside of the hub with grease. Fill the hub until the grease is flush with the inside diameters of both bearing cups.

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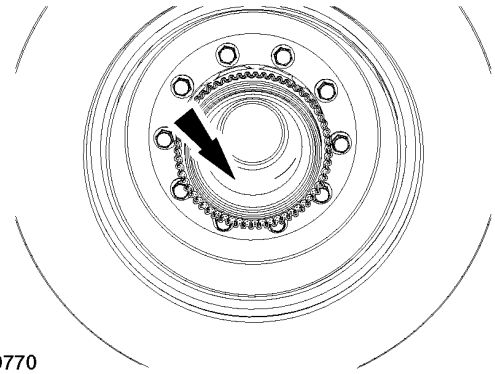
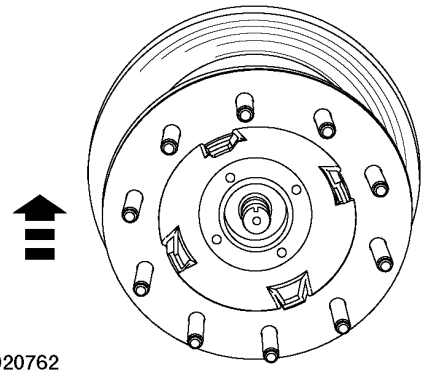
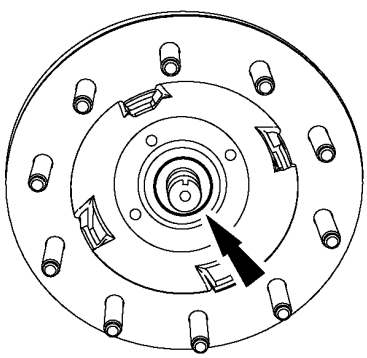

N0020770


N0020762

3. Pack the bearing cone and roller assemblies with grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages.

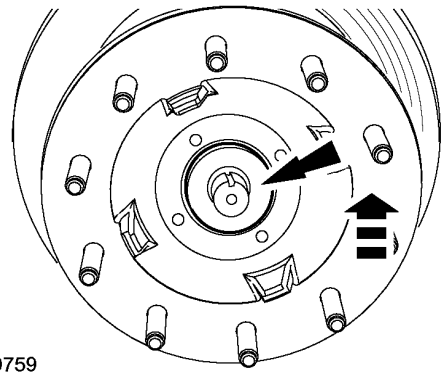
CAUTION: Keep the hub centered on the spindle to prevent damage to the grease seal or spindle threads.

4. Place the inner bearing cone and roller assembly in the inner cup, then install the wheel bearing hub seal, using a suitable seal installer. Make sure seal is fully seated and lubricated.

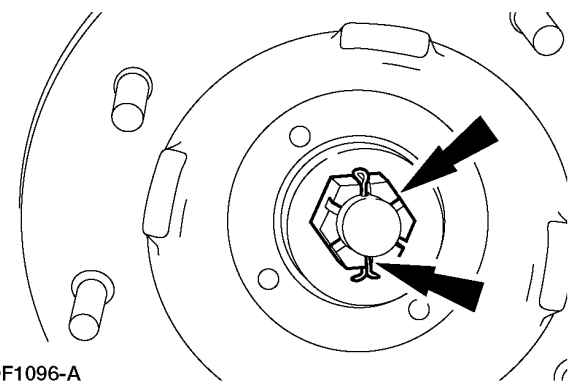

N0020761

5. Install the rotor and hub assembly.

6. Install the outer bearing cone and roller assembly and the flatwasher on the spindle.


N0020759

7. Install the wheel bearing adjusting nut. For additional information, refer to Wheel Bearing Adjustment.


DF1096-A

8. Install a new gasket and the hub cap.

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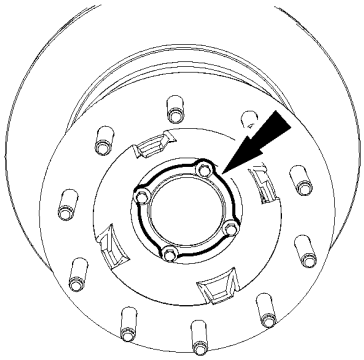
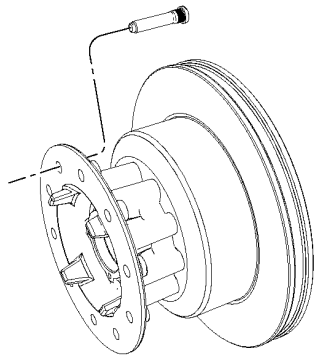
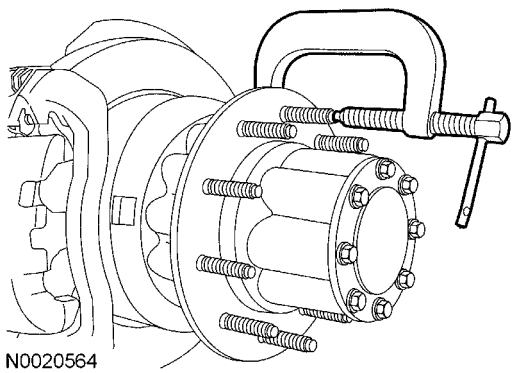

N0020767


N0020771

9. Install the front brake disc. For additional information, refer to Front Disc Brake in S04049.

Wheel Stud Removal

1. Remove the wheel and tire assembly. For additional information, refer to Wheels and Tires in S17002.
2. Remove and discard the wheel stud.


N0020564

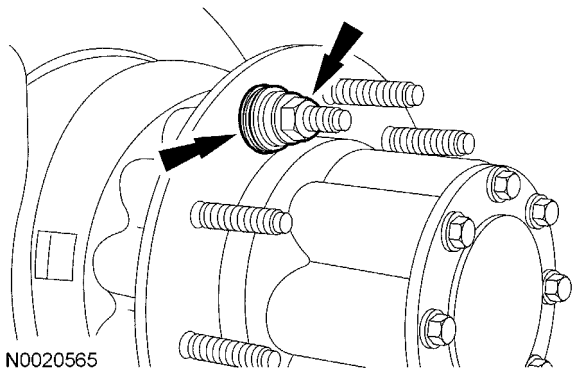
Wheel Stud Installation

1. Install the new wheel stud and align the serrations in the wheel adapter flange made by the original wheel stud.

   • Place 4 flatwashers over the outside end of the wheel stud and thread a standard wheel nut with the flat side against the washers.

   • Tighten the wheel nut until the wheel stud head seats against the back side of the wheel adapter flange.

2. Remove the wheel nut and flatwashers.


N0020565

3. Install the wheel and tire assembly. For additional information, refer to Wheels and Tires in S17002

Stabilizer Bar and Link Removal and Installation

CAUTION: Suspension fasteners are critical parts because they affect performance of vital parts and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation becomes 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. Raise and support the vehicle. For additional information, refer to Jacking and Lifting in S10019.

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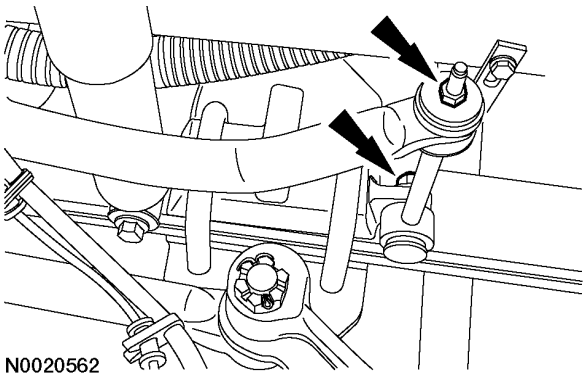
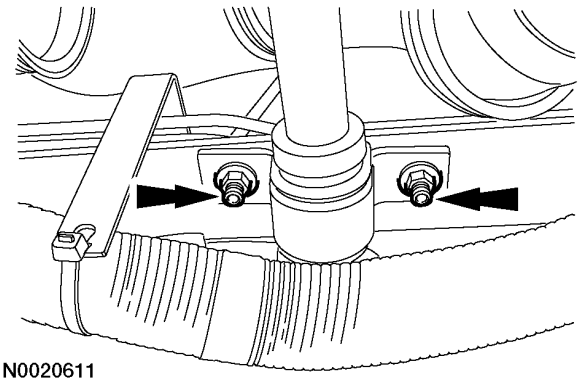
2. Remove the nuts, bolts, brackets and the stabilizer bar links.
   - To install, tighten to 90 Nm (66 Lbf-ft).



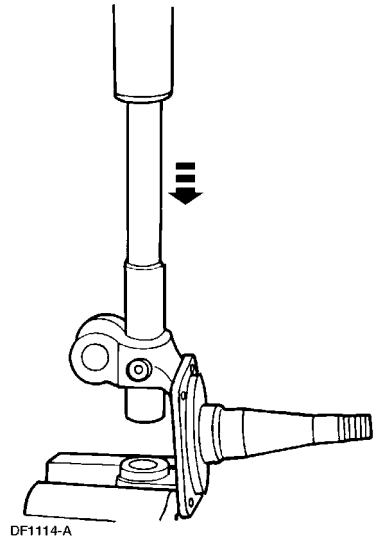
3. Remove the nuts, bolts, brackets and the front stabilizer bar.
   - To install, tighten to 90 Nm (66 Lbf-ft).



4. To install, reverse the removal procedure.

Spindle Bushing Removal

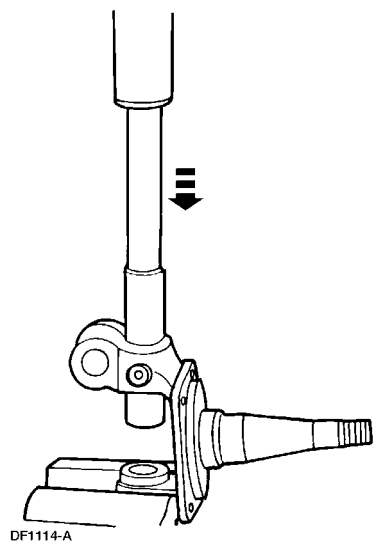
1. Remove the spindle. For additional information, refer to Wheel Spindle.
2. On a spindle with bronze or low friction (garlock) bushings, press the bushing out of the spindle with a tool that is slightly smaller then the spindle bore.



3. Clean the spindle bores thoroughly. Make sure lubricating holes are not plugged.

Spindle Bushing Installation

1. Position the new bushing in the spindle bore. For spindles with bronze bushings, position the lubricating hole in line with the lubricating fitting and the open end of the oil groove toward the axle. Press the bushing into the spindle with a driver that pilots in the bushing.



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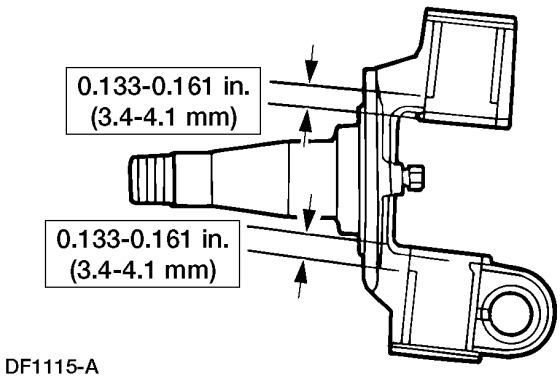
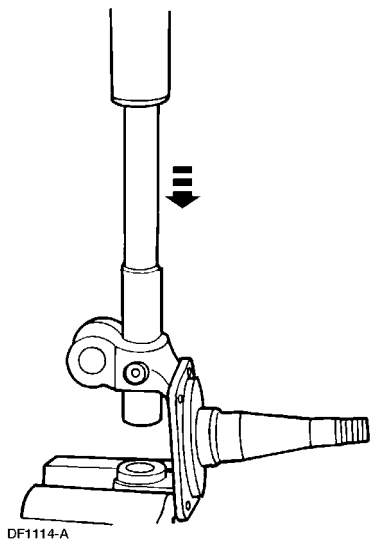
2. Press the bushing until there is 3.4-4.1 mm (0.133-0.161 inch) between the bottom of the bushing and the bottom of the top bore.



DF1115-A

3. Turn the spindle over and install the remaining bushing in the same manner.

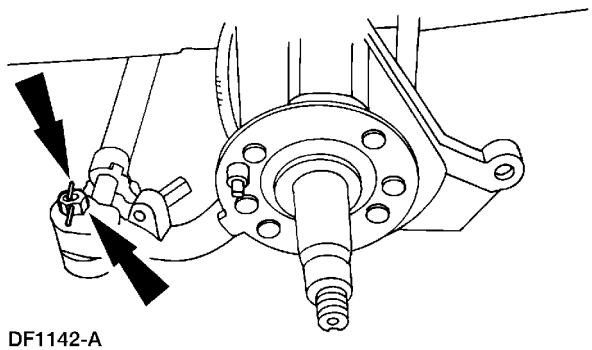

DF1114-A

4. Clean the bushing and coat the bushing and pin with lubricant prior to assembly.
5. Install the spindle. For additional information, refer to Wheel Spindle.

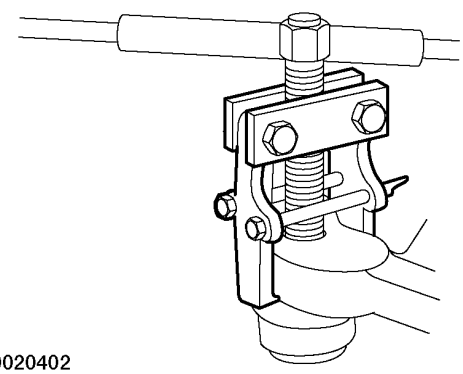
Wheel Spindle Removal

CAUTION: Suspension fasteners are critical parts because they affect performance of vital parts and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation becomes 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 front brake disc. For additional information, refer to Front Disc Brake in S04049.
2. Remove and discard the cotter pin and the tie-rod end castellated nut.


DF1142-A

3. Remove the tie-rod end.


N0020402

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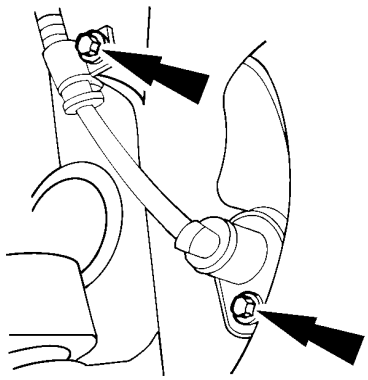
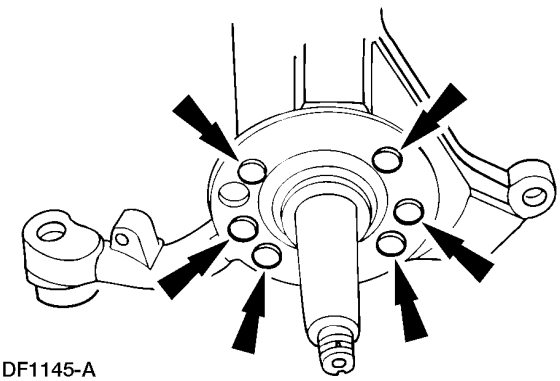
4. Remove the ABS sensor bolt, ABS sensor harness bolt and position the ABS sensor aside.



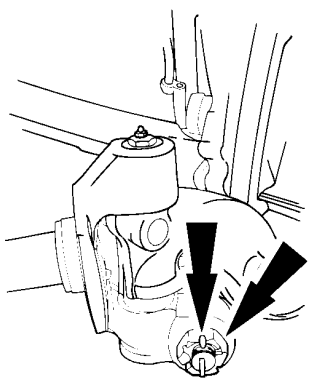
DF1144-A

5. Remove and discard the 6 spindle adapter plate nuts and bolts and the spindle adapter plate.



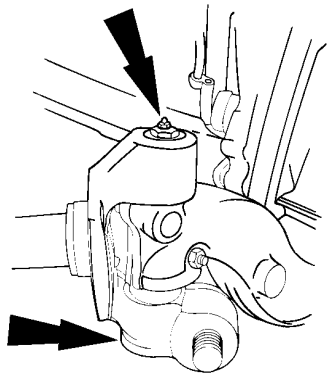
DF1145-A

6. Remove and discard the cotter pin and the spindle stearing arm castellated nut. Disconnect the spindle arm from the spindle.



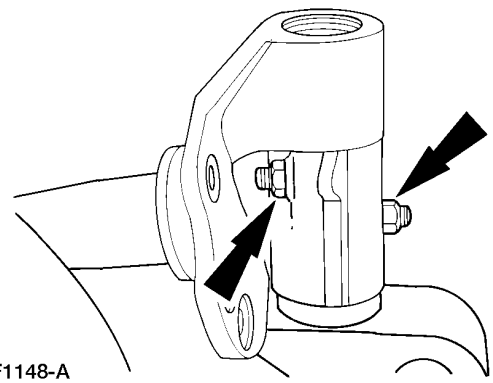
DF1146-A

7. Remove the upper and lower spindle caps and spindle seals.



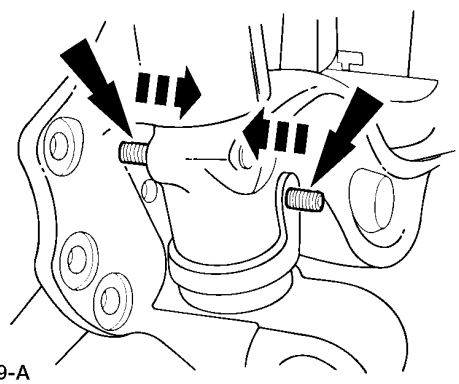
DF1147-A

8. Remove and discard the upper and lower spindle lock pin nuts.



DF1148-A

9. Using a bronze drift, drive out the spindle lock pins.



DF1149-A

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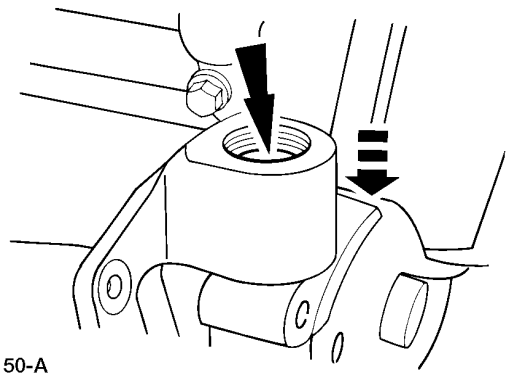
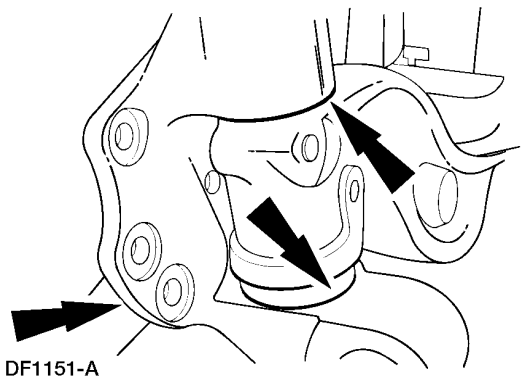
10. Using a bronze drift, drive out the spindle pin.



DF1150-A

11. Remove the spindle, spindle bearing and the spindle shim(s) from the axle assembly.



DF1151-A

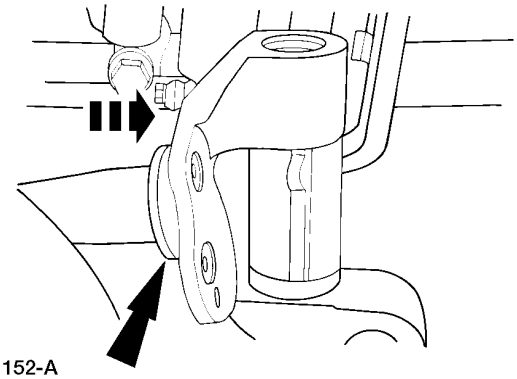
Wheel Spindle Installation

NOTE: Pack the spindle bearing and coat all mating surfaces of spindle and axle parts with grease prior to assembly.

NOTE: The spindle bearing must be installed with the retainer lip facing down.

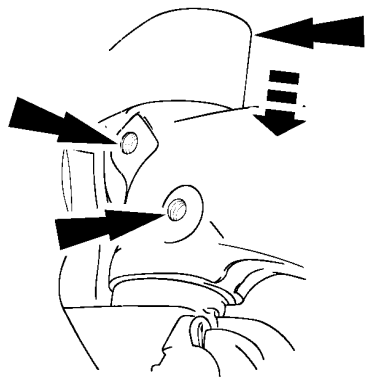
NOTE: Use shims as required to maintain a 0.076-0.254 mm (0.003-0.010-inch) axle-to-spindle clearance.

1. Position the spindle, spindle bearing and the spindle shim(s) on the front axle assembly.



DF1152-A

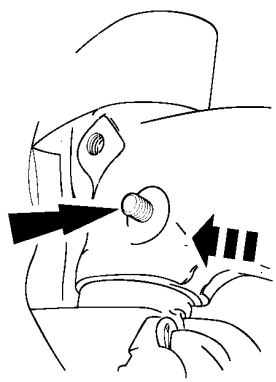
2. Insert the spindle pin into the axle until the notches in the spindle pin and the holes in the axle are in line.



DF1153-A

NOTE: Do not install both lock pins from the same side of axle.

3. Install the lower (longer) lock pin first and seat using a bronze drift.



DF1154-A

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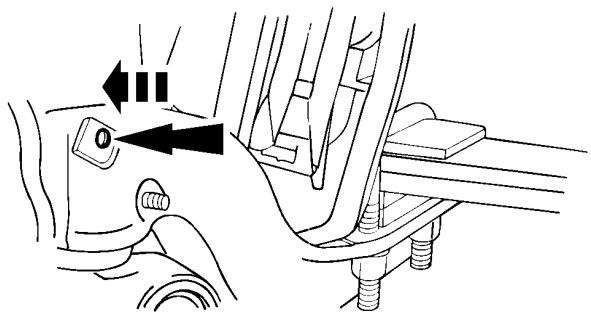
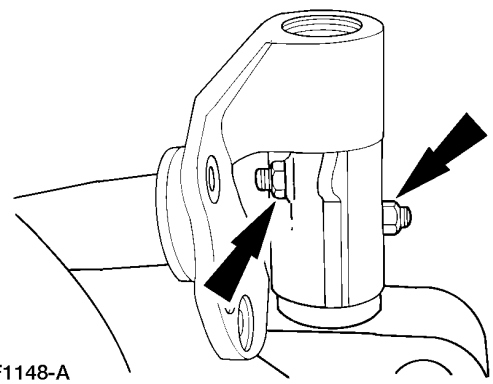
4. Install the upper (shorter) lock pin and seat using a bronze drift.



DF1155-A

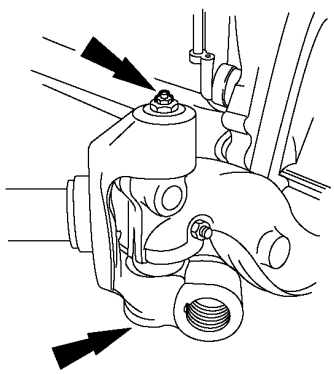
5. Install new spindle lock pin nuts.
   - Tighten to 81 Nm (60 Lbf-ft).



DF1148-A

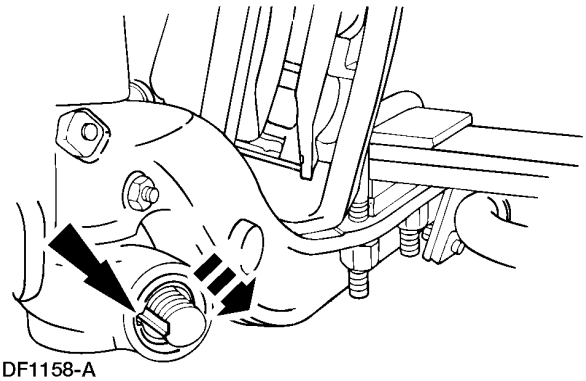
6. Install the upper and lower spindle seals and spindle pin caps.

   Tighten to 56 Nm (41 Lbf-ft).



N0020403

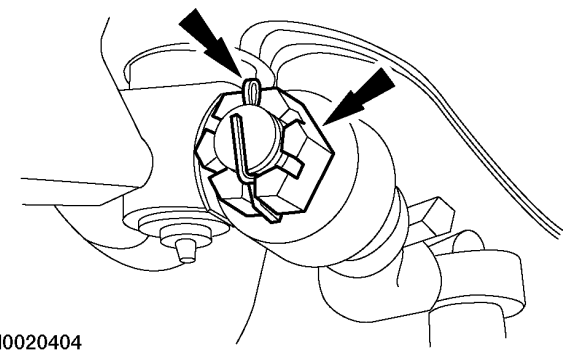
7. Align the key in the spindle arm with the key way slot in the spindle and insert the spindle arm.



DF1158-A

8. Install a new spindle steering arm castellated nut and a new cotter pin.

   Tighten to 575 Nm (424 Lbf-ft).



N0020404

9. Using new fasteners, install the spindle adapter plate.

   Tighten to 90 Nm (66 Lbf-ft).

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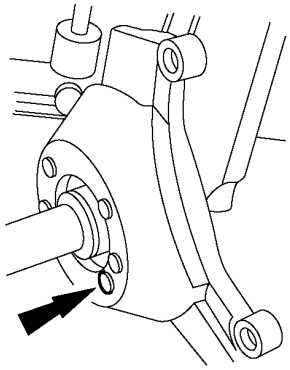
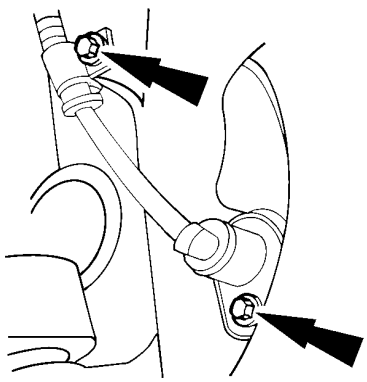


N0020405

10. Install the ABS sensor, ABS sensor bolt and the ABS sensor harness bolt.

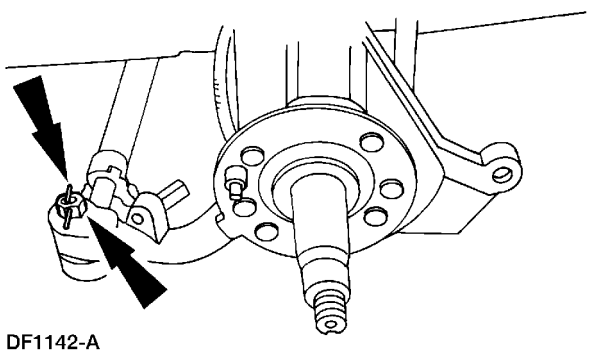
    Tighten to 11 Nm (8 Lbf-ft).



DF1144-A

11. Install the tie-rod end using a new tie-rod end castellated nut and a new cotter pin.

    Tighten to 89 Nm (66 Lbf-ft).



DF1142-A

12. Install the front brake disc. For additional information, refer to Front Disc Brake in S04049.
13. Check the front end alignment. For additional information, refer to Suspension System — General Information.

Shock Absorber Removal and Installation

WARNING: All vehicles are equipped with gas-pressurized shock absorbers which will extend unassisted. Do not apply heat or flame to the shock absorbers during removal or component servicing.

CAUTION: Suspension fasteners are critical parts because they affect performance of vital parts and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation becomes 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. Raise and support the vehicle. For additional information, refer to Jacking and Lifting in S10019.
2. Using a suitable jack, support the front axle assembly.
3. Remove the upper shock absorber nut, washers and bolt.

   • To install, tighten 353 Nm (260 Lbf-ft).

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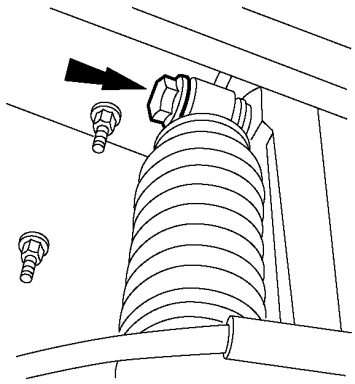
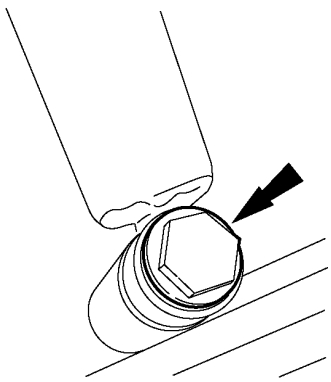

N0020406

4. Remove the lower shock absorber nut, washers and bolt.
   - To install, tighten to 353 Nm (260 Lbf-ft).


N0020407

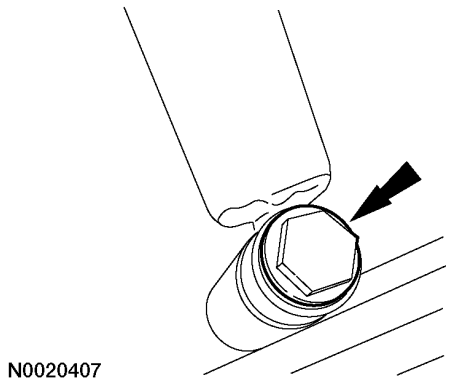
5. Remove the shock absorber.
6. To install, reverse the removal procedure.

Spring Removal and Installation

WARNING: All vehicles are equipped with gas-pressurized shock absorbers which will extend unassisted. Do not apply heat or flame to the shock absorbers during removal or component servicing.

CAUTION: Suspension fasteners are critical parts because they affect performance of vital parts and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation becomes 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 assembly. For additional information, refer to Wheels and Tires in S17002.
2. Using a suitable jack, support the front axle assembly.
3. Remove the lower shock absorber nut, washers and bolt.
   - To install, tighten 353 Nm (260 Lbf-ft).


N0020407

4. Remove the front spring hanger nut and bolt.
   - To install, tighten to 246 Nm (181 Lbf-ft).

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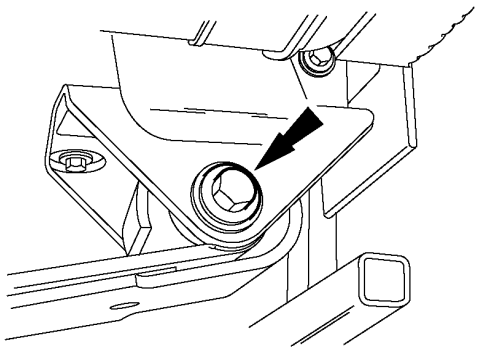
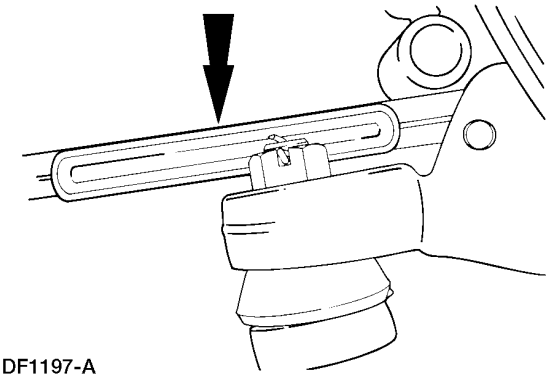
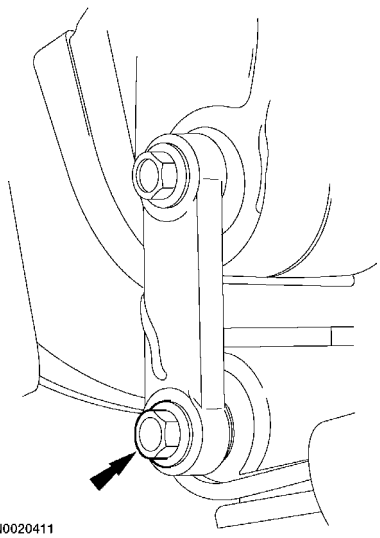

N0020410

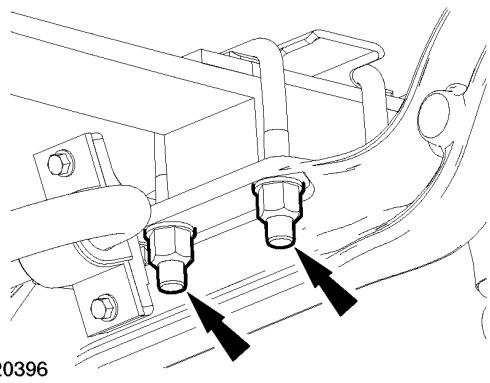

DF1197-A

5. Remove the front spring shackle nut and bolt.
   - To install, tighten to 125 Nm (92 Lbf-ft).


N0020411

6. If equipped, remove the spring insulator and retain for reuse.

7. Remove the 4 U-bolt nuts, washers and the 2 U-bolts.
   - To install, tighten to 380 Nm (280 Lbf-ft).


N0020396

8. Remove the spring.
9. To install, reverse the removal procedure.

Axle Removal and Installation

CAUTION: Suspension fasteners are critical parts because they affect performance of vital parts and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation becomes 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.

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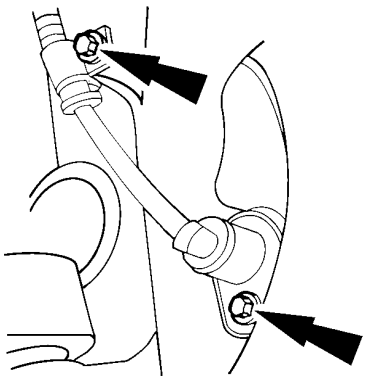
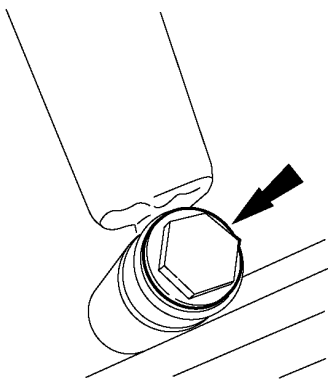
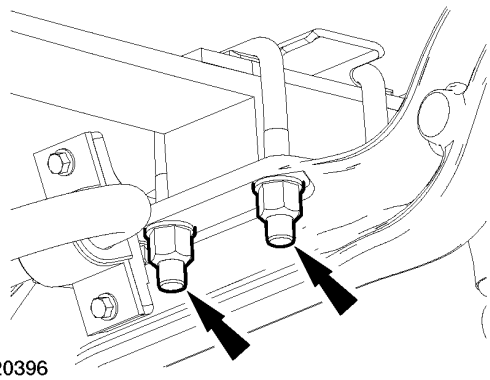
1. Remove the front brake disc. For additional information, refer to Front Disc Brake in S04049.
2. Remove the ABS sensor bolt and ABS sensor harness bolt and position aside.
   - To install, tighten to 11 Nm (8 Lbf-ft).


DF1144-A

3. Using a suitable jack equipped with safety chains, support the front axle.
4. Remove both of the lower shock absorber nut, washers and bolts.
   - To install, tighten to 353 Nm (260 Lbf-ft).


N0020407

5. Remove the spindles. For additional information, refer to Wheel Spindle Removal.
6. Remove the stabilizer bar and link. For additional information, refer to Stabilizer Bar and Link.
7. Remove the U-bolt nuts, the U-bolts and the upper spring spacer plates.
   - To install, tighten to 380 Nm (280 Lbf-ft).


N0020396

8. Lower the jack and remove the axle assembly.
9. To install, reverse the removal procedure.
10. Check and, if necessary, align the front end. For additional information, refer to Suspension System — General Information.

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Rear Suspension

Specifications

Table 7 Torque Specifications

Description	Nm	lbf-ft
U-bolt nut	380	280
Rear shackle bolt	250	184
Auxiliary spring nut	55	41
Front shackle nuts and bolts	122	90
Rear shackle nut	133	98
Shock absorber upper nut	350	258
Shock absorber lower nut	350	258
Rear shackle bolt	45	33
Spring pin mounting bolt	45	33
Spring pin mounting nut	45	33
Spring pin nut	133	98
Jounce bumper nut	19	14
Jounce bumper bolt	39	29

Description and Operation

Rear Suspension

WARNING: All vehicles are equipped with gas-pressurized shock absorbers which will extend unassisted. Do not apply heat or flame to the shock absorbers during removal or component servicing. Failure to follow these instructions can result in personal injury.

CAUTION: Suspension fasteners are critical parts because they affect performance of vital parts and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation becomes 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.

The rear suspension system is a leaf spring and shock type design and consists of the following components:

- Leaf springs
- Gas-pressurized shock absorbers

Diagnosis and Testing

Refer to Suspension System — General Information.

General Procedures

Wheel Bearing End Play

For additional information, refer to Suspension System — General Information.

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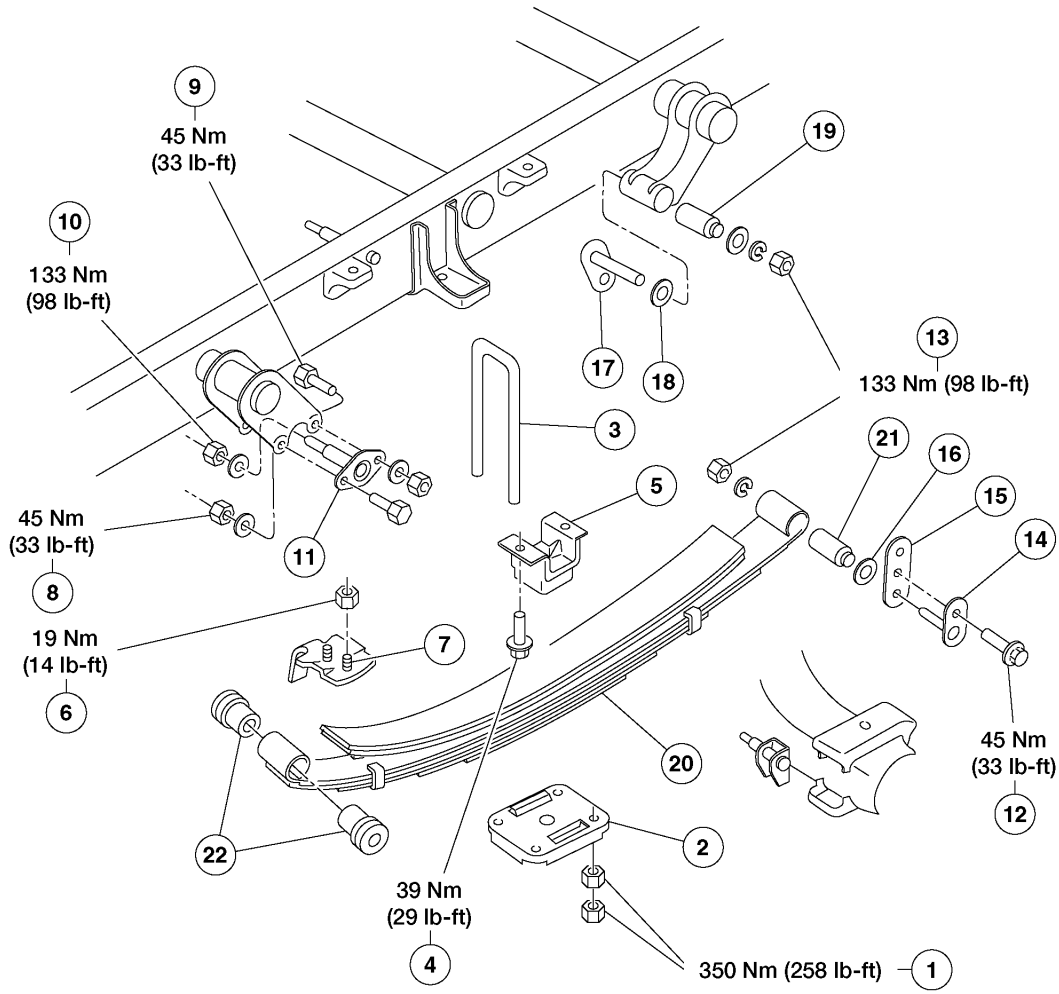
Removal and Installation

Rear Suspension



N0023723

Figure 77

1. U-bolt nut (8 required)
2. U-bolt plate (2 required)
3. U-bolt (4 required)
4. Jounce bumper bolt (4 required)
5. Jounce bumper (2 required)
6. Jounce bumper nut (4 required)
7. Jounce pad (2 required)
8. Spring pin mounting nut (4 required)
9. Spring pin mounting bolt (4 required)
10. Spring pin nut (2 required)
11. Spring pin (2 required)
12. Rear shackle bolt (2 required)
13. Rear shackle nut (2 required)
14. Rear shackle pin (2 required)
15. Rear shackle plate (2 required)
16. Thrust washer (2 required)
17. Rear shackle pin (2 required)
18. Thrust washer (2 required)
19. Shackle bushing (2 required)
20. Rear leaf spring assembly (2 required)
21. Shackle bushing (2 required)
22. Spring bushing (4 required)

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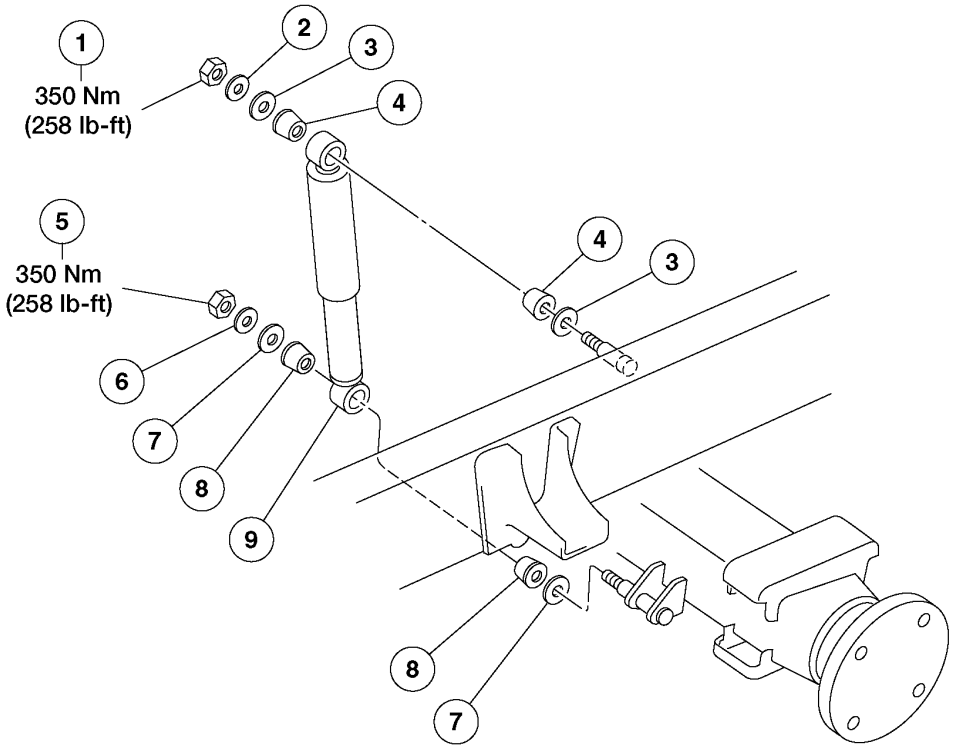

Figure 78

1. Shock absorber-to-frame mounted bracket nut (2 required)
2. Washer
3. Washer (2 required)
4. Bushing (2 required)
5. Shock absorber-to-axle bracket nut (2 required)
6. Washer
7. Washer (2 required)
8. Bushing (2 required)
9. Shock absorber (2 required)

1. For additional information, refer to the procedures in this section.

Wheel Hub

For additional information, refer to Wheel Hubs and Bearings in S14020.

Wheel Stud Removal

1. Raise and support the vehicle. For additional information, refer to Jacking and Lifting in S10019.
2. Remove the wheel and tire assembly. For additional information, refer to Wheels and Tires in S17002.
3. On vehicles equipped with dual rear wheels, go to Step 7.
4. Remove the disc brake caliper and rotor. For additional information, refer to Rear Disc Brake in S04049.
5. Remove the rear wheel hub assembly. For additional information, refer to Wheel Hubs and Bearings in S14020.
6. Using a suitable press, remove and discard the wheel stud.

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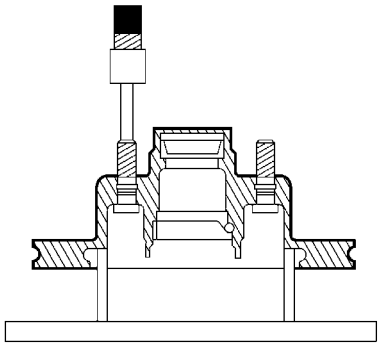
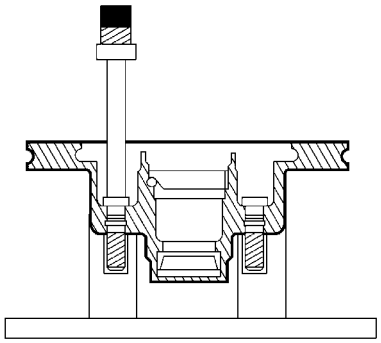
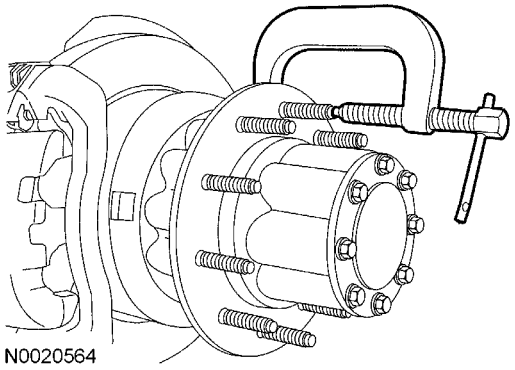

DF0594-A


DF0595-A

NOTE: For vehicles equipped with dual rear wheels, use the C-Frame and Screw to remove the wheel bolt on the vehicle.

7. Remove the wheel bolt from the wheel hub and discard.

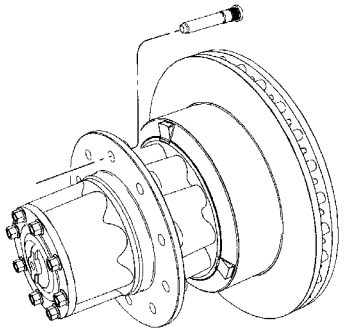

N0020564

Wheel Stud Installation

1. Using a suitable press, install the new wheel stud aligning the serrations in the wheel hub flange made by the original wheel stud.
2. On vehicles with dual rear wheels, install the new wheel stud aligning the serrations in the wheel hub flange made by the original wheel stud.

   • Place 4 flatwashers over the outside end of the wheel stud and thread a standard wheel nut with the flat side against the washers.

   • Tighten the wheel nut until the wheel stud head seats against the back side of the hub flange.


N0020775

3. Remove the wheel nut and flatwashers.

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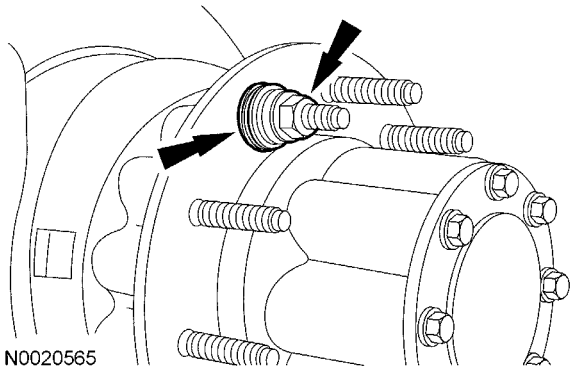

N0020565

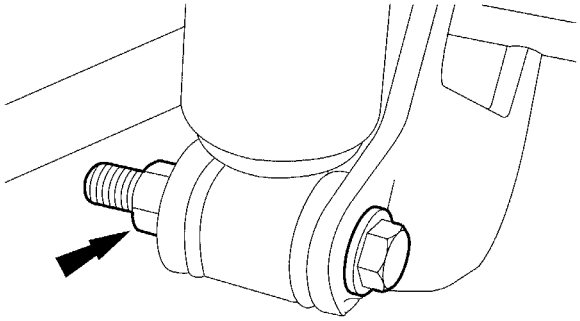
4. On vehicles with dual rear wheels, go to Step 7.
5. Install the rear wheel hub assembly. For additional information, refer to Rear Drive Axle/Differential in S14020.
6. Install the disc brake caliper and rotor. For additional information, refer to Rear Disc Brake in S04049.
7. Install the wheel and tire assembly. For additional information, refer to Wheels and Tires in S17002.
8. Lower the vehicle. For additional information, refer to Jacking and Lifting in S10019.

Shock Absorber Removal and Installation

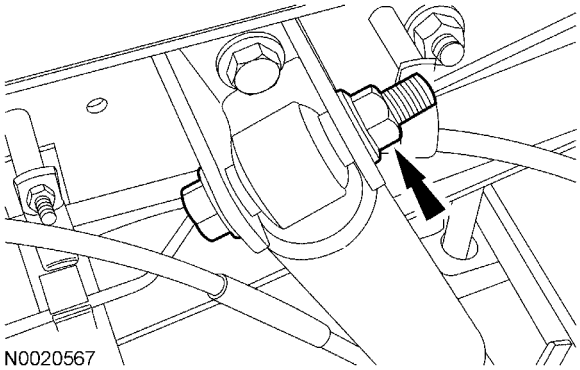
CAUTION: Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure can result in major service expense. Install new parts with the same part number or an equivalent part if installation is necessary. Do not use an installation part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

CAUTION: The low pressure gas shock absorbers are charged with nitrogen gas. Do not attempt to open, puncture or apply heat to shock absorbers.

1. Raise and support the vehicle. For additional information, refer to Jacking and Lifting in S10019.
2. Using a suitable jack, support the rear axle.
3. Remove the shock absorber lower nut and bolt.
   - To install, tighten to 350 Nm (258 Lbf-ft).


N0020568

4. Remove the shock absorber upper nut and bolt.
   - To install, tighten to 350 Nm (258 Lbf-ft).


N0020567

5. Remove the shock absorber.
6. To install, reverse the removal procedure.

Spring Removal and Installation

1. Remove the rear wheel and tires. For additional information, refer to Wheels and Tires in S17002.
2. Using 2 jack stands, support the vehicle at the frame.

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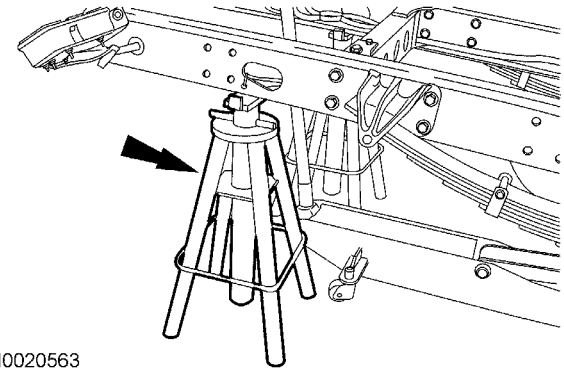
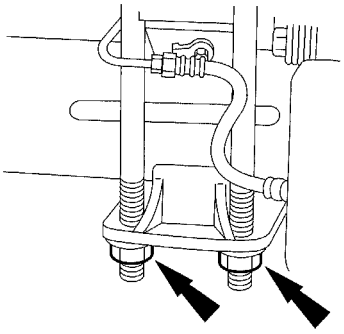


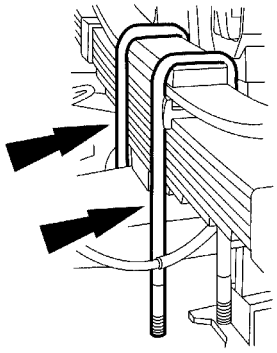
N0020563

3. Lower the rear axle to release the tension on the springs.
4. Remove the 4 U-bolt nuts and the U-bolt plate.
   - To install, tighten to 380 Nm (280 Lbf-ft).



N0020417

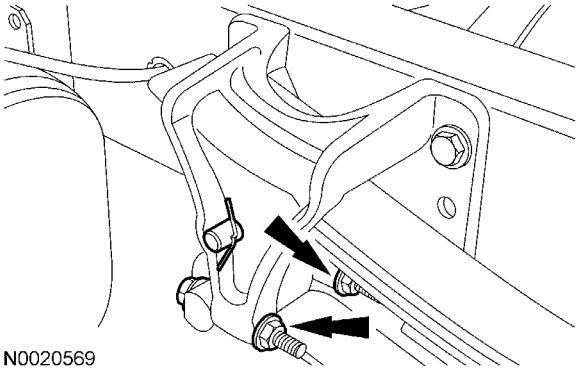
5. Remove the 2 U-bolts.



DF0961-A

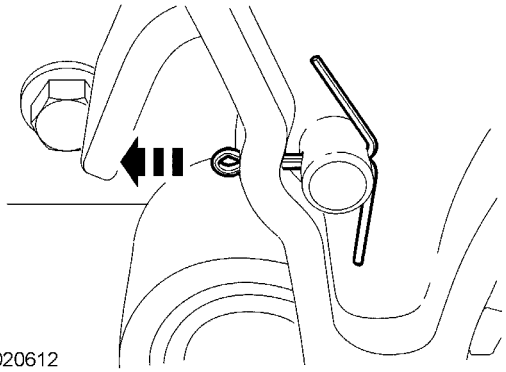
⚠ WARNING: The rear springs are under tension. Adjust the height of the rear axle to relieve the tension as necessary before removing any shackle bolts, nuts or spring pins.

6. Remove the 2 front shackle nuts and bolts.
   - To install, tighten to 122 Nm (90 Lbf-ft).



N0020569

7. Remove and discard the cotter pin, then remove the leaf spring front retaining pin.



N0020612

8. Remove and discard the cotter pin, then remove the leaf spring rear retaining pin.

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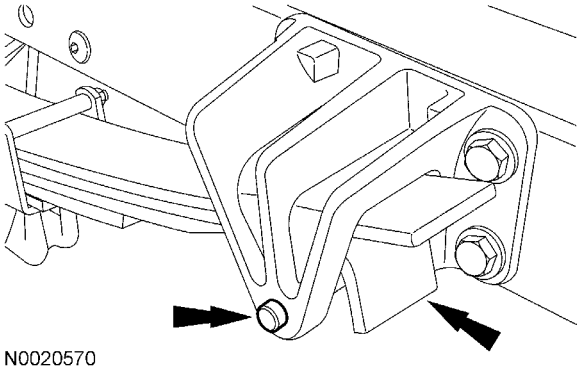
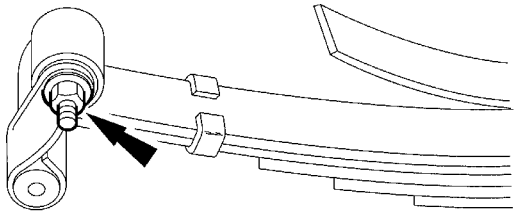
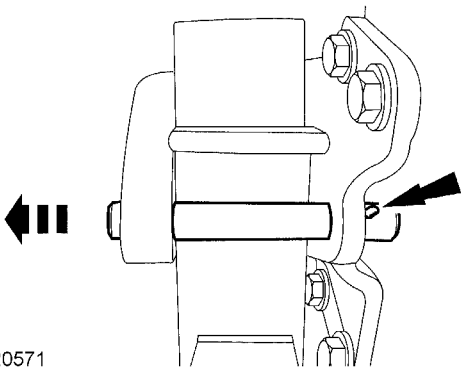


N0020570

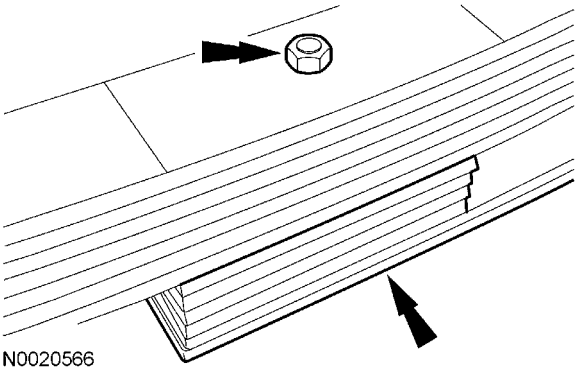


N0020420



N0020571

9. Remove the spring assembly.
10. Remove the rear spring shackle nut and bolt, then remove the rear spring shackle.
    - To install, tighten to 250 Nm (184 Lbf-ft).
11. Remove the auxiliary spring nut and separate the auxiliary spring from the primary spring.
    - To install, tighten to 55 Nm (41 Lbf-ft).



N0020566

12. To install, reverse the removal procedure.
    - Always install new cotter pins.

Read all safety instructions in the "Safety Information" section of this manual before doing any procedures.
Follow all warnings, cautions, and notes.
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