SERVICE MANUAL SECTION

CF 500, CF 600 Rear Axle

Truck Model: CF 500

Truck Model: CF 600

Unit Code: 14ACK

Unit Code: 14ACL

S14020

04/28/2005

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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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.

Rear Drive Axle/Differential — Dana S110

Specifications

Table 1 General Specifications

Item	Specification
Lubricant Fill Level Checks	
Rear axle lubricant	7.6 liters (8 quarts)[a]
Additive Friction Modifier XL-3 or equivalent	240 milliliters (4 fluid ounces)
Backlash Specifications	
Pinion bearing preload[b]	2.3-4.5 Nm (20-40 lb-in)
Differential ring gear to pinion backlash[c]	0.15-0.46 mm (0.006-0.018 inch)

[a] The lubricant capacity will vary depending upon the housing mounting angle. The capacity given is for an angle of 4 degrees. A lubricant level close enough to the bottom of the fill hole to be seen or touched is not sufficient. The lubricant must be level with the fill hole.

[b] Establish the pinion bearing preload prior to pinion seal installation.

[c] The acceptable backlash tolerance is ± 0.0508 mm (0.002 inch) from the backlash etched in the differential ring gear. The tooth contact pattern can move only by adjusting backlash. The tooth contact pattern can move only in the direction of heel-to-toe and toe-to-heel. Depth of the tooth contact pattern is not adjustable. Contact Spicer Service at 1-800-666-8688 for assistance if you are unable to establish an acceptable tooth contact pattern within the limits of backlash.

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Table 2 Torque Specifications

Description	Nm	lbf-ft
Carrier mounting bolts	203	150
Differential bearing cap bolts	190	140
Differential ring gear bolt	204	150
Fill plug	54	40
Pinion nut	1128	832
Lower shock absorber nuts	90	66
U-bolt nuts*	—	—
Anchor bolts	400	295
Anti-lock brake sensor bolt	27	20
U-joint retaining bolts	74	55
Parking brake cable anchors	25	18
Parking brake cable adjuster lock nut	18	13
* Refer to the procedure.		

Description and Operation

Rear Drive Axle and Differential

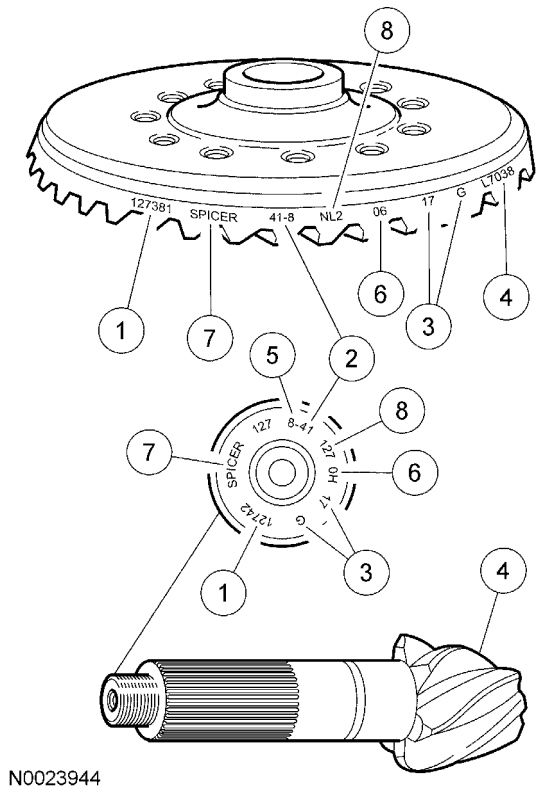

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Figure 1

1. Part number
2. Number of ring gear teeth
3. Manufacturing date
4. Matching gear set number
5. Number of pinion teeth
6. Date code
7. Genuine Dana Spicer parts
8. Heat code

1. The trademark shows the company logo, and identifies the location of the manufacturing facility.

CAUTION: Never mate a differential ring gear and pinion together that do not have the same matched set numbers. Always install a new matched set if discarding either the differential ring gear or the pinion.

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2. A corresponding number marked on the differential ring gear and pinion identifies them as a matched set.
3. The number of teeth on the pinion and the number of teeth on the differential ring gear result in gear ratio. A tooth combination of 41-11, for example, would indicate that the pinion has 11 teeth and the ring gear has 41 teeth that results in a 3.73:1 ratio.

NOTE: Unless noted, the procedures in this section apply to both the conventional differential and the Truetrac® differential, though most of the illustrations used in the procedures show the conventional differential.

The Model S110 rear axle features include the following:

- a hypoid design differential ring gear and pinion.
- a 2-bearing overhung pinion mounting.
- full-floating axle shafts.
- a steel differential housing.
- a front mounted removable 1-piece carrier housing.
- a conventional differential assembly or a Truetrac® limited-slip differential assembly.

Rear Drive Axle and Differential Diagnosis and Testing

Refer to Driveline System in S10019.

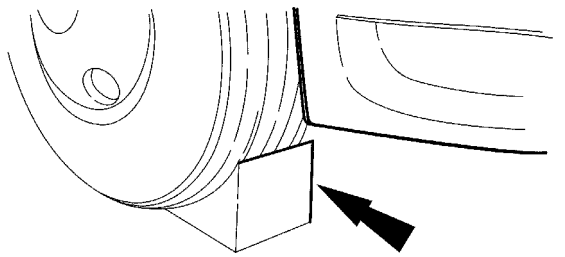
In-Vehicle Repair

Differential Carrier Removal

WARNING: Do not use heat when disassembling a drive axle. To do so will destroy heat treat properties and weaken or distort axle components. Failure to follow these instructions may result in personal injury.

CAUTION: Steam clean the axle prior to removal from the vehicle. Dirt is abrasive and will cause premature wear of otherwise usable components.

1. Steam clean the axle assembly.
2. Set the parking brake.
3. Chock the wheels.



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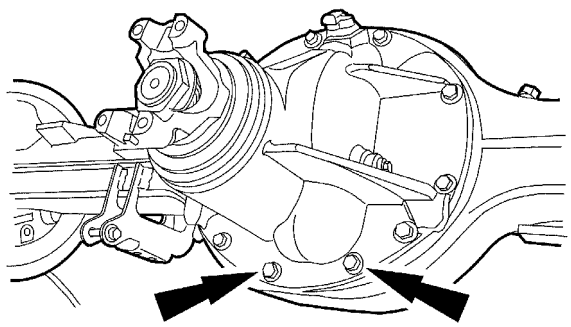
4. Drain the axle lubricant into a suitable container.
   - Remove the bottom 2 carrier bolts and drain the assembly.



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5. Disconnect the rear anti-lock brake sensor electrical connector, if equipped.

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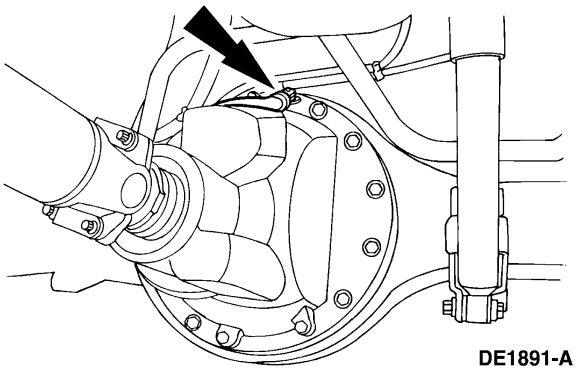
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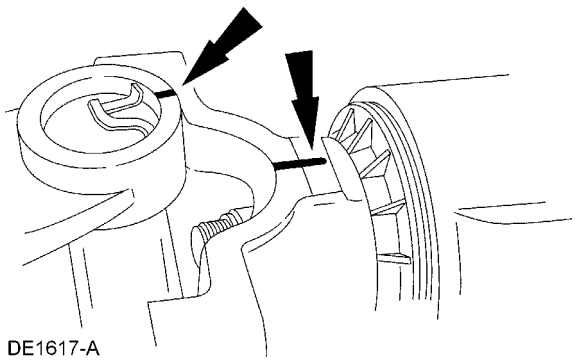
6. Index-mark the driveshaft so it can be reinstalled in its original position to maintain driveline balance.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7. Disconnect the driveshaft at the axle.

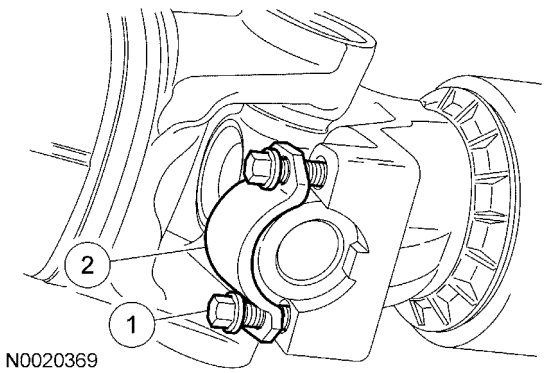

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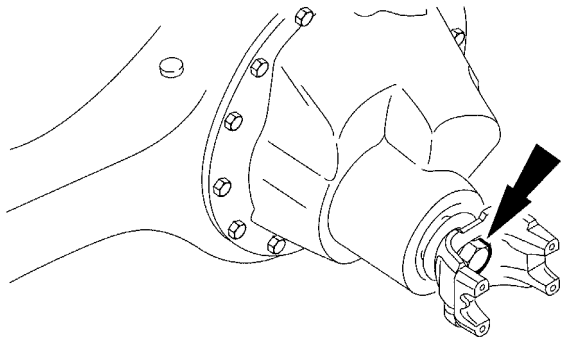
Figure 6

1. Remove and discard the U-joint retaining bolts.
2. Remove and discard the U-joint retaining straps.
   a. Using mechanic's wire, position aside and support the driveshaft.

8. Loosen the pinion nut if drive pinion disassembly is necessary.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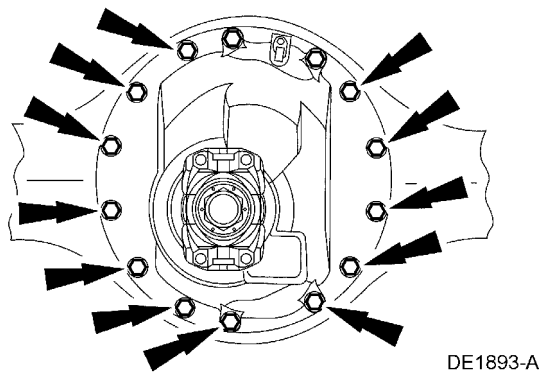
9. Remove the axle shafts. For additional information, refer to Wheel Hubs and Bearings(Wheel Hubs and Bearings — Full Floating Axle — Dana, page 29).
10. Remove all but the 2 top carrier-to-axle housing retaining bolts, noting the length and position of each bolt.
    • Discard the differential carrier housing bolts.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WARNING: Secure the differential carrier to the jack to prevent it from falling when removing it from the axle housing. Failure to follow these instructions may result in personal injury.

11. Remove the differential carrier from the axle housing.

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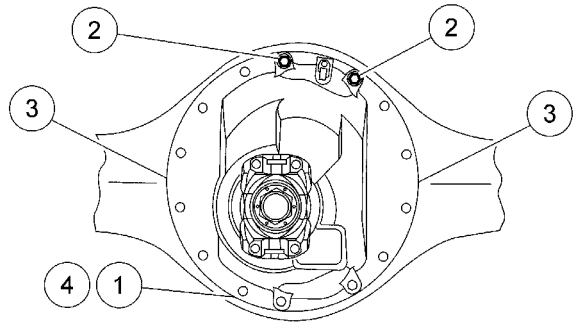

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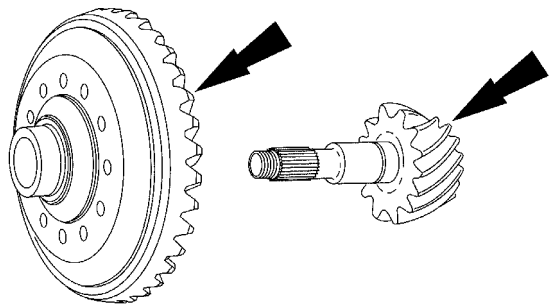

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Figure 9

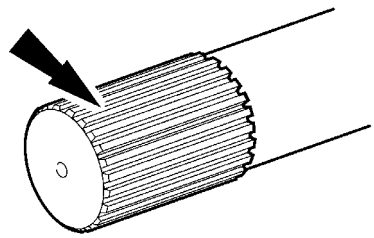
1. Position a suitable jack under the differential carrier.
2. Remove and discard the remaining retaining bolts.
3. Use the slots to separate the differential carrier approximately 25.4-50.8 mm (1-2 inches) from the axle housing.
4. Secure the differential carrier to a suitable jack, and remove the differential carrier from the axle housing.

CAUTION: Alkaline cleaning solutions will damage machine surfaces. Use only emulsion cleaners or petroleum-based cleaning solvent.

CAUTION: Use only soft, clean, lintless towels to dry the components.

CAUTION: After drying, lightly coat the components with rust inhibitor or clean lubricant to prevent damage from corrosion. Wrap all components that are going to be in storage for a prolonged period in wax paper.

12. Clean and dry the components as necessary.
13. Inspect the gear set for pitting, scoring, wear and damage.
14. Inspect the splines for wear, cracking and distortion from twisting.



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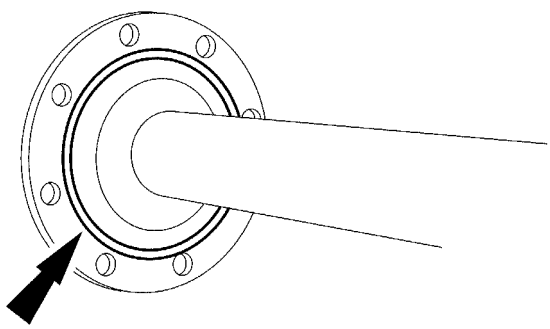
15. Inspect the axle flange O-ring.



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16. Clean the axle housing interior, the axle and differential carrier housing sealing surfaces and the differential carrier mounting bolt hole threads. Inspect the housing for stripped and damaged threads and bending fatigue.

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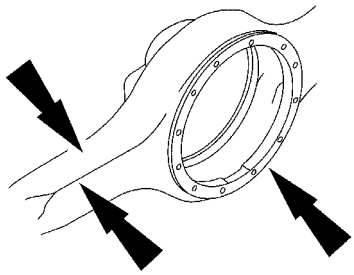

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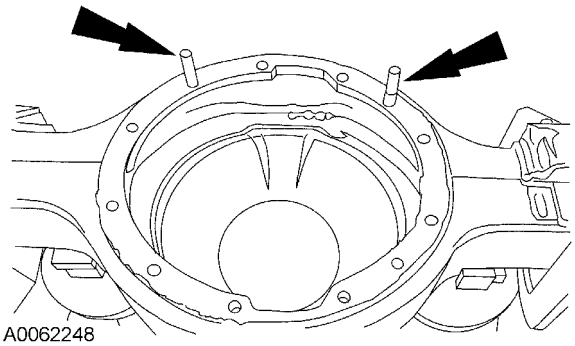

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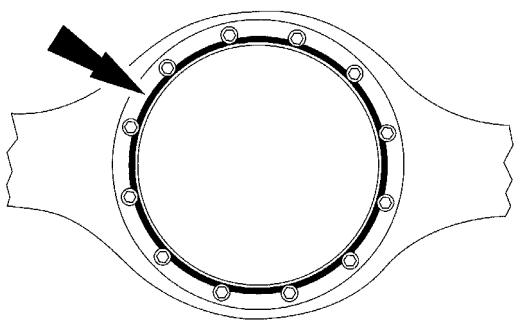
Differential Carrier Installation

CAUTION: The gasket material must cure for one hour before filling the axle with lubricant.

1. Apply a continuous bead of Gasket Maker onto the axle housing mounting flange and around each bolt hole.
   - Use Gasket Maker or equivalent.

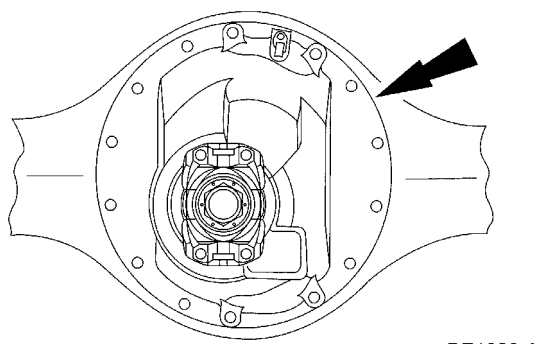


DE1898-A

2. Thread 2 studs into the axle housing. This will eliminate rotation of the differential carrier assembly after it makes contact with the gasket material.

WARNING: Secure the differential carrier to the jack to prevent it from falling. Failure to follow these instructions may result in personal injury.

3. Position the differential carrier into the axle housing, using the 2 studs to align the differential carrier and housing.



DE1900-A

CAUTION: Make sure the bolt threads are clean.

4. Install new differential carrier housing bolts.
   - Remove the 2 alignment studs only after installing several of the bolts.
   - Tighten the bolts in a cross pattern.
   - Tighten to 203 Nm (150 lb-ft).

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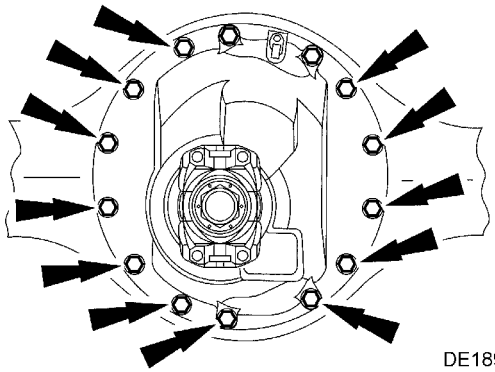
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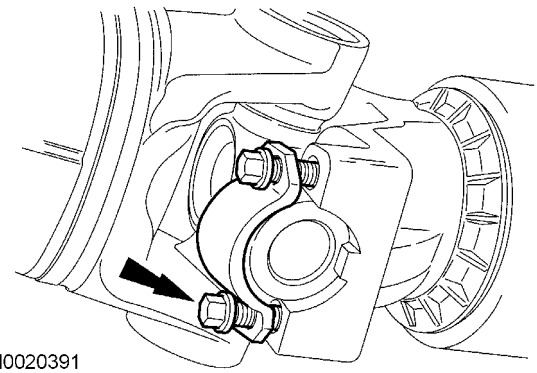
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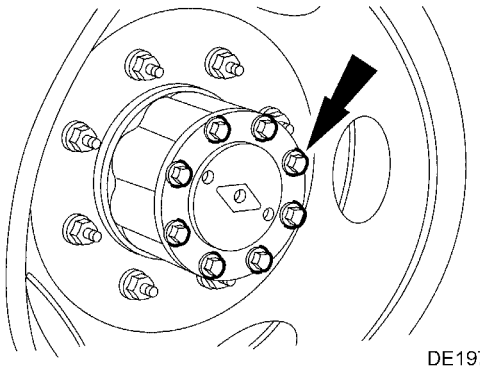
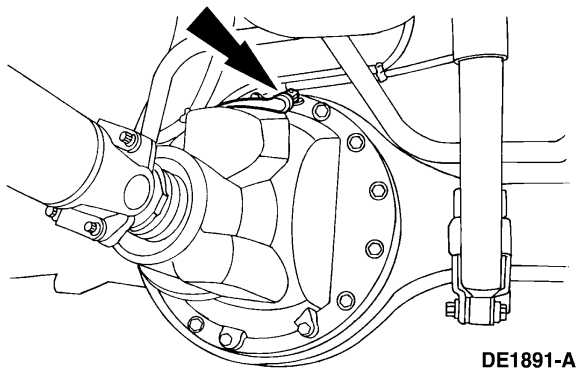
5. Install the axle shafts. For additional information, refer to Wheel Hubs and Bearings(Wheel Hubs and Bearings — Full Floating Axle — Dana, page 29).


DE1976-A

NOTE: Align the index marks made during removal.

6. Connect the driveshaft at the axle.
   - Install new U-joint retaining straps and new U-joint retaining bolts.
   - Tighten to 74 Nm (55 lb-ft).

7. Connect the rear anti-lock brake sensor electrical connector, if equipped.


DE1891-A

8. Remove the fill plug.

CAUTION: A lubricant level close enough to the bottom of the fill hole to be seen or touched is not sufficient. The lubricant must be level with the fill hole.

9. Fill the axle with lubricant until the lubricant is level with the fill hole.
   - Use SAE 75W-140 High Performance Rear Axle Lubricant or equivalent.
10. Clean and install the fill plug.
    - Tighten to 54 Nm (40 lb-ft).
11. Remove the wheel chocks.

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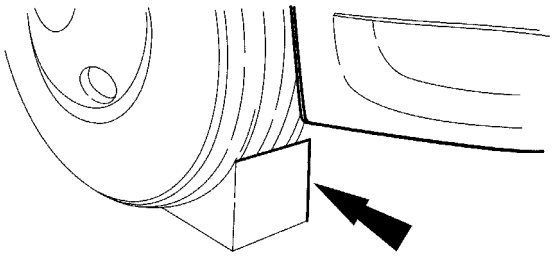

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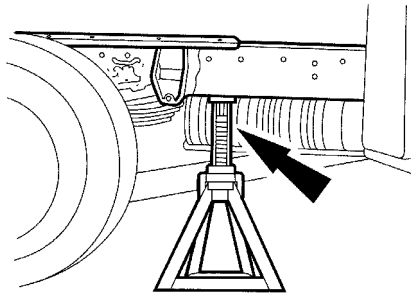

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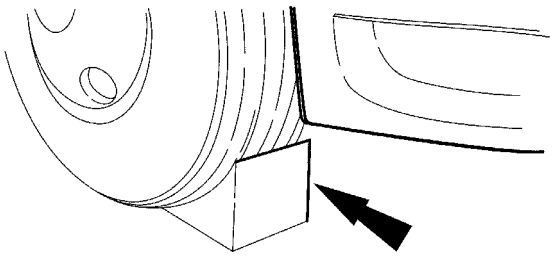
12. Release the parking brake.

Removal and Installation

Axle Assembly Removal

1. Set the parking brake.
2. Chock the front wheels.



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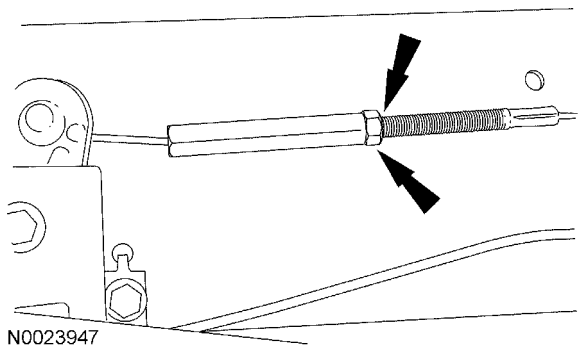
3. Raise and support the rear of the vehicle high enough so that it will clear the axle assembly when removing it.
4. Remove the rear wheels.
5. Loosen the lock nut and index mark the parking brake cable adjuster.



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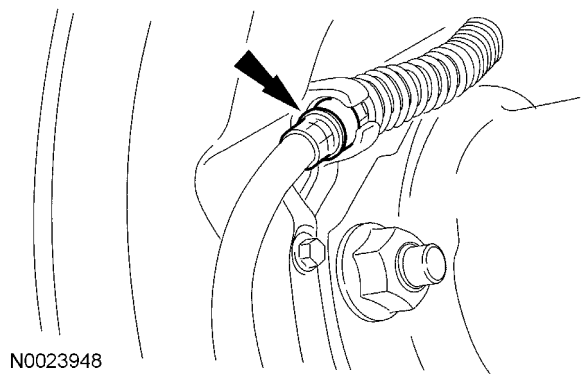
6. Release the parking brake cable tension and disconnect the cables from the wheel ends.



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7. Remove the parking brake cable anchor and position the parking brake cables aside.

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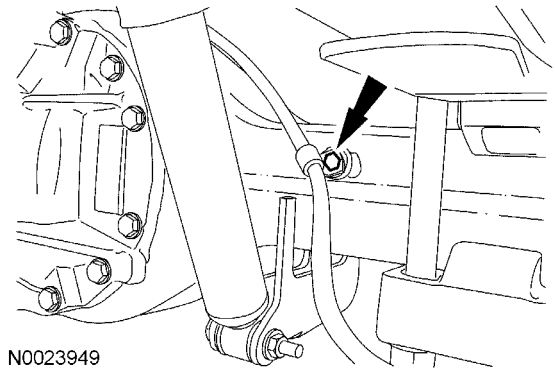
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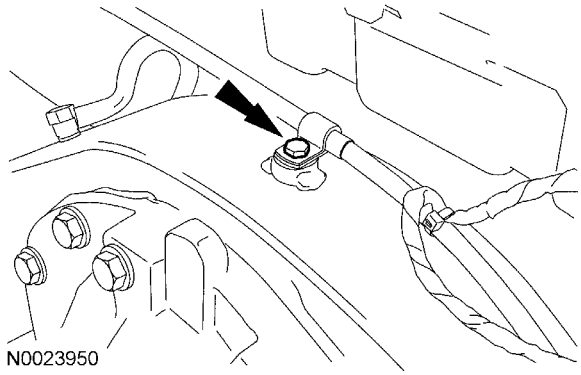
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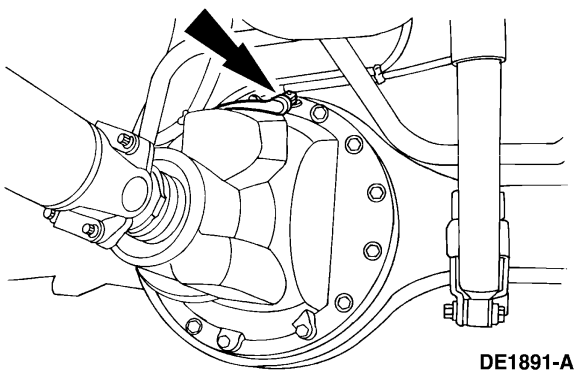
8. Disconnect the rear anti-lock brake sensor electrical connector. Release the harness clips and position the harness aside.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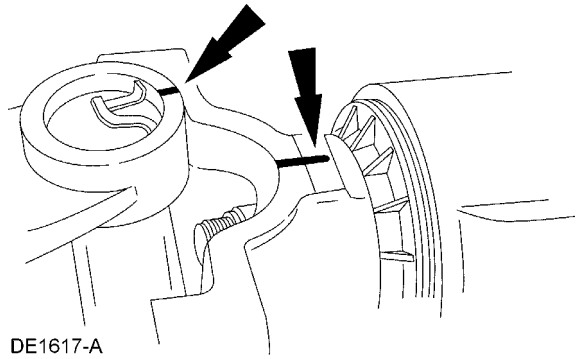
9. Index-mark the driveshaft so it can be reinstalled in its original position to maintain driveline balance.


DE1617-A

10. Disconnect the driveshaft at the axle.

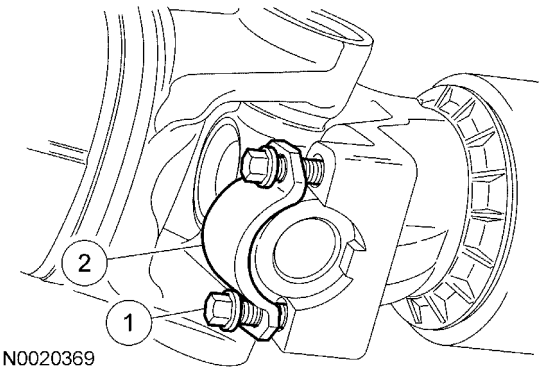


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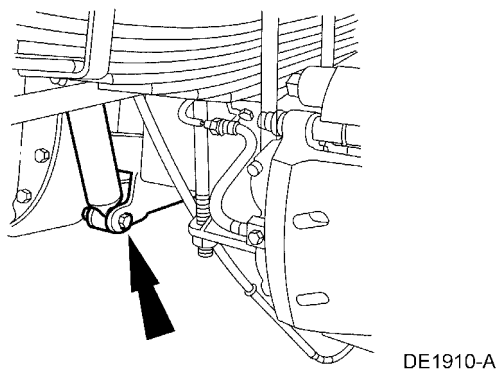
Figure 30

1. Remove and discard the U-joint retaining bolts.
2. Remove and discard the U-joint retaining straps.
   a. Using mechanic's wire, position aside and support the driveshaft.

11. Disconnect the shock absorbers at the axle.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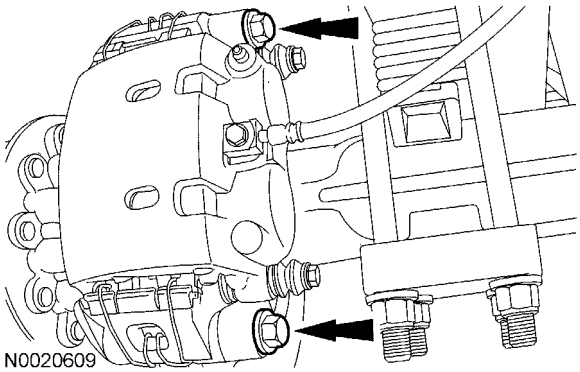
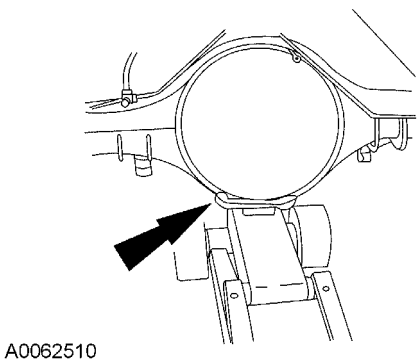
12. Disconnect the disc brake caliper and the anchor as an assembly.

    • Using mechanic's wire, support the disc brake caliper and anchor assembly.

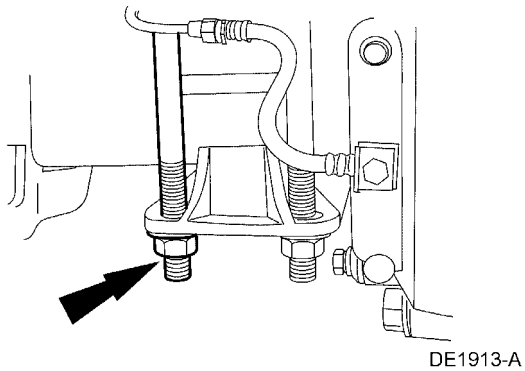

N0020609

13. Support the axle with a suitable floor jack.


A0062510

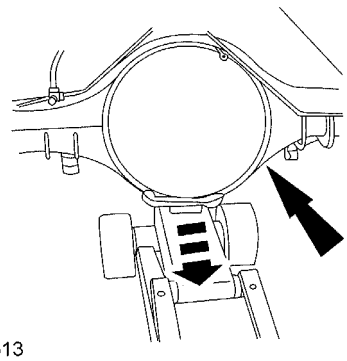
NOTE: Mark the front of each spring seat cap for correct orientation during installation.

14. Remove the U-bolt nuts, the spring seat caps and the U-bolts.


DE1913-A

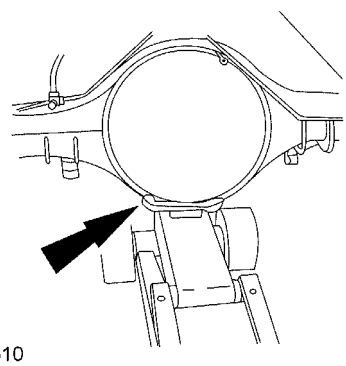
⚠ WARNING: Watch for obstructions while lowering and removing the axle.

15. Carefully lower the axle and remove it.


A0062513

Axle Assembly Installation

1. Using a suitable floor jack, position the axle.


A0062510

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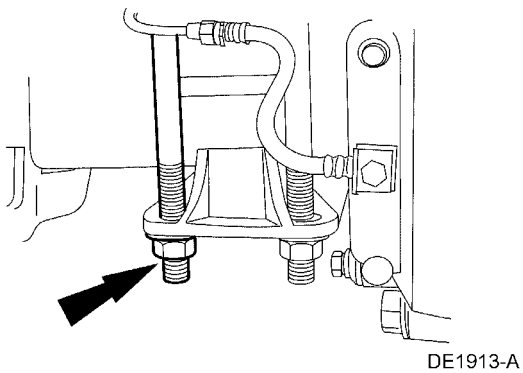
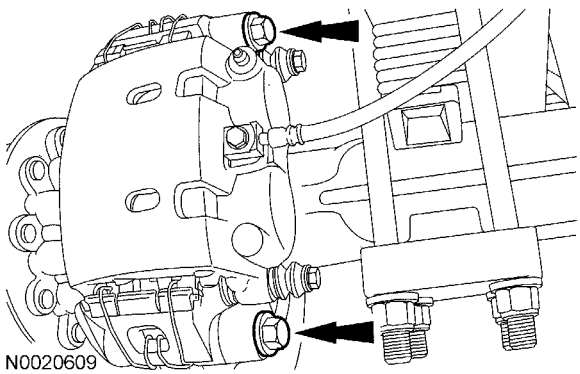
NOTE: Tighten the U-bolt nuts alternately and evenly.

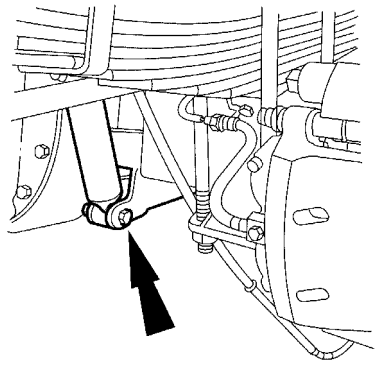
2. Align the index marks made during removal and install the spring seat caps, U-bolts and U-bolt nuts.
   - Tighten the U-bolt nuts evenly in a cross-type pattern in 4 stages:
     — Stage 1: Tighten to 100 Nm (74 lb-ft).
     — Stage 2: Tighten to 200 Nm (148 lb-ft).
     — Stage 3: Tighten to 300 Nm (222 lb-ft).
     — Stage 4: Tighten to 400 Nm (295 lb-ft).


DE1913-A

3. Install the disc brake caliper and anchor assembly.
   • Tighten to 400 Nm (295 lb-ft).

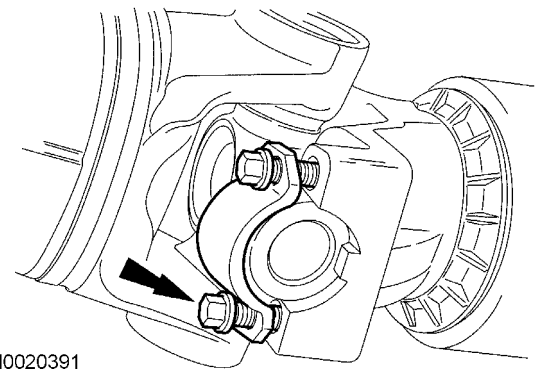

N0020609

4. Connect the shock absorbers at the axle.
   • Tighten to 90 Nm (66 lb-ft).

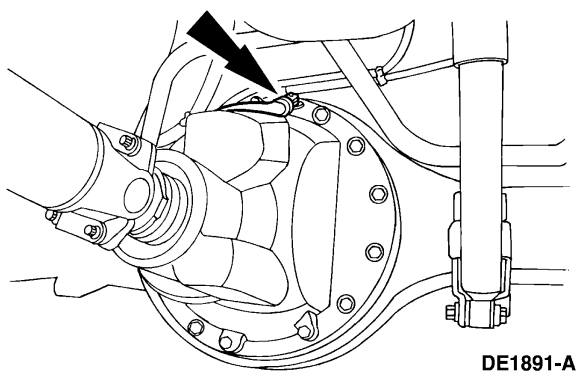

DE1910-A

NOTE: Align the index marks made during removal.

5. Connect the driveshaft at the axle.
   - Install new U-joint retaining straps and new U-joint retaining bolts.
   - Tighten to 74 Nm (55 lb-ft).


N0020391

6. Connect the rear anti-lock brake sensor electrical connector and harness clips.


DE1891-A

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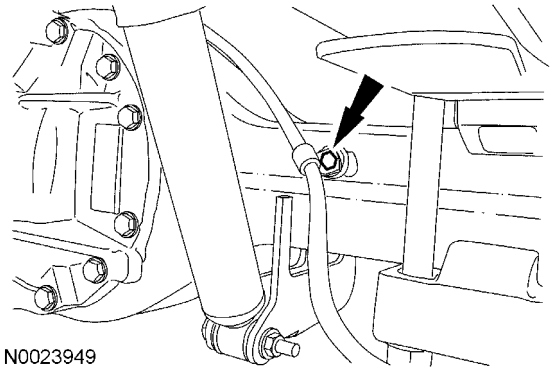
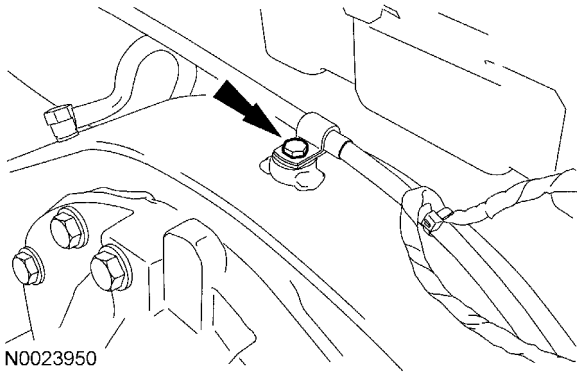
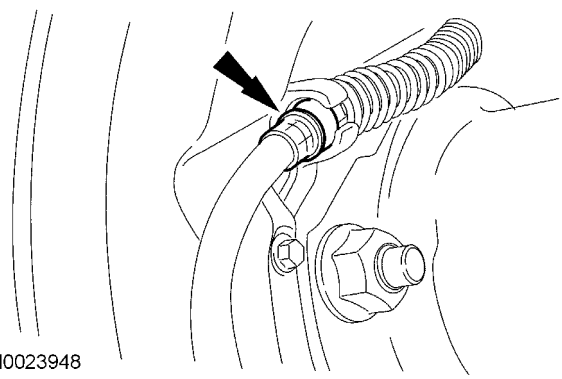
7. Position back the parking brake cables and install the parking brake cable anchors.
   - Tighten to 25 Nm (18 lb-ft).


N0023949

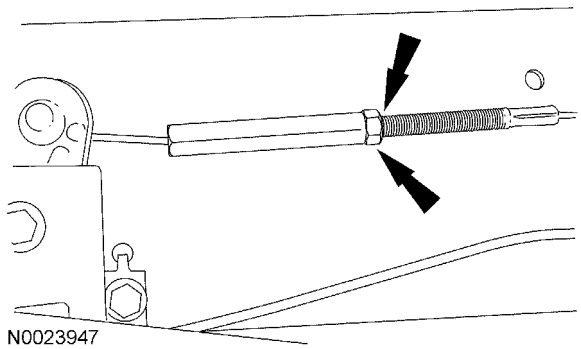

N0023950

8. Connect the parking brake cables to the wheel ends.


N0023948

NOTE: Align the index marks made during removal.

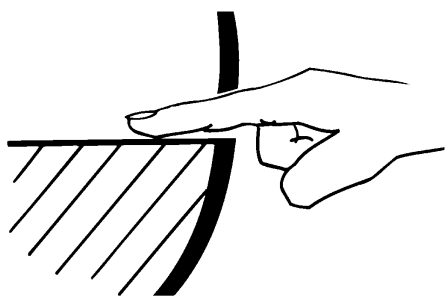
9. Install the parking brake cable adjuster and tighten the lock nut.
   - Tighten to 18 Nm (13 lb-ft).


N0023947

10. Remove the fill plug.

CAUTION: A lubricant level close enough to the bottom of the fill hole to be seen or touched is not sufficient. The lubricant must be level with the fill hole.

11. Fill the axle until the lubricant is level with the fill hole.
    - Use SAE 75W-140 High Performance Rear Axle Lubricant or equivalent.


DE1903-A

12. Install the fill plug.
    - Tighten to 54 Nm (40 lb-ft).
13. Install the rear wheels. For additional information, refer to Wheels and Tires in S17002.

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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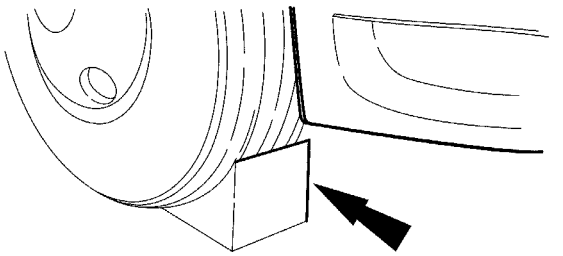
14. Remove the wheel chocks.



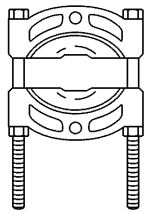
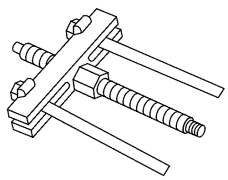
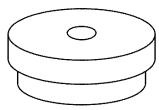
DE1889-A

15. Release the parking brake.

Disassembly and Assembly

Differential Case and Ring Gear — Disassembly

Table 3 Special Tools

 ST1368-A	Puller, Bearing
 ST1516-A	Remover/Installer, Front Wheel Hub
 ST1369-A	Step Plate ZTSE4727

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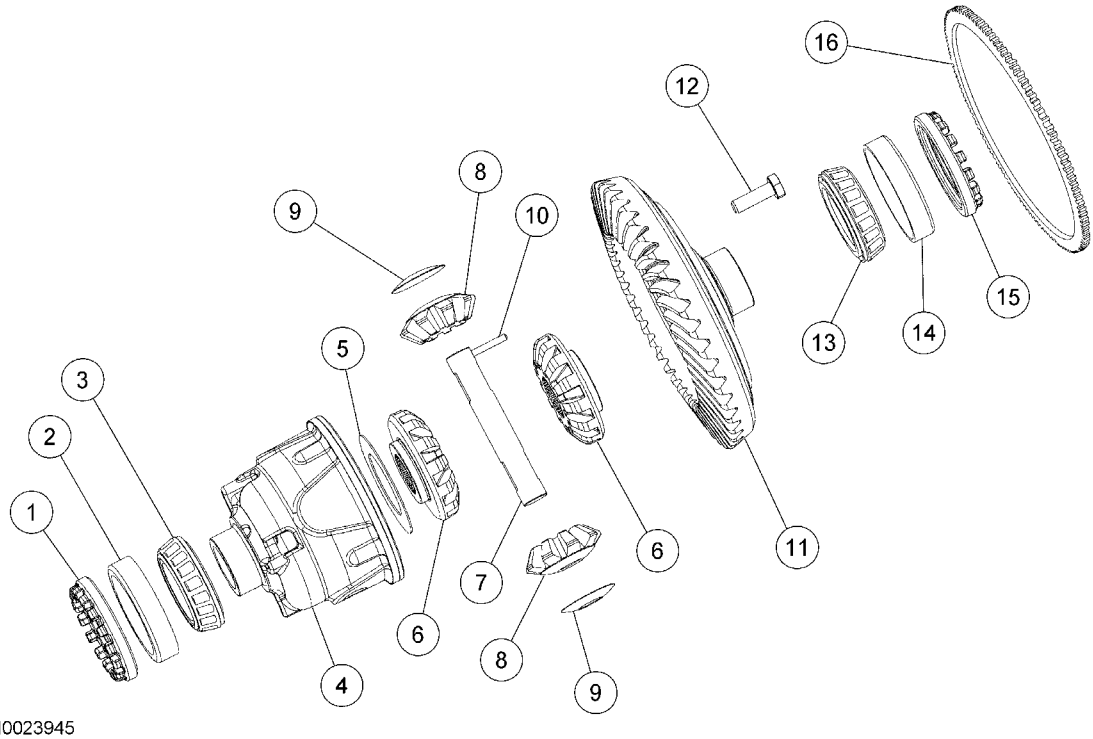
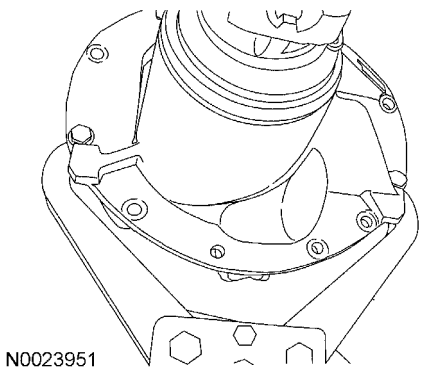


Figure 48 Dana Model S110 Wheel Differential Assembly, Disassembled View

1. Differential bearing adjusting ring
2. Differential side bearing cup
3. Differential side bearing cone
4. Differential case (conventional differential)
5. Differential side gear thrust washer
6. Differential side gear (conventional differential)
7. Differential pinion shaft
8. Differential pinion gear
9. Differential pinion thrust washer
10. Differential pinion shaft pin (conventional differential)
11. Differential ring gear
12. Differential ring gear bolt
13. Differential side bearing cone
14. Differential side bearing cup
15. Differential bearing adjusting ring
16. Anti-lock speed sensor ring

1. Mount the carrier housing in a suitable repair stand.



CAUTION: If reusing the differential ring gear and pinion, measure and record the backlash before disassembly. Assembling the differential ring gear and pinion to the recorded backlash will match the established wear patterns. Hand-rolled patterns will cover less area than the established patterns.

2. Measure and record the differential ring gear and pinion backlash.
   - Check the backlash in 4 equally spaced positions around the differential ring gear.

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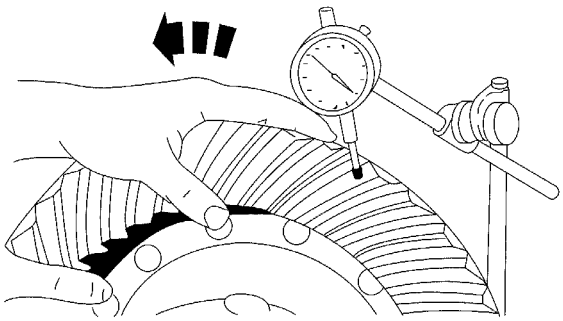
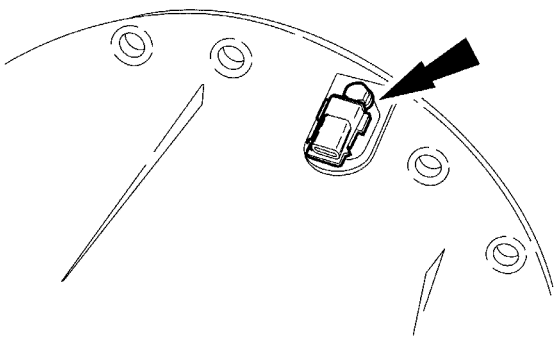
- The tooth contact pattern can move only by adjusting backlash. The tooth contact pattern can move only in the direction of heel-to-toe and toe-to-heel. Depth of the tooth contact pattern is not adjustable. Contact Spicer Service at 1-800-666-8688 for assistance if you are unable to establish an acceptable tooth contact pattern within the limits of backlash.



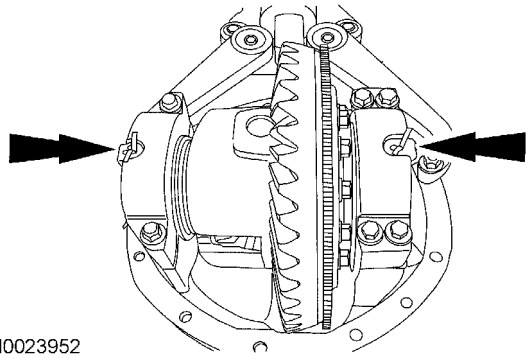
DE1916-A

3. Remove the rear anti-lock brake sensor.



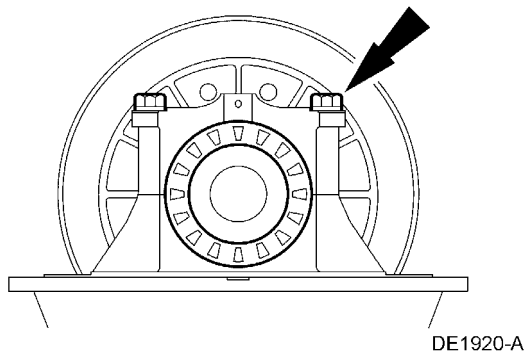
DE1917-A

4. Remove the adjusting ring cotter pins.



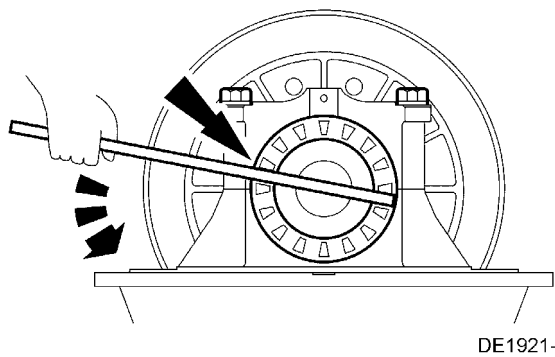
N0023952

5. Loosen, but do not remove, the 6 differential bearing cap bolts.



DE1920-A

6. Relieve the bearing preload.
   - Loosen each differential bearing adjusting ring.



DE1921-A

7. Remove the differential bearing cap bolts, differential bearing caps and adjusting rings.

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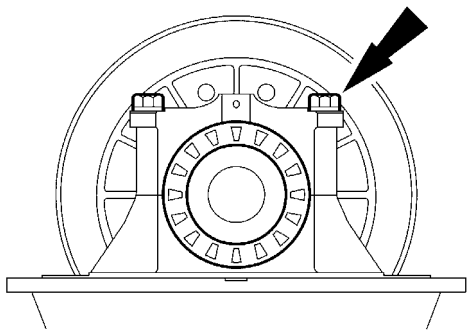
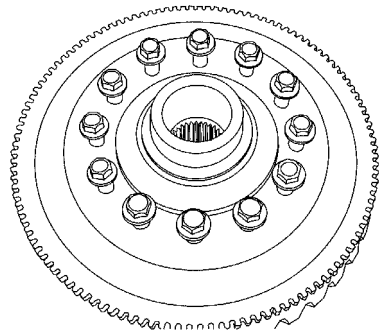
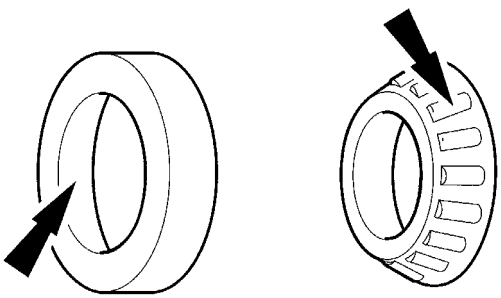


DE1920-A



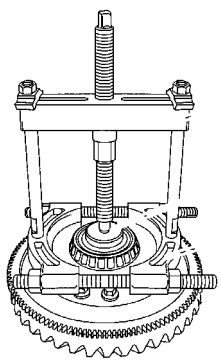
A0062219

8. Carefully lift the differential subassembly out of the carrier.
9. Inspect the differential side bearing surfaces for pitting, wear and overheating.



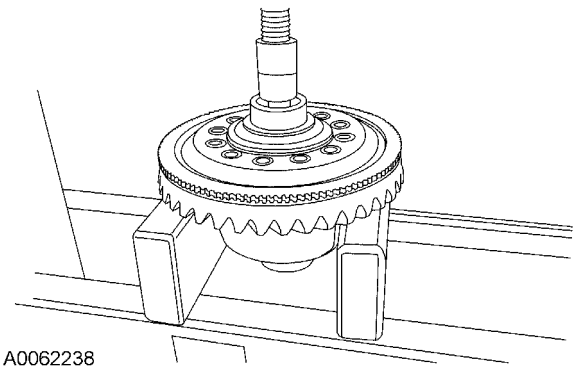
DE1929-A

10. Using the special tools, remove the differential side bearings if worn or damaged.



N0024108

11. Remove the 12 differential ring gear bolts.
12. Place the differential assembly in a suitable press supported on the differential ring gear.



A0062238

WARNING: The differential case will fall after separation. Support the case so it will not result in damage to the component or equipment. Failure to follow these instructions can result in personal injury.

CAUTION: It should not require more than 3 tons of press load to separate the ring gear from the differential case.

CAUTION: Do not bend the differential pinion cross shaft.

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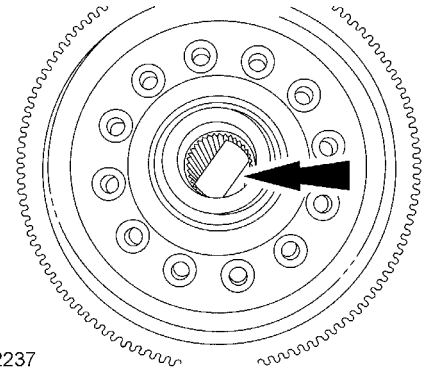
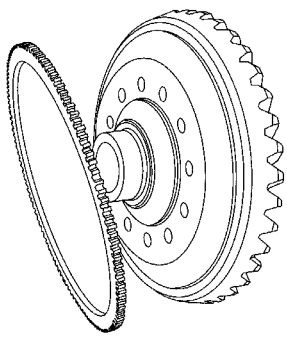
13. The press arbor will push on the differential pinion cross shaft to separate the ring gear half of the differential from the cross shaft half of the assembly.



A0062237

CAUTION: Discard the anti-lock speed sensor ring if separating it from the ring gear side case half.

14. If necessary, remove the anti-lock speed sensor ring.



A0062213

CAUTION: Alkaline cleaning solutions will damage machine surfaces. Use only emulsion cleaners or petroleum-based cleaning solvents.

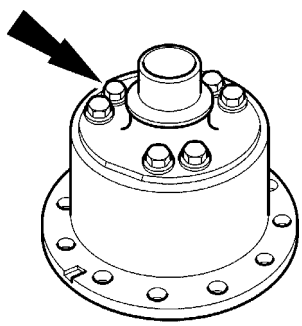
CAUTION: Use soft, clean, lintless towels to dry the components.

CAUTION: Never spin-dry bearings with compressed air. This will damage the mating surfaces due to a lack of lubrication.

CAUTION: After drying, lightly coat the components with rust inhibitor or clean lubricant to prevent damage from corrosion. Wrap all components that are going to be in storage for a prolonged period in wax paper.

NOTE: For Truetrac® differentials, submerge the entire differential assembly in a suitable solvent to wash away contaminants from within the housing.

15. Clean and dry the components.
16. The Truetrac® differential assembly is non-repairable. Discard the entire assembly if it is worn or damaged.



DE3043-A

17. With a conventional differential, lift out the side gear.

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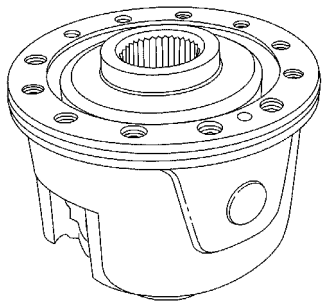
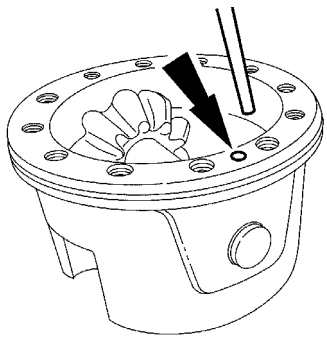


A0062241

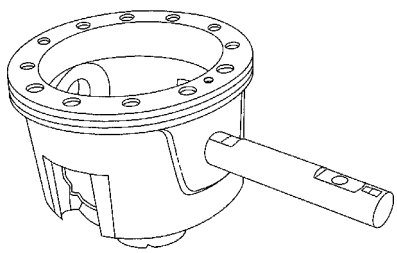
18. Remove the differential pinion cross shaft lock pin.



A0062242

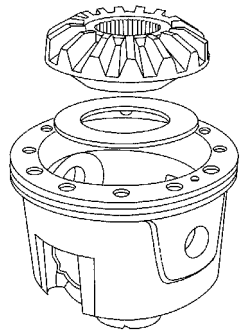
CAUTION: Discard all gears in sets if one or more sustains wear or damage.

19. Remove the pinion cross shaft.



A0062245

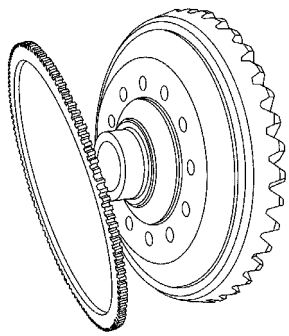
20. Remove the inner side gear and thrust washer.



A0062246

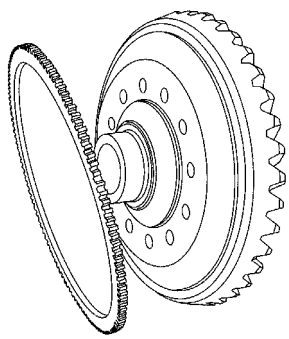
Differential Case and Ring Gear — Assembly

1. If removed, install a new anti-lock speed sensor ring with a dead blow hammer.



A0062213

2. Press the anti-lock speed sensor ring on the case flange.



A0062213

3. Install the inner side gear thrust washer and inner side gear.

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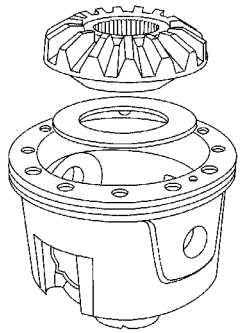
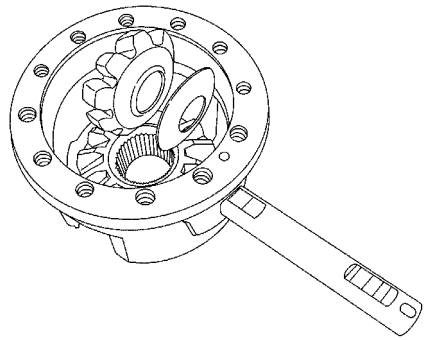
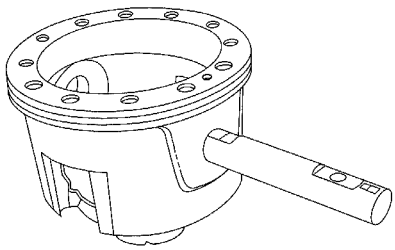


A0062246



A0062244

4. Align the pinion gear cross shaft with the pin hole vertical position.



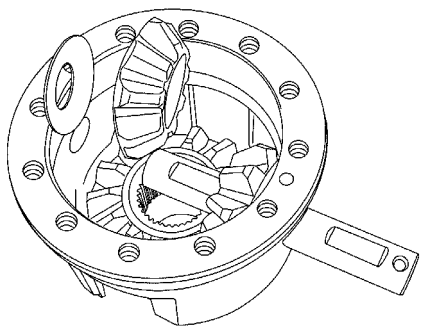
A0062245

NOTE: Lightly lubricate all of the mating surfaces with clean axle lubricant. This will aid in assembly and provide initial lubrication.

5. Install the 1st pinion gear thrust washer and pinion gear on the pinion cross shaft.

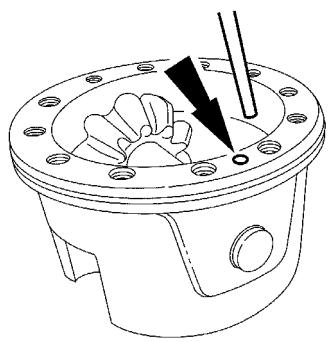
   • Use SAE 75W-140 High Performance Rear Axle Lubricant or equivalent.

6. Install the 2nd pinion gear and pinion gear thrust washer on the differential cross shaft.



A0062243

7. Install the differential cross shaft lock pin.



A0062242

NOTE: There is no thrust washer in this location.

8. Install the outer side gear.

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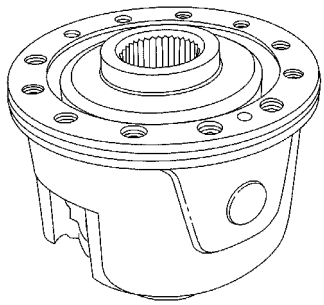
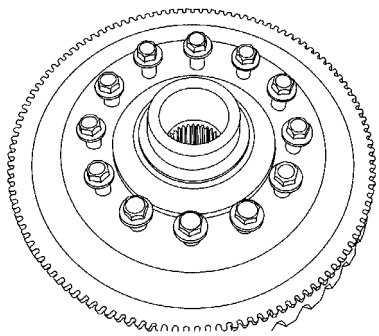


A0062241

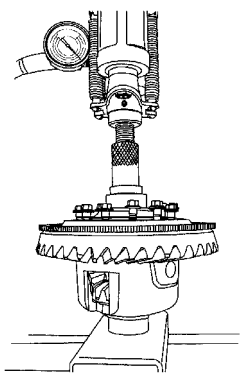
NOTE: Apply Stud and Bearing Mount TA-27 or equivalent to the differential ring gear bolts.

9. Align the ring gear and the differential case bolt holes. Install the differential ring gear bolts in the holes finger tight.



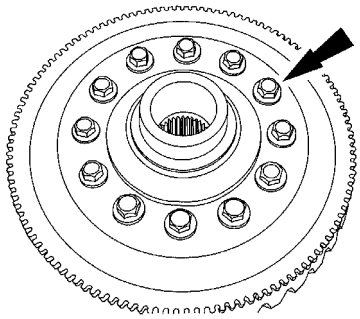
A0062219

10. Using the special tool and a shop press, press the differential assembly half on the differential ring gear half.



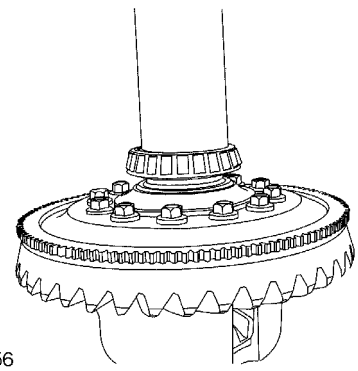
N0023954

11. Install the differential ring gear bolts.
    - Tighten to 204 Nm (150 lb-ft).



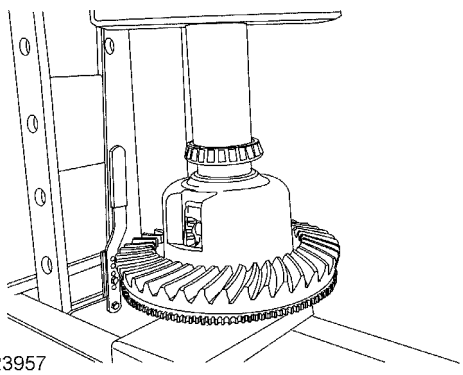
N0023955

12. Using the special tools, install the ring gear side carrier bearing.



N0023956

13. Using the special tools, install the differential side carrier bearing.



N0023957

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14. Carefully position the differential assembly into the carrier housing.

CAUTION: The bearing cups must seat on the differential side bearings.

CAUTION: Align the match marks.

CAUTION: The bolt threads must be clean.

15. Install the differential bearing caps.

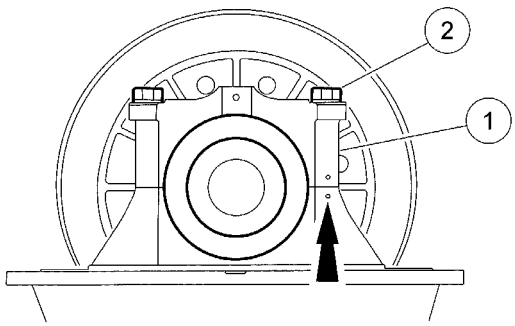


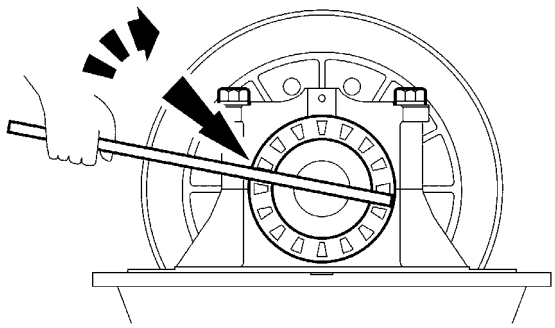
Figure 80

1. Position the bearing cap onto the leg.
2. Apply High Strength Threadlocker TA-26 to the differential bearing cap bolt threads and install the differential bearing cap bolts.
   a. Use Threadlock® 262 TA-26 or equivalent.
   b. Tighten the differential bearing cap bolts enough to eliminate visible space between the differential bearing cap and leg. Do not tighten the differential bearing cap bolts to the appropriate torque at this time.

CAUTION: Align the differential assembly within the bearing bores before applying preload or damage to the bearings will result.

16. Install the differential bearing adjusting rings.

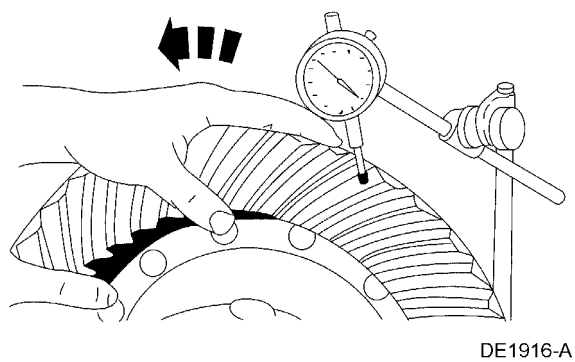
• Tighten both adjusting rings until there is zero end play, and some backlash between the differential ring gear and pinion. Make sure the adjusting ring tooth aligns so that installation of the adjusting ring cotter pin is possible.



17. Set the backlash at zero.

NOTE: The adjusting ring tooth must always align so that installation of the adjusting ring cotter pin is possible.

Loosen the adjusting ring on the tooth side of the differential ring gear one tooth, and tighten the opposite adjusting ring one tooth. Repeat this process until backlash is at zero.



18. Set the backlash and the bearing preload to specifications.
    • With a new matched set installed, set the backlash to the specification.

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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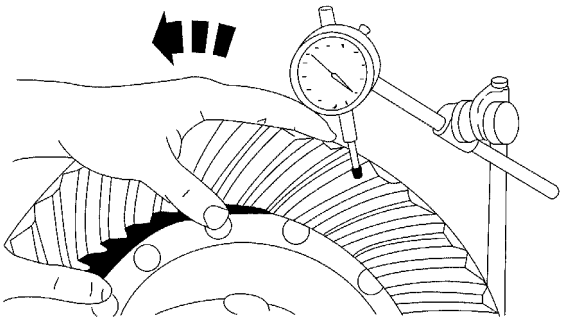
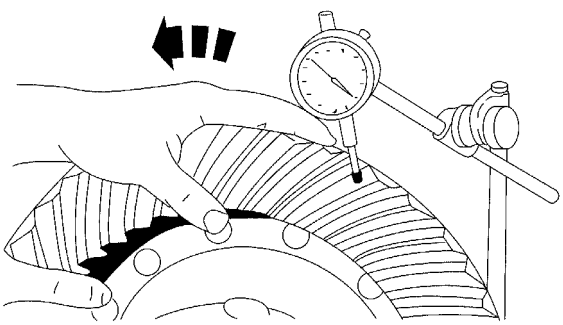
- With the original matched set installed, set the backlash to the specification recorded prior to disassembly.
- **NOTE: The adjusting ring tooth must always align so that installation of the adjusting ring cotter pin is possible.**

  Tighten the adjusting ring on the tooth side of the differential ring gear until backlash is within specifications.



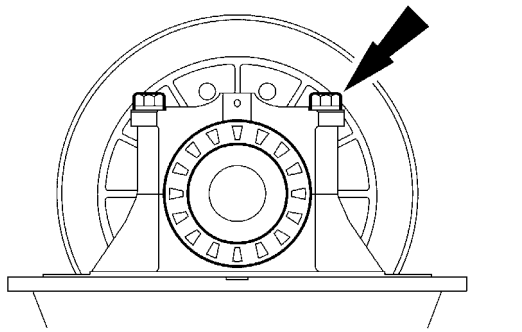
DE1916-A

19. Check the differential ring gear and pinion backlash in 4 equally spaced positions around the differential ring gear.
    - The acceptable backlash tolerance is ± 0.0508 mm (0.002 inch) from the backlash specification.
    - If the backlash tolerance varies more than 0.080 mm (0.003 inch) between the 4 positions, remove the differential and determine the cause.



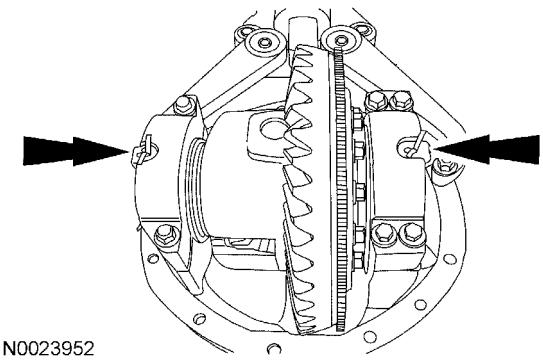
DE1916-A

20. Tighten the bolts.
    - Tighten to 190 Nm (140 lb-ft).
    - Check the differential ring gear and pinion backlash, as described in the previous step, after tightening the bolts.



DE1920-A

21. Install the adjusting ring cotter pins.



N0023952

22. Install the rear anti-lock brake sensor, if equipped.
    - Tighten to 27 Nm (20 lb-ft).

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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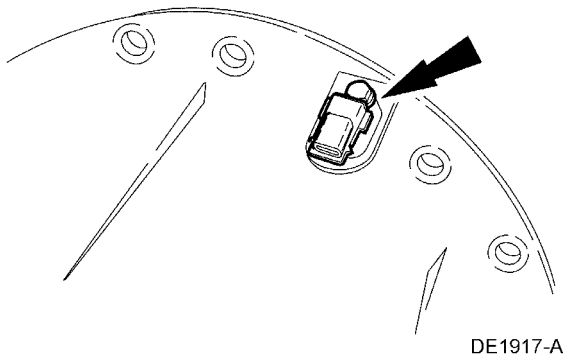
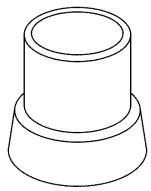
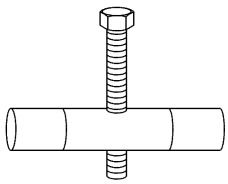
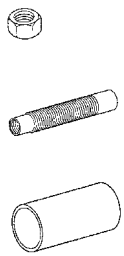

DE1917-A

Drive Pinion — Disassembly

Table 4 Special Tools

 ST2225-A	Installer, Drive Pinion Oil Seal ZTSE4711
 ST2224-A	Remover, Yoke ZTSE4713
	Installer, Yoke ZTSE4712

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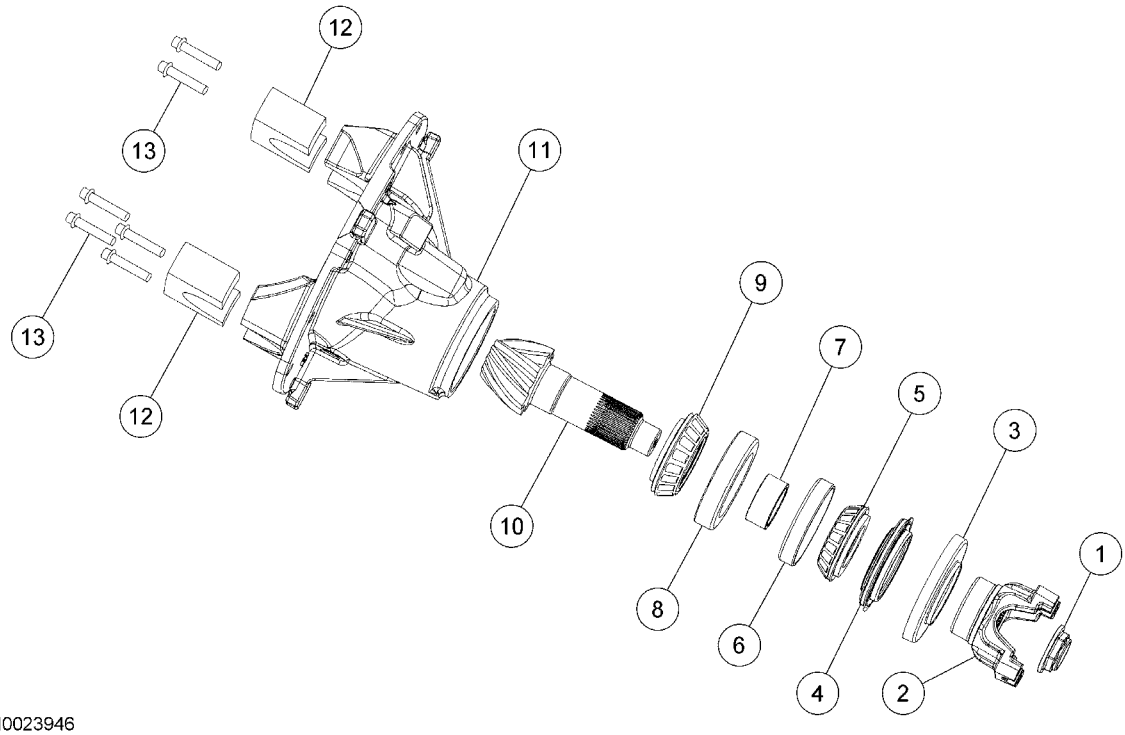
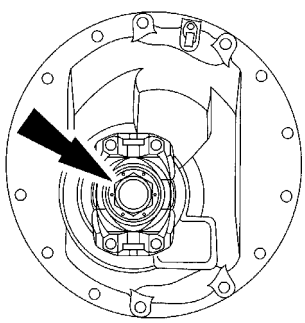


Figure 88 Dana Model S110 Wheel Differential Assembly, Disassembled View

1. Pinion nut
2. Pinion flange
3. Drive pinion oil seal slinger
4. Drive pinion oil seal
5. Outer pinion bearing
6. Outer pinion bearing cup
7. Pinion preload spacer (selective)
8. Inner pinion bearing cup
9. Inner pinion bearing
10. Rear axle drive pinion
11. Carrier housing
12. Differential bearing caps
13. Differential bearing cap bolts

1. Remove the pinion nut.



CAUTION: Hammering on the pinion flange will close in the bearing bores and misalign the flange lugs. This will result in premature failure of the journal needle bearings. Serious damage will also occur internally to the differential ring gear and pinion set or pinion bearings by hammering on external components. Remove and install the pinion flange using only the procedures in this section.

2. Using the special tool, remove the pinion flange.

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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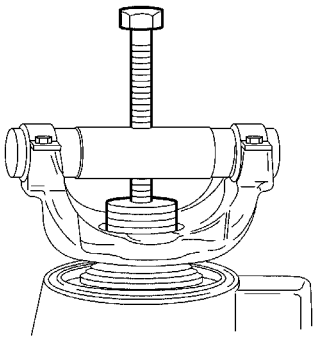
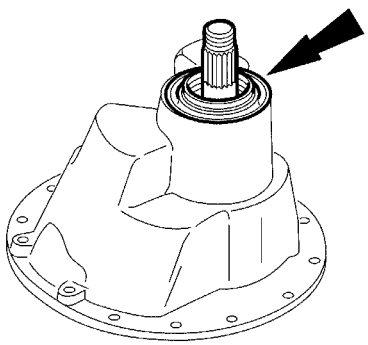


N0020650

3. Remove the pinion seal.

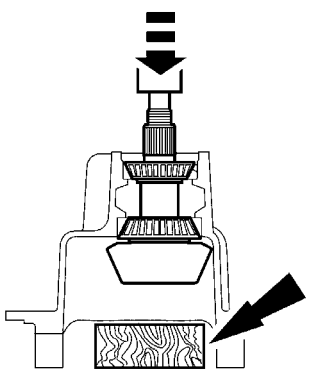


DE1963-A

CAUTION: Position a block of wood under the pinion to avoid damage to the gear teeth.

NOTE: The outer bearing is press fit.

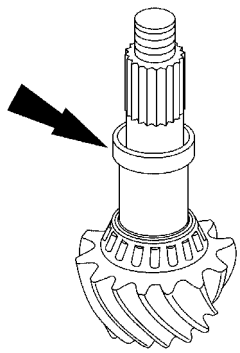
4. Press the pinion through the outer pinion bearing, and remove the pinion.



DE1964-A

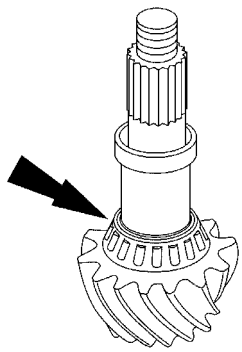
5. Remove the pinion preload spacer.

   • Measure and record the spacer thickness. Set the spacer aside for use in assembly.



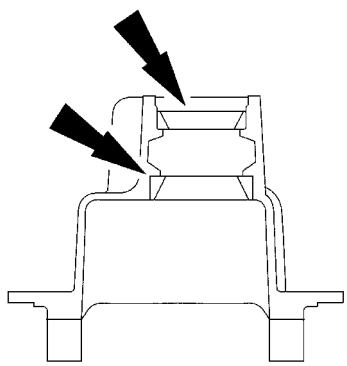
DE1965-A

6. If reusing the gear set, remove the inner pinion bearing with a suitable puller.



DE1966-A

7. If new pinion bearings are being installed, remove the outer and inner pinion bearing cups.



DE1967-A

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CAUTION: Alkaline cleaning solutions will damage machine surfaces. Use only emulsion cleaners or petroleum-based cleaning solvent.

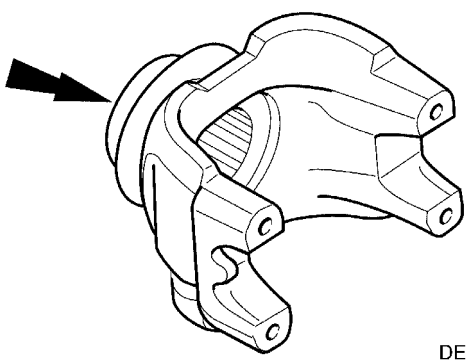
CAUTION: Use soft, clean, lintless towels to dry the components.

CAUTION: Never spin-dry bearings with compressed air. This will damage the mating surfaces due to a lack of lubrication.

CAUTION: After drying, lightly coat the components with rust inhibitor or clean lubricant to prevent damage from corrosion. Wrap all components that are going to be in storage for a prolonged period in wax paper.

8. Clean and dry the components as necessary.
9. Inspect the pinion flange for grooves in the sealing surface caused by contamination.

   • If grooves are detectable with a fingernail, repair the flange with a CR-approved sleeve or install a new pinion flange.

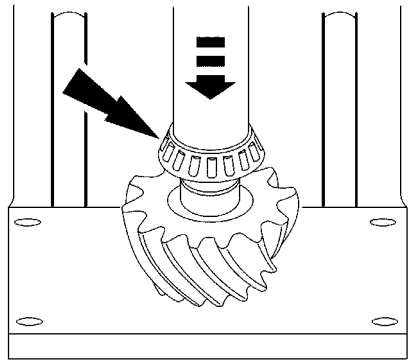


DE1968-A

Drive Pinion — Assembly

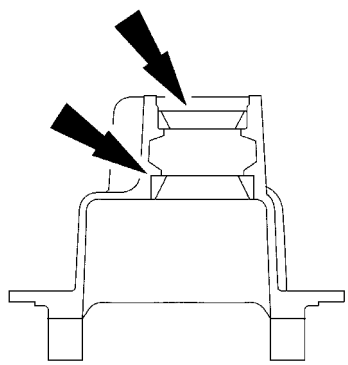
Initial Assembly

1. Using a suitable driver, press the inner pinion bearing onto the pinion.



DE1969-A

2. Press the inner and outer pinion bearing cups into the carrier until seated.
   - Use a 0.0381 mm (0.0015 in) feeler gauge to verify the bearing cups have completely seated in the bearing bores.
   - Lubricate the bearing cups and cone.
     — Use SAE 75W-140 High Performance Rear Axle Lubricant or equivalent.



DE1967-A

3. Seat the outer pinion bearing on the pinion.

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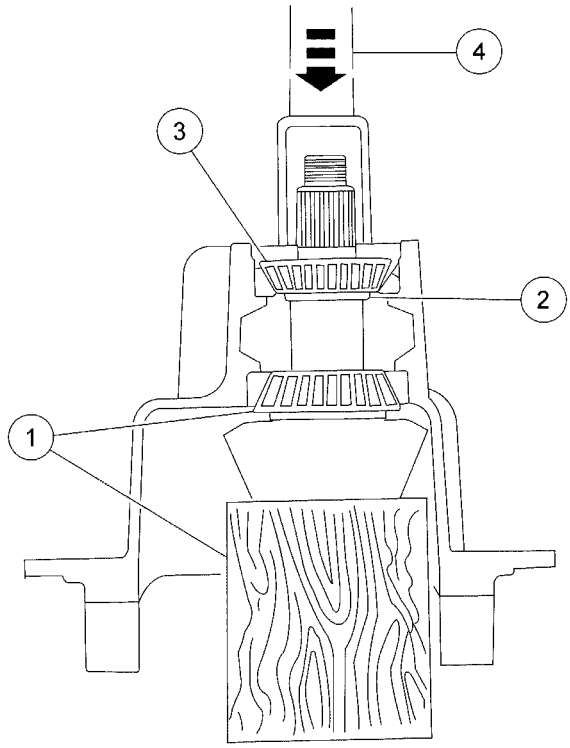


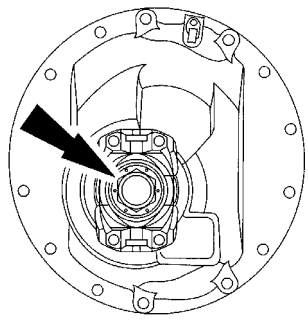
N0020651

Figure 99

1. Seat the inner pinion bearing into the cup by positioning a 152.4 x 152.4 x 152.4-mm (6 x 6 x 6-inch) block of wood under the pinion.
2. Place the original pinion preload spacer onto the pinion.
3. Place the outer pinion bearing onto the pinion.
4. Using a suitable press, seat the outer bearing on the pinion.

NOTE: Do not install the pinion seal at this time.

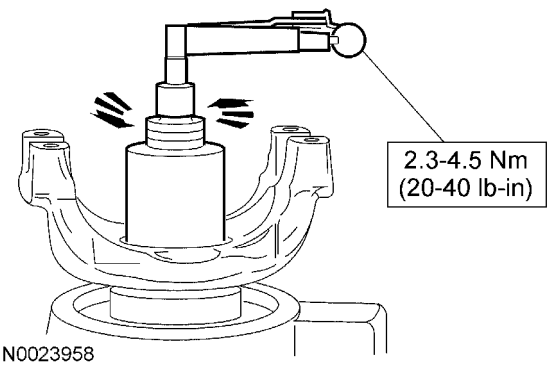
4. Install the pinion flange.
5. Install the pinion nut.
   - Using a suitable torque multiplier, tighten the pinion nut.
   - Tighten to 1128 Nm (832 lb-ft).



DE1961-A

Measuring pinion bearing preload torque

6. Measure the torque to rotate.
   - Take torque measurements every fourth revolution.
   - Proceed to Pinion bearing preload adjustment in this procedure if the bearing preload torque is not within the specifications. Proceed to Final assembly in this procedure if the bearing preload torque is within the specifications.



N0023958

Pinion bearing preload adjustment

NOTE: Also refer to the following illustration.

7. Adjust the pinion bearing preload by installing a new pinion bearing preload spacer.
   - To increase the preload, install a thinner spacer. To decrease the preload, install a thicker spacer.
   - The pinion bearing preload spacers are available in sizes from 7.26 to 8.00 mm (0.286 to 0.315 inch).

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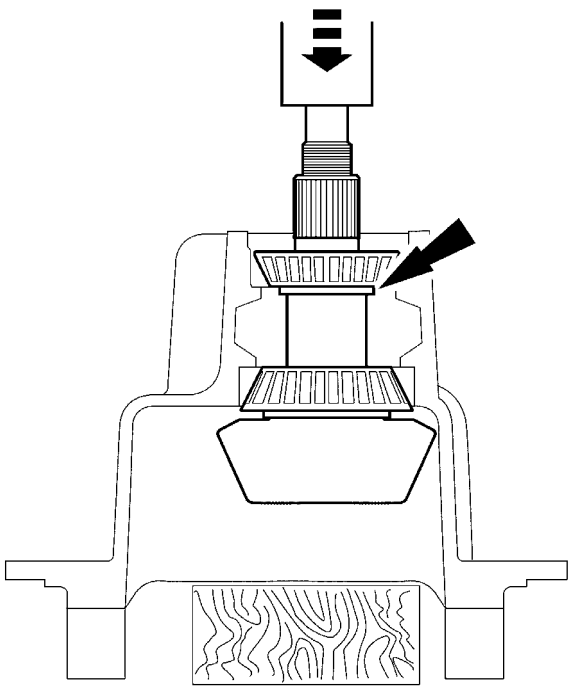
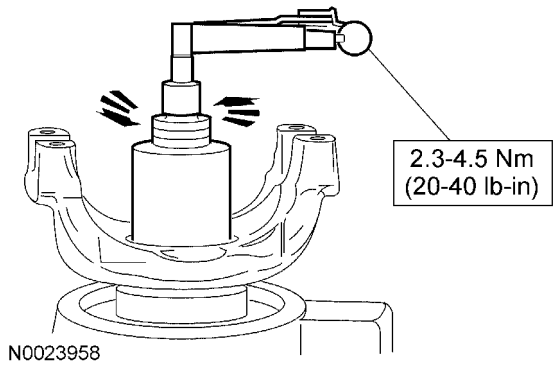
- Always measure the new spacer before installing it.
- On a flat surface, sand the next thicker size spacer with emery cloth to the required thickness to obtain a closer adjustment. Thoroughly wash the spacer to remove the emery cuttings before installation.
- A 0.0254 mm (0.001 inch) change in the spacer thickness will change the torque rate approximately 3.3894 Nm (30 lb-in).
- Repeat Measuring pinion bearing preload torque and Pinion bearing preload adjustment in this procedure until the rotational torque is within specifications.



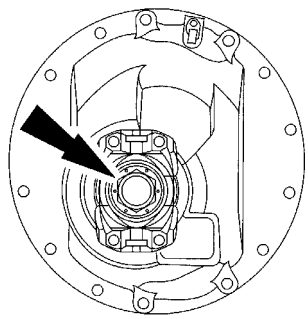
DE1974-A



N0023958

Final Assembly

8. Using a suitable torque multiplier, remove the pinion nut.



DE1961-A

CAUTION: Hammering on the pinion flange will close in the bearing bores and misalign the flange lugs. This will result in premature failure of the journal needle bearings. Serious damage will also occur internally to the differential ring gear and pinion or pinion bearings by hammering on external components. Remove and install the pinion flange using only the procedures in this section.

9. Using the special tool, remove the pinion flange.

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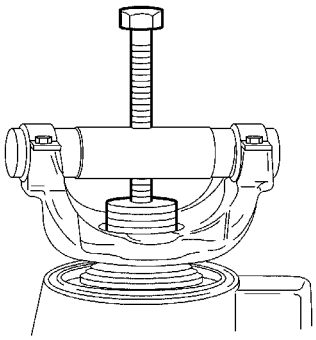
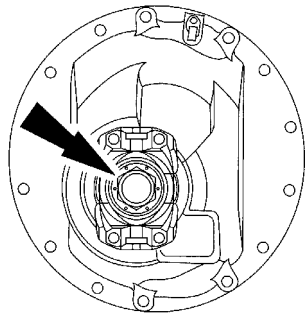


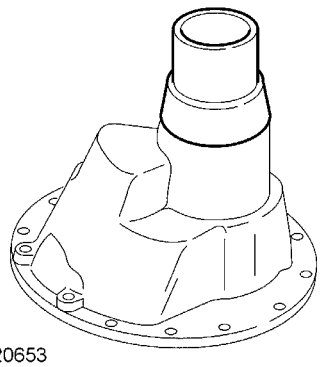
N0020650



DE1961-A

10. Using the special tool, install the pinion seal.

    • A rotational torque of 1.6947-5.0841 Nm (15-45 lb-in) is acceptable with the pinion seal installed.



N0020653

11. Install the pinion flange.
12. Apply Stud and Bearing Mount to the pinion threads and install a new pinion nut. Using a suitable torque multiplier, tighten the nut.
    - Tighten to 1128 Nm (832 lb-ft).
    - Use Stud and Bearing Mount TA-27 or equivalent.

Wheel Hubs and Bearings — Full Floating Axle — Dana

Specifications

Table 5 Torque Specifications

Description	Nm	lbf-ft
Rear hub nut (To set bearings, back off the hub nut 90 degrees, retighten.)	95 24*	70 18
Axle shaft bolts	133	98
Rear hub bolts	104	77
Anchor plate bolts	400	296
Maximum torque to rotate the hub is 2.3 (20 lb-in) when the end play is zero.		

Description and Operation

Wheel Hubs and Bearings

The rear hub is supported or floats on the axle spindle on 2 opposing tapered roller bearings. A rear hub seal is installed behind the inner rear wheel bearing to prevent axle lubricant from leaking onto the rotor. The rear hub is retained on the spindle by a hub nut tabbed to a slot on the spindle.

The rear wheel bearings are packed with a lithium-based grease to provide initial lubrication until axle lubricant flows into the rear hubs and the inner rear wheel bearings during vehicle operation.

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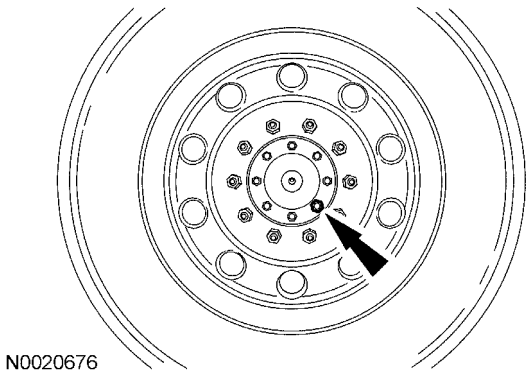
Wheel Hubs and Bearings — Diagnosis and Testing

Refer to Driveline System in S10019.

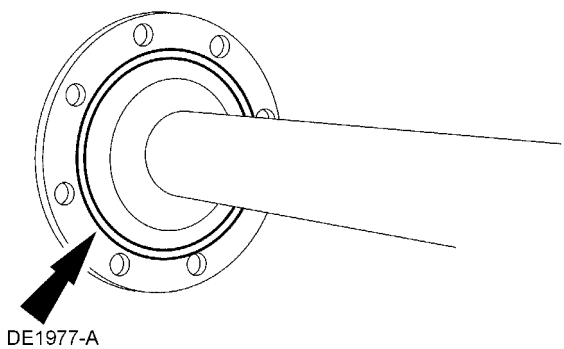
Removal and Installation

Axle Shaft

1. Set the parking brake.
2. Remove the 8 axle shaft bolts and axle shaft.
   - Place a drain pan under the rear hub.
     — To install, tighten to 133 Nm (98 lb-ft).


N0020676

3. Inspect the following components:
   - The O-ring for damage. Replace as necessary.
   - The axle shaft for cracked material around the holes or oversized holes. Replace as necessary.

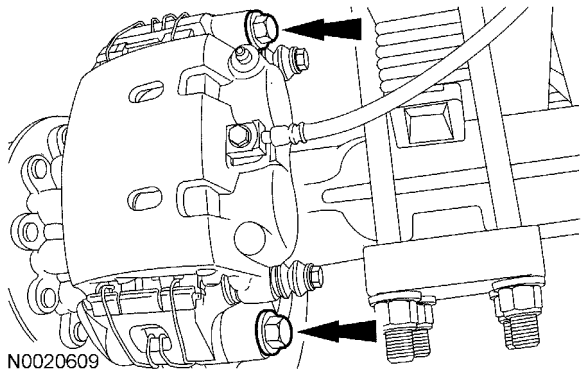

DE1977-A

NOTE: Lubricate the O-ring.

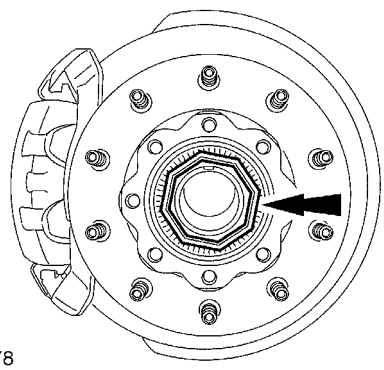
4. To install, reverse the removal procedure.

Wheel Hub Removal

1. Remove the tire and wheel assembly. For additional information, refer to Wheels and Tires in S17002.
2. Remove the 2 anchor plate bolts. Disconnect the disc brake caliper and the anchor as an assembly.
   • Using mechanic's wire, support the disc brake caliper and anchor assembly.


N0020609

3. Remove the axle shaft. For additional information, refer to Axle Shaft in this section.
4. Using a suitable socket, remove the hub nut.


N0020678

5. Remove the outer rear wheel bearing.

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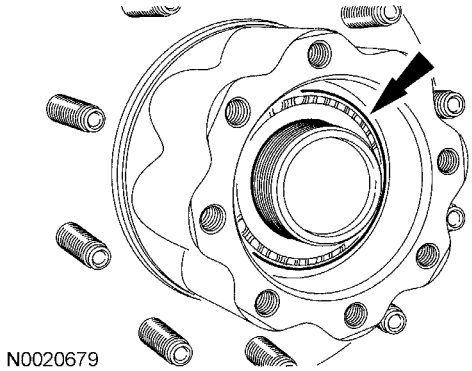
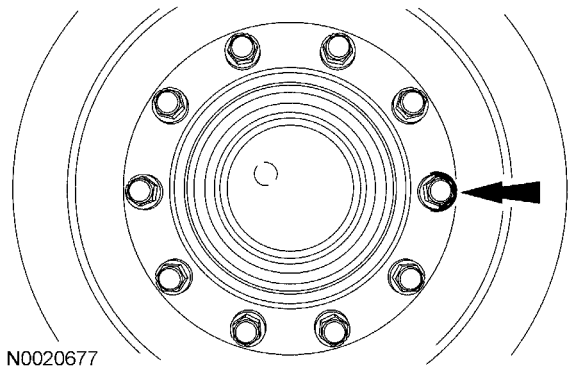

N0020679

6. Remove the rear hub and brake disc assembly.
7. Remove the rear hub bolts and separate the rear hub from the rear brake disc.


N0020677

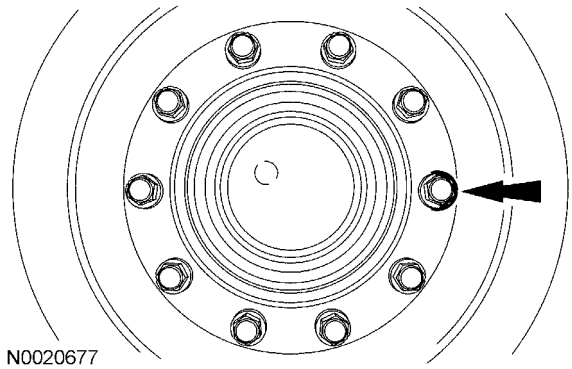
8. Inspect the rear hub for the following:
   - Cracks and damage around the bolt holes
   - Oversized holes

Wheel Hub Installation

⚠ WARNING: Install a new rear hub seal after removing the rear hub from the axle. A damaged or worn seal can permit bearing lubricant to reach the brake linings, resulting in ineffective brake operation. Failure to follow these instructions may result in personal injury.

CAUTION: Clean and remove any dirt or foreign material in the rear hub bolt holes.

1. Install a new rear hub seal. For additional information, refer to Wheel Bearings, Wheel Hub Seal and Wheel Bearing Cups in this section.
2. Position the rear brake disc on the rear hub and install the rear hub bolts.
   - Tighten to 104 Nm (77 lb-ft).


N0020677

CAUTION: Thoroughly clean the spindle. Wrap the spindle threads with electrician's tape to prevent damage while installing the rear hub and brake disc assembly.

CAUTION: Lightly coat the spindle and pack each rear wheel bearing with Premium Long-Life Grease or equivalent.

3. Prepare the spindle for rear hub installation.
4. Slide the rear hub and brake disc assembly over the axle housing spindle.
   - Remove the electrician's tape.
5. Install the outer rear wheel bearing.

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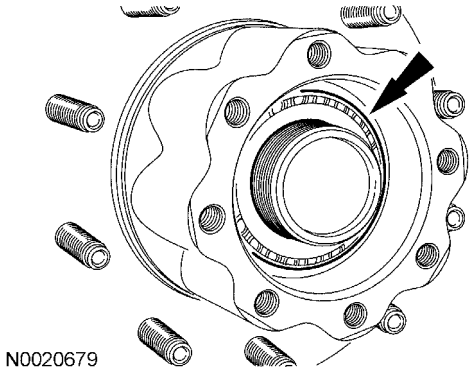
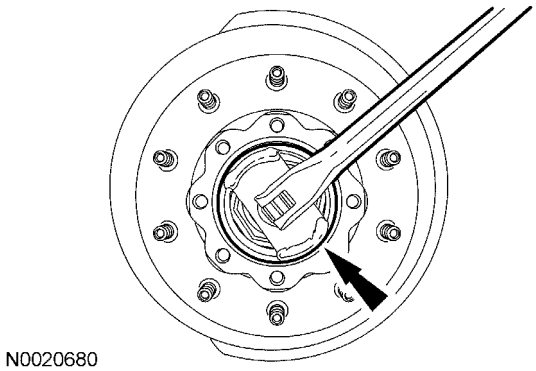
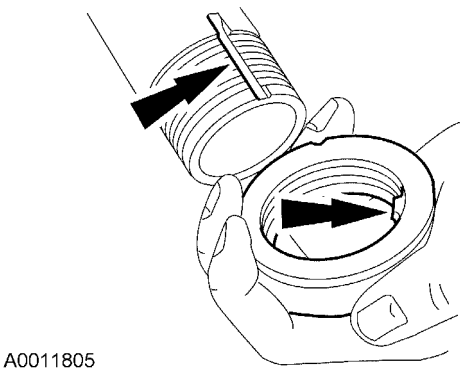

N0020679


N0020680

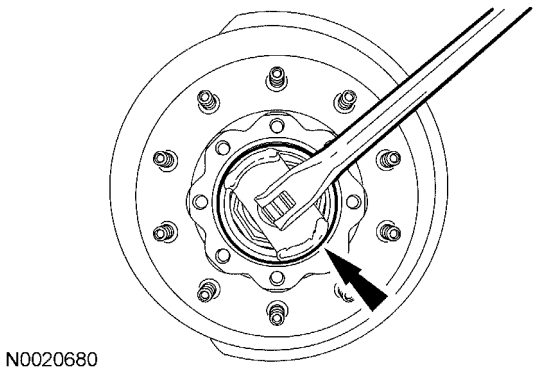
6. Start the hub nut making sure that the tab aligns correctly in the keyway prior to thread engagement.


A0011805

NOTE: The following hub nut tightening sequence will prevent side-to-side end play of the hub and brake disc assembly.

NOTE: Apply inward pressure to the socket to separate the ratcheting components of the hub nut.

7. To adjust the bearings, tighten the hub nut to 95 Nm (70 lb-ft) then back off the hub nut 90 degrees.
8. Re-tighten the hub nut to 24 Nm (18 lb-ft).
   - To verify that there is no side-to-side end play, attach a magnetically mounted dial indicator to the spindle end and place the dial indicator tip on the outboard surface of the hub. Check for side-to-side end play.
   - Final bearing adjustment has zero end play. The maximum torque to rotate the hub is 2.3 Nm (20 lb-in) when end play is zero.


N0020680

9. Install the axle shaft. For additional information, refer to Axle Shaft in this section.
10. Position the disc brake caliper and anchor assembly on the mounting bracket. Install the 2 anchor plate bolts.
    - Tighten to 400 Nm (296 lb-ft).

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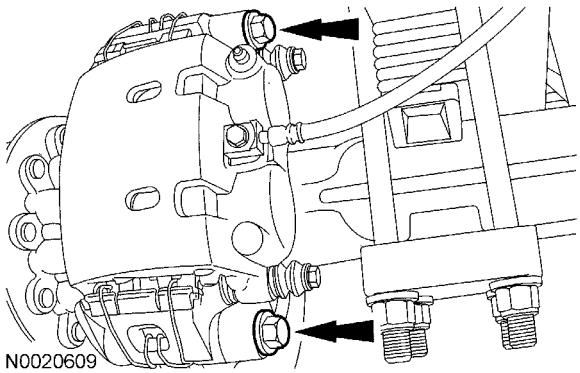
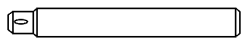
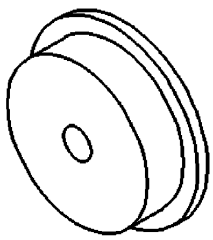
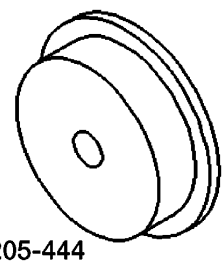
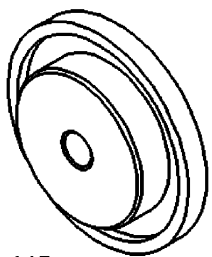


11. Install the tire and wheel assembly. For additional information, refer to Wheels and Tires in S17002.

Wheel Bearings, Wheel Hub Seal and Wheel Bearing Cups Removal

Table 6 Special Tools

 ST1255-A	Universal Handle ZTSE2365A
 205-442	Installer, Wheel Hub Inner Bearing Cup ZTSE4740
 205-444	Installer, Wheel Hub Outer Bearing Cup ZTSE4741
 205-445	Installer, Wheel Hub Inner Oil Seal ZTSE4742

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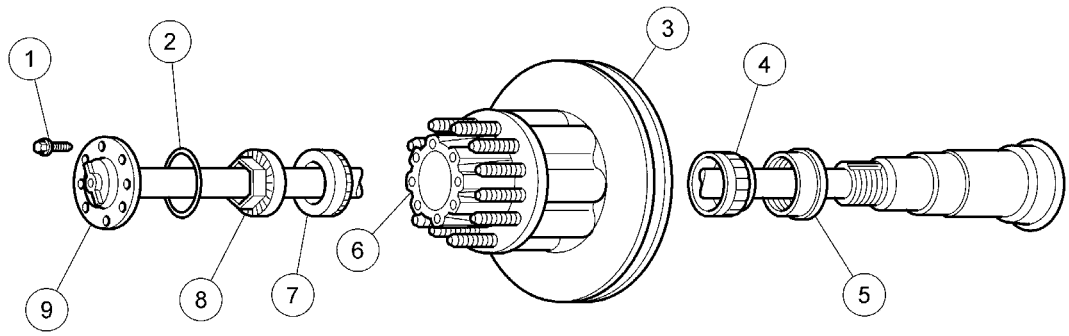
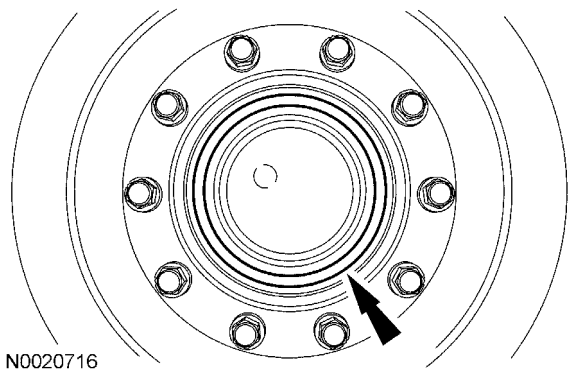


N0020711

Figure 120

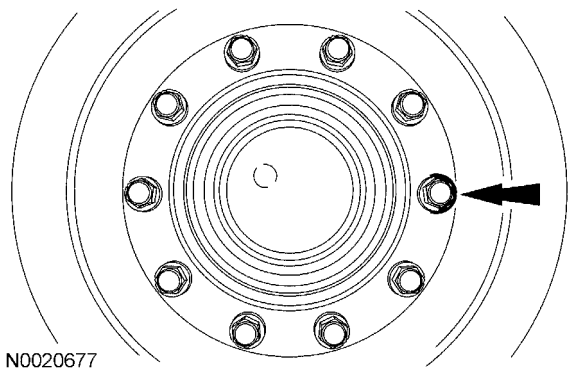
1. Axle shaft bolt (16 required)
2. O-ring (part of 4234) (2 required)
3. Brake disc (2 required)
4. Inner rear wheel bearing (2 required)
5. Hub seal (2 required)
6. Rear hub (includes bearing cups) (2 required)
7. Outer rear wheel bearing (2 required)
8. Hub nut (2 required)
9. Axle shaft (2 required)

1. Remove the rear hub and brake disc assembly. For additional information, refer to Wheel Hub in this section.
2. Remove the rear hub seal and the inner rear wheel bearing.
   - Discard the rear hub seal.



N0020716

3. If not done previously, remove the bolts and separate the rear hub from the brake disc.



N0020677

4. Remove the inner (Item 2) and outer (Item 1) bearing cups.

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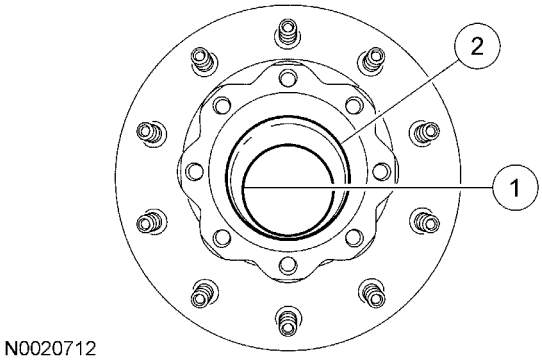


5. Clean the following components:
   - The rear axle housing spindle.
   - All the old grease and axle lubricant from the rear hub.
   - The rear wheel bearings and cups.
6. Inspect the bearing races and rollers for pitting, galling or erratic wear patterns. Check the rollers for end wear. Discard the bearings, if necessary.

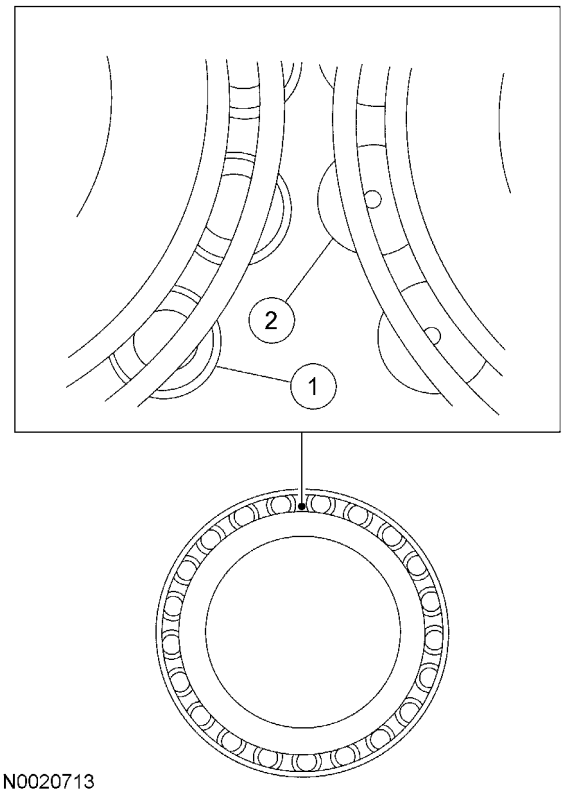
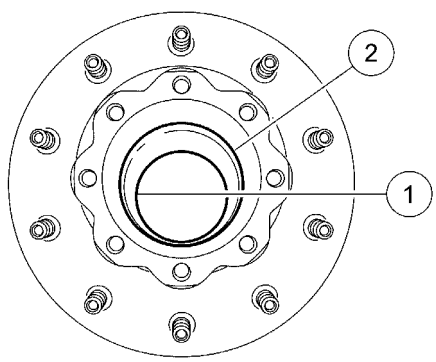


Figure 124
1. A typical new bearing roller.
2. A worn bearing roller.

Wheel Bearings, Wheel Hub Seal and Wheel Bearing Cups Installation

1. Install the inner (Item 2) and outer (Item 1) bearing cups.



2. Install the inner rear wheel bearing in the rear hub.

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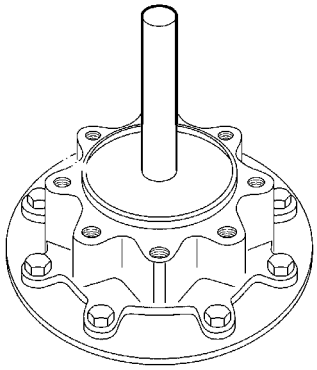
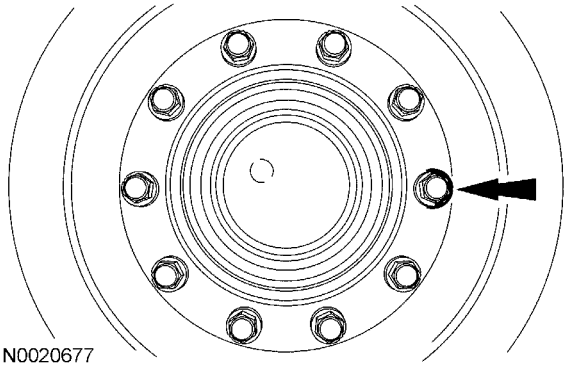
3. Install a new rear hub seal.



N0020714

4. Position the rear brake disc on the rear hub and install the bolts.



N0020677

5. Install the rear hub and brake disc assembly. For additional information, refer to Wheel Hub in this section.

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