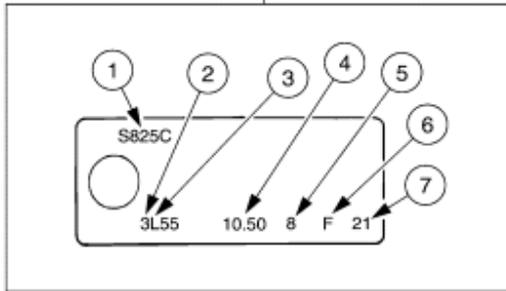
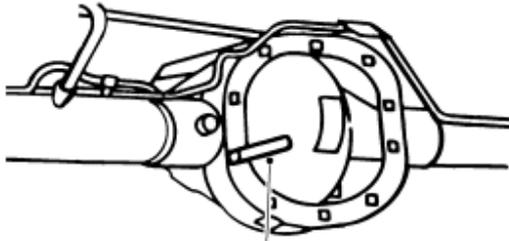


DE1579-B

Item	Description
1	Axle Ratio (Part of 4001)
2	Axle Assy Number (Prefix Letters) (Part of 4001)
3	Axle Assy Number (Suffix Letters) (Part of 4001)
4	Dana Part Number (Part of 4001)
5	Included on Limited Slip Only (Part of 4001)

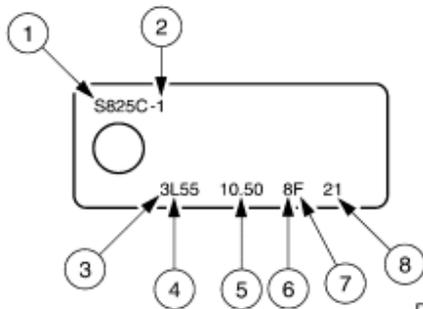
Ford Rear Axle Identification Tag



DE2053-A

Item	Description
1	Plant Code
2	Axle Ratio
3	Denotes Traction-Lok®
4	Ring Gear Diameter
5	Build Year
6	Build Month
7	Build Day

Axle Identification Tag Denoting Interchangeability Affected Internally



DE2054-A

Item	Description
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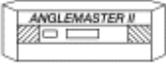
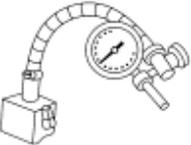
1	Plant Code
2	Denotes Interchangeability Affected Internally
3	Axle Ratio
4	Denotes Traction-Lok®
5	Ring Gear Diameter (Inch)
6	Build Year
7	Build Month
8	Build Day

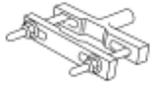


CAUTION: The axle identification tag is the official identifier. Do not damage the tag. Always reinstall the tag after removing it for axle inspection/repair.

The axle identification tag identifies a particular axle design, a specific ratio, and if it is a conventional or limited slip (Traction-Lok®) type. In addition, the plant code will not change as long as that particular axle assembly never undergoes an external design change. If, however, an internal design change takes place during the production life of the axle and that internal change affects parts interchangeability, a dash and numerical suffix is added to the plant code. This means that as an assembly both axles are interchangeable; however, internally they are different. Therefore, each requires different internal parts at the time of repair.

Driveline System

Special Tool(s)	
 ST1622-A	Anglemaster II Driveline Inclinometer 164-R2402 or Equivalent
 ST1268-A	Clamp Plate 205-320 (T92L-4851-C)
 ST1257-A	Companion Flange Holding Tool 205-126 (T78P-4851-A)
 ST1267-A	Companion Flange Runout Gauge 205-319 (T92L-4851-B)
 ST2044-A	Companion Flange Runout Gauge 205-323 (T92T-4851-D)
 ST1266-A	Dial Indicator with Magnetic Base 100-D002 (D78P-4201-B) or Equivalent

 <p>ST2207-A</p>	<p>Electronic Vibration Analyzer 014-00344</p>
 <p>ST1802-A</p>	<p>Flange Holder 205-012 (T57T-4851-B)</p>
 <p>ST2045-A</p>	<p>Gauge Pin 205-325 (T92T-4851-F)</p>
 <p>ST2045-A</p>	<p>Gauge Pin 205-326 (T92T-4851-G)</p>

Inspection and Verification

Certain axle and driveline trouble symptoms are also common to the engine, transmission, wheel bearings, tires, and other parts of the vehicle. For this reason, verify that the cause of the trouble is in the axle before adjusting, repairing, or installing new parts. For additional information, refer to [Section 100-04](#).

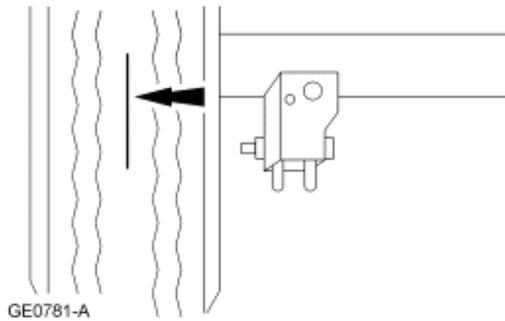
Certain symptoms may be caused by Ford Traction-Lok® differentials. Check the vehicle certification label and the axle identification tag to determine the type of differential. For additional information, refer to [Section 100-01](#).

Universal Joint (U-Joint) Inspection

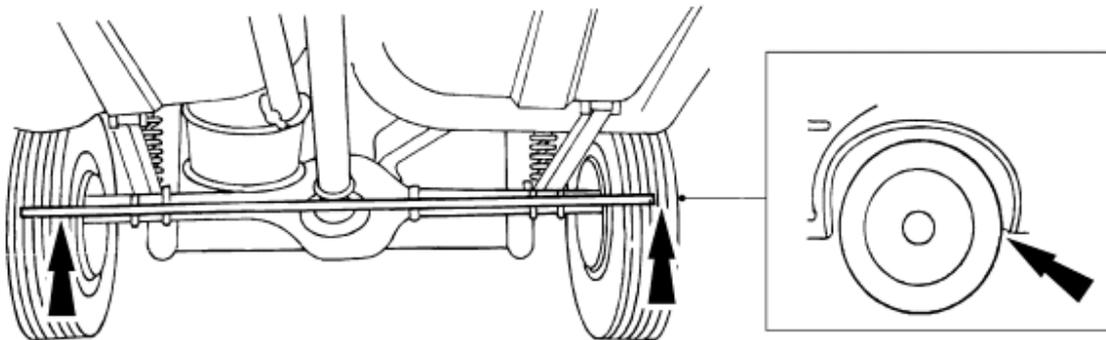
Place the vehicle on a frame hoist and rotate the driveshaft by hand. Check for rough operation or seized U-joints. Install a new U-joint if it shows signs of seizure, excessive wear, or incorrect seating. For additional information, refer to [Section 205-01](#).

Inspection For Bent Rear Axle Housing

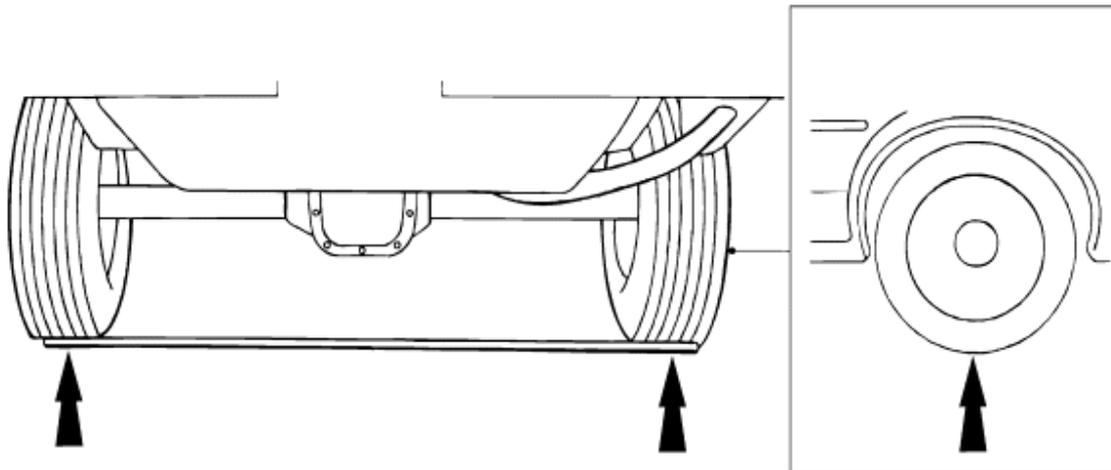
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#). Allow the rear axle to be freely suspended.
2. Use white chalk or paint to mark a vertical line on the center of each rear tire.



3. Adjust both wheels so that the markings face the front of the vehicle. With a tape measure, measure the distance between the marks and record this reading (front reading).

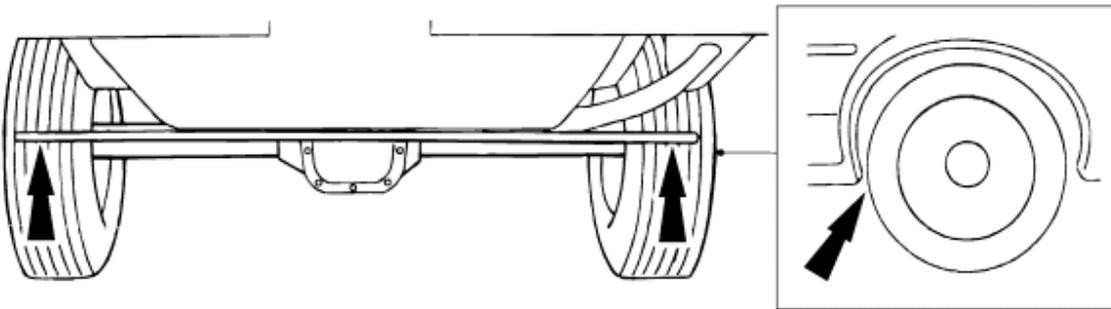


4. Rotate the rear wheels so the markings are directly underneath the vehicle. Measure the distance between the marks and record this reading (bottom reading).



DE1349-A

5. Rotate the rear wheels so the markings face the rear of the vehicle. Measure and record the distance between the marks (rear reading).



DE1350-A

6. Compare the front and the rear readings (Steps 3 and 5) to find the toe-in or toe-out condition.
 - Toe-in occurs when the front measurement is less than the rear measurement.
 - Toe-out occurs when the rear measurement is less than the front measurement.
7. To determine camber, find the average of the front and the rear measurements (Steps 3 and 5). Subtract the bottom reading (Step 4) from this number.
8. Positive (+) camber is when the bottom reading is less than the average of the front and rear readings. Negative (-) camber is when the bottom reading is greater than the average of the front and rear readings.

9. The results of the calculations in Steps 6 and 7 must conform to the following specifications:
Toe-in: 0 — 1/16 inch.
Toe-out: 0 — 3/16 inch.
Camber: 0 ± 5/32 inch.
If the differential housing does not meet these specifications, install a new differential housing. For additional information, refer to [Section 205-02A](#), [Section 205-02B](#) or [Section 205-02D](#).
10. After installing a new differential housing, repeat Steps 2 through 7.

Noise Acceptability

NOTE: A gear-driven unit will produce a certain amount of noise. Some noise is acceptable and audible at certain speeds or under various driving conditions such as a newly paved blacktop road. Slight noise is not detrimental to the operation of the axle and is considered normal.

With the Ford Traction-Lok® differential, slight chatter noise on slow turns after extended highway driving is considered acceptable and has no detrimental effect on the locking differential function.

Preliminary Diagnosis

Question the Customer

The preliminary diagnosis starts with the customer interview. The history of the concern must be investigated: When was it first noticed? Did it appear suddenly or gradually? Did any abnormal occurrence coincide with or precede its appearance such as pothole or curb impacts, minor collisions, etc.)? Were there any repair procedures carried out or new parts installed previously? It is also necessary to know any special conditions affecting the appearance and degree of the concern, such as road speed, type of road, drive mode, engine temperature, ambient temperature, etc.

A gradual appearance of the concern indicates a deterioration of a component, such as tires or front wheel bearings.

A sudden appearance of the concern could indicate a lost wheel balance weight.

Road Test

A road test is mandatory for any customer concern of noise/vibration that is not verified by the on-hoist check of chassis components. The Vehicle Road Test Evaluation form is arranged to record the conditions heard or felt during this test.

The road test form lists four operating conditions or modes in which some axle noises come and go: DRIVE, CRUISE, COAST, and FLOAT.

Mode	Conditions
DRIVE	Accelerating the vehicle; a definite throttle depression applying engine torque.
CRUISE	Maintaining a constant speed with the throttle applied.
COAST	Decelerating with the throttle closed.
FLOAT	Controlled deceleration; backing the throttle continually to prevent either braking or accelerating torque from the engine.

Operate the vehicle in all four modes and record those in which the noise occurs. Write down the kilometers-per-hour (miles-per-hour) range at which both noise and vibration occur. Evaluate rear axle noise with the transmission in DIRECT DRIVE and not in OVERDRIVE. Transmission noise can be mistaken for rear axle noise when in OVERDRIVE.

Vehicle Road Test Evaluation Form

VEHICLE ROAD TEST EVALUATION

Road Test Evaluations:

1. Does the problem occur with engine, driveshaft, or wheel speed?
Engine
Driveshaft
Wheel
2. Is the problem road speed dependent? (Occurs at the same vehicle speed independent of transmission gear).
Yes
No
3. Is the problem engine speed dependent? (Occurs at the same engine rpm independent of transmission gear).
Yes
No
4. If the problem is engine speed dependent, perform a neutral engine runup (NERU), and compare rpm's to road rpm's.
Same as NERU
Different than NERU
5. Is the problem drive mode dependent? (Occurs in drive, cruise, coast/float).
Drive Speed
Cruise Speed
Coast Speed
Float Speed
6. Is the problem acceleration rate dependent? (Light, Medium or heavy throttle).
Light
Medium
Heavy
7. Does the problem occur from a stop?
Yes
No
8. Is the problem transmission gear dependent? (Occurs in overdrive, but not direct drive).
Yes
No
9. Does the problem occur on turns?
Yes
No
10. Does the problem only occur when going from reverse to drive or drive to reverse?
Yes
No

DE1351-B

Analysis of Leakage

Clean up the leaking area enough to identify the exact source.

A plugged differential housing vent can cause excessive pinion seal lip wear due to internal pressure buildup.

Verify the axle lubricant level is correct; refer to Specifications in this section.

Axle Vent

NOTE: If the vent cannot be cleared, install a new vent.

A plugged vent will cause excessive seal lip wear due to internal pressure buildup. If a leak occurs, check the vent. Verify the vent hose is not kinked. Remove the hose from the vent nipple and clear the hose of any foreign material. While the hose is removed, pass a length of mechanics wire or a small diameter Allen wrench in and out of the vent to clean it. Connect the hose when done.

Flange Yoke Seal

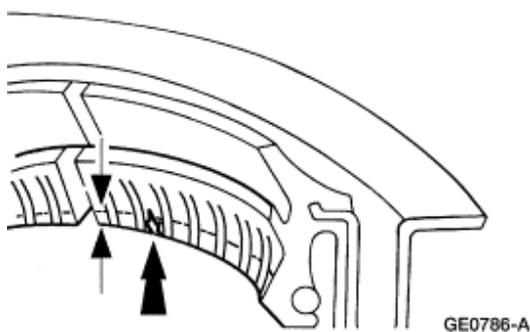
Leaks at the axle drive pinion seal originate for the following reasons:

- Seal was installed incorrectly.
- Poor quality seal journal surface.

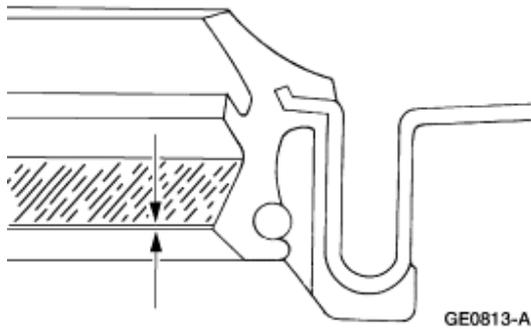
Any damage to the seal bore (dings, dents, gouges, or other imperfections) will distort the seal casing and allow leakage past the outer edge of the axle drive pinion seal.

The axle drive pinion seal can be torn, cut, or gouged if it is not installed carefully. The spring that holds the axle drive pinion seal against the pinion flange may be knocked out and allow leakage past the lip.

The rubber lips can occasionally become hard (like plastic) with cracks at the oil lip contact point. The contact point on the pinion flange may blacken, indicating excessive heat. Marks, nicks, gouges, or rough surface texture on the seal journal of the pinion flange will also cause leaks.



Axle drive pinion seal wear 1.27 mm (0.050 inch) or greater is considered excessive.



Install a new pinion flange if any of these conditions exist.

Metal chips or sand trapped at the sealing lip may also cause oil leaks. This can cause a wear groove on the pinion flange and heavy pinion seal wear.

When a seal leak occurs, install a new seal and check the vent and the vent hose to verify that they are clean and free of foreign material.

Drive Pinion Nut

⚠ CAUTION: Follow the correct procedure for setting the bearing preload when the nut is installed. For additional information, refer to [Section 205-02A](#), [Section 205-02B](#) or [Section 205-02D](#) for the rear axle or [Section 205-03](#) for the front axle.

On some high-mileage units, oil may leak past the threads of the pinion nut. This condition can be corrected by removing the nut and applying Pipe Sealant with Teflon® D8AZ-19554-A or equivalent meeting Ford specification WSK-M2G350-A2 on the threads and nut face.

Wheel Hub Oil Seals

Wheel hub oil seals are susceptible to the same kinds of damage as axle drive pinion seals if installed incorrectly. The seal bore must be clean and the lip handled carefully to avoid cutting or tearing it. Spindle journal surface must be free of nicks, gouges, and rough surface texture. For additional information on wheel hub oil seals, refer to [Section 205-02C](#) or [Section 205-02E](#).

Analysis of Vibration

⚠ WARNING: A vehicle equipped with a Ford Traction-Lok® differential or a Tractech® Truetrac® differential will always have both wheels driving. If only one wheel is raised off the floor and the rear axle is driven by the engine, the wheel on the floor could drive the vehicle off the stand or jack. Verify that both rear wheels are off the floor.

Few vibration conditions are caused by the front or rear axle. On a vibration concern, follow the diagnosis procedure in [Section 100-04](#) unless there is a good reason to suspect the axle.

Tires

⚠️ WARNING: Do not balance the wheels and tires while they are mounted on the vehicle. Possible tire disintegration/differential failure could result, causing personal injury/extensive component damage. Use an off-vehicle wheel and tire balancer only.

Most vibration in the rear end is caused by tires or driveline angle.

Vibration is a concern with modern, high-mileage tires if they are not "true" both radially and laterally. They are more susceptible to vibration around the limits of radial and lateral runout of the tire and wheel assembly. They also require more accurate balancing. Wheel and tire runout checks, truing and balancing are normally done before an axle inspection. For additional information, refer to [Section 204-04](#).

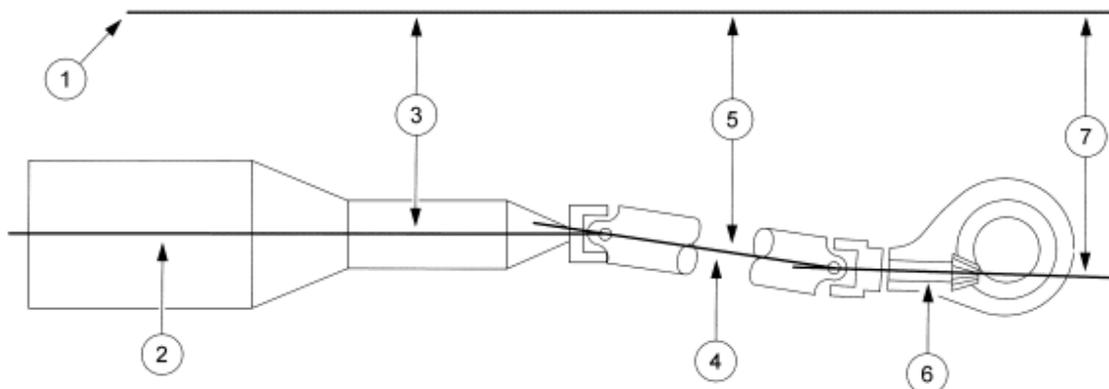
Driveshaft

1. Road test the vehicle to determine the critical vibration points. Note the road speed, the engine RPM, and the shift lever positions at which the vibration occurs.
2. Stop the vehicle, place the transmission lever in neutral and run the engine through the critical speed ranges determined in Step 1.
3. If no vibration is felt, balance the driveshaft. For additional information, refer to Driveline Vibration in this section.

Driveline Angle

Driveline angularity is the angular relationship between the engine crankshaft (6303), the driveshaft, and the rear axle pinion. Factors determining driveline angularity include ride height, rear spring, and engine mounts.

Driveline Angle

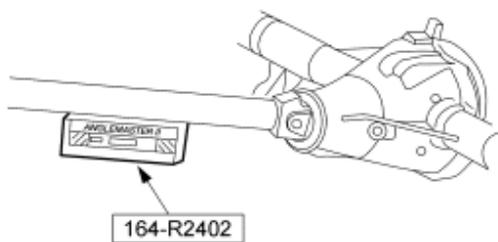


GE0789-A

Item	Description
1	Bottom of the frame
2	Engine crankshaft centerline
3	Engine angle
4	Driveshaft and coupling shaft centerline
5	Driveshaft and coupling shaft angle
6	Rear axle pinion centerline
7	Axle pinion angle

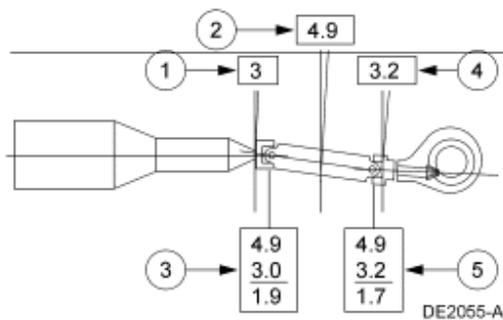
Calculate the driveline operating angles as follows.

1. Preliminary setup procedures.
 1. Inspect the U-joints for correct operation.
 2. Park the vehicle on a level surface such as a drive-on hoist, or back onto a front end alignment rack.
 3. Verify the curb position ride height is within specifications with the vehicle unloaded, and all of the tires inflated to their normal operating pressures.
 4. Rotate the transmission output yoke until vertical. This will simplify taking measurements.
2. Using the special tool, measure the slope of the components. Record the measurements and the direction of the component's slope.



DE2076-B

Example for Calculating Operating Angles



Item	Description
1	Output yoke slope
2	Driveshaft slope
3	The driveshaft slope minus the output yoke slope equals the transmission/driveshaft operating angle
4	Pinion flange slope
5	The driveshaft slope minus the pinion flange slope equals the driveshaft/axle operating angle

- Calculate the difference in the slope of the components to determine the U-joint operating angle.
 - When two connected components slope in the same direction, subtract the smaller number from the largest to find the U-joint operating angle. When two connected components slope in the opposite direction, add the measurements to find the U-joint operating angle.
 - The U-joint operating angle is the angle formed by two yokes connected by a cross and bearing kit. Ideally, the operating angles on each end of the driveshaft must:
 - be equal or within one degree of each other.
 - have a three degree maximum operating angle.
 - have at least one-half of one degree continuous operating angle.

An incorrect driveline (pinion) angle can often be detected by the driving condition in which the vibration occurs.

- A vibration during coast-down from 72 to 56 km/h (45 to 35 mph) is often caused by an excessive U-joint angle at the axle (pinion nose downward).
- A vibration during acceleration, from 56 to 72 km/h (35 to 45 mph) may indicate an excessive U-joint angle at the axle (pinion nose upward).

If the tires and driveline angle are not the cause, perform the NVH tests to determine whether the concern is caused by a condition in the axle. For additional information, refer to [Section 100-04](#).

Universal Joint (U-Joint) Wear

Place the vehicle on a frame hoist and rotate the driveshaft by hand. Check for rough operation or seized U-joints. Install a new U-joint if it shows signs of seizure, excessive wear, or incorrect seating. For additional information, refer to [Section 205-01](#).

Drive Pinion Stem and Pinion Flange

Check the pinion flange runout when all other checks have failed to show the cause of vibration.

One cause of excessive pinion flange runout is incorrect installation of the axle drive pinion seal. Check to see if the spring on the seal lip has been dislodged before installing a new differential ring gear and pinion.

Coupling Shaft/Center Bearing Alignment

Vehicle noise and vibration can be caused by a dislodged or failed driveshaft center bearing support rubber insulator, a contaminated driveshaft center bearing support (4800) or excessive compression of the rubber insulator. For additional information, refer to [Section 205-01](#).

Bearing Shimming

Drive-away shudder is the predominant symptom associated with driveline angles condition on vehicles with two-piece driveshafts. Drive-away shudder can usually be corrected by shimming down the driveshaft center bearing bracket. For additional information, refer to [Section 205-01](#).

If the drive-away shudder cannot be corrected by shimming down the driveshaft center bearing bracket, check the driveline angles as described in this section.

Non-Axle Noise

There are several components, which when subject to certain conditions, can produce sound similar to axle noise. These components are the exhaust, the tires, roof racks, the power steering pump, auxiliary fluid coolers and the trim mouldings.

- The pitch of the exhaust may sound like gear whine.
- Tires — especially snow tires — can have a high-pitched tread whine or roar similar to gear noise. Radial tires, to some degree, have this characteristic. Any non-standard tire with an unusual tread construction may also emit a roar or whine-type noise.
- Trim, grille, and mouldings can also cause whistling or whining noises.

Make sure that none of these are the cause of the noise before proceeding with axle teardown and diagnosis.

Axle Noise

NOTE: Before disassembling the axle to diagnose and correct gear noise, eliminate the tires, exhaust, trim items, roof racks, axle shafts (4234) and wheel bearings as possible causes.

The noises described as follows usually have specific causes that can be diagnosed by observation as the unit is disassembled. The initial clues are the type of noise heard during the road test.

Gear Howl and Whine

Howling or whining of the differential ring gear and pinion is due to an incorrect gear pattern, gear damage or incorrect bearing preload.

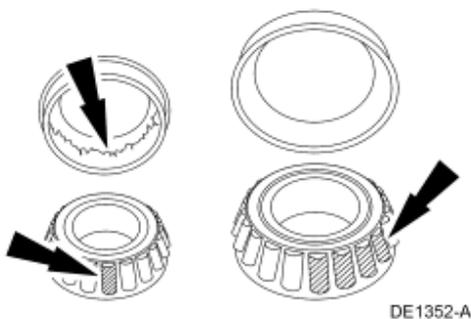
Bearing Whine

Bearing whine is a high-pitched sound similar to a whistle. It is usually caused by worn/damaged pinion bearings, which are operating at driveshaft speed. Bearing noise occurs at all driving speeds. This distinguishes it from gear whine which usually comes and goes as speed changes.

As noted, pinion bearings make a high-pitched, whistling noise, usually at all speeds. If however, there is only one pinion bearing that is worn/damaged, the noise may vary in different driving phases. Do not install new pinion bearings unless bearings are scored or damaged or there is a specific pinion bearing noise. A worn/damaged bearing will normally be obvious at disassembly. Examine the large end of the rollers for wear. If the pinion bearings original blend radius has worn to a sharp edge, install a new pinion bearing.

NOTE: A low-pitched rumble normally associated with a worn/damaged wheel bearing can be caused by the exterior luggage rack or tires.

A wheel bearing noise can be mistaken for a pinion bearing noise. Check the wheel bearing for a spalled cup, and spalled/damaged rollers. Install a new wheel bearing and cup if any of these concerns are detected.



Chuckle

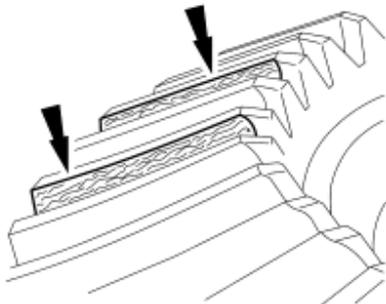
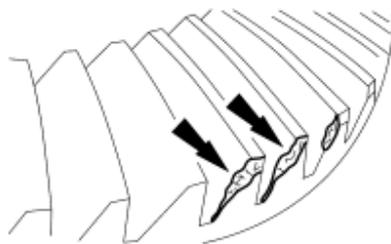
Chuckle that occurs on the coast driving phase is usually caused by excessive clearance between the differential gear hub and the differential case bore.

Damage to a gear tooth on the coast side can cause a noise identical to a chuckle. A very small tooth nick or ridge on the edge of a tooth can cause the noise.

Clean the gear tooth nick or ridge with a small grinding wheel. If the damaged area is larger than 3.2 mm (1/8 inch), install a new gearset.

To check the differential ring gear and pinion, remove as much lubricant as possible from the gears with clean solvent. Wipe the gears dry or blow them dry with compressed air. Look for scored or damaged teeth. Also look for cracks or other damage.

If either gear is scored or damaged badly, install a new differential ring gear and pinion.

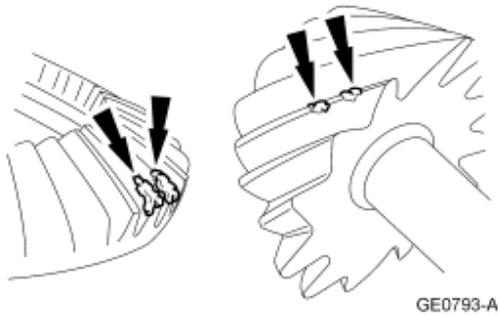


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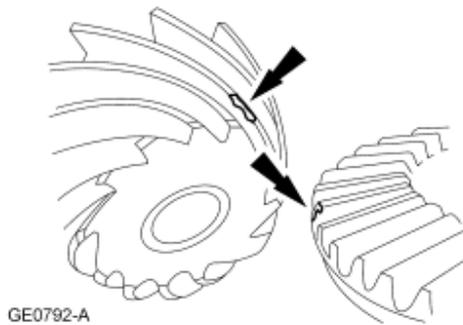
If metal has broken loose, the differential housing must be cleaned to remove particles that will cause damage. At this time, any other damaged parts in the differential housing must also be discarded and new parts installed.

Knock

Knock, which can occur on all driving phases, has several causes including damaged teeth or gearset.



A gear tooth damaged on the drive side is a common cause of the knock. This can usually be corrected by grinding the damaged area.



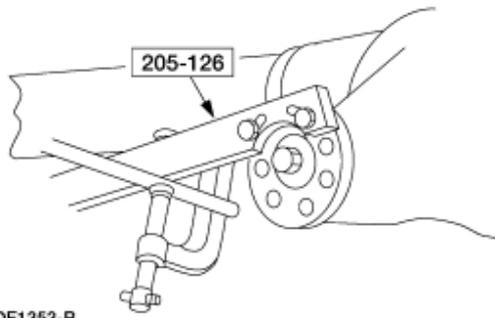
Clunk

Clunk is a metallic noise heard when the automatic transmission is engaged in REVERSE or DRIVE. The noise may also occur when throttle is applied or released. It is caused by backlash somewhere in the driveline or loose suspension components; it is felt or heard in the axle. For additional information, refer to Total Backlash Check in this section.

Additionally, clunk may be heard upon initial drive-away. This occurs as engine torque shifts vehicle weight, forcing changes in driveline angles, preventing the driveshaft slip-yoke from sliding on the output shaft. To correct for this condition, lubricate the slip-yoke splines. For additional information, refer to [Section 205-01](#).

Total Backlash Check

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the driveshaft. For additional information, refer to [Section 205-01](#).
3. Install the special tool.
 - Clamp a rigid bar or pipe to the tool. Clamp the other end of the bar or pipe to the frame or a body member in order to prevent movement of the pinion flange.



4. Lower the vehicle so that one rear wheel is resting on a wheel chock to prevent it from turning. The other rear wheel will be used to measure total rear axle backlash.
5. Rotate the free wheel slowly, by hand, until the feeling of driving the rear axle is encountered. Place a mark on the side of the tire, 305 mm (12 inches) from the center of the wheel, with a crayon or chalk.
6. While holding the crayon or chalk against the tire, rotate the wheel slowly in the opposite direction until the feeling of driving the rear axle is encountered again.
7. Measure the length of the crayon or chalk mark on the tire.
 - If the length of the mark is 25.4 mm (1 inch) or less, the rear axle backlash is within allowable limits.
 - If the chalk mark is greater than 25.4 mm (1 inch), check for these conditions:
 - Elongation of the differential pinion shaft and holes in the differential case (4204).
 - Missing differential pinion thrust washer (4230) or differential side gear thrust washer (4228).
 - Galling of the differential pinion shaft (4211) and bore.
 - Excessive ring gear and pinion backlash. Follow the procedure for the type of rear axle to check backlash.

Bearing Rumble

Bearing rumble sounds like marbles being tumbled. This condition is usually caused by worn/damaged wheel bearing. The lower pitch is because the wheel bearing turns at only about one-third of the driveshaft speed. Wheel bearing noise also may be high-pitched, similar to gear noise, but will be evident in all four driving modes.

Analysis of Inoperative Conditions

If the axle does not operate, one of the following may be the cause.

Broken Welds

If the differential housing welds are completely broken, install a new differential housing.

Wheel Bearing Wear/Damage

Because of the severe loads they must handle, new wheel bearings may need to be installed at high mileage. If a wheel bearing fails at low mileage, it is often caused by overloading.

Axle Lock Up

Lock up or seizure of the axle shaft usually indicates inadequate lubrication. Without enough lubricant, the heated parts get soft and may eventually weld together. Check for lubricant leaks after repair.

Symptom Chart

Symptom Chart		
Condition	Possible Sources	Action
<ul style="list-style-type: none"> Excessive Rear/Front Axle Noise 	<ul style="list-style-type: none"> Rear/front axle. 	<ul style="list-style-type: none"> CARRY OUT the NVH tests to determine whether the noise is a NVH concern caused by a condition in the rear/front axle. REFER to Section 100-04.
	<ul style="list-style-type: none"> Wheel bearing. 	<ul style="list-style-type: none"> INSPECT and INSTALL new wheel bearings as necessary.
<ul style="list-style-type: none"> Loud Clunk in the Driveline When Shifting from Reverse to Forward 	<ul style="list-style-type: none"> High idle speed. 	<ul style="list-style-type: none"> REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
	<ul style="list-style-type: none"> Engine mounts. 	<ul style="list-style-type: none"> INSPECT and REPAIR as necessary.
	<ul style="list-style-type: none"> Driveshaft components. 	<ul style="list-style-type: none"> REFER to Universal Joint (U-joint) Inspection under Inspection and Verification in this section. REPAIR as necessary.
	<ul style="list-style-type: none"> Rear axle shafts / 	<ul style="list-style-type: none"> REMOVE, INSPECT and

	differential.	REPAIR as necessary.
	<ul style="list-style-type: none"> • Suspension components. 	<ul style="list-style-type: none"> • INSPECT, REPAIR as necessary.
	<ul style="list-style-type: none"> • Backlash in the axle or the transmission. 	<ul style="list-style-type: none"> • CARRY OUT Total Backlash Check in this section. REPAIR as necessary.
	<ul style="list-style-type: none"> • Lubrication. 	<ul style="list-style-type: none"> • ADD lubricant as necessary.
<ul style="list-style-type: none"> • Driveline Clunk as the Vehicle Starts to Move Following a Stop 	<ul style="list-style-type: none"> • Rear spring U-bolts. 	<ul style="list-style-type: none"> • TIGHTEN the U-bolts to specification.
	<ul style="list-style-type: none"> • Output driveshaft and coupling shaft splines. 	<ul style="list-style-type: none"> • REMOVE the driveshaft from the vehicle. CLEAN the male splines and INSPECT for worn or galled splines. REPAIR as necessary.
	<ul style="list-style-type: none"> • Driveshaft slip-yoke splines. 	<ul style="list-style-type: none"> • CLEAN and INSPECT the female splines of the driveshaft slip-yoke for worn or galled condition. REPAIR as necessary.
<ul style="list-style-type: none"> • Rear Axle Has a High-Pitched Chattering Noise While Turning (Ford Traction-Lok®) 	<ul style="list-style-type: none"> • Lubricant. 	<ul style="list-style-type: none"> • ROAD TEST the vehicle. DRIVE in tight circles, 5 clockwise and 5 counterclockwise. If the chatter is still evident, FLUSH and REFILL with the specified rear axle lubricant and dosage of friction modifier additive. REFER to Specifications in this section.

	<ul style="list-style-type: none"> Differential. 	<ul style="list-style-type: none"> REPAIR as necessary.
<ul style="list-style-type: none"> Powr-Lok® Rear Axle Has a Chatter Noise While Turning 	<ul style="list-style-type: none"> Lubricant Differential 	<ul style="list-style-type: none"> Refer to Differential Check — Powr-Lok® Road Test (Dana) in this section.
<ul style="list-style-type: none"> Ford Traction-Lok® Does Not Work in Snow, Mud or on Ice 	<ul style="list-style-type: none"> Differential. 	<ul style="list-style-type: none"> CARRY OUT the Differential Check — Ford Traction-Lok® Road Test in this section. REPAIR as necessary.
<ul style="list-style-type: none"> Clicking, Popping, or Grinding Noises While Turning 	<ul style="list-style-type: none"> Wheel bearings. 	<ul style="list-style-type: none"> REFER to Section 204-01B (4x4) or Section 206-03 (4x2).
	<ul style="list-style-type: none"> Brake components. 	<ul style="list-style-type: none"> REFER to Section 206-00.
	<ul style="list-style-type: none"> Suspension components. 	<ul style="list-style-type: none"> REFER to Section 204-00.
	<ul style="list-style-type: none"> Steering components. 	<ul style="list-style-type: none"> REFER to Section 211-00.
<ul style="list-style-type: none"> Vibration at Highway Speeds 	<ul style="list-style-type: none"> Out-of-balance wheels or tires. 	<ul style="list-style-type: none"> BALANCE wheels and tires, or INSTALL new tires as necessary.
	<ul style="list-style-type: none"> Out-of-round tires. 	<ul style="list-style-type: none"> REFER to Section 204-04.
<ul style="list-style-type: none"> Shudder, Vibration During Acceleration 	<ul style="list-style-type: none"> Axle assembly mispositioned. 	<ul style="list-style-type: none"> CHECK the axle mounts for damage and wear. REPAIR as necessary.
	<ul style="list-style-type: none"> Front suspension 	<ul style="list-style-type: none"> CHECK for worn suspension bushings and

	components.	damaged components. REPAIR as necessary.
	<ul style="list-style-type: none"> • Driveline angles out of specification. 	<ul style="list-style-type: none"> • CHECK the driveline angles.
	<ul style="list-style-type: none"> • Rear spring U-bolt. 	<ul style="list-style-type: none"> • TIGHTEN the U-bolt.
	<ul style="list-style-type: none"> • Binding, damaged, or galled splines on driveshaft slip-yoke. 	<ul style="list-style-type: none"> • CHECK the transmission for correct lubricant. CLEAN and lap the splines. LUBRICATE the splines with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.
	<ul style="list-style-type: none"> • U-joints binding or seized. 	<ul style="list-style-type: none"> • REFER to Section 205-01.
<ul style="list-style-type: none"> • Driveline Vibration 	<ul style="list-style-type: none"> • U-joint. 	<ul style="list-style-type: none"> • INSPECT and INSTALL new universal joints (4249) as necessary. REFER to Section 205-01.
	<ul style="list-style-type: none"> • Pinion flange runout. 	<ul style="list-style-type: none"> • REFER to Driveline Vibration in this section.
	<ul style="list-style-type: none"> • Driveshaft out of balance. 	<ul style="list-style-type: none"> • REFER to Driveline Vibration in this section.
	<ul style="list-style-type: none"> • Driveshaft runout. 	<ul style="list-style-type: none"> • REFER to Driveline Vibration in this section.
	<ul style="list-style-type: none"> • Lateral and radial tire and wheel runout. 	<ul style="list-style-type: none"> • REFER to Section 204-04.
	<ul style="list-style-type: none"> • Driveline angles out of 	<ul style="list-style-type: none"> • CORRECT as necessary.

	specification.	
	<ul style="list-style-type: none"> Splines on driveshaft slip yoke (4841). 	<ul style="list-style-type: none"> CHECK the transmission for correct lubricant. CLEAN and lap the splines. LUBRICATE the splines with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.
	<ul style="list-style-type: none"> Loose driveshaft-to-pinion flange retainers. 	<ul style="list-style-type: none"> TIGHTEN to specifications. REFER to Section 205-01.
<ul style="list-style-type: none"> Noise Is the Same on Drive or Coast 	<ul style="list-style-type: none"> Road. 	<ul style="list-style-type: none"> Normal condition.
	<ul style="list-style-type: none"> Tire(s). 	<ul style="list-style-type: none"> BALANCE or INSTALL new tire(s). REFER to Section 204-04.
	<ul style="list-style-type: none"> Wheel bearing. 	<ul style="list-style-type: none"> INSPECT and, as necessary, ADJUST or INSTALL new wheel bearings.
	<ul style="list-style-type: none"> Incorrect driveline angles or phasing. 	<ul style="list-style-type: none"> CORRECT as necessary.
<ul style="list-style-type: none"> Lubricant Leaking from the Pinion Seal, Axle Shaft Oil Seals (3254) 	<ul style="list-style-type: none"> Vent. 	<ul style="list-style-type: none"> CLEAN the differential housing vent.
	<ul style="list-style-type: none"> Damage in the seal contact area or dust slinger on the pinion flange dust shield. 	<ul style="list-style-type: none"> INSTALL a new pinion flange and pinion seal if damage is found.

<ul style="list-style-type: none"> Noise Tone Lowers as the Vehicle Speed is Lowered 	<ul style="list-style-type: none"> Tire(s). 	<ul style="list-style-type: none"> BALANCE or INSTALL new tire(s). REFER to Section 204-04.
<ul style="list-style-type: none"> Similar Noise Is Produced with the Vehicle Standing and Driving 	<ul style="list-style-type: none"> Engine. 	<ul style="list-style-type: none"> REFER to Section 303-00.
	<ul style="list-style-type: none"> Transmission. 	<ul style="list-style-type: none"> REFER to the appropriate transmission section.
<ul style="list-style-type: none"> Noise Most Pronounced While Turning 	<ul style="list-style-type: none"> Differential side gears and pinion gears. 	<ul style="list-style-type: none"> For conventional and Ford Traction-Lok® differentials, INSTALL new gears. The Tractech® Truetrac® differential is non-repairable. DISCARD the entire assembly if it is worn/damaged.
<ul style="list-style-type: none"> Drive Noise, Coast Noise or Float Noise 	<ul style="list-style-type: none"> Wheel/axle shaft bearings or differential side bearings. 	<ul style="list-style-type: none"> INSPECT and, as necessary, ADJUST or INSTALL new bearings.
	<ul style="list-style-type: none"> Differential ring gear and pinion. 	<ul style="list-style-type: none"> CHECK the differential ring gear and pinion. ADJUST or INSTALL a new differential ring gear and pinion.

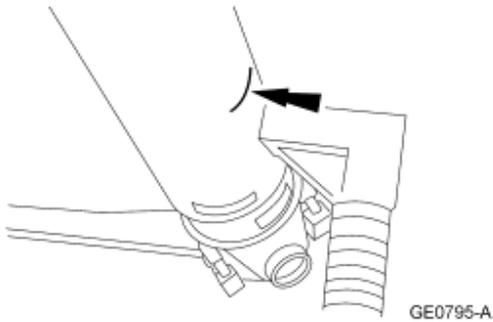
Component Tests

Driveline Vibration

NOTE: An analysis of driveline vibration can also be conducted using the Electronic Vibration Analyzer and following the manufacturer's directions.

Driveline vibration exhibits a higher frequency and lower amplitude than does high-speed shake. Driveline vibration is directly related to the speed of the vehicle and is usually noticed at various speed ranges. Driveline vibration can be perceived as a tremor in the floor pan or is heard as a rumble, hum, or boom. Driveline vibration can exist in all drive modes, but may exhibit different symptoms depending upon whether the vehicle is accelerating, decelerating, floating, or coasting. Check the driveline angles if the vibration is particularly noticeable during acceleration or deceleration, especially at lower speeds. Driveline vibration can be duplicated by supporting the axle upon a hoist or upon jack stands, though the brakes may need to be applied lightly in order to simulate road resistance.

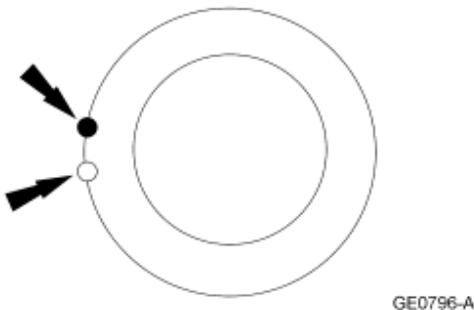
1. Raise the vehicle promptly after road testing. Use twin-post hoist or jack stands to prevent tire flat-spotting. Engage the drivetrain and accelerate to the observed road test speed to verify the presence of the vibration. If the vibration is not evident, check the non-driving wheels with a wheel balancer to rule out imbalance as a possible cause. If necessary, balance the non-driving wheels and repeat the road test. If the vibration is still evident, proceed to Step 2.
2. Mark the relative position of the drive wheels to the wheel lugs. Remove the wheels. Install all the wheel nuts in the reversed position (wheel nuts can be installed in their normal orientation on axles with dual rear wheels) and repeat the road speed acceleration. If the vibration is gone, refer to the tire and wheel runout procedure in [Section 204-04](#). If the vibration persists, proceed to Step 3.
3. Inspect the driveshaft(s) (for signs of physical damage, missing balance weight, undercoating, incorrect seating, wear and binding universal joints [4635]). Clean the driveshaft and install new universal joints or a driveshaft if damaged. Check the index marks (paint spots) on the rear of the driveshaft and pinion flange. If these marks are more than one quarter turn apart, disconnect the driveshaft and re-index it to align the marks as closely as possible. After any corrections are made, recheck for vibration at the road test speed. If the vibration is gone, reinstall the wheels and road test. If the vibration persists, proceed to Step 4.
4. Raise the vehicle on a hoist and remove the wheels. Rotate the driveshaft by turning the axle and measure the runout at the front, the center, and the rear of the driveshaft with the indicator. If the runout exceeds 0.89 mm (0.035 inch) at the front or center, install a new driveshaft. If the front and center are within this limit, but the rear runout is not, mark the rear runout high point and proceed to Step 5. If the runout is within the limits at all points, proceed to Step 7.



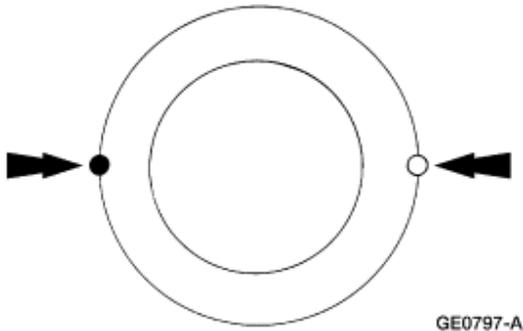
5. **NOTE:** Check the U-joints during re-indexing. If a U-joint feels stiff or gritty, install new U-joints.

Scribe alignment marks on the driveshaft and the pinion flange. Disconnect the driveshaft, rotate it one half turn, and reconnect it. Circular pinion flanges can be turned in one quarter increments to fine tune the runout condition; half-round pinion flanges are limited to two positions. Check the runout at the rear of the driveshaft. If it is still over 0.89 mm (0.035 inch), mark the high point and proceed to Step 6. If the runout is no longer excessive, check for vibration at the road test speed. If vibration is still present, re-index the driveshaft slip yoke on the transmission output shaft one half turn and road test the vehicle. If the vibration persists, proceed to Step 7.

6. Excessive driveshaft runout may originate in the driveshaft itself or in the pinion flange. To determine which, compare the two high points marked in Steps 4 and 5. If the marks are close together, within about 25 mm (1 inch), install a new driveshaft and road test the vehicle.

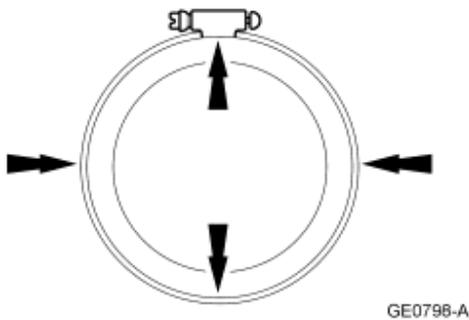


If the marks are on opposite sides of the driveshaft, the pinion flange is responsible for the vibration.



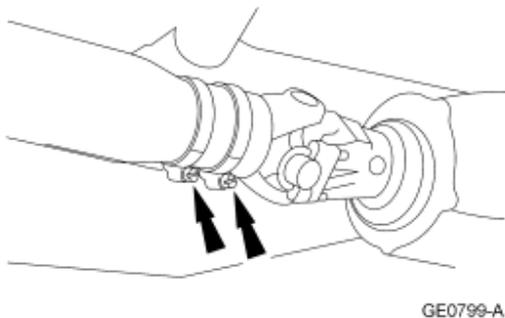
When installing a new pinion flange, the driveshaft runout must not exceed 0.89 mm (0.035 inch). When runout is within limits, recheck for vibration at road speed. If vibration persists, balance the driveshaft.

7. To balance the driveshaft, install one or two hose clamps on the driveshaft, near the rear. Position of the hose clamp head(s) can be determined by trial-and-error.
8. Mark the rear of the driveshaft into four approximately equal sectors and number the marks 1 through 4. Install a hose clamp on the driveshaft with its head at position No. 1.

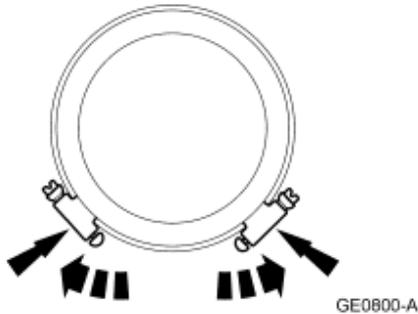


Check for vibration at road speed. Recheck with the clamp at each of the other positions to find the position that shows minimum vibration. If two adjacent positions show equal improvement, position the clamp head between them.

9. If the vibration persists, add a second clamp at the same position and recheck for vibration.



If no improvement is noted, rotate the clamps in opposite directions, equal distances from the best position determined in Step 8. Separate the clamp heads about 13 mm (1/2 inch) and recheck for vibration at the road speed.



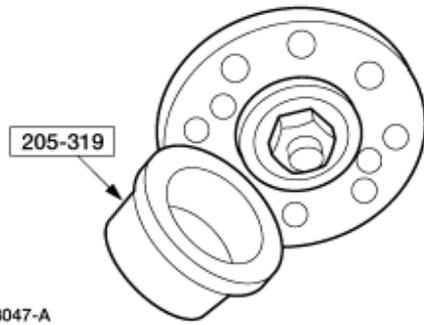
Repeat the process with increasing separation until the best combination is found or the vibration is reduced to an acceptable level.

10. Install the wheels and road test (vibration noticeable on the hoist may not be evident during the road test). If the vibration is still not acceptable, install a new axle driveline vibration damper first, if so equipped. If the vibration is still not acceptable, refer to [Section 205-02A](#), [Section 205-02B](#) or [Section 205-02D](#) for differential case and ring gear runout checks.

Runout Check — Circular Pinion Flange

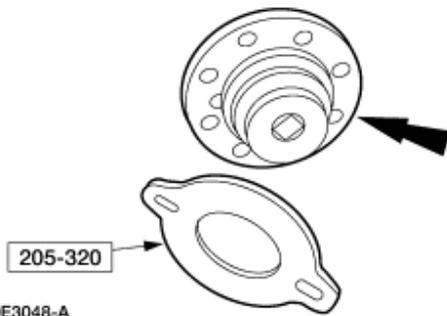
⚠ CAUTION: This operation disturbs the pinion bearing preload. Pinion bearing preload must be reset if the pinion nut has been loosened or removed for pinion flange reindexing or if a new pinion flange was installed.

1. Raise the vehicle on a twin-post hoist that supports the rear axle.
2. Remove the driveshaft. For additional information, refer to [Section 205-01](#).
3. Check the pinion flange for damage.
4. Position the special tool on the pinion flange.



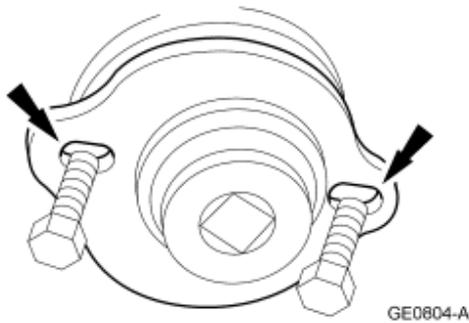
DE3047-A

5. Position the special tool onto the Companion Flange Runout Gauge.



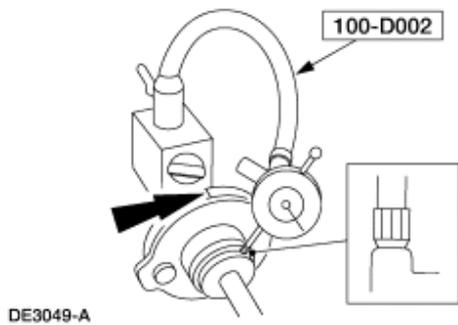
DE3048-A

6. Align the holes on the clamp plate with the holes in the pinion flange and install the bolts. Snug the bolts evenly.



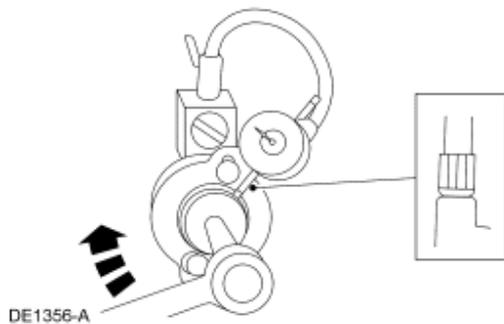
GE0804-A

7. Position the special tool as shown. Turn the Companion Flange Runout Gauge, and locate and mark the high spot on the pinion flange with yellow paint.



If the flange runout exceeds 0.25 mm (0.010 inch), remove the pinion flange, reindex the flange one half turn on the pinion, and reinstall it.

8. Check the runout again. If necessary, rotate the flange until an acceptable runout is obtained. If the flange runout is still more than 0.25 mm (0.010 inch), install a new pinion flange.

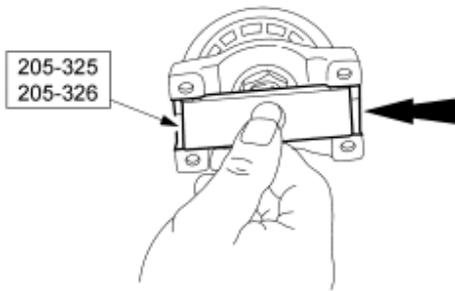


9. If excessive runout is still evident after installing the new pinion flange, install a new ring and pinion. Repeat the above checks until the runout is within specifications.
10. Install the driveshaft. For additional information, refer to [Section 205-01](#).

Runout Check — Half-Round Companion Flange

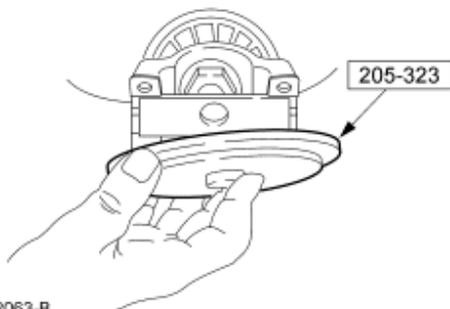
⚠ CAUTION: Pinion bearing preload must be reset if the pinion nut has been loosened or removed for pinion flange reindexing or replacement.

1. Raise the vehicle on a twin-post hoist that supports the rear axle.
2. Remove the driveshaft. For additional information, refer to [Section 205-01](#).
3. Check the pinion flange for damage.
4. Insert the correct size special tool.



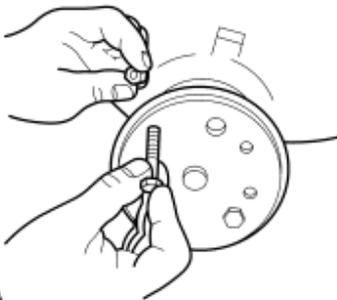
DE2062-B

5. Position the special tool on the pinion flange.



DE2063-B

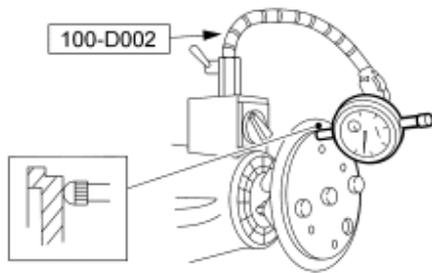
6. Align the holes on the gauge with the holes in the pinion flange and install the bolts and nuts.



DE2064-A

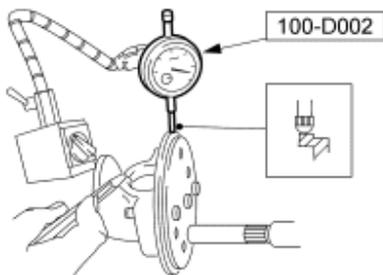
7. **NOTE:** Accurate tool setup will result in accurate final readings.

Position the special tool as shown. Adjust and lightly tighten the mounting bolts and nuts so the gauge runout is 0.254 mm (0.010 inch) or less.



DE2065-B

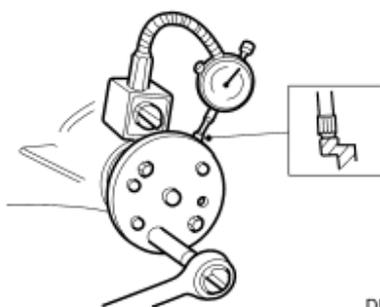
8. Position the special tool on the edge of the gauge. Turn the Companion Flange Runout Gauge, and locate and mark the high spot on the pinion flange with yellow paint.



DE2066-B

If the flange runout exceeds 0.25 mm (0.010 inch), remove the pinion flange, reindex the flange one-half turn on the pinion, and reinstall it.

9. Check the runout again. If necessary, reindex the flange until an acceptable runout is obtained. If the flange runout is still more than 0.25 mm (0.010 inch), install a new pinion flange.



DE2067-A

10. If excessive runout is still evident after installing the new pinion flange, install a new ring and pinion. Repeat the above checks until the runout is within specifications.

11. Install the driveshaft. For additional information, refer to [Section 205-01](#).

Differential Check — Ford Traction-Lok® Road Test (Ford)

1. Place one wheel on a dry surface and the other wheel on ice, mud or snow.
2. Gradually open the throttle to obtain maximum traction prior to break away. The ability to move the vehicle demonstrates correct performance of a Traction-Lok® rear axle assembly (4006).
3. When starting with one wheel on an excessively slippery surface, a slight application of the parking brake may be necessary to help energize the Traction-Lok® feature of the differential. Release the brake when traction is established. Use light throttle on starting to provide maximum traction.
4. If, with unequal traction, both wheels slip, the limited slip rear axle has done all it can possibly do.
5. In extreme cases of differences in traction, the wheel with the least traction may spin after the Traction-Lok® has transferred as much torque as possible to the non-slipping wheel.

Differential Check — Tractech® Truetrac®

1. Shift the transmission into NEUTRAL.
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Spin either rear wheel.
 - Both wheels must spin with a fluid motion. Any feeling of gripping and release/roughness indicates that further inspection of the axle assembly is necessary. For additional information about axle disassembly and inspection, refer to [Section 205-02A](#) or [Section 205-02B](#).
4. Shift the transmission into gear.
5. Spin either rear wheel.
 - The other wheel must spin with a fluid motion in the opposite direction and at the same speed of the wheel being spun. Any feeling of gripping and release/roughness indicates that further inspection of the axle assembly is necessary. For additional information about axle disassembly and inspection, refer to [Section 205-02A](#) or [Section 205-02B](#).

Differential Check — Powr-Lok® Road Test (Dana)

1. Drive the vehicle for at least ten miles to warm up the axle lubricant.
 - More miles may be necessary depending on the outside temperature.

2. Drive the vehicle in a tight circle for five minutes and then in the opposite direction for another five minutes.
3. Make a minimum of ten figure eight turns.
4. If chatter is still present, drain and refill the axle with the specified type and amount of lubricant and friction modifier. For additional information, refer to Specifications in this section.
5. Perform the road test again.
 - There might be a slight chatter. If the chatter persists after 160 km (100 miles) of vehicle operation, install a new differential.

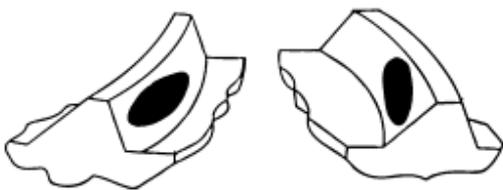
Tooth Contact Pattern Check — Gearset, Dana S135

1.  **CAUTION: If reusing the differential ring gear and pinion, measure and record the backlash before disassembly. Re-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.**

Paint one quarter of both the drive and the coast side of the differential ring gear with marking compound.

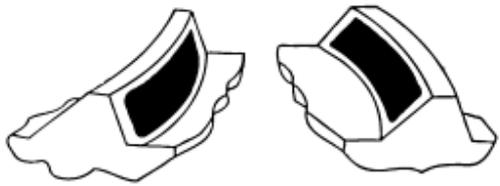
2. While applying a load, rotate the differential ring gear one complete revolution.

Correct Contact Pattern — Single Index Lightly Loaded



DE2068-A

Correct Contact Pattern — Single Index Heavily Loaded



DE2069-A

3. Verify the contact pattern is correct.
 - Tooth contact pattern can move only by adjusting backlash. Tooth contact pattern can move only in the direction of heal-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.

Tooth Contact Pattern Check — Gearset, Except Dana S135

1. To check the gear tooth contact, paint the gear teeth with the special marking compound. A mixture that is too wet will run and smear; a mixture that is too dry cannot be pressed out from between the teeth.
2. Use a box wrench on the ring gear bolts as a lever to rotate the differential ring gear several complete revolutions in both directions or until a clear tooth contact pattern is obtained.
3. Certain types of gear tooth contact patterns on the differential ring gear indicate incorrect adjustment. Incorrect adjustment can be corrected by readjusting the differential ring gear or the pinion.

Contact Pattern Location — Except Dana S135

In general, desirable ring gear tooth patterns must have the following characteristics:

- Drive pattern on the drive side differential ring gear well centered on the tooth.
- Coast pattern on the coast side differential ring gear well centered on the tooth.
- Clearance between the pattern and the top of the tooth.
- No hard lines where the pressure is high.

Acceptable differential ring gear tooth patterns for all axles.



GE0807-A

Correct backlash with a thinner pinion position shim required.



GE0808-A

Correct backlash with a thicker pinion position shim required.



GE0809-A

Correct pinion position shim that requires a decrease in backlash.



GE0810-A

Correct pinion position shim that requires an increase in backlash.



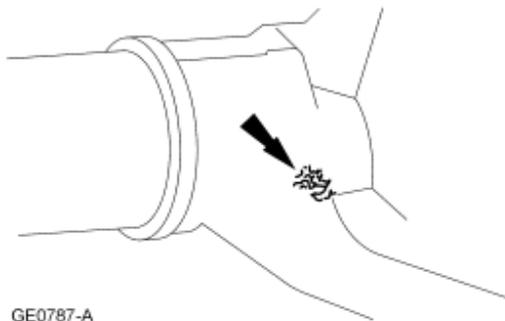
GE0811-A

Axle Housing Casting Porosity (Holes in Casting) Repair

NOTE: Do not disassemble the carrier. Make repairs on the outside of the axle.

NOTE: Casting porosity is a condition where occasionally gas bubbles will form during the casting process leaving small pockets in the metal that may cause the axle housing to show signs of dampness.

1. To fill small pockets,peen in a small amount of body lead.



2. Seal the pocket.
 - Use Devcon Aluminum Liquid F2 or equivalent meeting Ford specification M-3D35A(E).
 3. To fill large pockets, drill and tap a shallow hole for a small setscrew. Install the setscrew and seal it.
 - Use Devcon Aluminum Liquid F2 or equivalent meeting Ford specification M-3D35A(E).
-

SECTION 205-01:
Driveshaft

[SPECIFICATIONS](#)

DESCRIPTION AND OPERATION

[Driveshaft](#)

[Universal Joints](#)

DIAGNOSIS AND TESTING

[Driveshaft](#)

GENERAL PROCEDURES

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[Driveshaft—Rear, One-Piece, 4x2 With 137-Inch and 141-Inch Wheel Base](#)

[Driveshaft—Rear, One-Piece, 4x4 With 137-, 141- and 142-Inch Wheel Base](#)

[Driveshaft—Rear, Two-Piece](#)

[Driveshaft—Rear, Three-Piece, F-450, F-550](#)

[Driveshaft—Rear, Three-Piece, Motorhome](#)

DISASSEMBLY AND ASSEMBLY

[Center Bearing](#)

[Universal Joint—Single Cardan](#)

[Universal Joint—Double Cardan](#)

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SECTION 205-01: Driveshaft
SPECIFICATIONS

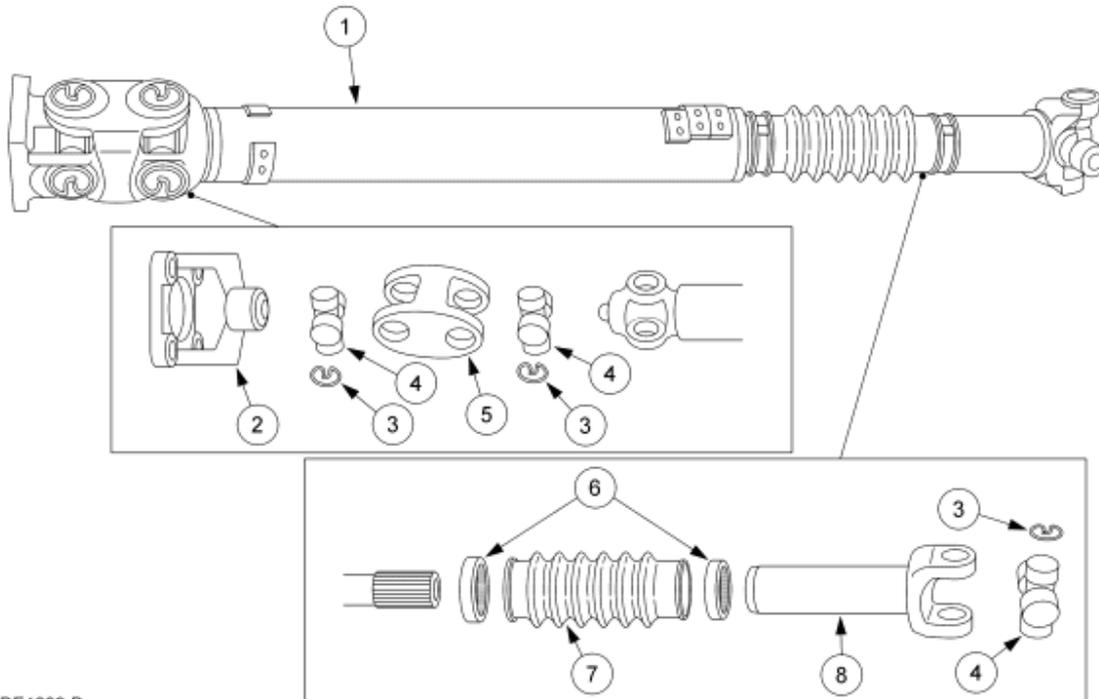
1999 F-Super Duty 250-550 Workshop Manual
[Procedure revision date: 01/26/2000](#)

General Specifications	
Item	Specification
Premium Long-Life Grease XG-1-C	ESA-M1C75-B

Torque Specifications		
Description	Nm	lb-ft
Driveshaft to transfer case bolts, front	102	76
Driveshaft to transfer case bolts, rear	102	76
Driveshaft to front axle bolts	35	26
Driveshaft to rear axle bolts (except Motorhome)	35	26
Driveshaft to parking brake drum bolts	150	111
Driveshaft center bearing bolts (except Motorhome)	63	47
Driveshaft to coupling shaft (except Motorhome)	35	26
Driveshaft to manual transmission flange	102	76
Driveshaft to coupling shaft (Motorhome)	102	76
Driveshaft to rear axle bolts (Motorhome)	74.5	55
Driveshaft center bearing bolts (Motorhome)	90	66
Reverse slip driveshaft flange nut	407	300

Driveshaft

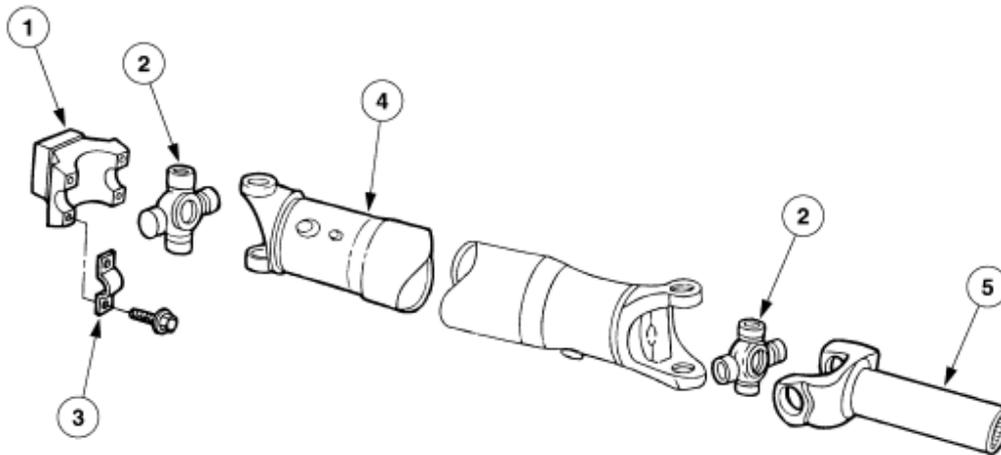
Driveshaft — Front



DE1609-B

Item	Part Number	Description
1	4A376	Driveshaft
2	4782	Driveshaft Centering Socket Yoke
3	—	Snap Ring (Part of 4635)
4	4635	Universal Joint (U-Joint)
5	4784	Driveshaft Center Yoke
6	4K277	Driveshaft Slip Yoke Boot Clamp
7	4421	Driveshaft Slip Yoke Boot
8	4841	Driveshaft Slip Yoke

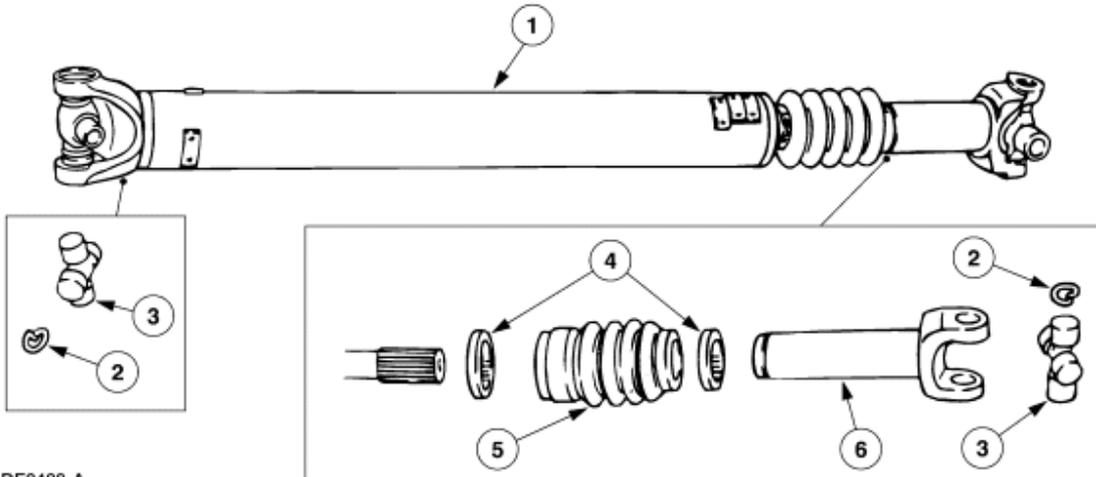
Driveshaft — Rear, One-Piece 4x2 with 137- and 141-Inch Wheel Base



DE2179-A

Item	Part Number	Description
1	4851	Driveshaft Rear Axle Flange
2	4635	Universal Joint (U-Joint)
3	4A254	U-Joint Retainer
4	4602	Driveshaft
5	4841	Driveshaft Slip Yoke

Driveshaft — Rear, One-Piece 4x4 with 141-Inch Wheel Base

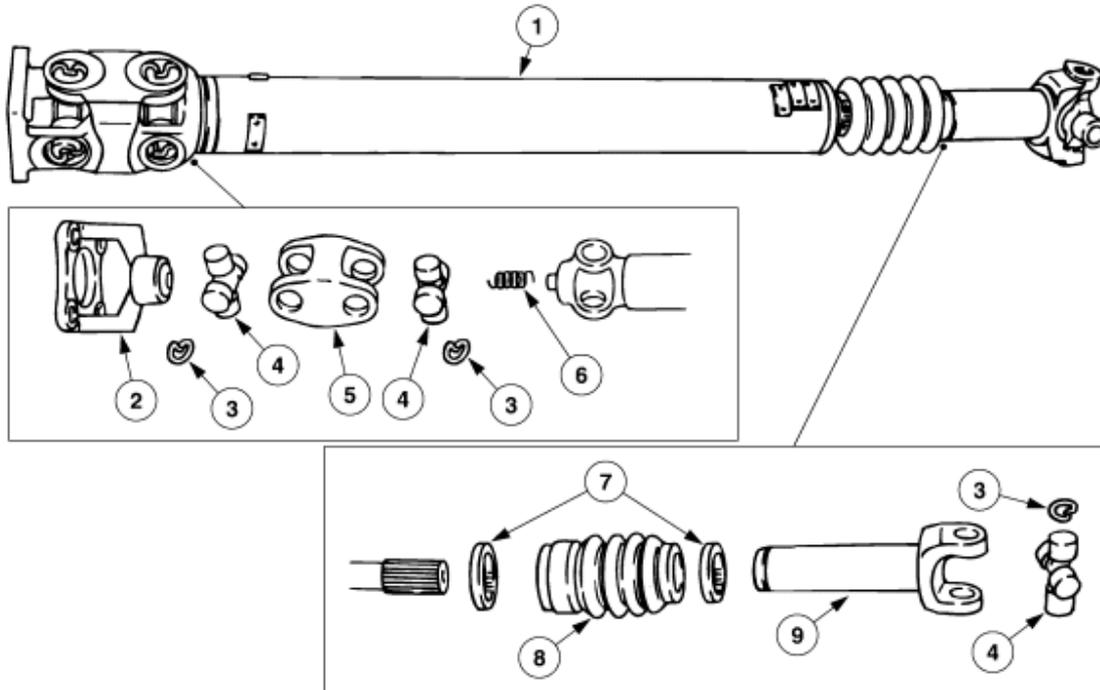


DE2428-A

Item	Part Number	Description
1	4602	Driveshaft
2	—	Snap Ring (Part of 4635)
3	4635	Universal Joint (U-Joint)
4	4K277	Driveshaft Slip Yoke Boot Clamp

5	4421	Driveshaft Slip Yoke Boot
6	4841	Driveshaft Slip Yoke

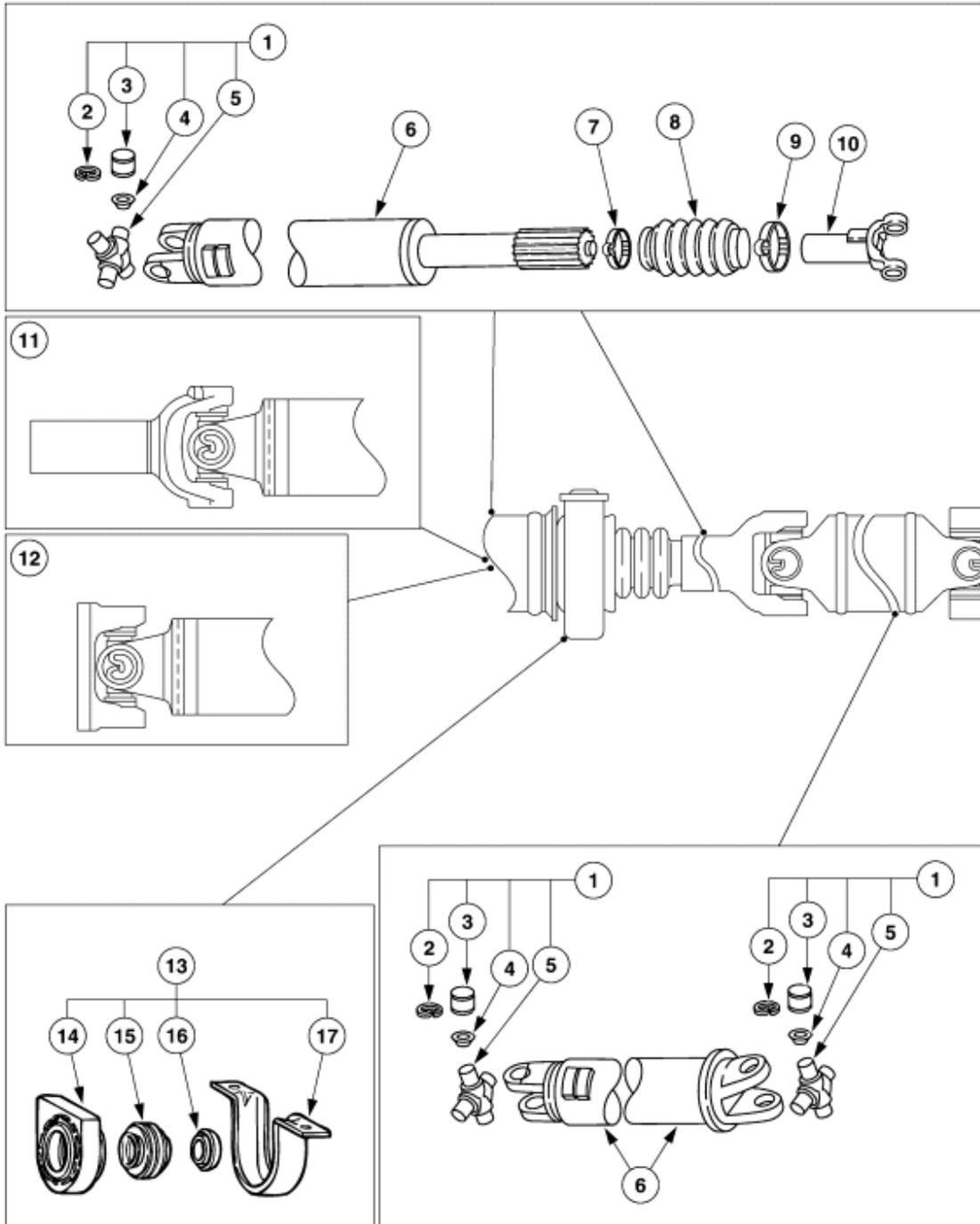
Driveshaft — Rear, One-Piece 4x4 with 137- and 142-Inch Wheel Base



DE2429-A

Item	Part Number	Description
1	4602	Driveshaft
2	4782	Driveshaft Centering Socket Yoke
3	—	Snap Ring (Part of 4635)
4	4635	Universal Joint (U-Joint)
5	4784	Driveshaft Center Yoke
6	—	Spring (Part of 4A376)
7	4K277	Driveshaft Slip Yoke Boot Clamp
8	4421	Driveshaft Slip Yoke Boot
9	4841	Driveshaft Slip Yoke

Driveshaft — Rear, Two-Piece, All Models Except XLT and Lariat 4x2 with 142-Inch Wheel Base and 156- and 158-Inch Wheel Base

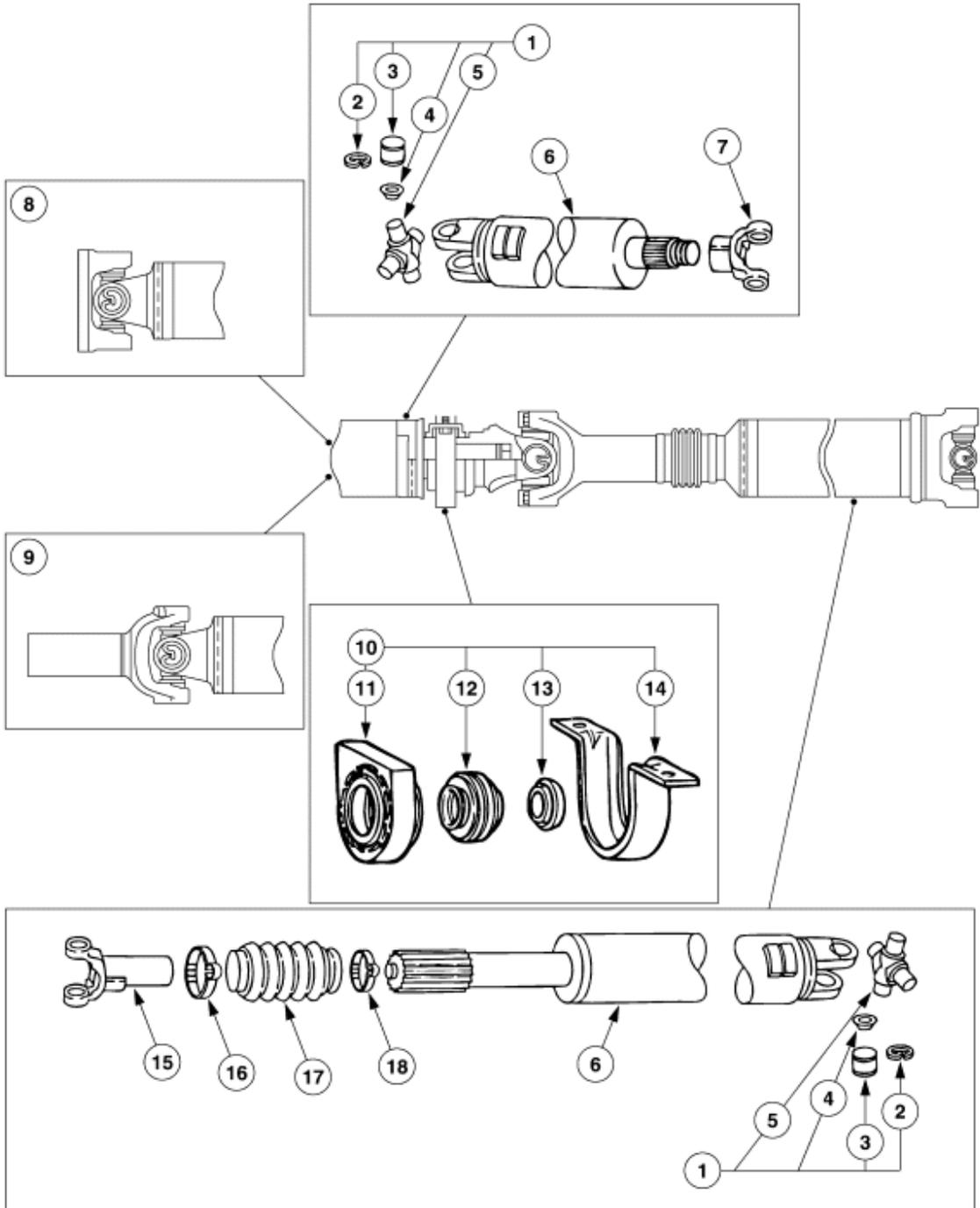


DE2430-A

Item	Part Number	Description
1	4635	Universal Joint (U-Joint)
2	—	Snap Ring (Part of 4635)
3	—	Bearing (Part of 4635)
4	—	Seal (Part of 4635)
5	—	Spider (Part of 4635)

6	4K145	Driveshaft Assy
7	4K277	Driveshaft Slip Yoke Boot Clamp (Small)
8	4421	Driveshaft Slip Yoke Boot
9	4K277	Driveshaft Slip Yoke Boot Clamp (Large)
10	4841	Driveshaft Slip Yoke
11	—	Vehicles with Manual Transmission
12	—	Vehicles with Automatic Transmission
13	4800	Center Bearing Assy
14	—	Rubber Insulator (Part of 4800)
15	—	Center Bearing (Part of 4800)
16	—	Bearing Retainer Ring (Part of 4800)
17	4A499	Driveshaft Center Bearing Bracket

Driveshaft — Rear, Two-Piece, XLT and Lariat Models 4x2 with 142-Inch Wheel Base and 156- and 158-Inch Wheel Base

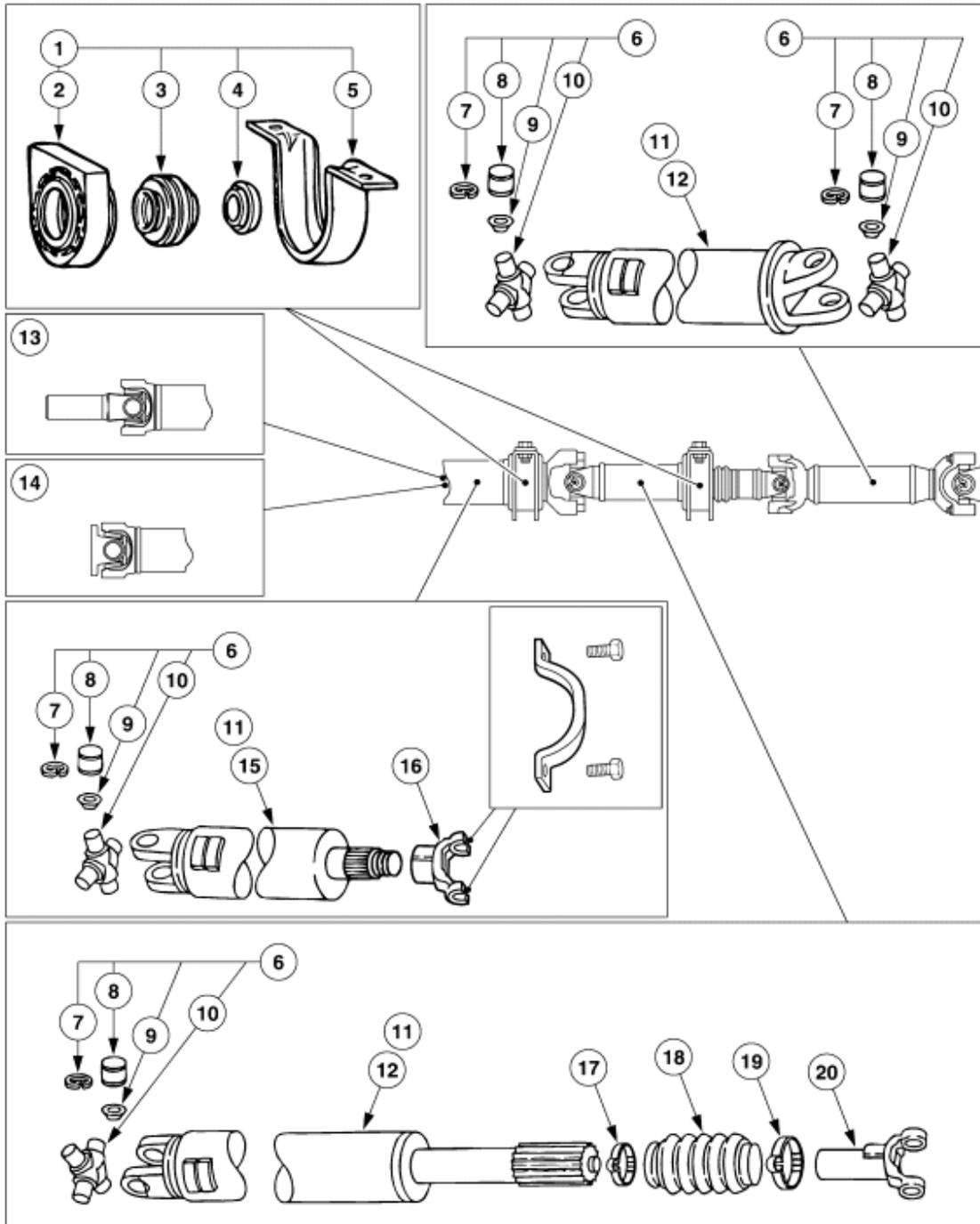


DE2432-A

Item	Part Number	Description
1	4635	Universal Joint (U-Joint)
2	—	Snap Ring (Part of 4635)
3	—	Bearing (Part of 4635)
4	—	Seal (Part of 4635)
5	—	Spider (Part of 4635)

6	4K145	Driveshaft Assy
7	4851	Driveshaft Yoke
8	—	Vehicles with Manual Transmissions
9	—	Vehicles with Automatic Transmissions
10	4800	Center Bearing Assy
11	—	Rubber Insulator (Part of 4800)
12	—	Center Bearing (Part of 4800)
13	—	Bearing Retainer Ring (Part of 4800)
14	4A499	Driveshaft Center Bearing Bracket
15	4841	Driveshaft Slip Yoke
16	4K277	Driveshaft Slip Yoke Boot Clamp (Large)
17	4421	Driveshaft Slip Yoke Boot
18	4K277	Driveshaft Slip Yoke Boot Clamp (Small)

Driveshaft — Rear, Three-Piece



DE2176-B

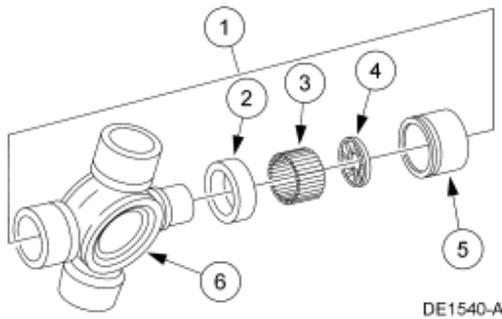
Item	Part Number	Description
1	4800	Center Bearing Assy
2	—	Rubber Insulator (Part of 4800)
3	—	Center Bearing

		(Part of 4800)
4	—	Bearing Retainer Ring (Part of 4800)
5	4A499	Driveshaft Center Bearing Bracket
6	4635	Universal Joint (U-Joint)
7	—	Snap Ring (Part of 4635)
8	—	Bearing (Part of 4635)
9	—	Seal (Part of 4635)
10	—	Spider (Part of 4635)
11	4K357	Driveshaft Assy
12	4K185	Driveshaft Assy — Rear
13	—	Vehicles with Automatic Transmission
14	—	Vehicles with Manual Transmission or Motorhome
15	4817	Driveshaft — Front
16	4851	Driveshaft Yoke
17	4K277	Driveshaft Slip Yoke Boot Clamp (Small)
18	4421	Driveshaft Slip Yoke Boot
19	4K277	Driveshaft Slip Yoke Boot Clamp (Large)
20	4841	Driveshaft Slip Yoke

The driveshaft (4602) is a tubular shaft used to transfer torque from the engine, through the transmission to the ring and pinion in the rear axle, which transmits the torque to the wheels. Driveshafts differ in length, diameter and type to accommodate various wheelbase, GVW ratings and powertrain combinations.

The driveshaft has half round end yokes with bolt and strap attachment at all front and rear axle ends and bolt attachments at the transfer case and manual transmission outputs.

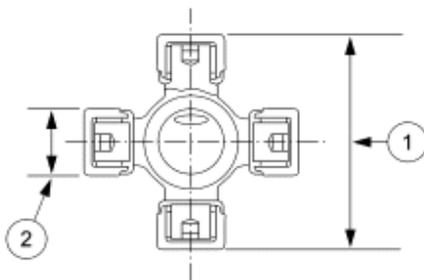
Universal Joints



Item	Part Number	Description
1	4635	Universal joint (U-joint)
2	—	Grease seal (part of 4635)
3	—	32 needle rollers (part of 4635)
4	—	Thrust washer (part of 4635)
5	—	Bearing cup (part of 4635)
6	—	Spider (part of 4635)

Universal joints have the following:

- A lubed-for-life design.
- Equipped with nylon thrust washers located at the base of each bearing cup, which control end play, positions the needle bearings and improves grease movement.
- Size 1350 for E-150-350, size 1410 for E-450, and size 1480 for E-550.



DE2431-A

Universal Joint (U-Joint) Identification Chart		
Series	Diameter 1 (Spider outer diameter with bearing)	Diameter 2 (bearing cup outer)

	cups fully seated)	diameter)
1350	91.9 (3.62)	30.2 (1.19)
1410	106.4 (4.19)	30.2 (1.19)
1480	106.4 (4.19)	35.1 (1.38)

SECTION 205-01: Driveshaft
DIAGNOSIS AND TESTING

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Driveshaft

For additional information, refer to [Section 205-00](#).

SECTION 205-01: Driveshaft
GENERAL PROCEDURES

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Indexing

For additional information, refer to [Section 205-00](#).

SECTION 205-01: Driveshaft
GENERAL PROCEDURES

1999 F-Super Duty 250-550 Workshop Manual
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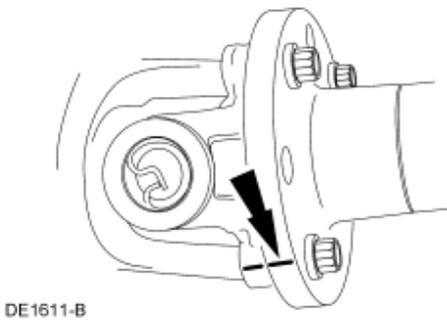
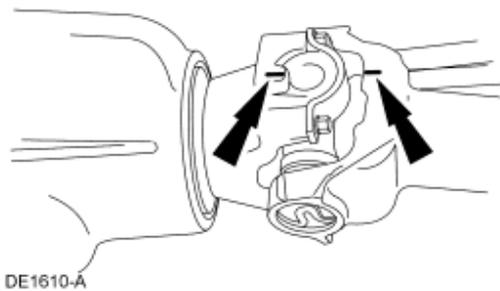
Runout and Balance

For additional information, refer to [Section 205-00](#).

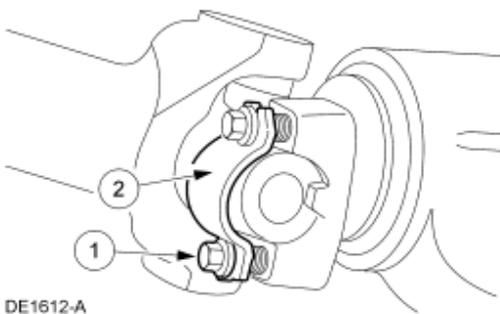
Driveshaft—Front

Removal

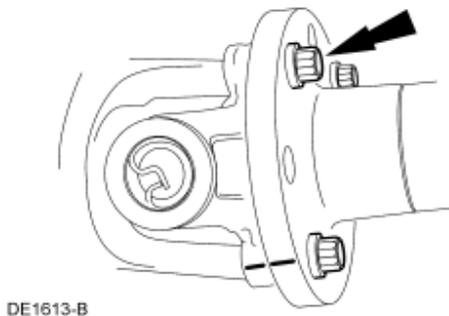
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Index-mark the front driveshaft to the front axle flange and at the transfer case flange.



3. Remove and discard the fasteners.
 1. Remove and discard the bolts.
 2. Remove and discard the U-joint retainers.



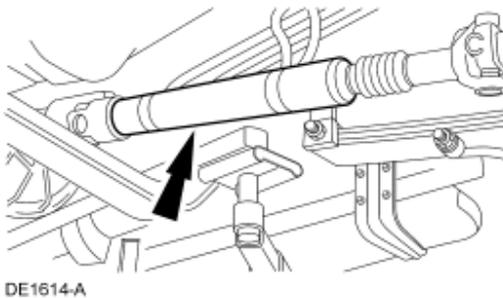
4. Remove and discard the four bolts.



5. **NOTE:** Wrap electrical tape around the bearing cups to prevent them from falling off the U-joint spider.

Remove the front driveshaft.

- Compress and separate the front driveshaft from the front axle, then separate the driveshaft from the transfer case.



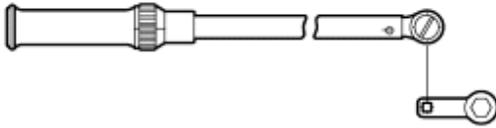
Installation

1. **NOTE:** Install the front driveshaft with the index marks aligned.

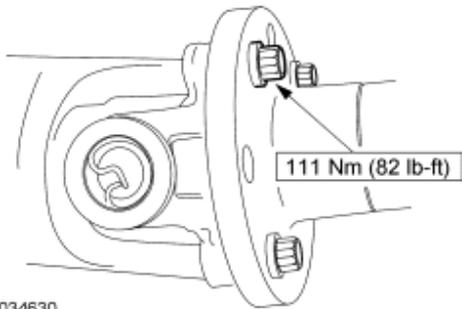
NOTE: An extension must be used to tighten the driveshaft to transfer case bolts. Extensions change the calibration of the torque wrench. Use the torque wrench manual to calculate the correct settings.

NOTE: Install new bolts and retainers.

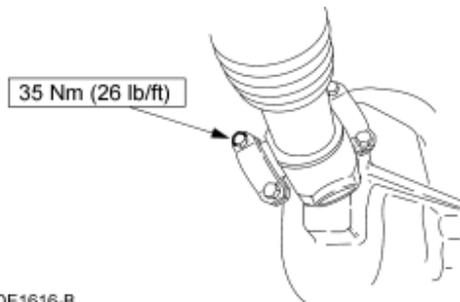
To install, reverse the removal procedure.



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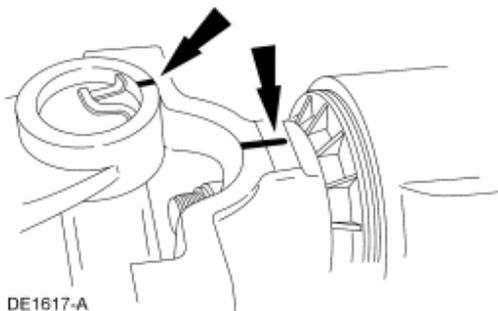


DE1616-B

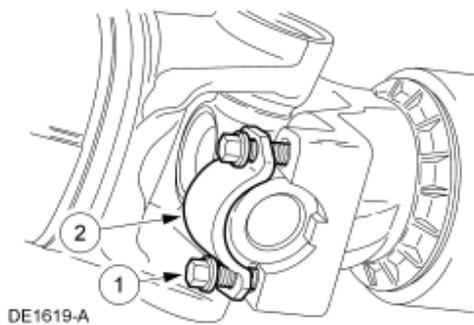
Driveshaft—Rear, One-Piece, 4x2 With 137-Inch and 141-Inch Wheel Base

Removal

1. Raise and support the vehicle. For additional information, refer to [Section 100-04](#).
2. Index-mark the driveshaft (4602) at the axle flange.



3. Disconnect the driveshaft from the axle flange.
 1. Remove and discard the bolts.
 2. Remove and discard the U-joint retainers.



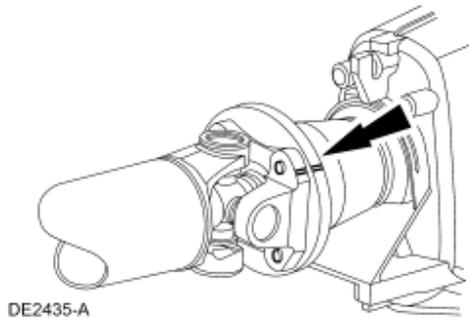
4. **NOTE:** Index-mark the output shaft to the slip yoke.

For vehicles equipped with an automatic transmission, lower the driveshaft and slide the driveshaft rearward off the transmission output shaft.

- Plug the extension housing to prevent fluid loss.

5. **NOTE:** Index-mark the driveshaft to the transmission flange.

For vehicles equipped with a manual transmission, remove and discard the bolts.



6. Remove the driveshaft.

Installation

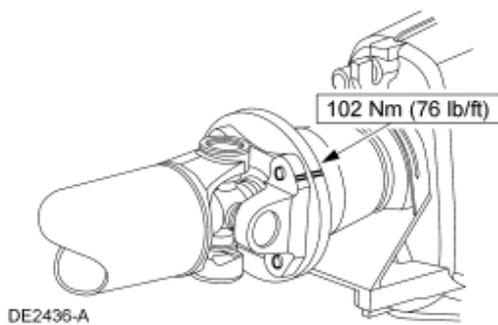
1. **NOTE:** Inspect the transmission and axle seals for damage. Install new components as necessary.

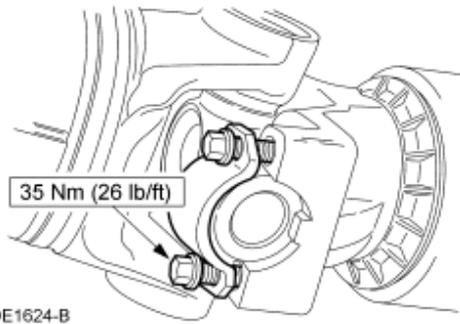
NOTE: Lubricate the slip yoke spline with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.

NOTE: Install new bolts and retainers.

NOTE: Install the driveshaft so that the index marks made before removal are aligned or the yellow mark on the driveshaft tube is in line with the yellow mark on the rear axle flange.

To install, reverse the removal procedure.



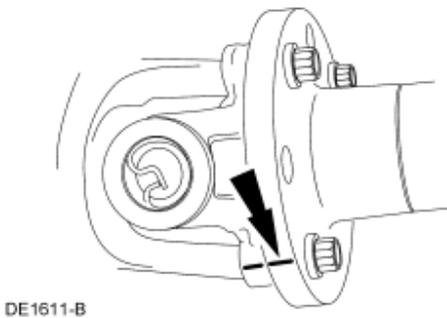
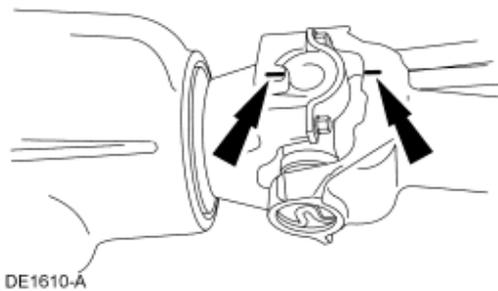


DE1624-B

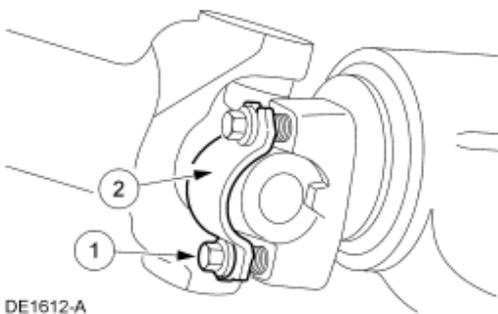
Driveshaft—Rear, One-Piece, 4x4 With 137-, 141- and 142-Inch Wheel Base

Removal

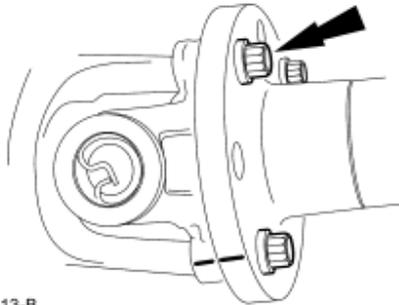
1. Raise and support the vehicle. For additional information, refer to [Section 100-04](#).
2. Index-mark the rear driveshaft to the rear axle flange and at the transfer case flange.



3. Remove and discard the fasteners.
 1. Remove and discard the bolts.
 2. Remove and discard the U-joint retainers.



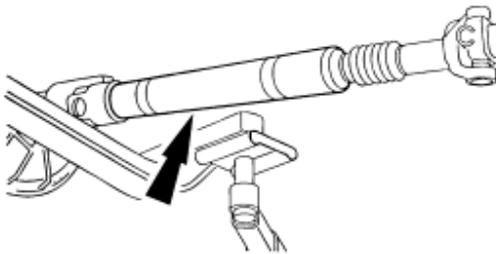
4. Remove and discard the four bolts.



5. **NOTE:** Wrap electrical tape around the bearing cups to prevent them from falling off the U-joint spider.

Remove the rear driveshaft.

- Compress and separate the rear driveshaft from the rear axle, then separate the driveshaft from the transfer case.

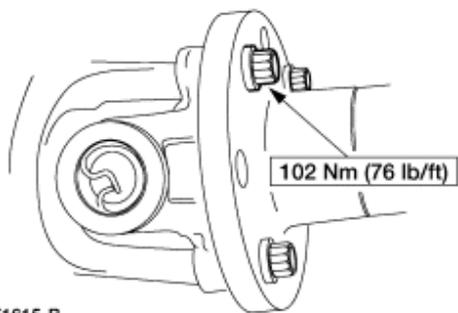


Installation

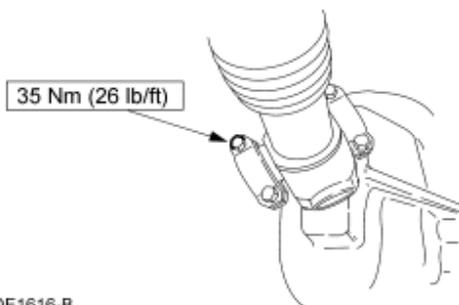
1. **NOTE:** Install the rear driveshaft with the index marks aligned.

NOTE: Install new bolts and retainers.

To install, reverse the removal procedure.



DE1615-B

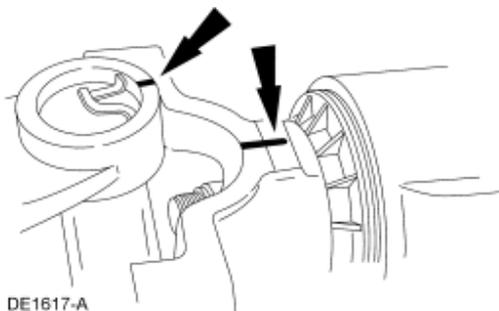


DE1616-B

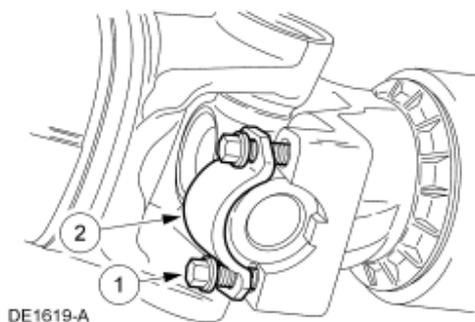
Driveshaft—Rear, Two-Piece

Removal and Installation

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Index-mark the driveshaft at the axle flange.



3. Disconnect the driveshaft from the axle flange.
 1. Remove and discard the bolts.
 2. Remove and discard the U-joint retainers.
 - Using mechanics wire, support the driveshaft.

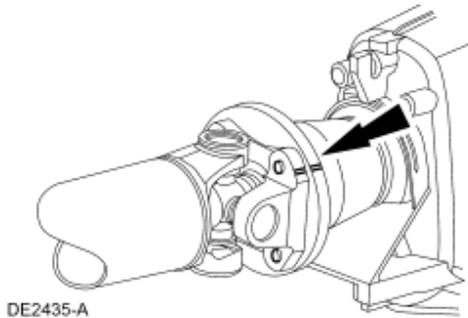
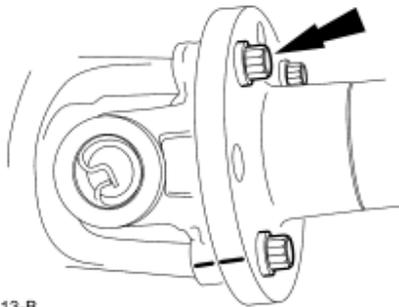


4. **NOTE:** Index-mark the driveshaft to transfer case or transmission flange.

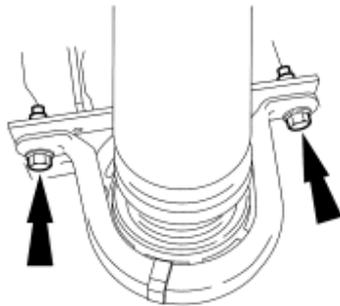
For four-wheel drive vehicles, or vehicles equipped with a manual transmission, disconnect the driveshaft from the transfer case or transmission.

- Remove and discard the bolts.

- Using mechanics wire, support the driveshaft.



5. For vehicles equipped with an automatic transmission, index-mark the output shaft to slip yoke.
6. Remove the center bearing support bolts.



7. Remove the driveshaft assembly.
 - For vehicles equipped with an automatic transmission, lower the driveshaft and slide the driveshaft rearward off of the transmission output shaft.
 - Plug the extension housing to prevent fluid loss.
8. Clean grease deposits, dirt and rust from the following:
 - The driveshaft yoke areas.
 - All driveshaft components.
 - Wipe the bearing and rubber insulator of the driveshaft center bearing. Do not immerse in solvent.

9. Inspect the following:

- The driveshaft slip yoke boot for rips or holes. Install a new boot if necessary.
- The driveshaft center bearing support for wear or rough action. If roughness or wear is evident, install a new driveshaft center bearing support.
- The center bearing rubber insulator for evidence of hardening, cracking or deterioration. Install a new insulator if necessary.

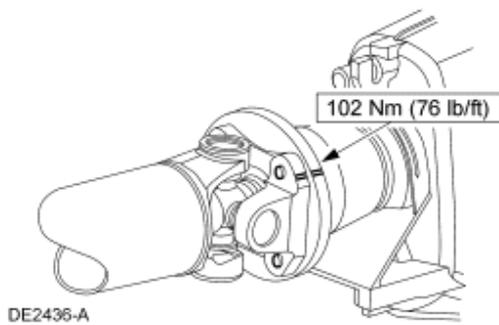
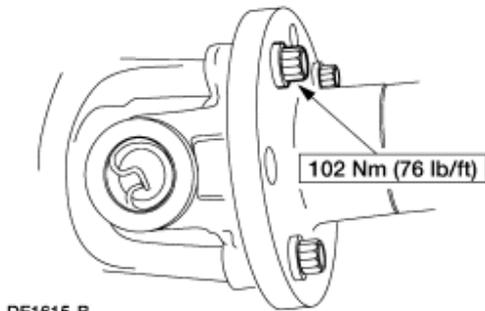
10. **NOTE:** Inspect the transmission, transfer case and axle seals for damage. Install new components as necessary.

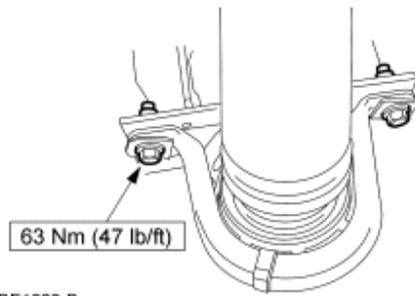
NOTE: Lubricate the slip yoke spline with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.

NOTE: Install the driveshaft so that the index marks made before removal are aligned or the yellow mark on the driveshaft tube is in line with the yellow mark on the rear axle flange.

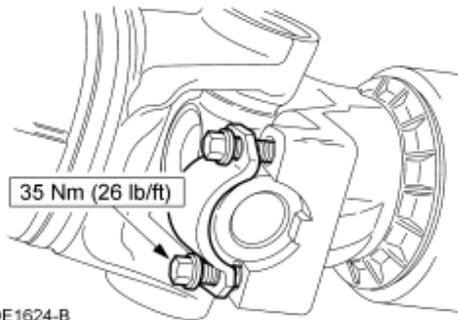
NOTE: Install new bolts and retainers.

To install, reverse the removal procedure.





DE1623-B

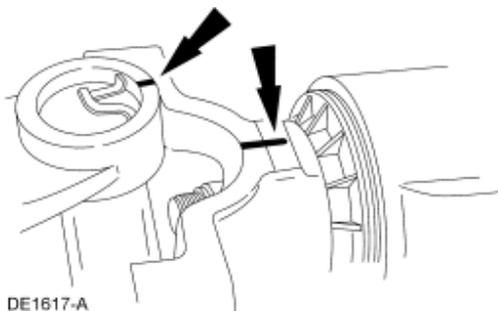


DE1624-B

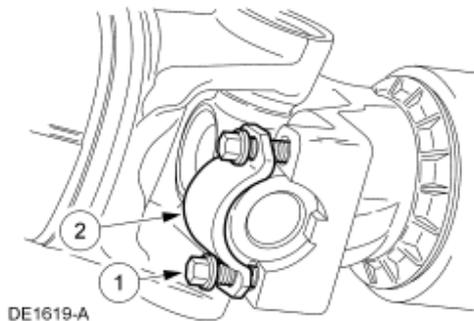
Driveshaft—Rear, Three-Piece, F-450, F-550

Removal

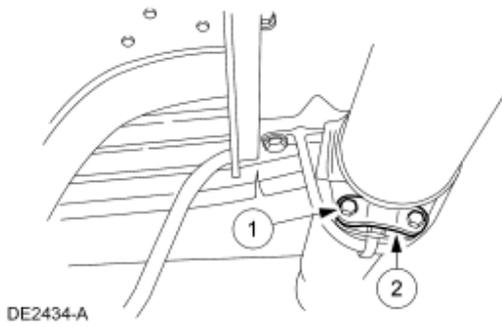
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Index-mark the driveshaft at the axle flange.



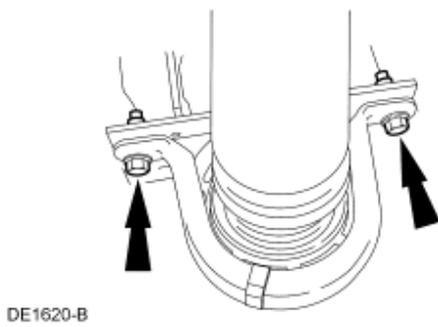
3. Disconnect the driveshaft from the axle flange.
 1. Remove and discard the bolts.
 2. Remove and discard the U-joint retainers.
 - Using mechanics wire, support the driveshaft.



4. Disconnect the driveshaft from the coupling shaft.
 1. Remove and discard the bolts.
 2. Remove the U-joint retainers.
 - Using mechanics wire, support the driveshaft.

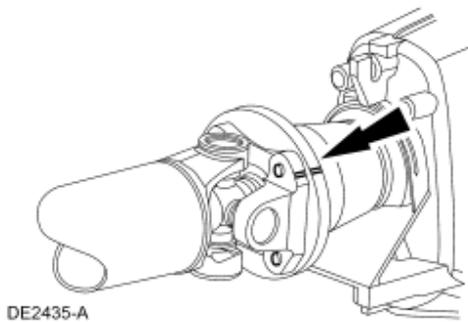


5. Remove the center bearing support bolts.

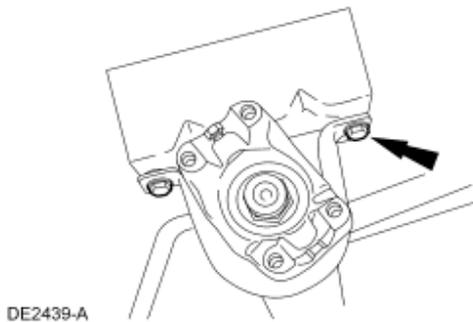


6. Remove the rear driveshaft assembly.
7. **NOTE:** Index-mark the driveshaft to transmission flange (manual transmission) or output shaft to slip yoke (automatic transmission).

For vehicles equipped with a manual transmission, remove and discard the bolts.



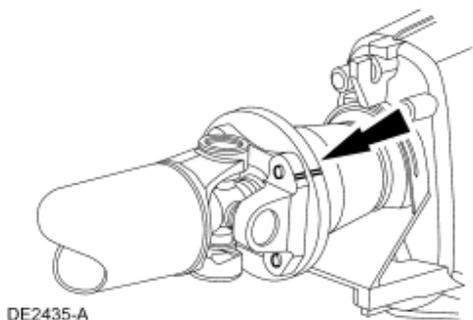
8. Remove the center bearing support bolts.



9. Remove the front driveshaft.
 - For vehicles equipped with an automatic transmission, lower the driveshaft and slide it rearward off the transmission output shaft.
 - Plug the extension housing to prevent fluid loss.
10. Clean grease deposits, dirt and rust from the following:
 - The driveshaft yoke areas.
 - All driveshaft components.
 - Wipe the bearing and rubber insulator of the driveshaft center bearing. Do not immerse in solvent.
11. Inspect the following:
 - The universal joint slip yoke boot for rips or holes. Install a new boot if necessary.
 - The driveshaft center bearing support for wear or rough action. If roughness or wear is evident, install a new driveshaft center bearing support.
 - The center bearing rubber insulator for evidence of hardening, cracking or deterioration. Install a new insulator if necessary.

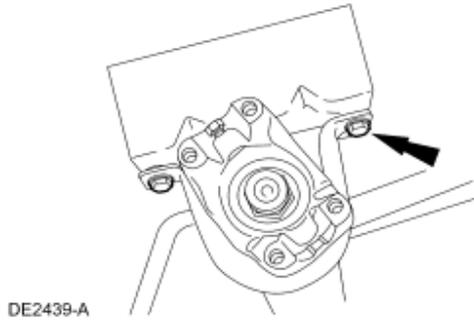
Installation

1. For vehicles equipped with a manual transmission, align the index marks and connect the front driveshaft to the transmission. Install the new bolts.
 - Hand-tighten only; do not tighten at this time.

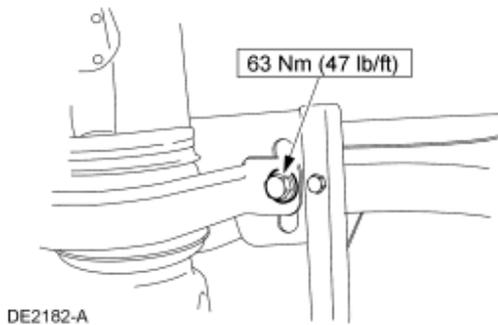
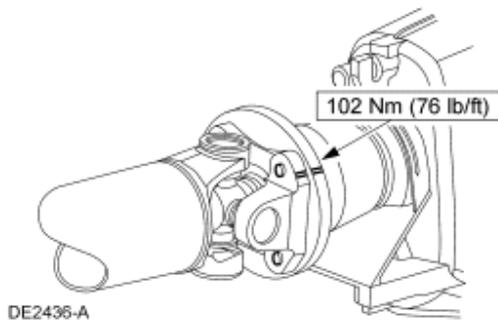


2. For vehicles equipped with an automatic transmission, align the index marks and slide the driveshaft slip yoke onto the output shaft.

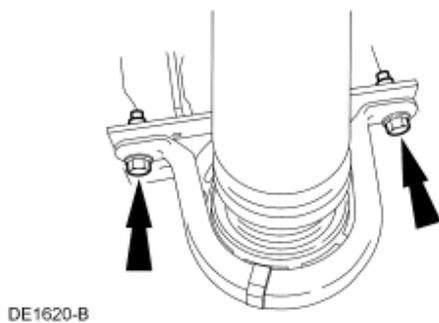
3. Position the center support bearing and install the bolts.
 - Hand-tighten only; do not tighten at this time.



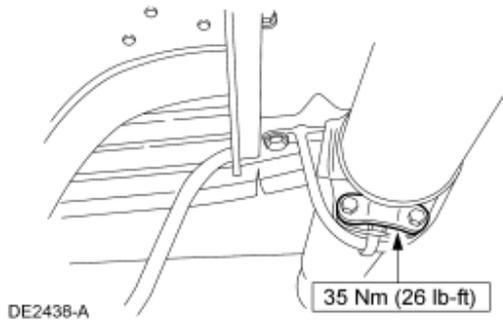
4. Tighten the driveshaft to transmission flange bolts and the driveshaft center bearing bolts.



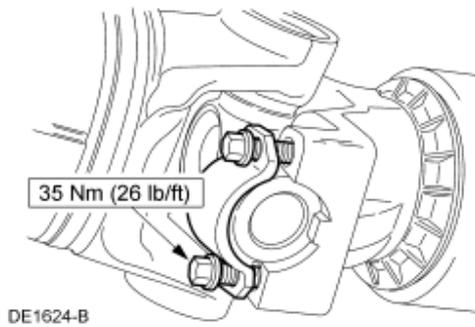
5. Position the rear driveshaft assembly and install the center support bearing bolts.
 - Hand-tighten only; do not tighten at this time.



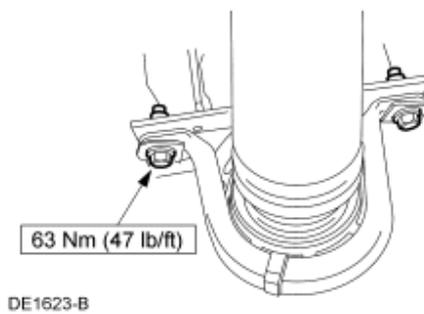
6. Connect the rear driveshaft assembly to the front driveshaft. Install the new retainers and bolts.



7. Connect the rear driveshaft assembly to the rear axle. Install the new retainers and bolts.



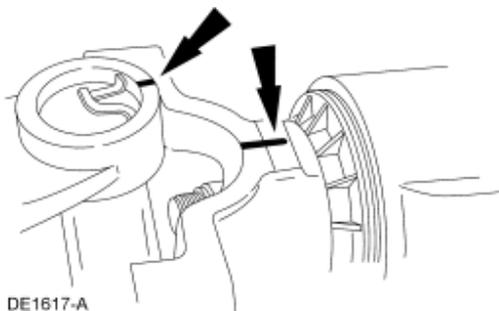
8. Tighten the driveshaft center support bearing bolts.



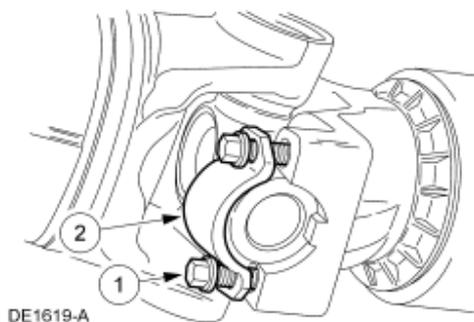
Driveshaft—Rear, Three-Piece, Motorhome

Removal

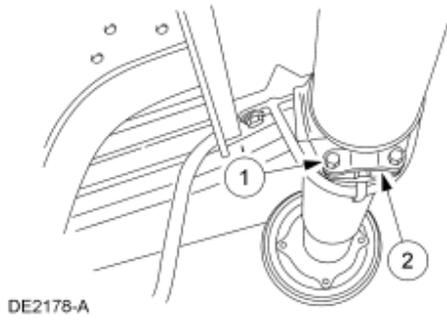
1. Raise and support the vehicle. For additional information, refer to [Section 100-04](#).
2. Index-mark the driveshaft at the axle flange.



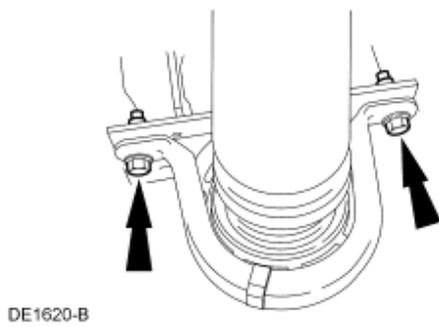
3. Disconnect the driveshaft (4602) from the axle flange.
 1. Remove and discard the bolts.
 2. Remove and discard the U-joint retainers.
 - Using mechanics wire, support the driveshaft.



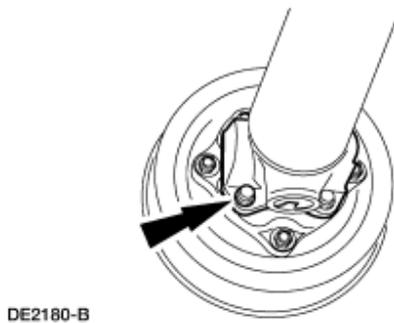
4. Disconnect the driveshaft from the coupling shaft.
 1. Remove and discard the bolts.
 2. Remove and discard the U-joint retainers.
 - Using mechanics wire, support the driveshaft.



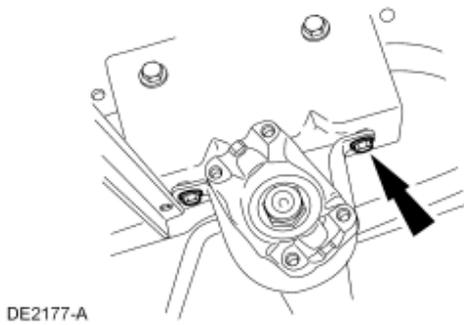
5. Remove the center bearing support bolts.



6. Remove the rear driveshaft assembly.
7. Remove and discard the bolts.



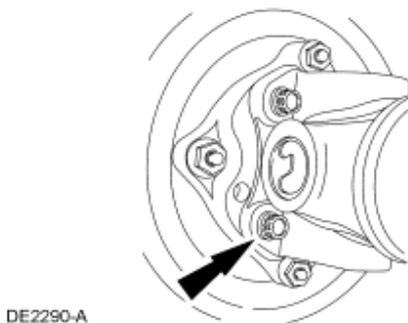
8. Remove the center bearing support bolts.



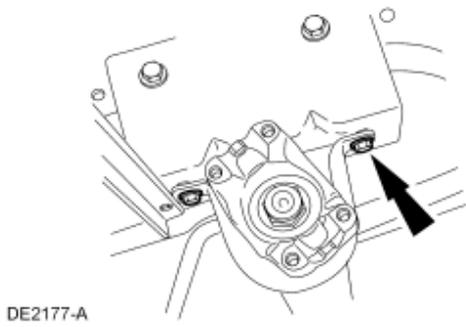
9. Remove the front driveshaft.
10. Clean grease deposits, dirt and rust from the following:
 - The driveshaft yoke areas.
 - All driveshaft components.
 - Wipe the bearing and rubber insulator of the driveshaft center bearing. Do not immerse in solvent.
11. Inspect the following:
 - The universal joint slip yoke boot (4421) for rips or holes. Install a new boot if necessary.
 - The driveshaft center bearing support (4800) for wear or rough action. If roughness or wear is evident, install a new driveshaft center bearing support.
 - The center bearing rubber insulator for evidence of hardening, cracking or deterioration. Install a new insulator if necessary.

Installation

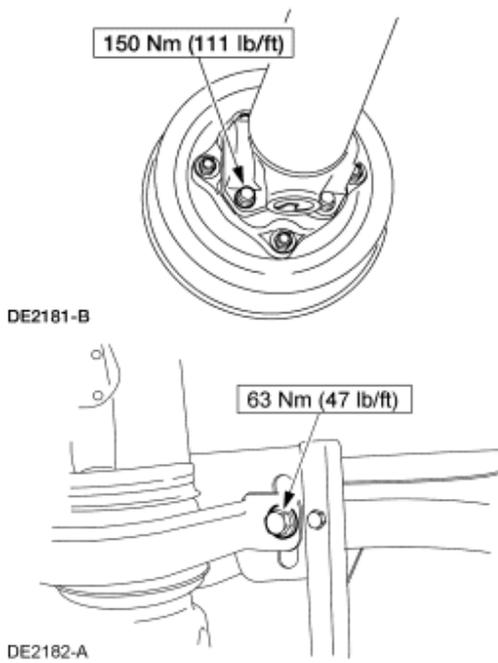
1. Connect the front driveshaft (4A376) to the transmission. Install the new bolts.
 - Hand-tighten only; do not tighten at this time.



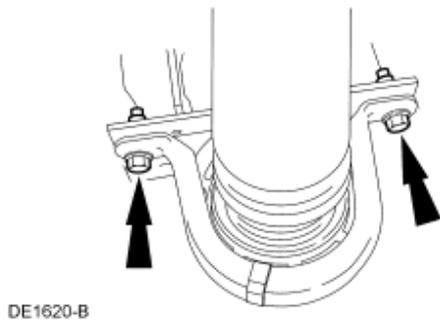
2. Position the center support bearing and install the bolts.
 - Hand-tighten only; do not tighten at this time.



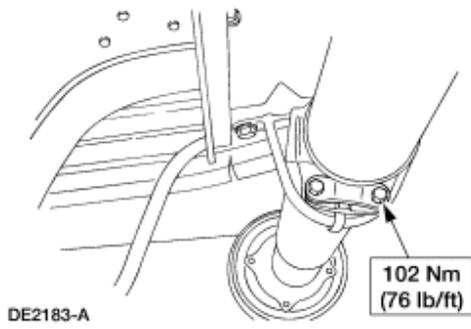
3. Tighten the driveshaft to parking brake drum bolts and the driveshaft center bearing bolts.



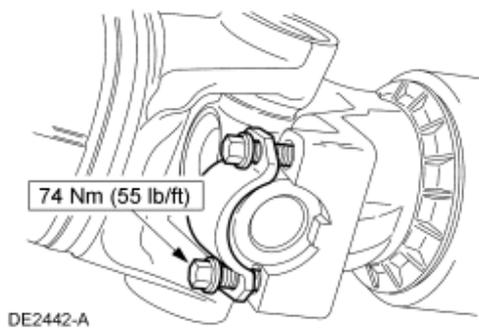
4. Position the rear driveshaft assembly and install the center support bearing bolts.
 - Hand-tighten only; do not tighten at this time.



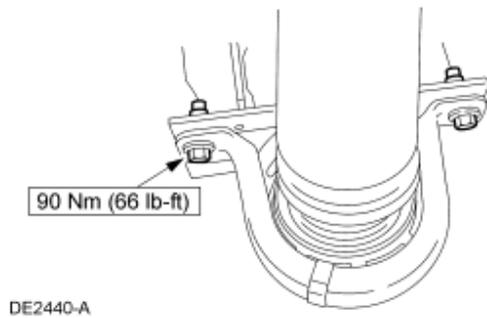
5. Connect the rear driveshaft assembly to the front driveshaft. Install the new retainers and bolts.



6. Connect the rear driveshaft assembly to the rear axle. Install the new retainers and bolts.



7. Tighten the driveshaft center support bearing bolts.



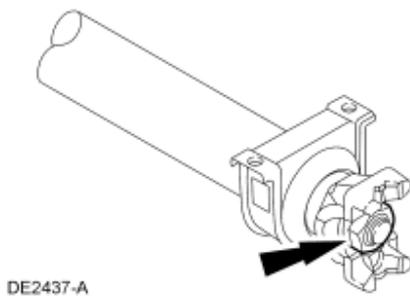
Center Bearing

Disassembly and Assembly

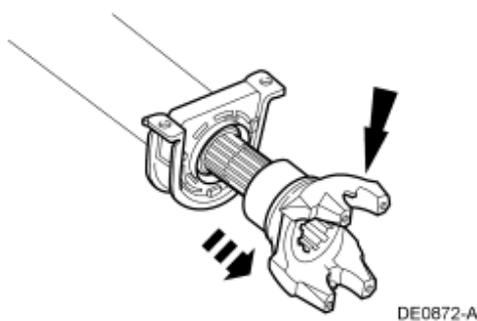
1.  **CAUTION: Do not clamp the driveshaft in the jaws of a vice or a similar holding fixture.**

Place the driveshaft on a suitable workbench.

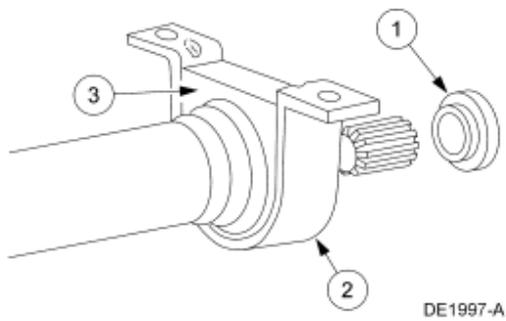
2. On reverse slip driveshafts, while using a suitable flange holding tool to prevent shaft rotation, remove the flange retaining nut.



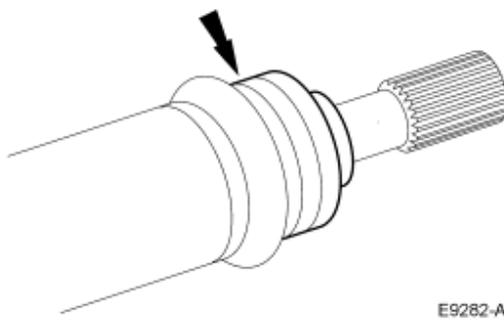
3. On reverse slip driveshafts, remove the flange.



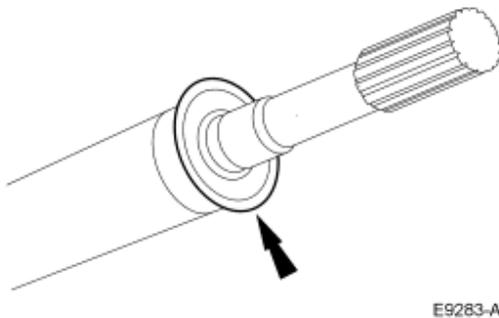
4. Remove the rubber insulator surrounding the bearing.
 1. Remove the driveshaft center bearing retainer.
 2. Remove the driveshaft center bearing bracket.
 3. Remove the rubber insulator.



5. Using a suitable press, remove the bearing from the driveshaft.



6. Using a suitable press, remove the dust slinger.



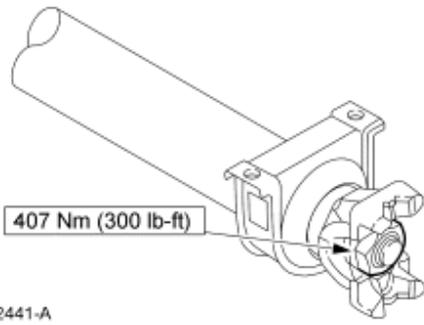
7. **NOTE:** Clean grease deposits, dirt and rust from the stub shaft.

NOTE: Inspect the stub shaft splines for nicks, gouges, or burrs. Remove with a file or emery cloth.

NOTE: The driveshaft center bearing bracket must be installed with the deep flange rearward.

To assemble, reverse the disassembly procedure.

- Lubricate the stub shaft spline with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.



DE2441-A

Universal Joint—Single Cardan

Special Tool(s)	
 ST1172-A	C-Frame and Screw 205-086 (T74P-4635-C)

Disassembly

1.  **CAUTION: Do not clamp the driveshaft (4602) in the jaws of a vice or a similar holding fixture.**

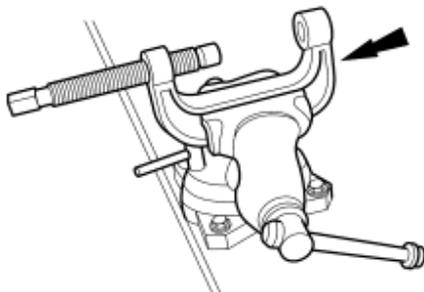
Place the driveshaft on a suitable workbench.

2. Index mark the driveshaft and driveshaft components.



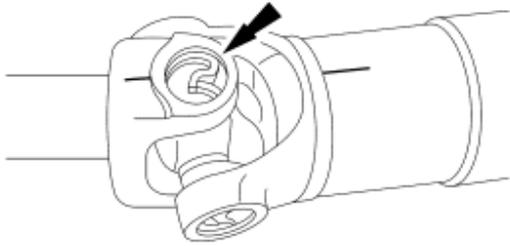
GE0825-A

3. Clamp the C-Frame and Screw in a vise.



GE0294-A

4. Remove the snap rings.

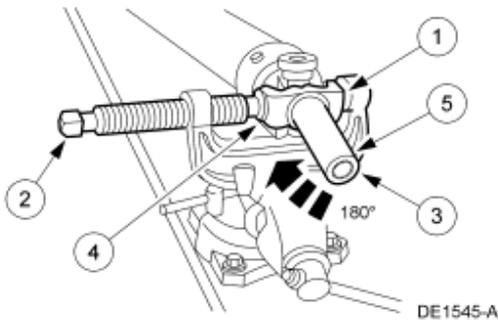


GE0837-A

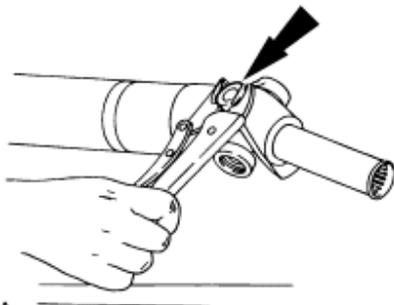
5. **NOTE:** If the bearing cup cannot be pressed all the way out, remove it with gripping pliers.

Remove the driveshaft slip yoke (4841).

1. Position the driveshaft into the C-Frame and Screw.
2. Press out a bearing cup.
3. Rotate the driveshaft 180 degrees.
4. Press on the spider to remove the bearing cup from the opposite side.
5. Remove the driveshaft slip yoke.



DE1545-A



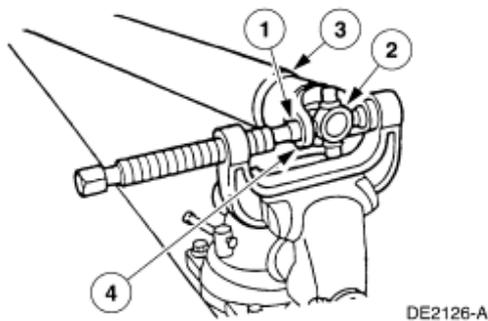
DE1625-A

6. Remove the remaining bearing cups and spider.
7. Clean the driveshaft yoke area at each end of the driveshaft.
 - Inspect the driveshaft and driveshaft components for wear or damage.

Assembly

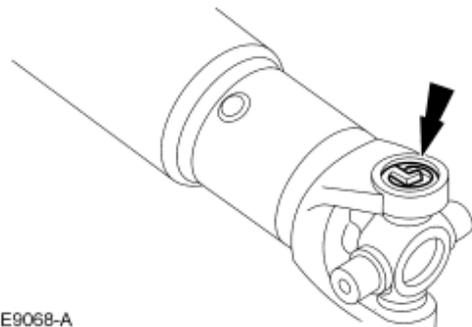
NOTE: Universal joint service kits are to be installed as complete assemblies only. Do not use components from other universal joints.

1. Install a new bearing cup.
 1. Start a new bearing cup into the driveshaft yoke.
 2. Position a new spider in the driveshaft yoke.
 3. Install the driveshaft into the C-Frame and Screw.
 4. Press the bearing cup just below the snap ring groove.



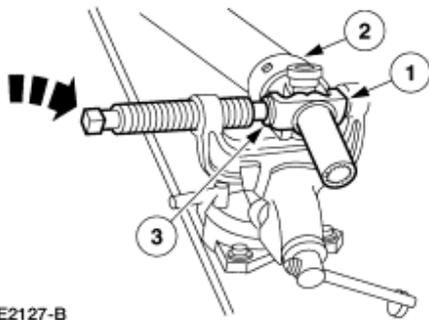
2. **NOTE:** Use the yellow snap rings supplied in the universal kit. If difficulty is encountered installing the yellow snap rings, install the black snap rings also supplied in the kit.

Remove the driveshaft from the tool and install the snap ring.



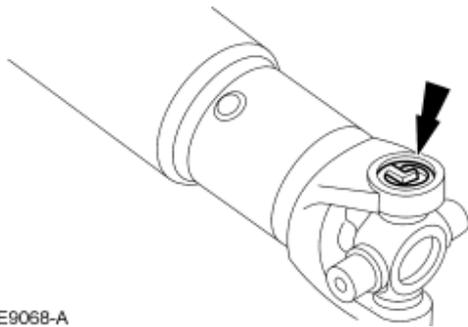
3. Repeat Steps 1 and 2 for the opposite side of the driveshaft yoke.

4. Install a new bearing cup.
 1. Position a new bearing cup in the driveshaft slip yoke.
 2. Install the driveshaft into the C-Frame and Screw.
 3. Press the bearing cup just below the snap ring groove.



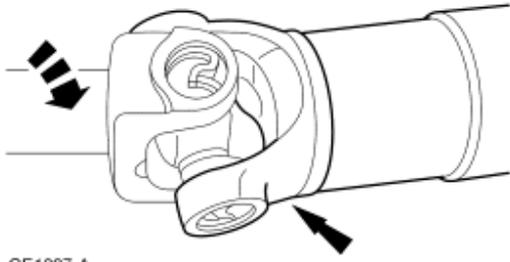
5. **NOTE:** Use the yellow snap rings supplied in the universal kit. If difficulty is encountered installing the yellow snap rings, install the black snap rings also supplied in the kit.

Remove the driveshaft from the tool and install the snap ring.



6. Repeat Steps 4 and 5 for the opposite side.
7. **NOTE:** Do not strike the bearings. If binding, strike the yoke with a brass or plastic hammer to seat the bearing cups.

Check the U-joint for freedom of movement.



GE1087-A

Universal Joint—Double Cardan

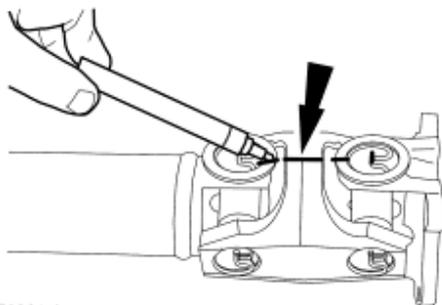
Special Tool(s)	
 ST1172-A	C-Frame and Screw 205-086 (T74P-4635-C)
 ST1220-A	Differential Bearing Cone Remover 205-116 (T77F-4220-B1)
 ST1389-A	Step Plate 8059

Disassembly

1.  **CAUTION: Do not clamp the driveshaft (4602) in the jaws of a vice or a similar holding fixture.**

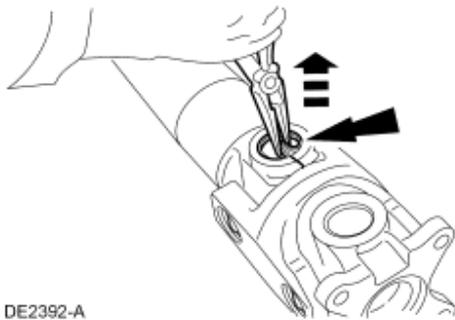
Place the driveshaft on a suitable workbench.

2. Index mark the double cardan yokes.

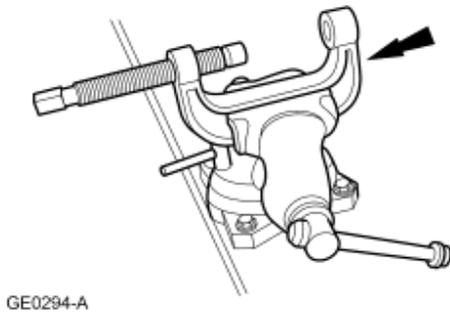


DE2391-A

3. Remove the snap rings.



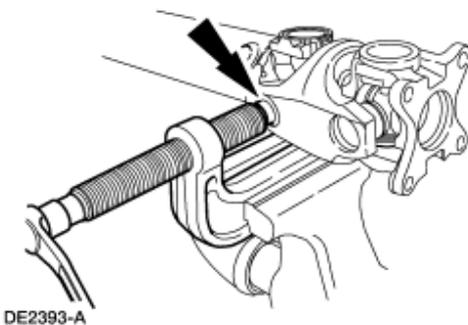
4. Position the C-Frame and Screw in a swivel base vise.



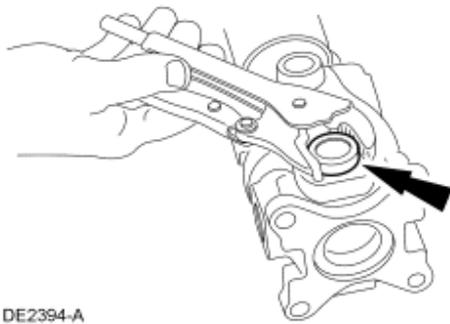
5.  **CAUTION: Do not force the tool when the U-joint bottoms out as the center bearing shield may be damaged.**

Using the C-Frame and Screw, press the driveshaft center yoke bearing cups through the opposite side.

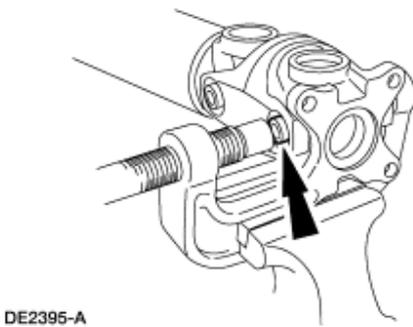
- Alternate the pressure between the U-joints.



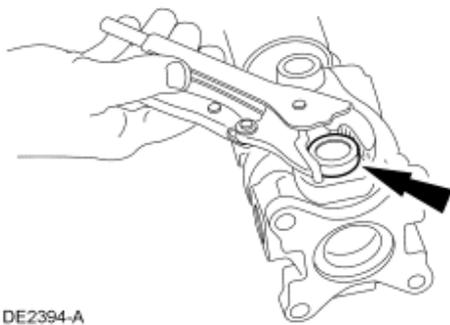
6. Remove opposing bearing cups with gripping pliers.



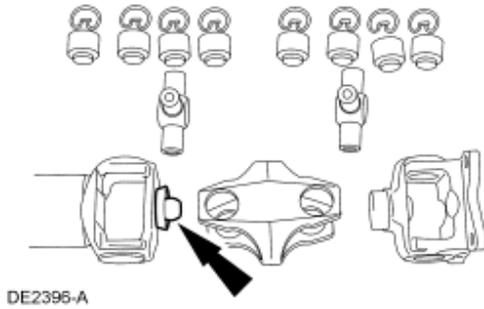
7. Rotate the double cardan 180 degrees, and press the bearing cups through on the opposite side.



8. Remove the bearing cups with gripping pliers.

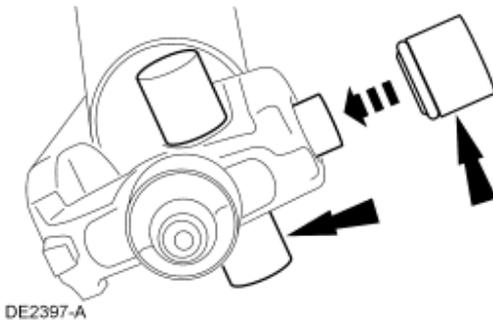


9. Remove remaining bearing cups and spiders, and on the one-piece rear driveshaft, the spring.
 - The centering ball on the driveshaft end yoke is not serviceable. If the centering ball is damaged, install a new driveshaft.

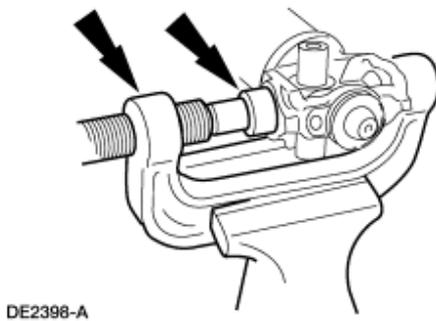


Assembly

1. Position the spider in the driveshaft end yoke, and position the bearing cup on the spider trunnion.



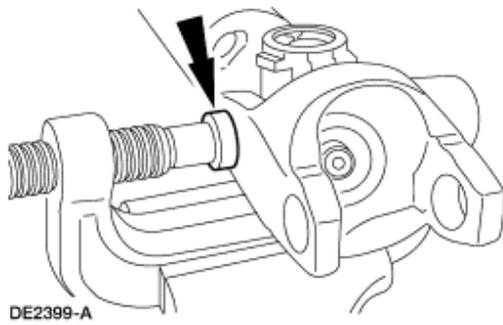
2. Using the C-Frame and Screw, press the bearing cup until the opposite bearing cup can be positioned on the spider trunnion.



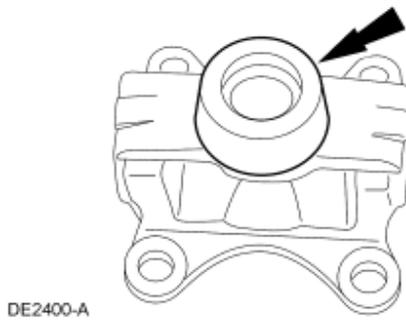
3. **NOTE:** Align the index marks made during disassembly.

Position the driveshaft center yoke on the spider, and using the C-Frame and Screw, press the bearing cups into position.

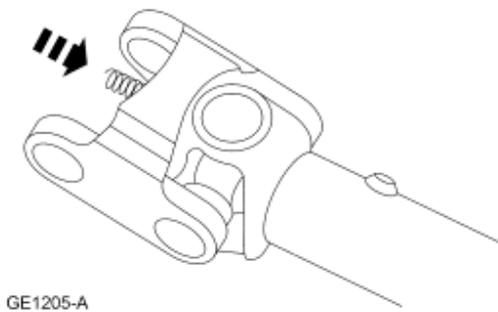
- Install the snap rings.



4. Apply Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.

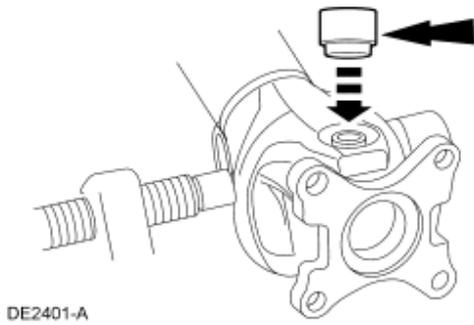


5. On the one-piece rear driveshaft, install a new spring.

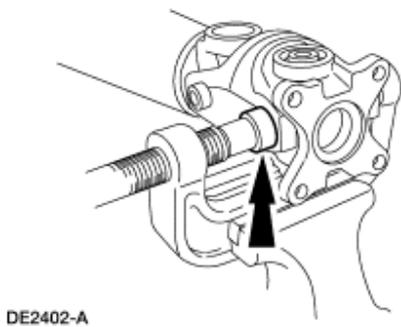


6. **NOTE:** Align the index marks made during disassembly.

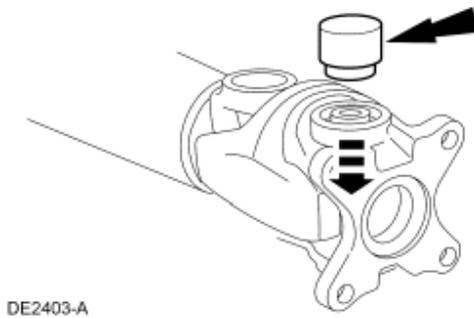
Position the remaining spider, the centering flange yoke and the bearing cup.



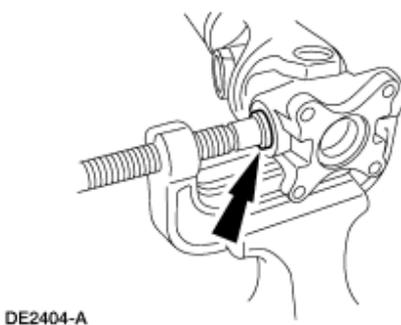
7. Using the C-Frame and Screw, press the bearing cup until the opposite bearing cup can be positioned on the spider trunnion.



8. Position the bearing cup on the spider in the centering flange yoke.



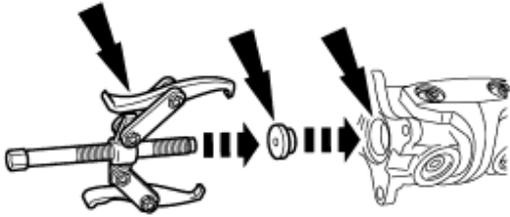
9. Press the bearing cup into position.



10.  **CAUTION:** The final bearing cup will require centering due to spring pressure.

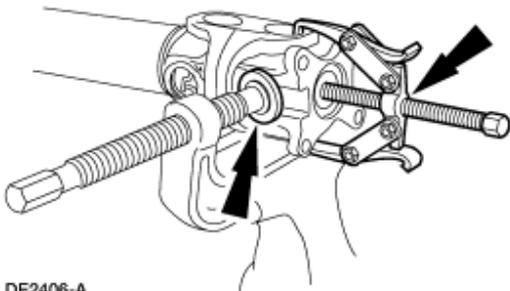
NOTE: Position the jaws of the Differential Bearing Cone Remover into the driveshaft center yoke bearing cup bores.

Use the Differential Bearing Cone Remover and Step Plate and hand tighten the Differential Bearing Cone Remover to center the spider trunnion in the bore.



DE2405-A

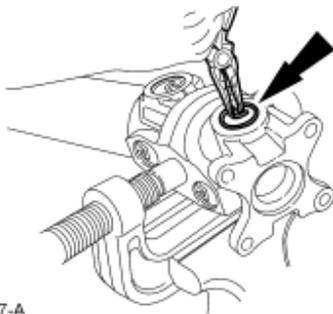
11. Install the final bearing cup.



DE2406-A

12. **NOTE:** It may be necessary to tap the yokes with a soft-faced hammer to seat the bearing cups.

Install the remaining snap rings.



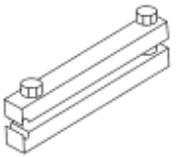
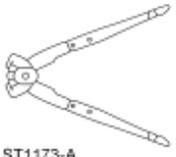
DE2407-A

13. Move the end yoke through the working angles to ensure freedom of movement.



DE2408-A

Driveshaft Slip Yoke

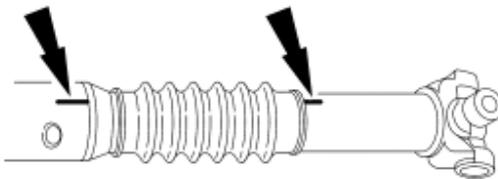
Special Tool(s)	
 ST1301-A	Installer, Constant Velocity Joint Boot Clamp 205-343 (T95P-3514-A)
 ST1173-A	Installer, Keystone Clamp 211-002 (T63P-9171-A)

Disassembly

1.  **CAUTION: Do not clamp the driveshaft in the jaws of a vice or a similar holding fixture.**

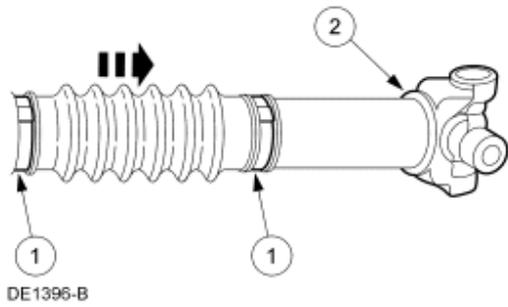
Place the driveshaft on a suitable workbench.

2. Index-mark the driveshaft slip yoke and the stub shaft.

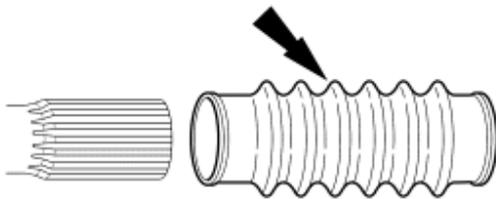


DE2409-A

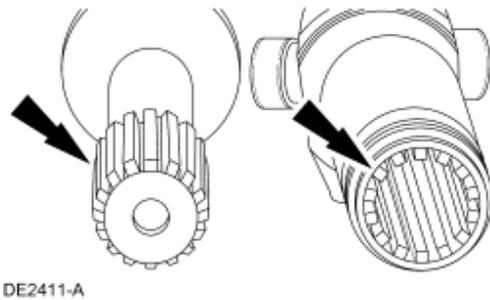
3. Remove the driveshaft slip yoke.
 1. Cut and discard the driveshaft slip yoke boot clamps.
 2. Separate the driveshaft slip yoke from the stub shaft.



4. Remove and discard the driveshaft slip yoke boot.



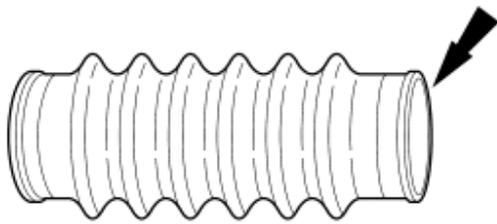
5. Check the lubricant for contamination. If the lubricant feels gritty, clean and inspect the stub shaft and driveshaft slip yoke for wear. Install new components as necessary.



Assembly

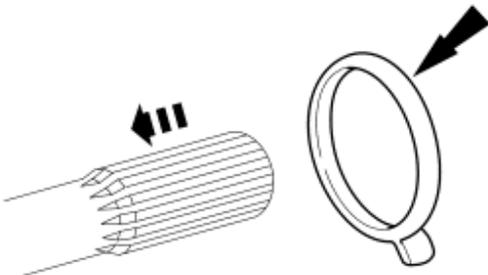
All driveshafts

1. Fill the driveshaft slip yoke boot with approximately 10 grams (0.36 ounce) of grease.
 - Use Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.



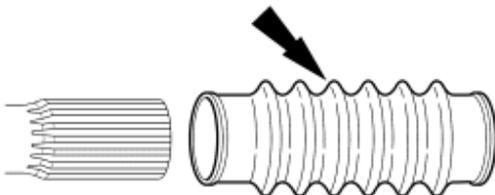
DE2412-A

2. Position the driveshaft slip yoke boot clamp on the stub shaft.



DE2415-A

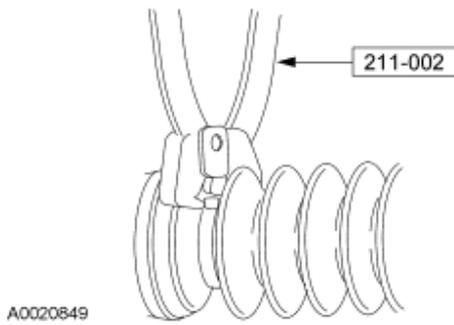
3. Slide the driveshaft slip yoke boot over the stub shaft, and seat it in the boot groove.



DE2410-A

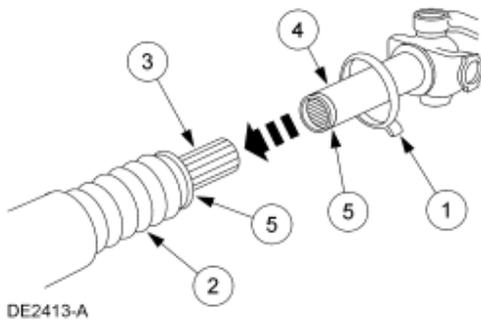
Rear driveshafts

4. Using the special tool, install the driveshaft slip yoke boot clamp.



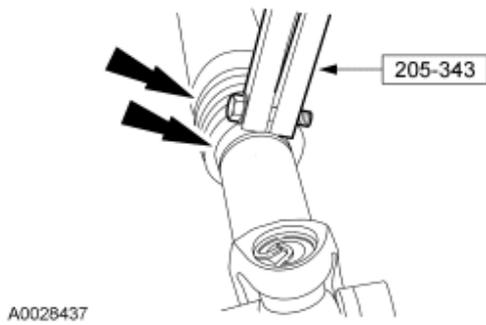
All driveshafts

5. Install the driveshaft slip yoke.
 1. Position the driveshaft slip yoke boot clamp.
 2. Pull the driveshaft slip yoke boot toward the stub shaft tube.
 3. Lubricate the stub shaft splines.
 - Use Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.
 4. Align the index marks, and install the driveshaft slip yoke.
 5. Seat the driveshaft slip yoke boot in the boot groove.



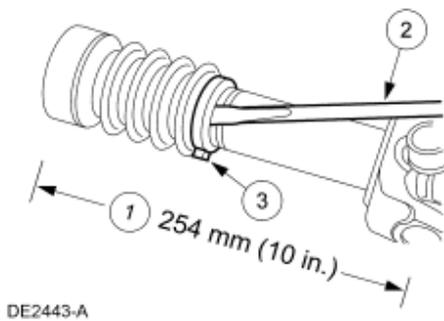
Front driveshaft

6. Remove all excess grease from the slip yoke boot and the slip yoke.
7. Using the special tool, install both driveshaft slip yoke boot clamps. Tighten the tool until the clamp is secure.

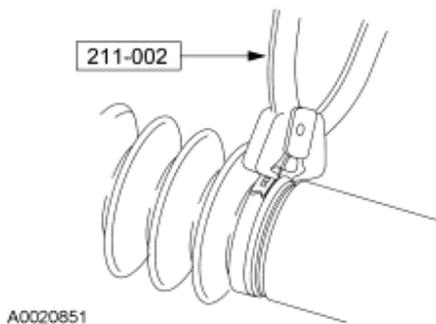


Rear driveshafts

8. Remove all excess grease from the slip yoke boot and the slip yoke.
9. Set the driveshaft assembled length to specification.
 1. Set the driveshaft assembled length to specification.
 - Measure from the stub shaft weld to the U-joint centerline.
 2. Bleed the air from the driveshaft slip yoke boot.
 3. Position the driveshaft slip yoke boot clamp.



10. Using the special tool, install the driveshaft slip yoke boot clamp.



**SECTION 205-02A:
Rear Drive Axle/Differential — Dana 80**

[SPECIFICATIONS](#)

DESCRIPTION AND OPERATION

[Rear Drive Axle and Differential](#)

DIAGNOSIS AND TESTING

[Rear Drive Axle and Differential](#)

GENERAL PROCEDURES

[Differential Case and Pinion Set Up](#)

[Differential Case End Play Check](#)

[Pinion Ring Gear Variation Number](#)

[Ring Gear and Pinion Backlash](#)

IN-VEHICLE REPAIR

[Axle Shaft](#)

[Axle Assembly](#)

[Driveshaft](#)

[Drive Pinion Flange](#)

[Drive Pinion Seal](#)

REMOVAL AND INSTALLATION

[Axle Assembly](#)

DISASSEMBLY AND ASSEMBLY

[Differential Case and Ring Gear](#)

SECTION 205-02A: Rear Drive Axle/Differential —
 Dana 80
 SPECIFICATIONS

1999 F-Super Duty 250-550
 Workshop Manual

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General Specifications	
Item	Specification
Lubricants	
SAE 75W-90 Thermally Stable Multi-Purpose Gear Lubricant XY-75W90-QL	WSP-M2C201-A
Additive Friction Modifier C8AZ-19B546-A	EST-M2C118-A
Premium Long-Life Grease XG-1-C or -K	ESA-M1C75-B
Sealants	
Silicone Rubber F7AZ-19554-CA	ESB-M4G92-A
Threadlock® and Sealer E0AZ-19554-AA	WSK-M2G351-A5

Axle Specifications			
Axle Model	Ford Specification	Approximate Capacities	
		Liters	Pint
80 (Conventional and Truetrac® Differentials)	WSP-M2C201-A	4.0	8.5
80 (Trac-Lok®)	WSP-M2C201-A	3.8 ^a	8.0 ^a

^a First fill the axle with 0.2365 liters (0.5 pints) of Additive Friction Modifier C8AZ-19B546-A or equivalent meeting Ford specification EST-M2C118-A.

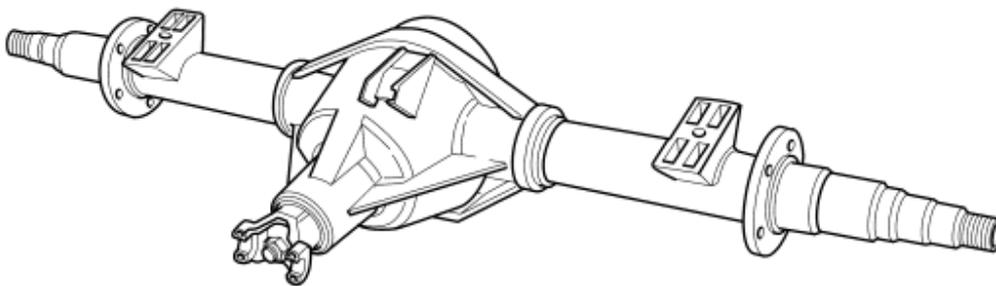
Dana Axle Adjustments	
Description	Specification
Maximum spread of rear axle	0.25 mm (0.010 in)
Backlash between differential ring gear and pinion	0.13-0.20 mm (0.005-0.008 in)
Backlash maximum variation between checkpoints	0.05 mm (0.002 in)

Pinion bearing preload (with new bearings)	2.26-4.53 Nm (20-40 lb-in)
Total (pinion plus differential) preload with new bearings	Add 0.7-0.9 Nm (6-8 lb-in)

Torque Specifications		
Description	Nm	lb-ft
Pinion shaft lock nut	637	470
Driveshaft bolts	123-149	91-110
Differential bearing cap bolts	108	80
Ring gear bolts — grade 9	298	220
Oil filler plug — 1/4-inch recess drive	27-41	20-31
Differential housing cover bolts (F350)	47	35
Differential housing cover bolts (F450-F550)	61	45
Sensor (ABS) bolt	34-47	26-35

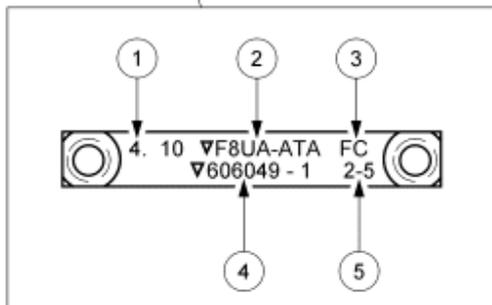
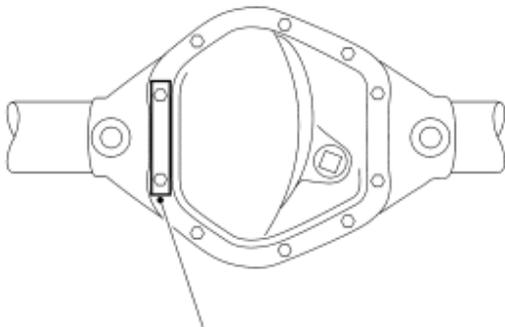
Rear Drive Axle and Differential

Dana Model 80 Full-Floating Rear Drive Axle



DE2416-A

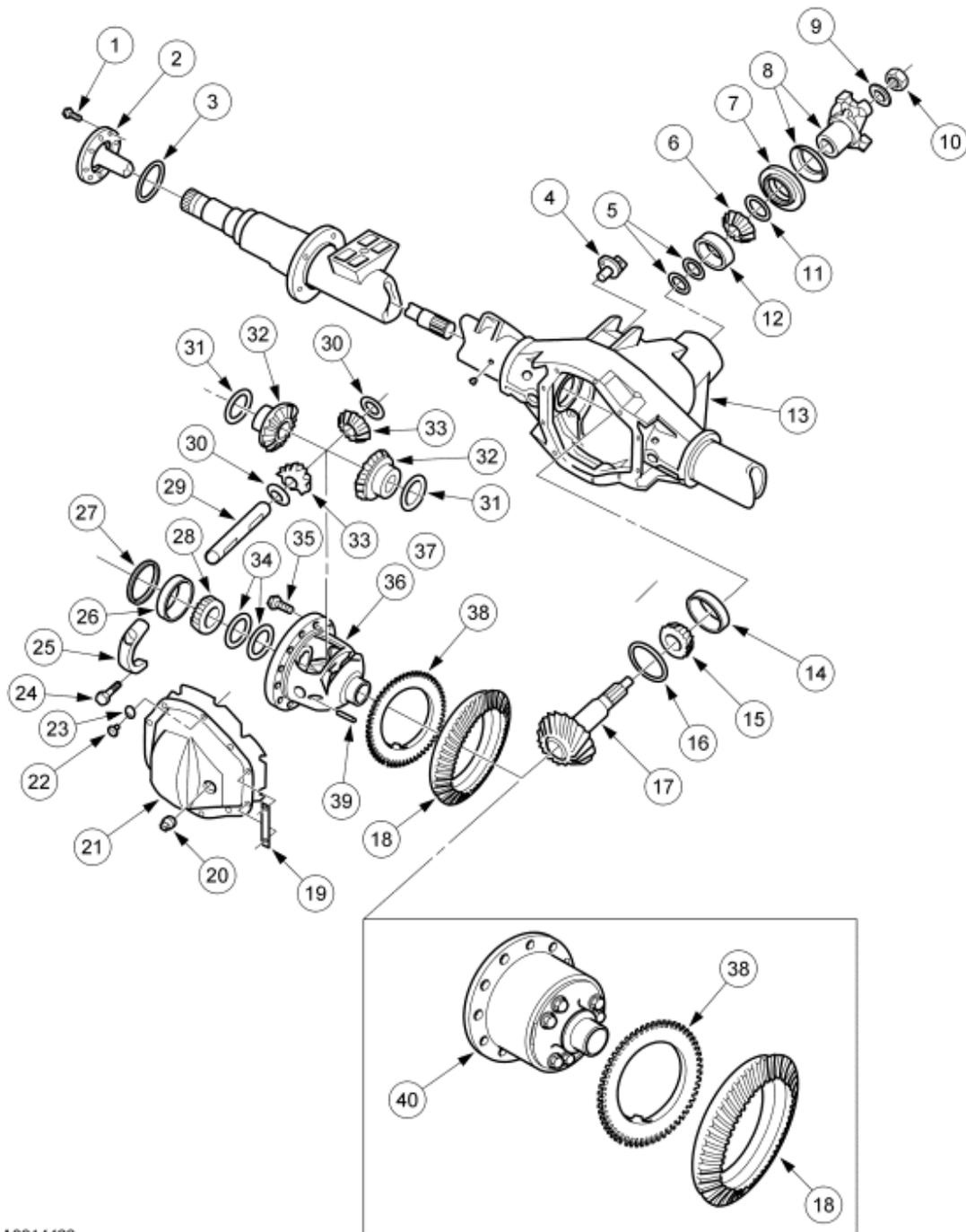
Identification Tag



DE1579-B

Item	Description
1	Axle ratio
2	Axle assembly number (prefix letters)
3	Axle assembly number (suffix letters)
4	Dana part number
5	Included for models with limited slip differential

Dana Model 80, Full-Floating Rear Axle, Disassembled View



A0014482

Item	Part Number	Description
1	N808133	Bolt
2	4234	Axle shaft
3	1001	Rear wheel gasket
4	2C190	Rear brake anti-lock sensor

5	4067	Drive pinion bearing preload shim
6	4621	Pinion bearing, outer
7	4676	Pinion seal
8	4851	Pinion flange
9	4329	Washer
10	354845	Lock nut
11	4667	Oil slinger
12	4616	Pinion bearing cup, outer
13	4010	Differential housing
14	4628	Pinion bearing cup, inner
15	4630	Pinion bearing, inner
16	4109	Drive pinion position shim
17	4209	Pinion (matched set)
18	4209	Differential ring gear (matched set)
19	—	Identification tag (part of 4002)
20	353051	Fill plug
21	4033	Differential housing cover
22	4346	Cover bolt
23	—	Brake line clip (part of 4033)
24	355765-S	Bearing cap bolt
25	—	Bearing cap (part of 4010)
26	4222	Differential bearing cup
27	4K067	Outboard spacer
28	4221	Differential bearing
29	4211	Differential pinion shaft
30	4230	Differential pinion thrust washer
31	4228	Differential side gear thrust washer
32	4236	Differential side gear
33	4215	Differential pinion gear
34	4067	Differential bearing shim (preload/backlash)
35	4558	Rear axle differential ring gear bolt
36	4204	Differential case (conventional)

37	4026	Differential case Trac-Lok® (The Trac-Lok® differential is a non-repairable unit)
38	4B409	Anti-lock speed sensor ring
39	4241	Differential pinion shaft lock pin
40	4026	Differential assembly Truetrac® (The Truetrac® differential is a non-repairable unit)

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

The Model 80 rear axle features the following:

- a hypoid design differential ring gear and pinion with the centerline of the pinion set below the centerline of the differential ring gear
- full floating axle shafts
- an integral-type differential housing consisting of a cast center section with two steel tubes
- a stamped differential housing cover for F-350 DRW
- a cast aluminum differential housing cover for F-450 DRW
- a conventional differential assembly for F250
- a conventional differential assembly or a Trac-Lok® limited slip differential assembly for F350
- a conventional differential assembly or a Truetrac® limited slip differential assembly for F450

SECTION 205-02A: Rear Drive Axle/Differential
— Dana 80
DIAGNOSIS AND TESTING

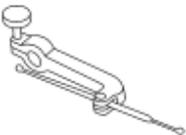
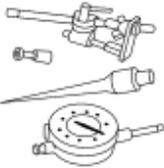
1999 F-Super Duty 250-550
Workshop Manual

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Rear Drive Axle and Differential

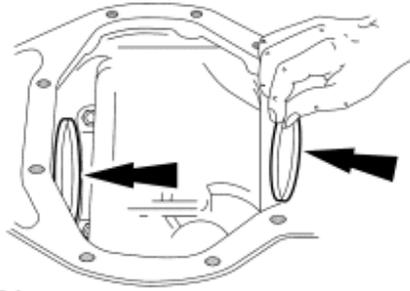
Refer to [Section 205-00](#).

Differential Case and Pinion Set Up

Special Tool(s)	
 ST1357-A	Installer, Differential Carrier Bearing 205-D044 (D81T-4221-A) or equivalent
 ST1348-A	Gauge, Clutch Housing 308-021 (T75L-4201-A)
 ST1214-A	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent
 ST1547-A	Set, Dummy Bearing 205-D048 (D81T-4222-ER) or equivalent
 ST1543-A	Step Plate 205-D019 (D80L-630-8) or equivalent

Differential Case End Play Check

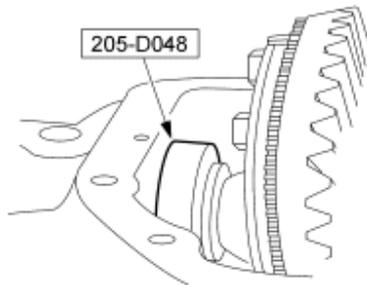
1. Install the outboard spacers in the side from which they were removed.



DE2425-A

2. **NOTE:** Remove all nicks, burrs, dirt, etc. from the differential case hubs, to allow the bearings to rotate freely.

Place the special tool on the differential case hubs, and position the assembly into the differential housing.

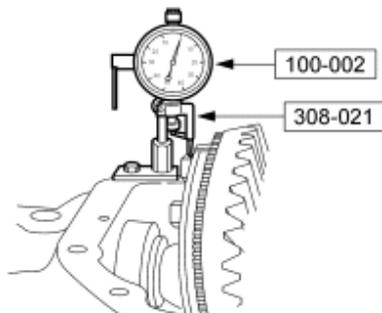


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3. **NOTE:** Use a dial indicator with a minimum travel capability of 5.08 mm (0.200 in).

NOTE: The rear axle uses a combination of differential bearing shims and selective outboard spacers to control differential case end play. The old outboard spacers provide a good starting point when setting end play. However, if additional shimming is necessary, beyond what the hardened differential bearing shims can provide, select and install different thickness outboard spacers.

Mount the special tools as shown. Locate the tip of the Clutch Housing Gauge on a flat surface of one of the bolts.



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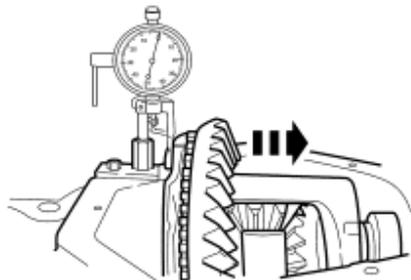
4. **NOTE:** Repeat this step and the following step until the same reading appears on the indicator each time. Record the reading. This is the total differential bearing shim thickness necessary, less preload. The final calculation occurs later during assembly.

Force the differential case as far as possible toward the indicator. With force still applied, set the indicator at 0.



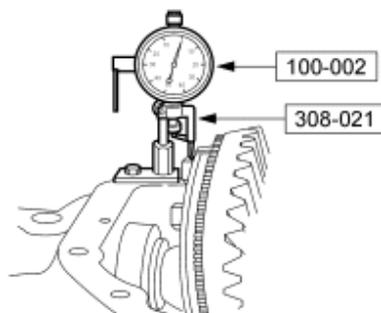
DE0094-B

5. Force the differential case as far as it will go in the opposite direction. Record the total differential case end play reading.

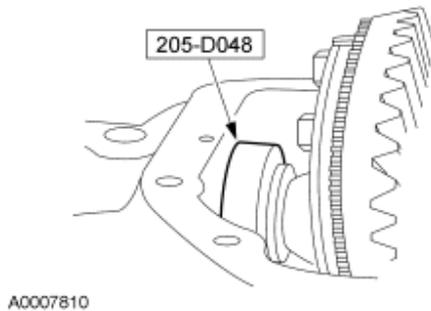


DE0527-A

6. After making sure the reading is correct, remove the special tools and the differential from the differential housing. Do not remove the Master Bearings from the differential case at this time.



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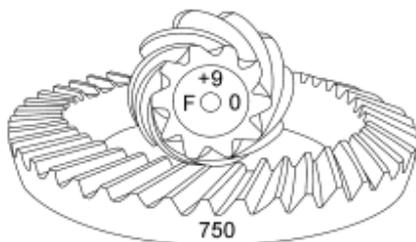
Pinion Ring Gear Variation Number

NOTE: If so equipped, install a new pinion shaft oil slinger if bent or mutilated.

NOTE: The differential ring gear and pinion is only available in a matched set. Matching numbers etched on both the differential ring gear and pinion are for verification. If installing a new differential ring gear and pinion, verify these numbers match before proceeding with assembly. The end of the pinion with the etched figures is the "button" end.

NOTE: Use the gear contact pattern method to verify the final pinion position is valid. For additional information, refer to [Section 205-00](#).

1. Shim the pinion as follows:
 - Etched on the button end of each pinion is a zero (0), or a plus (+) or minus (-) with a number. This number indicates the best running position for each particular differential ring gear. Shimming behind the inner pinion bearing controls this dimension.



DE0096-B

2. If reusing the old differential ring gear and pinion, measure and record the old drive pinion position shim thickness and select a new shim of the same dimension.
 - To change the pinion adjustment, shims are available in the thickness of 0.69-1.68 mm (0.027-0.066 in). Measure each shim separately with a micrometer.
3. If installing a new differential ring gear and pinion, notice the (+) or (-) etching on both the old and new pinion, and adjust the new shim thickness to compensate for the

difference of these two figures. If so equipped, include the oil slinger thickness in the total measurement to correctly set pinion depth.

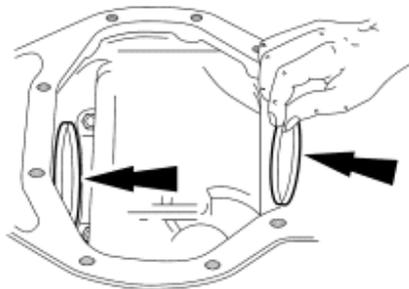
- For example, a pinion etched with m+8 (+3) requires 0.08 mm (0.003 in) less shimming than a pinion etched "0". This means to increase the mounting distance by the amount etched in the pinion, subtract 0.08 mm (0.003 in) from the drive pinion position shim selected for installation. A pinion etched m-8 (-3), requires 0.08 mm (0.003 in) more shimming than a pinion etched "0". In this instance, add 0.08 mm (0.003 in) to the drive pinion position shim selected for installation to decrease the pinion mounting distance by the amount etched in the pinion.

New Pinion Conversion Chart (Metric)									
Old Pinion Marking	New Pinion Marking (Metric)								
	-10	-8	-5	-3	0	+3	+5	+8	+10
+10	+0.20	+0.18	+0.15	+0.13	+0.10	+0.08	+0.05	+0.03	0
+8	+0.18	+0.15	+0.13	+0.10	+0.08	+0.05	+0.03	0	-0.03
+5	+0.15	+0.13	+0.10	+0.08	+0.05	+0.03	0	-0.03	-0.05
+3	+0.13	+0.10	+0.08	+0.05	+0.03	0	-0.03	-0.05	-0.08
0	+0.10	+0.08	+0.05	+0.03	0	-0.03	-0.05	-0.08	-0.10
-3	+0.08	+0.05	+0.03	0	-0.03	-0.05	-0.08	-0.10	-0.13
-5	+0.05	+0.03	0	-0.03	-0.05	-0.08	-0.10	-0.13	-0.15
-8	+0.03	0	-0.03	-0.05	-0.08	-0.10	-0.13	-0.15	-0.18
-10	0	-0.03	-0.05	-0.08	-0.10	-0.13	-0.15	-0.18	-0.20

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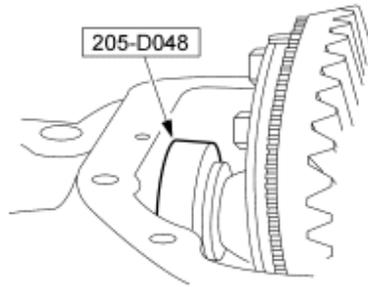
Ring Gear and Pinion Backlash

1. Install the outboard spacers in the side from which they were removed.



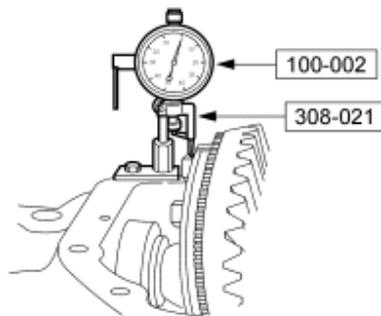
DE2425-A

2. Place the differential assembly with the special tool in the differential housing.



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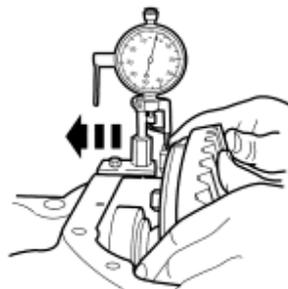
3. Install the special tools. Locate the tip of the Clutch Housing Gauge on a flat surface of one of the bolts.



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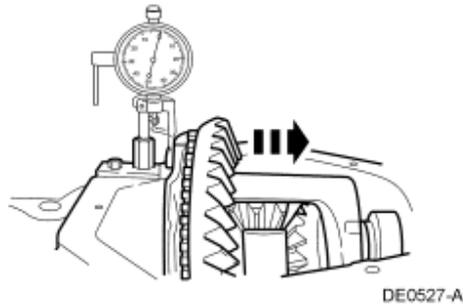
4. **NOTE:** Repeat this step and the following step until the same reading appears on the indicator each time. This is the differential bearing shim thickness necessary between the differential case and the differential bearing on the differential ring gear side of the differential case.

Force the differential case (differential ring gear) away from the drive pinion. With force still applied, set the indicator at 0.

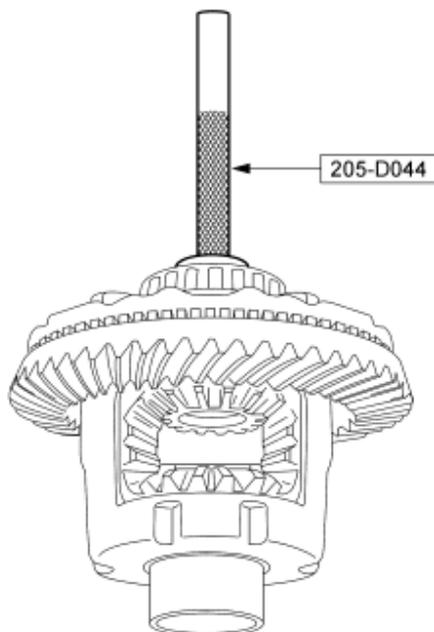


DE0094-B

5. Force the differential ring gear into mesh with the pinion, to obtain an indicator reading. Record the reading.



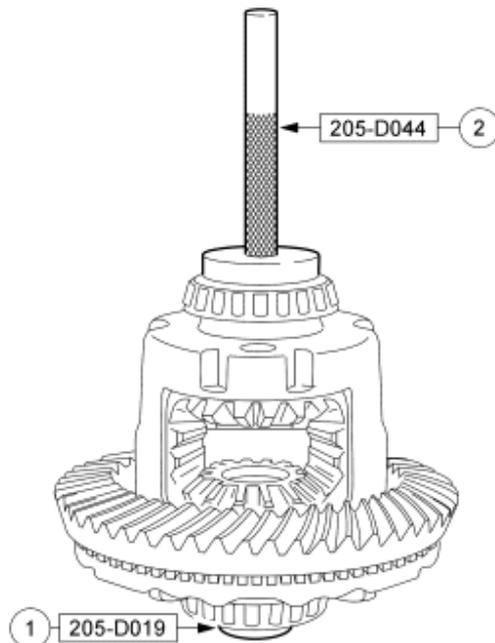
6. Remove the special tools and the differential case from the differential housing.
7. Remove the Master Bearings from the differential case.
8. Place one shim, of the necessary thickness as determined from the previous measurement, on the differential ring gear side of the differential case. If additional shimming is necessary, beyond what the hardened differential bearing shim can provide, select and install a different thickness outboard spacer.
9. Using the special tool, install the differential bearing on the differential ring gear side of the differential case.



10. Determine the correct shim thickness, and place the shim on differential case hub on the drive pinion side.
 - To determine the correct shim thickness, first subtract the reading of the previous measurement from the total differential case end play reading obtained under

Differential Case End Play Check in this section. Then, add 0.25 mm (0.010 in) to this amount. This is the correct thickness shim to place on the hub. If additional shimming is necessary, beyond what the hardened differential bearing shim can provide, select and install a different thickness outboard spacer.

11. Using the special tools, install the differential bearing.
 1. Place the special tool on the differential bearing to protect it during the installation of the opposite bearing.
 2. Using the special tool, drive the differential bearing onto the hub.



A0007813

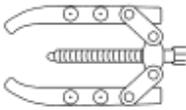
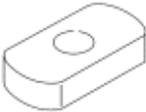
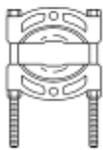
SECTION 205-02A: Rear Drive Axle/Differential
— Dana 80
IN-VEHICLE REPAIR

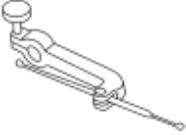
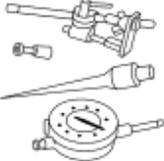
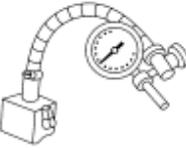
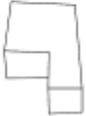
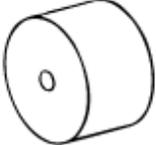
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Workshop Manual
[Procedure revision date: 01/26/2000](#)

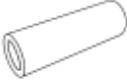
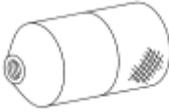
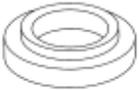
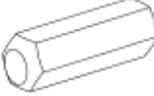
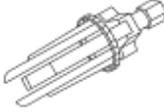
Axle Shaft

For additional information, refer to [Section 205-02C](#).

Axle Assembly

Special Tool(s)	
 ST1260-A	2 Jaw Puller 205-D026 (D80L-1002-L) or equivalent
 ST1743-A	Alignment Adapter 205-D028 (D80T-4020-R60)
 ST1550-A	Remover, Drive Pinion Inner Bearing 205-489
 ST1881-A	Remover, Rear Wheel Hub Bearing Cup 205-283 (T88T-4628-A)
 ST1783-A	Installer, Drive Pinion Bearing Cup 205-486
 ST1368-A	Puller, Bearing 205-D064 (D84L-1123-A)

 <p>ST1348-A</p>	<p>Gauge, Clutch Housing 308-021 (T75L-4201-A)</p>
 <p>ST1542-A</p>	<p>Installer, Drive Pinion Flange 205-285 (T88T-4851-A)</p>
 <p>ST1544-A</p>	<p>Depth Gauge, Drive Pinion 205-S156 (T80T-4020-A)</p>
 <p>ST1214-A</p>	<p>Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent</p>
 <p>ST1266-A</p>	<p>Dial Indicator Gauge with Holding Fixture 100-D002 (D78P-4201-B) or equivalent</p>
 <p>ST1259-A</p>	<p>Spreader, Differential Carrier 205-001 (TOOL-4000-E) or equivalent</p>
 <p>ST1431-A</p>	<p>Adapter for 205-S156 205-159 (T80T-4020-F42)</p>
 <p>ST1890-A</p>	<p>Depth Gauge/Aligner, Drive Pinion 205-280 (T88T-4020-A)</p>

 <p>ST1434-A</p>	<p>Gauge Tube 205-D038 (D81T-4020-F51) or equivalent</p>
 <p>ST1653-A</p>	<p>Handle 205-D055 (D81L-4000-A) or equivalent</p>
 <p>ST1891-A</p>	<p>Depth Gauge/Aligner, Drive Pinion (Handle) 205-281 (T88T-4020-B)</p>
 <p>ST1351-A</p>	<p>Slide Hammer 100-001 (T50T-100-A)</p>
 <p>ST1361-A</p>	<p>Installer, Drive Pinion Bearing Cup 205-024 (T67P-4616-A)</p>
 <p>ST1308-A</p>	<p>Installer, Drive Pinion Bearing 205-488</p>
 <p>ST1882-A</p>	<p>Protector, Drive Pinion Thread 205-487</p>
 <p>ST1213-A</p>	<p>Remover, Bushing 307-001 (TOOL-1175-AC) or equivalent</p>

 <p>ST1889-A</p>	<p>Draw Bar, Rear Axle 205-098 (T75T-1176-A)</p>
 <p>ST1429-A</p>	<p>Adapter for 205-S156 205-160 (T80T-4020-F43)</p>
 <p>ST1885-A</p>	<p>Seal Replacer Tool number not available at time of print</p>

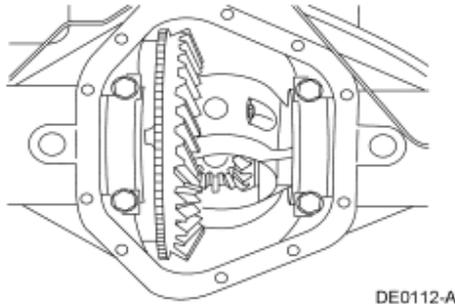
Material	
Item	Specification
SAE 75W-90 Thermally Stable Multi-Purpose Gear Lubricant XY-75W90-QL	WSP-M2C201-A
Additive Friction Modifier C8AZ-19B546-A or equivalent	EST-M2C118-A
Silicone Rubber F7AZ-19554-CA or equivalent	ESB-M4G92-A

Removal

1. Raise the vehicle on a hoist or raise the rear end of the vehicle with a jack. Install safety stands under the frame rails and lower the jack or hoist enough to allow the rear axle to drop into the rebound position for working clearance. For additional information, refer to [Section 100-02](#).
2. Remove the differential housing cover and drain the lubricant from the rear axle.
 - Clean the gasket material from the differential housing cover and the differential housing.
3. **NOTE:** An inspection can find the cause of the concern and determine the resolution.

Carry out the following before disassembly.

- Remove all the lubricant from the internal parts of the conventional differential assembly or Trac-Lok® differential assembly. Visually inspect the parts for wear and damage.
- Rotate the differential assembly to check for any roughness, indicating damaged bearings or gears.
- Remove all the lubricant and check the differential ring gear and pinion teeth for signs of scoring, abnormal wear, nicks and chips.
- Use a magnet to search for heavy metal particles indicating component damage.

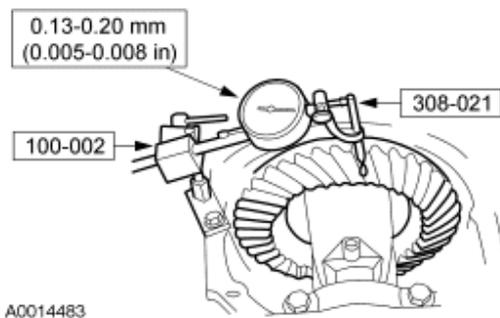


4.  **CAUTION: The differential ring gear and pinion must be clean and dry to obtain an accurate reading.**

NOTE: Measure the differential ring gear and pinion backlash at three equally spaced points.

Using the special tools, measure the differential ring gear and pinion backlash.

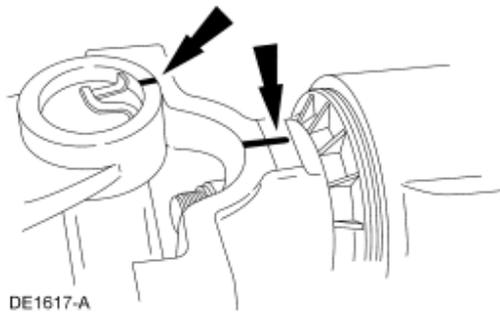
- The backlash tolerance is 0.13-0.20 mm (0.005-0.008 in) and cannot vary more than 0.05 mm (0.002 in) between points checked. A backlash variation of more than 0.05 mm (0.002 in) indicates gear/case runout.
- Move the differential ring gear toward the pinion to correct high backlash.
- Move the differential ring gear away from the pinion to correct low backlash.



5. Remove the axle shafts. For additional information, refer to [Section 205-02C](#).

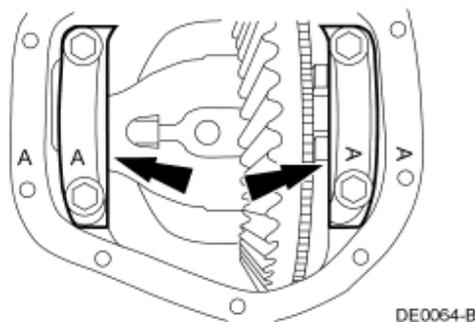
6. **⚠ CAUTION: Index-mark the driveshaft components to maintain driveline balance during assembly.**

Disconnect the driveshaft at the rear axle, and position it aside. For additional information, refer to [Section 205-01](#).



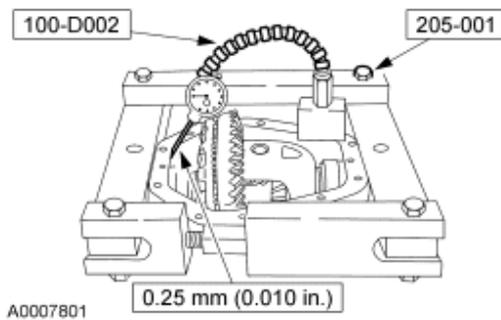
7. **⚠ CAUTION: Note the positions of the mating letters stamped vertically and horizontally on the bearing caps and the differential housing before removing the bearing caps. Matching the letters is important at the time of assembly.**

To ease removal of the differential assembly, loosen the bolts, then pry the differential case, bearing cups and outboard spacers outward until they are loose in the differential housing.



8. Remove the bolts and the bearing caps.
9. **⚠ CAUTION: Do not spread the differential housing more than specified.**

Using the special tools, spread the differential housing to the specification, then remove the Dial Indicator Gauge with Holding Fixture.

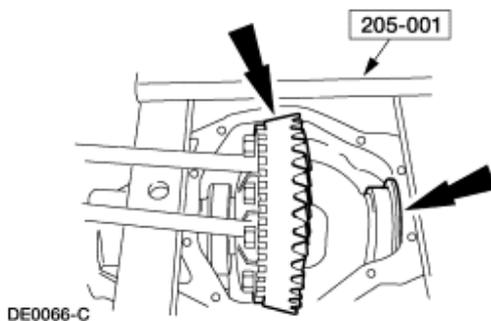


10. **⚠ CAUTION:** It will be necessary to use large pry bars to remove the differential assembly from the differential housing. Do not damage the differential ring rear when carrying out this step.

⚠ CAUTION: Mark or tag the differential bearing cups, indicating from which side they were removed.

Remove the differential assembly with the bearing cups.

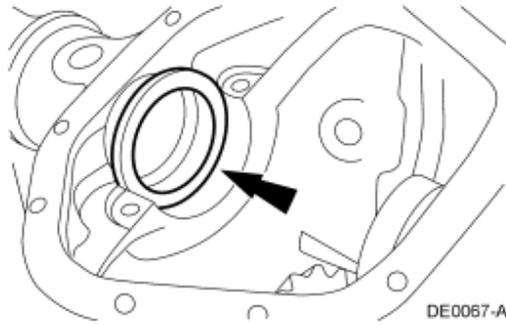
- Remove the special tool after removing the differential assembly.
- Inspect the differential bearing cups for deep scores, galling and spalling. Discard them if necessary.



11. **⚠ CAUTION:** Mark or tag the outboard spacer(s) indicating from which side they were removed.

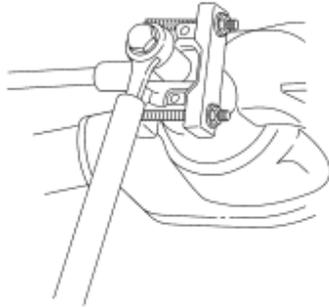
Remove the outboard spacer(s).

- Inspect the spacer(s) for nicks, bending and grooved conditions. Discard them if necessary.

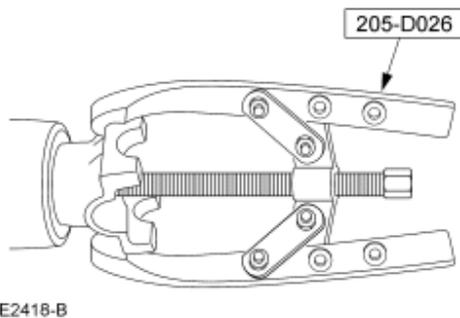


12. **⚠ CAUTION: Index-mark the pinion flange (4851) to the pinion shaft prior to removal.**

Use a suitable tool to prevent the flange from turning, and remove the lock nut and washer.

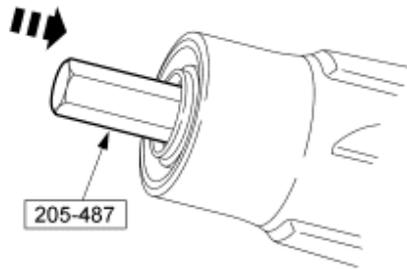


13. Using the special tool, remove the pinion flange.



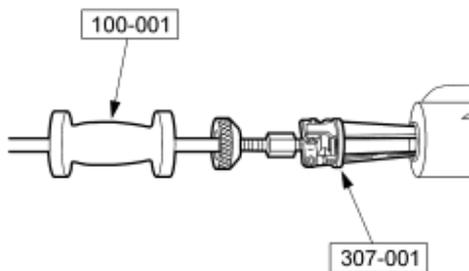
14. **NOTE:** There are drive pinion bearing preload shims on the spline-end of the pinion. These shims can stick to the pinion, the pinion bearing or they can fall out of the differential housing. Collect and keep the shims for reassembly.

Using a soft faced hammer and the special tool, tap the pinion out of the pinion bearing cup and remove it through the rear of the differential housing.



A0007802

15. Using the special tools, remove and discard the pinion seal.

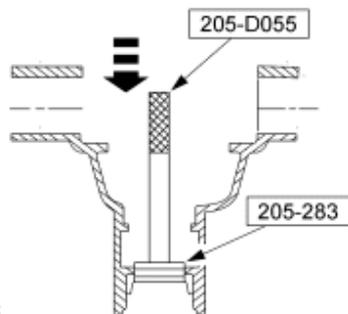


DE2553-A

16. Remove the oil slinger and the pinion bearing.

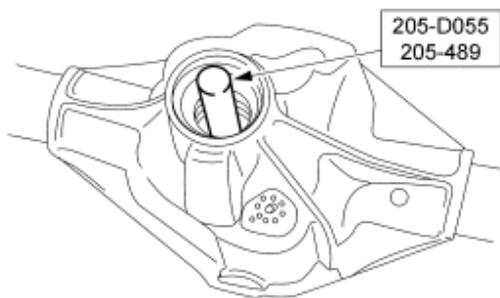
17.  **CAUTION: Do not nick the differential housing bore.**

Using the special tools, remove the outer pinion bearing cup.



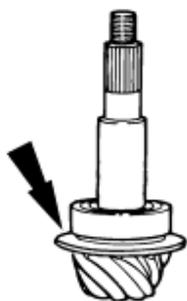
DE0080-C

18. Using the special tools, remove the inner pinion bearing cup.



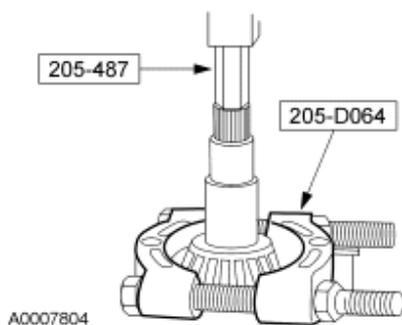
A0007803

19. The oil slinger, if so equipped, is part of the total drive pinion position shim height required to correctly set pinion depth. Keep the oil slinger intact for assembly.



DE0082-B

20. Using the special tools, remove the inner pinion bearing.



A0007804

21. **NOTE:** Discard the drive pinion position shim if bent or nicked. If discarding the shim, measure and record the shim thickness.

Remove the oil slinger, if so equipped, and the drive pinion position shim.

22. Carry out the following after disassembling the axle:

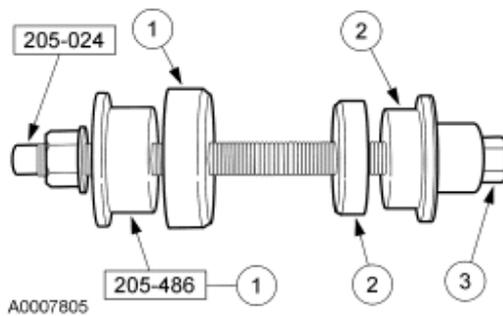
- Thoroughly clean all parts.
- Inspect all parts for damage and wear.
-  **CAUTION: Do not disassemble the Trac-Lok® differential assembly or the Truetrac® differential assembly. Discard the entire assembly if worn/damaged.**

Clean the inside of the differential case before assembly. For Truetrac® differentials, submerge the entire differential assembly in a suitable solvent to wash away contaminants from within the housing.

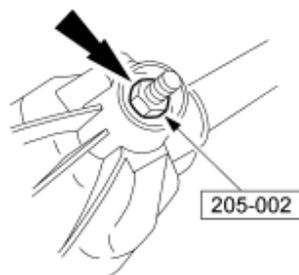
- Thoroughly clean the differential housing if gears have scores/chips in them.

Installation

1. Carry out the Differential Case End Play Check in the General Procedures portion of this section.
2. Position the special tools and the inner and outer pinion bearing cups in their respective differential housing bores.
 1. After placing the inner and outer pinion bearing cups in their bores, place the special tool (inner) on the inner pinion bearing cup.
 2. Place the special tool (outer) on the outer pinion bearing cup.
 3. Install the special tool.



3. Tighten the special tool to seat the pinion bearing cups into their bores.



4.  **CAUTION: Always install new pinion bearings when installing new bearing cups.**

NOTE: If the feeler gauge can fit between a cup and the bottom of its bore at any point around the cup, remove and reseal the cup.

Check that the cups have seated correctly in their bores.

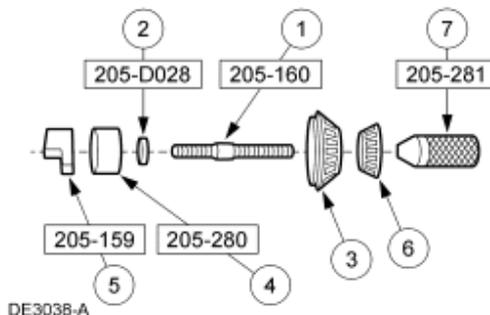


5.  **CAUTION:** If any of the gauge surfaces have nicks in them, remove the high spots with a medium India oilstone to prevent erroneous readings.

NOTE: Apply only a light oil film on the pinion bearings before assembling the tools.

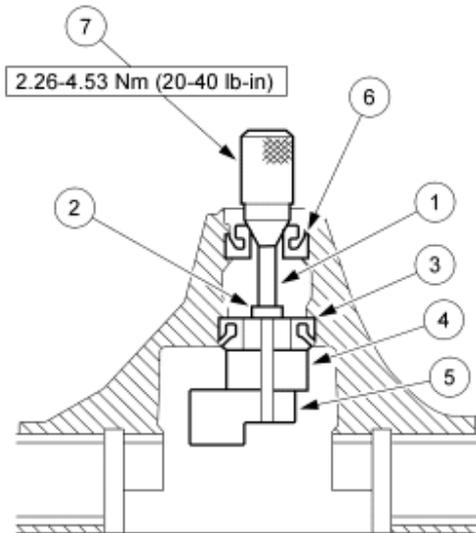
Assemble and position the following in the differential housing.

1. Position the screw (adapter for 205-S156).
2. Position the Alignment Adapter.
3. Position the inner pinion bearing.
4. Position the Drive Pinion Depth Gauge/Aligner.
5. Position the Gauge Block (adapter for 205-S156).
6. Position the outer pinion bearing.
7. Thread on the Drive Pinion Depth Gauge/Aligner (Handle).



6. **NOTE:** This step simulates pinion bearing preload.

Using a Nm (inch-pound) torque wrench, tighten the Handle to the specification.

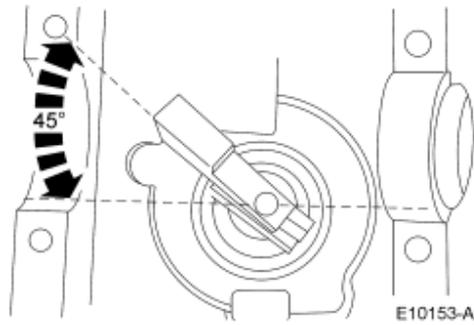


DE3039-A

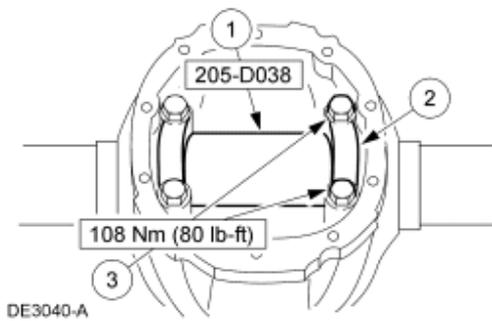
Item	Part Number	Description
1	205-160	Screw (Adapter for 205-S156)
2	205-D028	Alignment Adapter
3	4630	Rear (inner) pinion bearing
4	205-280	Drive Pinion Depth Gauge/Aligner
5	205-159	Gauge Block (Adapter for 205-S156)
6	4621	Front (outer) pinion bearing
7	205-281	Drive Pinion Depth Gauge/Aligner (Handle)

7. **NOTE:** Offset the Gauge Block to obtain an accurate reading.

Rotate the Gauge Block several half-turns to make sure the pinion bearings are correctly seated and position the Gauge Block.



8. Install the special tool.
 1. Position the special tool.
 2. Install the bearing caps.
 3. Install the four bolts.

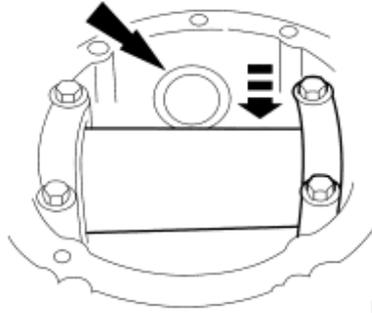


9. **NOTE:** Use a feeler gauge or flat, clean drive pinion position shims as a measuring device.

NOTE: Do not attempt to force the gauge or shim between the Gauge Block and the Gauge Tube. A slight drag indicates a correct selection.

Using a feeler gauge or flat, clean drive pinion position shims, measure between the Gauge Block and the Gauge Tube. Record the measurement. Refer to Pinion Ring Gear Variation Number in this section for shim selection information.

- Remove the special tools after making the correct shim selection.



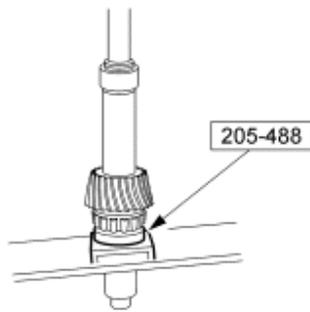
DE0254-C

10. **⚠ CAUTION:** Follow the drive pinion bearing preload shim and drive pinion position shim assembly sequence as directed or unit failure can result.

Install the correct thickness drive pinion position shim, and the oil slinger, if so equipped, on the pinion.

11. **NOTE:** Always use the same new inner pinion bearing installed when taking the measurement for drive pinion position shim selection.

Using the special tool, an axle bearing/seal plate, and a suitable press, install the pinion bearing.



A0007806

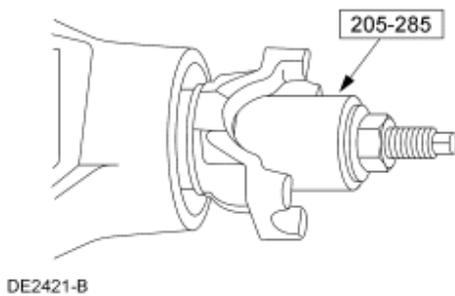
12. **NOTE:** Use the thickness of the old drive pinion bearing preload shims as a starting point for setting pinion bearing preload.

Inspect the drive pinion bearing preload shims for damage. Discard them if necessary. New shims are available in the thickness shown in the following chart.

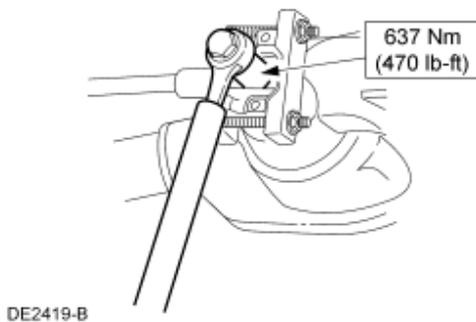
Available Drive Pinion Bearing Preload Shims	
mm	Inches
0.36	0.014
0.38	0.015
0.41	0.016
0.46	0.018

0.51	0.020
0.53	0.021
0.56	0.022
0.58	0.023
0.76	0.030

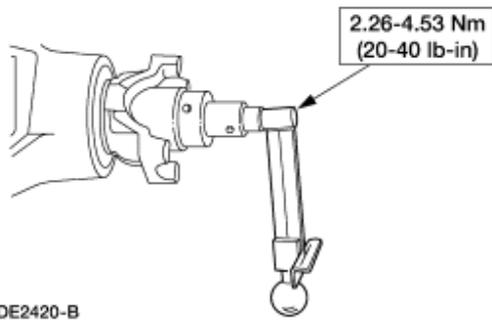
13. Assemble the drive pinion bearing preload shims onto the pinion and install the pinion into the differential housing.
14. Install the outer pinion bearing.
15. Using the special tool, install the pinion flange.



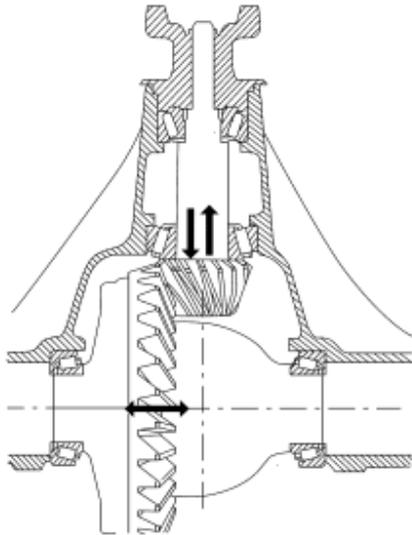
16. Install the old washer and the lock nut.



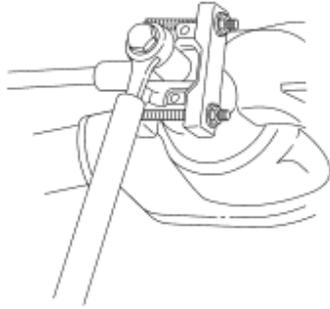
17. Using a Nm (inch-pound) torque wrench, rotate the pinion. The torque must read as specified.
 - To increase the preload, remove drive pinion bearing preload shims. To decrease the preload, add shims.



18. If the pinion bearing preload is within specification, and the pinion position shim has changed, change the drive pinion bearing preload shims by the same amount.
- The direction arrow pointing toward the pinion flange indicates that by removing the drive pinion position shim, the distance from the centerline of the tubes to the pinion backface increases, giving a plus (+) reading. The drive pinion bearing preload shim pack does not affect the pinion depth setting. However, if the pinion position is changed, the pinion preload will change and may require adjustment to bring the torque-to-rotate within specification. Arrows on the ring gear illustrate the method to increase or decrease backlash and differential bearing preload.

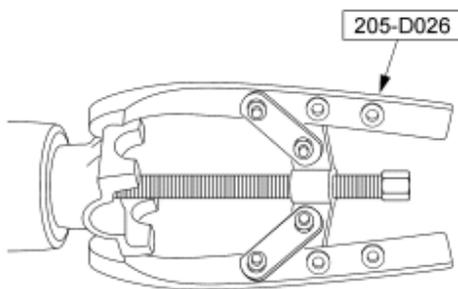


19. With the drive pinion at the correct preload as determined earlier in this procedure, remove and discard the lock nut and the washer.



DE2417-A

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



DE2418-B

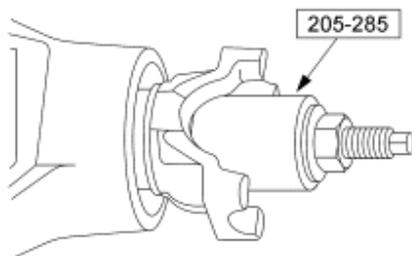
21. Coat the pinion seal rubber lips with lubricant.

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

- After installation, verify that the garter spring did not pop out of the seal. If the garter spring popped out, install a new pinion seal.

23. Coat the inside of the pinion flange with a small amount of lubricant.

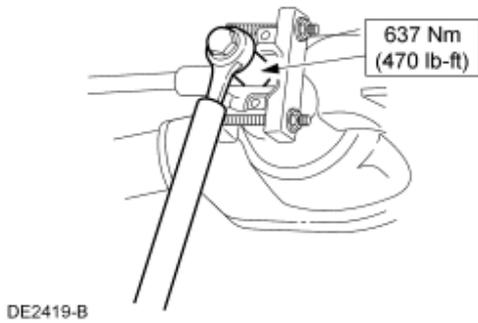
24. Using the special tool, install the pinion flange.



DE2421-B

25.  **CAUTION: Always install a new washer and lock nut.**

Install the new washer and lock nut.

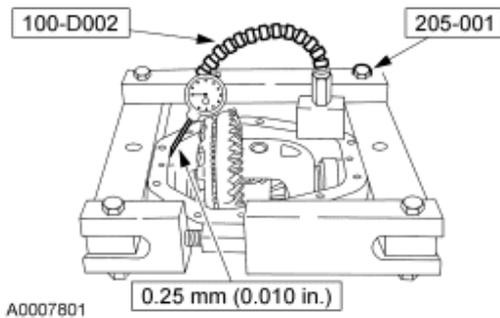


26. Carry out the Ring Gear and Pinion Backlash procedure in the General Procedures portion of this section.
27. Assemble the differential bearing cups to the differential bearings.
28.  **CAUTION: Do not spread the differential housing more than specified.**

 **CAUTION: Avoid nicking the ring gear teeth and the anti-lock speed sensor ring during assembly.**

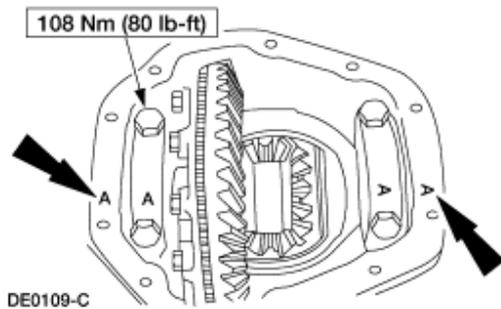
Using the special tools, spread the differential housing to the specification.

- Use a rawhide hammer to seat the differential into the differential housing pocket.
 - Remove the special tools.



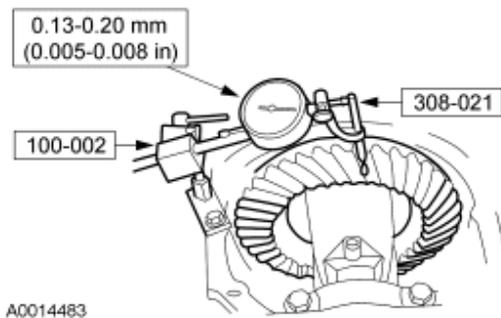
29.  **CAUTION: Match the mating letters as noted during disassembly.**

Install the bearing caps, aligning the letters with those on the differential housing. Tighten the bolts to specification.



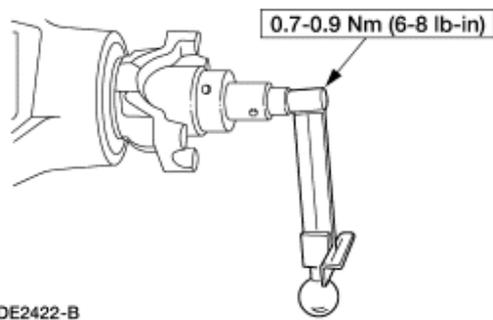
30. Using the special tools, measure the differential ring gear and pinion backlash at three equally spaced points.

- The backlash tolerance is 0.13-0.203 mm (0.005-0.008 in) and cannot vary more than 0.05 mm (0.002 in) between points checked. A backlash variation of more than 0.05 mm (0.002 in) indicates gear/case runout.
- Move the differential ring gear toward the pinion to correct high backlash.
- Move the differential ring gear away from the pinion to correct low backlash.
- Moving a specified amount of differential bearing shims from one side of the differential to the other makes these corrections.



31. Confirm the total preload.

- Using a Nm (inch-pound) torque wrench, check the torque to rotate the pinion. The reading must be higher than the initial reading (taken without the differential case installed) by the amount shown, with new bearings installed as recommended.
- If the total preload is too high, remove an equal amount of differential bearing shims from each differential case hub. If the total preload is too low, add an equal amount of differential bearing shims to each differential case hub.



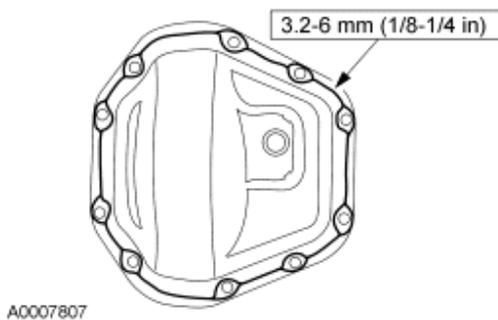
32. Carry out the Tooth Contact Pattern Check to verify the final pinion position is correct. For additional information, refer to [Section 205-00](#).
33. Install the axle shafts. For additional information, refer to [Section 205-02C](#).

34.  **CAUTION: Clean both flat surfaces (differential housing and differential housing cover) with a suitable solvent to remove all traces of oil film.**

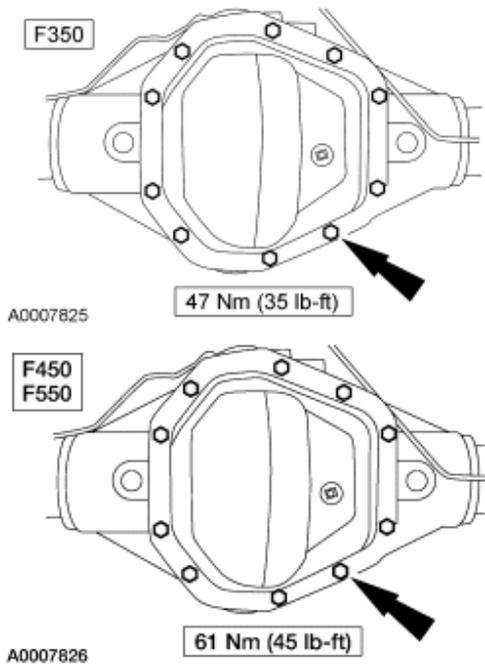
 **CAUTION: Install the differential housing cover within 15 minutes of applying the silicone, or it will be necessary to remove and reapply new sealant.**

NOTE: The differential housing cover requires a silicone rubber sealer material, rather than a gasket.

Apply a continuous bead of sealant of the specified thickness to the differential housing cover.

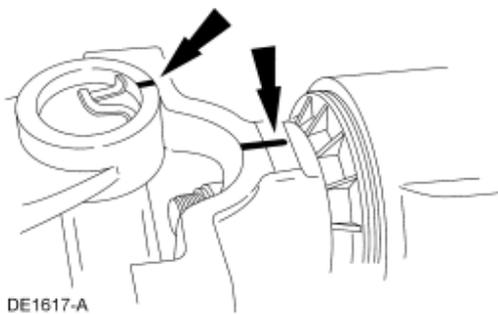


35. Place two bolts into the differential housing cover at the 8 o'clock and 2 o'clock positions. Install the differential housing cover.
- Use the two bolts to position the differential housing cover on the differential housing.
36. Install the remaining bolts. Tighten the bolts alternately and evenly.
- Allow 1-hour cure time before filling the axle with the correct amount of specified lubricant.



37. **NOTE:** Align the index marks made during removal.

Connect the driveshaft to the rear axle. For additional information, refer to [Section 205-01](#).



38. **⚠ CAUTION:** For Trac-Lok® axles, first fill the axle with 0.2365 liters (0.5 pints) of Additive Friction Modifier.

Fill the axle with the specified type and amount of lubricant. For additional information, refer to Specifications in this section.

SECTION 205-02A: Rear Drive Axle/Differential —
Dana 80
IN-VEHICLE REPAIR

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Driveshaft

For additional information, refer to [Section 205-01](#).

SECTION 205-02A: Rear Drive Axle/Differential —
Dana 80
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Drive Pinion Flange

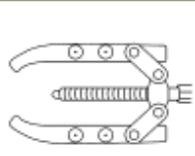
1. For additional information, refer to [Drive Pinion Seal](#) in this section.
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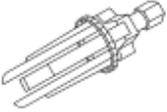
SECTION 205-02A: Rear Drive Axle/Differential —
Dana 80
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Workshop Manual

[Procedure revision date: 01/26/2000](#)

Drive Pinion Seal

Special Tool(s)	
	2 Jaw Puller 205-D026 (D80L-1002-L) or equivalent

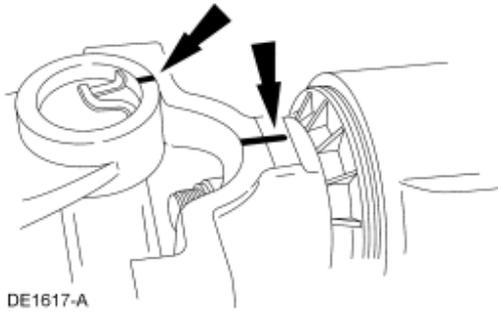
 <p>ST1542-A</p>	<p>Installer, Drive Pinion Flange 205-285 (T88T-4851-A)</p>
 <p>ST1351-A</p>	<p>Slide Hammer 100-001 (T50T-100-A)</p>
 <p>ST1885-A</p>	<p>Pinion Oil Seal Replacer Tool number not available at time of print</p>
 <p>ST1213-A</p>	<p>Remover, Bushing 307-001 (TOOL-1175-AC) or equivalent</p>

Material	
Item	Specification
SAE 75W-90 Thermally Stable Multi-Purpose Gear Lubricant XY-75W90-QL	WSP-M2C201-A

Removal

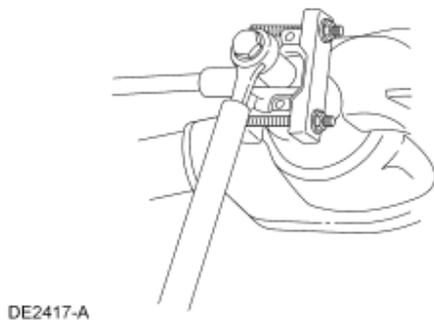
1. Raise the vehicle on a hoist or raise the rear end of the vehicle with a jack. Install safety stands under the frame rails and lower the jack or hoist far enough to allow the rear axle to drop into the rebound position for working clearance.
2. **NOTE:** To maintain driveline balance, mark the driveshaft components so they can be reinstalled in their original positions.

Disconnect the driveshaft at the rear axle, and position it aside. For additional information, refer to [Section 205-01](#).

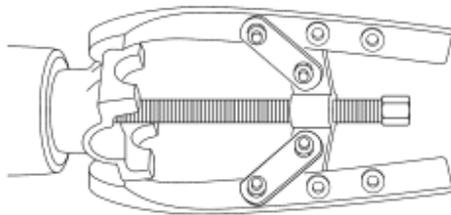


3. **NOTE:** Index-mark the flange (end yoke for Motorhome) to the pinion shaft.

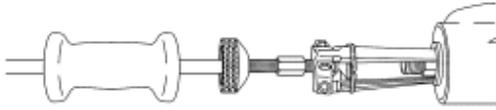
While using a suitable tool to prevent the flange or yoke from turning, remove the pinion nut.



4. Using the 2 Jaw Puller, remove the flange or yoke.



5. Using the Bushing Remover and the Slide Hammer, remove the pinion seal.



DE2424-A

6. Clean the rear axle pinion seal seat.

Installation

1.  **CAUTION: Installation without the correct tool can result in early seal failure. If the pinion seal becomes cocked during installation, remove and install a new one. Make sure the garter spring remains in place during assembly. If the spring is dislodged, a new pinion seal must be installed.**

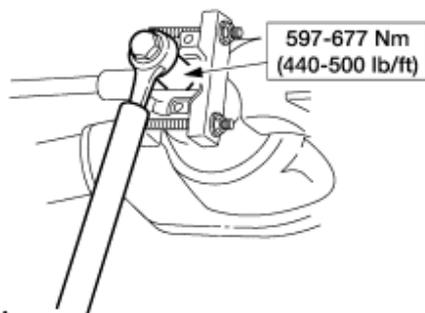
NOTE: Drive the pinion seal into the housing, using the Pinion Oil Seal Replacer.

NOTE: The pinion flange or end yoke must never be hammered on or installed with power tools.

NOTE: Install the flange or yoke using the Drive Pinion Flange Installer.

To install, reverse the removal procedure.

- Coat the pinion seal (rubber lips) with lubricant.



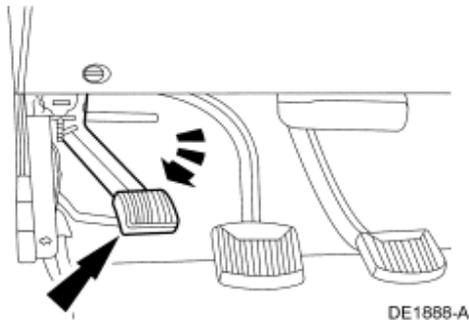
DE2419-A

Axle Assembly

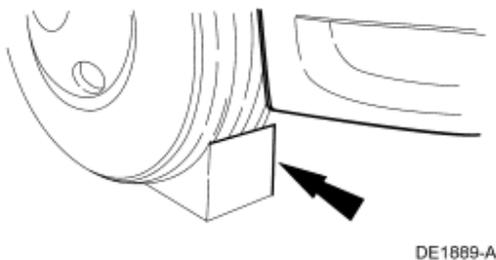
Special Tool(s)	
 ST2006-A	Wheel Dolly 014-00030 or Equivalent

Removal

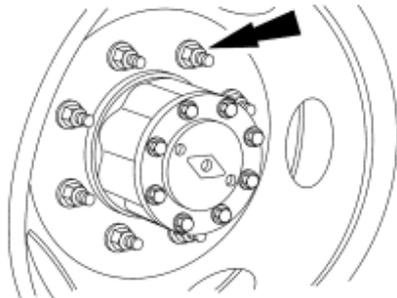
1. Set the parking brake.



2. Chock the front wheels.

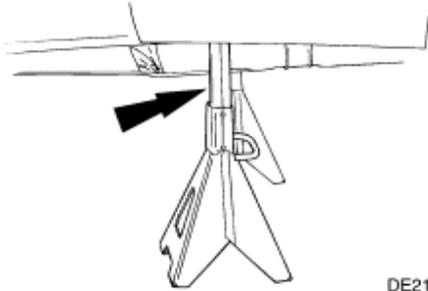


3. Loosen, but do not remove, the rear wheel lug nuts.



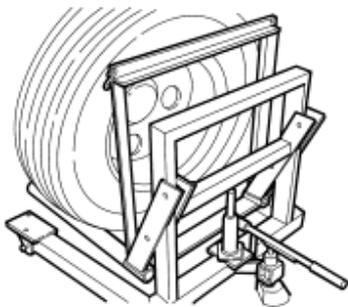
DE1978-A

4. Raise and support the rear of the vehicle high enough so that it will clear the axle assembly when removing it.



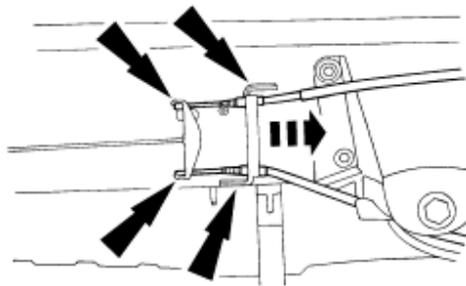
DE2131-A

5. Remove the rear wheels using the Wheel Dolly.



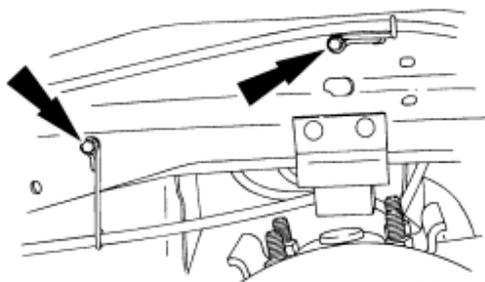
DE1001-A

6. Release the parking brake cable tension, and disconnect the cables at the equalizer and the anchor plate; for additional information, refer to [Section 206-05](#).



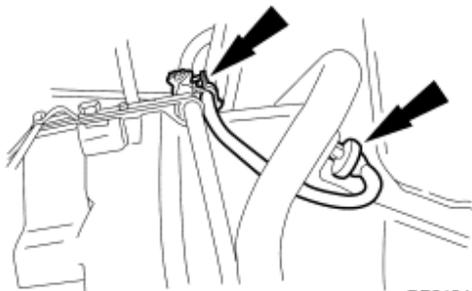
DE2132-A

7. Remove the frame anchors, and position the parking brake cables aside.



DE2133-A

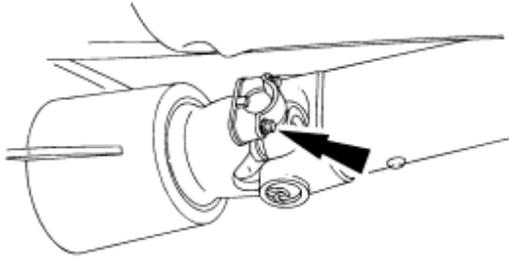
8. Disconnect the rear anti-lock brake sensor electrical connector. Release the harness clips and position the harness aside.



DE2134-A

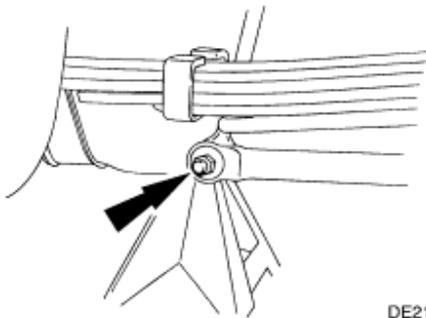
9. **NOTE:** To maintain driveline balance, mark the driveshaft components so they can be reinstalled in their original positions.

Disconnect the driveshaft, and position it aside; for additional information, refer to [Section 205-01](#).



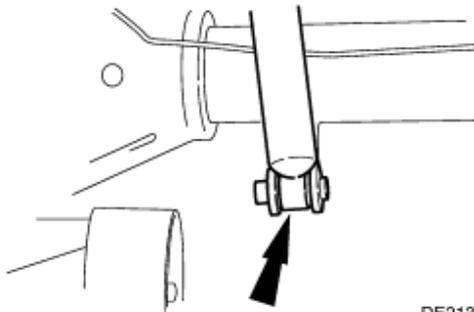
DE2135-A

10. Disconnect the sway bar at the sway links.



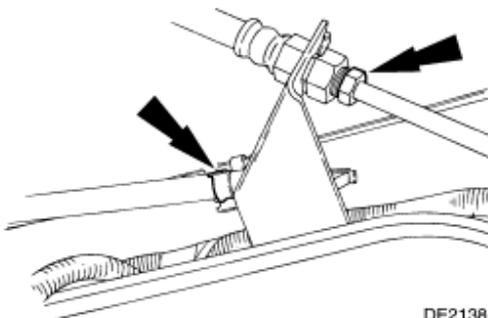
DE2136-A

11. Disconnect the shock absorbers at the axle.



DE2137-A

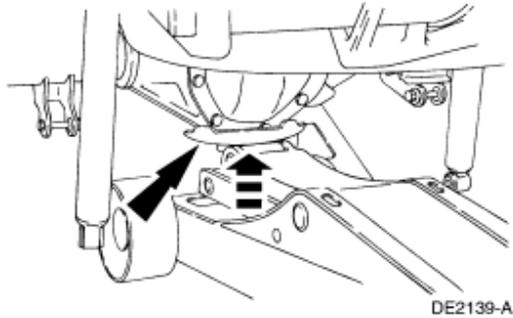
12. Disconnect the hydraulic brake hose and axle vent hose at the crossmember. Plug the brake hose and brake line, and position the hoses aside.



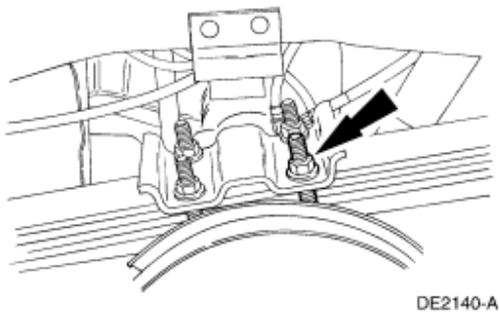
DE2138-A

13.  **CAUTION:** The nose of the axle will drop downward when loosening the U-bolts. Make sure to support the axle nose as well as the rear of the housing with the jack.

Support the axle with a suitable floor jack.

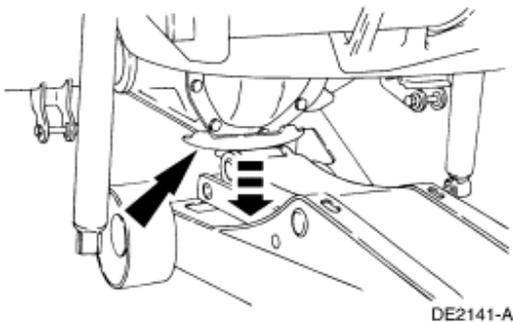


14. Remove the U-bolt nuts, the spring seat caps and the U-bolts.



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

Carefully lower the axle and remove it.



Installation

1. Follow the removal procedure in reverse order.

- Refer to [Section 204-02](#) for the shock absorber, the sway bar and the U-bolt torque specifications.
 - Refer to [Section 204-04](#) for the wheel lug nut torque specifications.
2. Bleed the brakes; for additional information, refer to [Section 206-00](#).
 3. Make sure the axle lubricant level is proper; refer to Specifications in this section.
-

Differential Case and Ring Gear

Special Tool(s)	
 ST1347-A	Puller, Drive Pinion/Differential Carrier 205-D036 (D81L-4220-A) or equivalent

Material	
Item	Specification
Premium Long Life Grease XG-1-C or equivalent	ESA-M1C75-B
Threadlock and Sealer E0AZ-19554-AA	WSK-M2G351-A5

Disassembly

All differentials

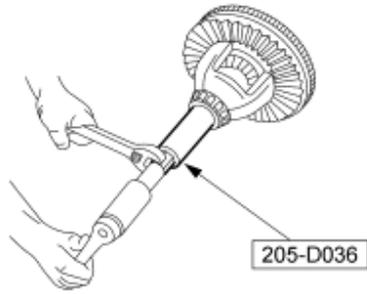
1. **NOTE:** Differential bearing shims are available in thicknesses of 0.762, 0.787, 0.813, 0.838, 0.864, 0.889 and 0.914 mm (0.030, 0.031, 0.032, 0.033, 0.034, 0.035 and 0.036 in).

NOTE: If damaged, install new differential bearing shims.

NOTE: Install new differential bearings if removing them from the differential case.

Using the special tool, remove the differential bearings.

- Wire the differential bearing shims, differential bearing cup, differential bearing, and selective outboard spacer(s) together. Note from which side they were removed (differential ring gear side or the opposite side).



DE2568-A

2. **NOTE:** Use a vise with brass jaws or wood blocks.

Place the differential case in a vise.

3. **⚠ CAUTION: Do not damage the anti-lock speed sensor ring when removing the differential ring gear. If removing the anti-lock speed sensor ring, discard it and install a new one.**

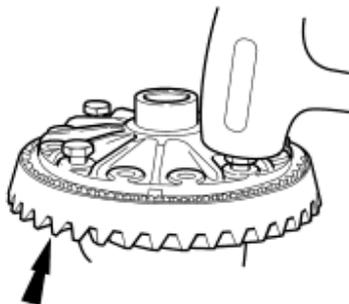
NOTE: Always install new bolts upon assembly. Use Grade 9 bolts for all Dana rear axles.

Remove the bolts. Leave four bolts loosely assembled, 90 degrees apart.



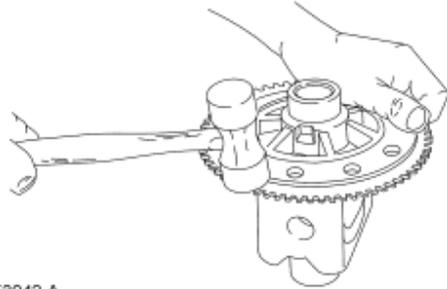
DE0069-B

4. Tap each bolt head alternately with a rawhide or plastic hammer to loosen the differential ring gear. Remove the bolts and the differential ring gear.



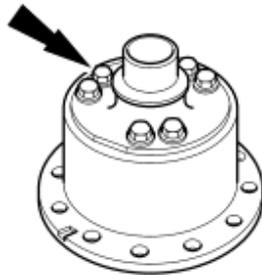
DE0070-A

5. If necessary, remove the anti-lock speed sensor ring with a soft-faced hammer. Discard the anti-lock speed sensor ring.

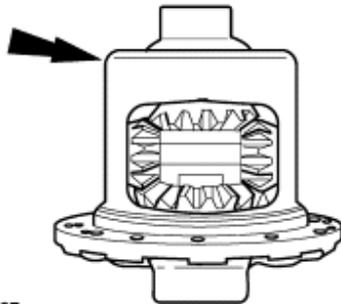


DE3042-A

6. The Truetrac® and Trac-Lok® differential assemblies are non-repairable. Discard the entire assembly if it is worn/damaged. For conventional differential assemblies, proceed as follows.



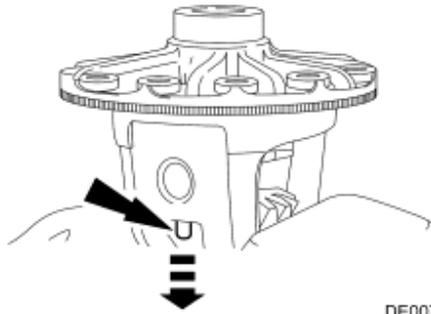
DE3043-A



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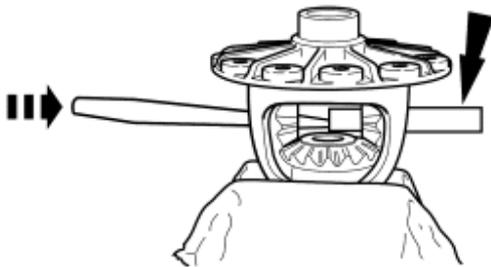
Conventional differential

7. **NOTE:** Use a vise with brass jaws or wood blocks.
Place the differential case in a vise.
8. Using a small drift, drive out the differential pinion shaft lock pin.



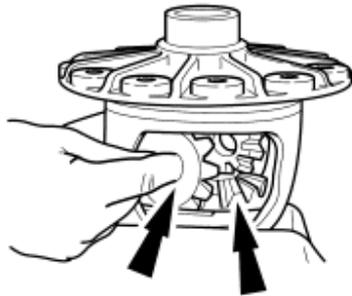
DE0072-B

9. Using a drift, remove the differential pinion shaft.



DE0074-B

10. To remove the differential side gears and the differential pinion gears, rotate the differential side gears. The differential pinion gears will turn to the opening in the differential case.



DE0075-B

11. Remove the differential pinion gears and the differential pinion thrust washers behind the differential pinion gears.

12. Lift out the differential side gears and the differential side gear thrust washers.

Assembly

Conventional differential

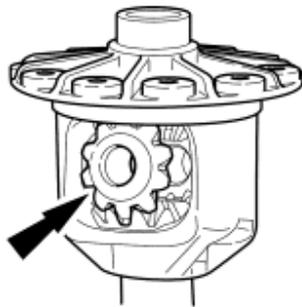
1. **NOTE:** For Truetrac® and Trac-Lok® differential assemblies proceed to All differentials in this procedure.

NOTE: Use a vise with brass jaws or wood blocks.

Place the differential case in a vise.

2. Lubricate the new differential side gear thrust washers, the thrust face of the new differential side gears, the new differential pinion thrust washers, and the new differential pinion gears with grease.
3. **NOTE:** The best way to assemble the differential side gears and the differential pinion gears is to lubricate all parts with the specified rear axle lubricant.

Lubricate and assemble both differential side gears and differential side gear thrust washers. Hold them in place. Then, lubricate and assemble the differential pinion gears and the differential pinion gear thrust washers to hold the differential side gears in place.

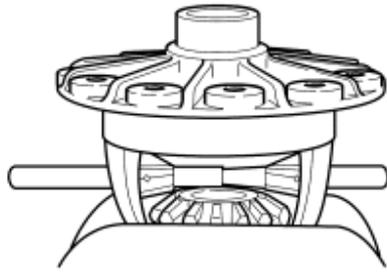


DE0084-B

4. **NOTE:** Rotate the differential side gears until the holes of the differential pinion gear thrust washers and the differential pinion gears line up with the holes of the differential case. If the differential pinion gears will not rotate by hand, install one of the axle shafts into the spline of the differential side gear and use a pipe wrench to turn the axle shaft.

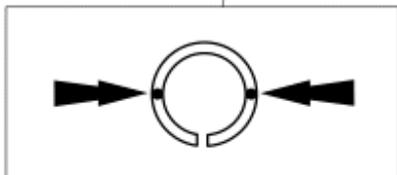
Using a drift, line up the holes with those of the differential case.

5. Assemble the differential pinion shaft and drive on the differential pinion shaft to remove the drift. Align the lock pin hole in the differential pinion shaft with the lock pin hole in the differential case.



DE0085-B

6. Assemble the differential pinion shaft lock pin. Peen the metal of the differential case over the differential pinion shaft lock pin in two places, 180 degrees apart, to lock it in place. Note the location of the slot in the differential pinion shaft lock pin and peen it 90 degrees apart.



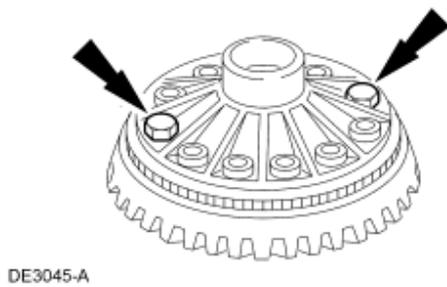
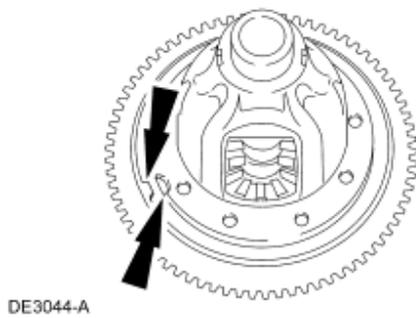
DE0086-B

All differentials

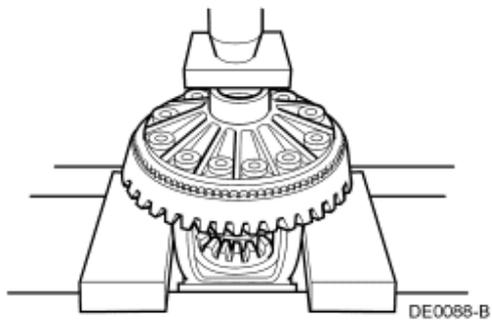
7. **NOTE:** Align the tab on the anti-lock speed sensor ring with the slot in the differential case.

NOTE: Apply Threadlock® and Sealer to the new bolts.

Align the tab in the anti-lock speed sensor ring with the slot in the differential case. Start the two bolts through the differential case flange and into the differential ring gear to make sure the differential case and the differential ring gear bolt hole align.

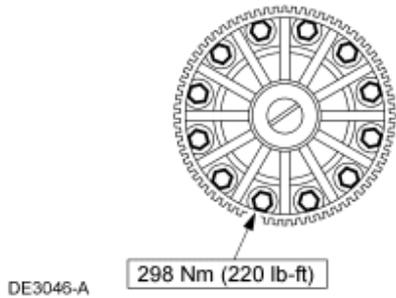


8. Press the anti-lock speed sensor ring on the differential case. The differential case flange acts as a pilot for the anti-lock speed sensor ring.



9. **NOTE:** Apply Threadlock® and Sealer to the new bolt threads.

Draw up the Grade 9 bolts alternately and evenly.



10. Install the differential bearings. For additional information, refer to [Differential Case and Pinion Set Up](#) in this section.

SECTION 205-02B:
Rear Drive Axle/Differential — Dana S135

[SPECIFICATIONS](#)

DESCRIPTION AND OPERATION

[Rear Drive Axle and Differential](#)

DIAGNOSIS AND TESTING

[Rear Drive Axle and Differential](#)

IN-VEHICLE REPAIR

[Axle Shaft](#)

[Driveshaft](#)

[Drive Pinion Flange](#)

[Pinion Seal](#)

[Drive Pinion](#)

[Differential Carrier](#)

REMOVAL AND INSTALLATION

[Axle Assembly](#)

DISASSEMBLY AND ASSEMBLY

[Differential Case and Ring Gear](#)

[Drive Pinion](#)

General Specifications	
Item	Specification
Lubricants/Adhesive/Sealants	
Ford Gasket Maker F8AZ-19B508-AB	WSK-M2G348-A5
Stud and Bearing Mount EOAZ-19554-BA	WSK-M2G349-A1
Threadlock 262 E2FZ-19554-B	WSK-M2G351-A6
Motorcraft SAE 75W-140 Synthetic XY-75W140-QL	WSL-M2C192-A
Capacity	
Rear axle lubricant	11.6 liters (24.5 pints) ¹
Clearance, Tolerance and Adjustments	
Differential ring gear rivet pressure	41-45 Metric Tons (45-50 Tons)
Pinion bearing preload ²	1.1298-4.5192 Nm (10-40 lb-in)
Differential ring gear to pinion backlash ³	0.15-0.30 mm (0.06-0.012 inch)

¹ 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.

² Establish the pinion bearing preload prior to pinion seal installation.

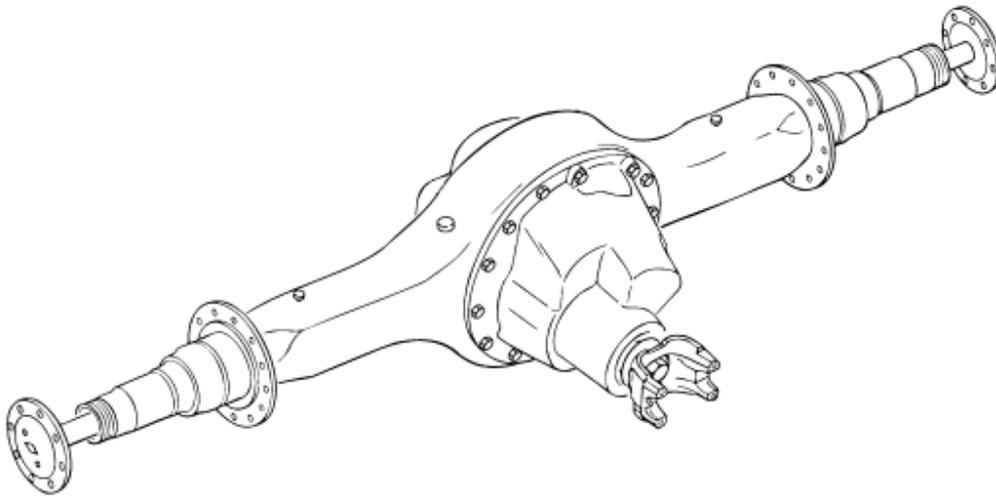
³ The acceptable backlash tolerance is ± 0.0508 mm (0.002 inch) from the backlash etched in the differential ring gear. The tooth contact pattern can move only by adjusting backlash. The tooth contact pattern can move only in the direction of heel-to-toe, and toe-to-heel. Depth of the tooth contact pattern 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.

Torque Specifications		
Description	Nm	lb-ft
Adjusting ring lock bolt	37	25
Carrier mounting bolt	136-163	101-121
Differential bearing cap bolt	169	125
Differential case bolt	149	110

Drain plug	47-61	35-45
Fill plug	47-61	35-45
Pinion hex nut	1085	800

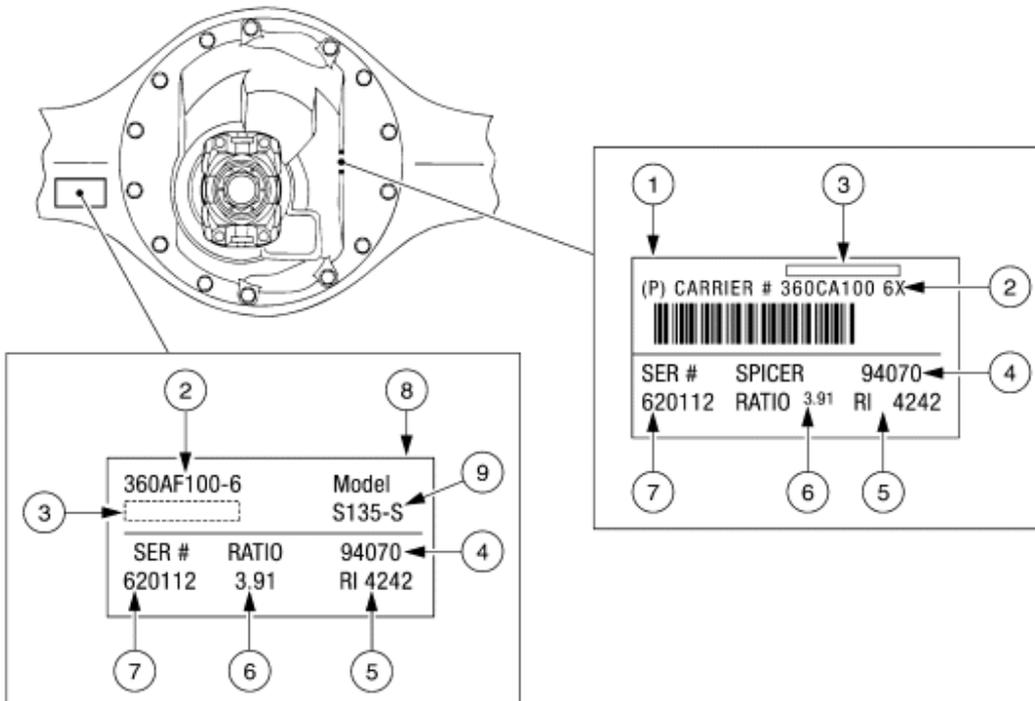
Rear Drive Axle and Differential

Dana Model S135 Full-Floating Rear Drive Axle



DE1878-A

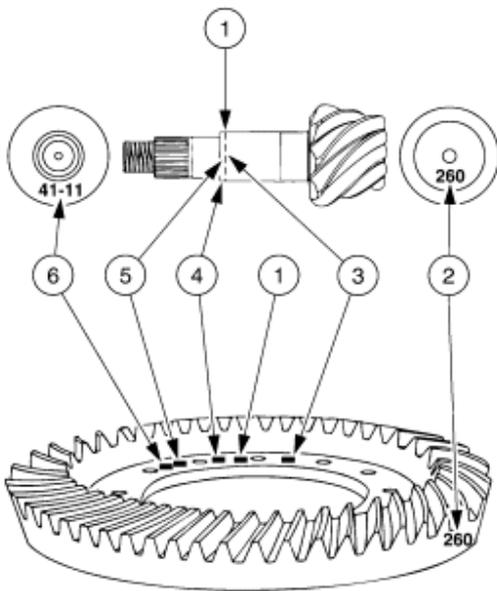
Identification Tags



DE1879-A

Item	Description
1	Carrier identification tag
2	Dana part number (complete assembly number)
3	Customer part number (optional)
4	Julian date code
5	Line set number (optional)
6	Axle ratio
7	Last six digits of the vehicle serial number (optional)
8	Axle assembly identification tag
9	Model

Gear Set Identification



DE1880-A

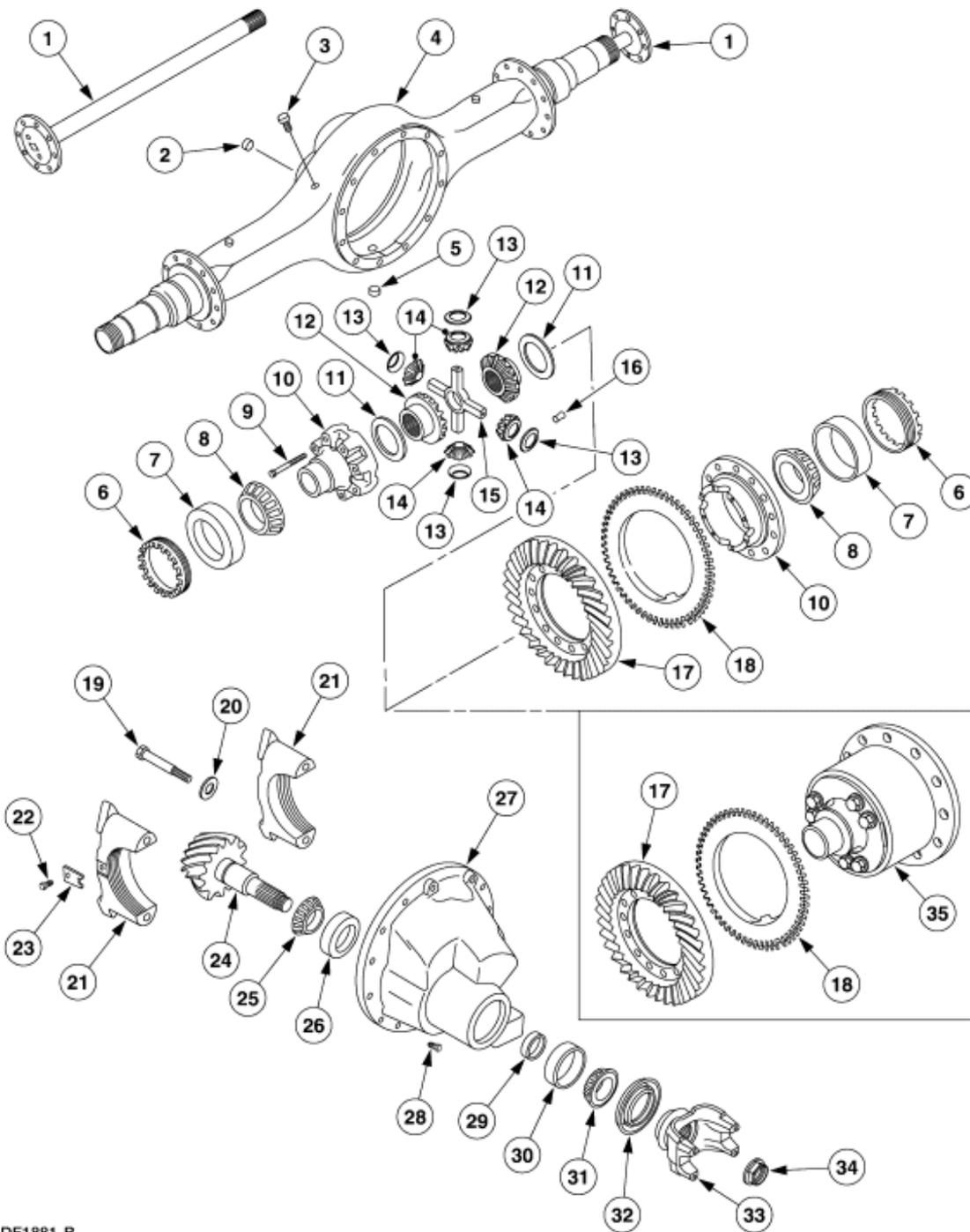
Item	Description
1	Trademark
2	Match set number
3	Manufacturing date
4	Heat code
5	Part number
6	Tooth combination

- 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 does not have the same matched set numbers. Always install a new matched set if discarding either the differential ring gear or the pinion.**

A corresponding number marked on the differential ring gear and pinion identifies them as a matched set.

- The manufacturer's date identifies the gear set's date of fabrication.
- The tooth combination identifies the number of teeth on the pinion and the number of teeth on the differential ring gear. 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.

Dana Model S135 Full-Floating Rear Axle, Disassembled View



DE1881-B

Item	Part Number	Description
1	4234	Axle shaft
2	4N292	Fill plug
3	4022	Breather
4	4010	Differential housing

5	4N282	Drain plug
6	4067	Differential bearing adjusting ring
7	4222	Differential side bearing cup
8	4221	Differential side bearing cone
9	4216	Differential case bolt
10	4204	Differential case half (conventional differential)
11	4228	Thrust washer (conventional differential)
12	4237	Differential side gear (conventional differential)
13	4230	Thrust washer (conventional differential)
14	—	Differential pinion mate (conventional differential) (part of 4237)
15	4211	Differential cross shaft (conventional differential)
16	4558	Differential ring gear rivet
17	4209	Differential ring gear (matched set)
18	4B409	Anti-lock speed sensor ring
19	—	Differential bearing cup bolt (part of 4141)
20	—	Washer (part of 4141)
21	—	Differential bearing cap (part of 4141)
22	—	Adjusting ring lock bolt (part of 4141)
23	4143	Adjusting ring lock
24	4209	Pinion (matched set)
25	4621	Pinion bearing cone, inner
26	—	Pinion bearing cup, inner
27	4141	Carrier housing
28	4616	Carrier mounting bolt
29	4537	Pinion preload spacer (selective)
30	4628	Pinion bearing cup, outer
31	4630	Pinion bearing cone, inner
32	4676	Pinion seal
33	4851	Pinion flange
34	4320	Pinion hex nut

35	4026	Differential assembly (Truetrac®)
----	------	-----------------------------------

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 S135 rear axle features the following:

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

SECTION 205-02B: Rear Drive Axle/Differential
— Dana S135
DIAGNOSIS AND TESTING

1999 F-Super Duty 250-550
Workshop Manual

[Procedure revision date: 01/26/2000](#)

Rear Drive Axle and Differential

Refer to [Section 205-00](#).

SECTION 205-02B: Rear Drive Axle/Differential
— Dana S135
IN-VEHICLE REPAIR

1999 F-Super Duty 250-550
Workshop Manual
[Procedure revision date: 01/26/2000](#)

Axle Shaft

For additional information, refer to [Section 205-02C](#).

SECTION 205-02B: Rear Drive Axle/Differential
— Dana S135
IN-VEHICLE REPAIR

1999 F-Super Duty 250-550
Workshop Manual
[Procedure revision date: 01/26/2000](#)

Driveshaft

For additional information, refer to [Section 205-01](#).

SECTION 205-02B: Rear Drive Axle/Differential
— Dana S135
IN-VEHICLE REPAIR

1999 F-Super Duty 250-550
Workshop Manual
[Procedure revision date: 01/26/2000](#)

Drive Pinion Flange

1. Refer to [Drive Pinion](#), Disassembly and Assembly in this section.
-

Pinion Seal

1. Refer to [Drive Pinion](#), Disassembly and Assembly in this section.
-

Drive Pinion

1. Refer to [Drive Pinion](#), Disassembly and Assembly in this section.
-

Differential Carrier

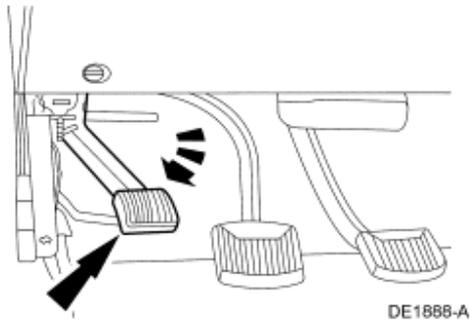
Removal

 **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.**

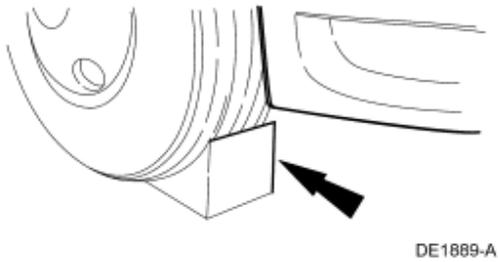
1.  **CAUTION: Steam clean the axle prior to removal from the vehicle. Dirt is abrasive and will cause premature wear of otherwise usable parts.**

Steam clean the axle assembly.

2. Set the parking brake.

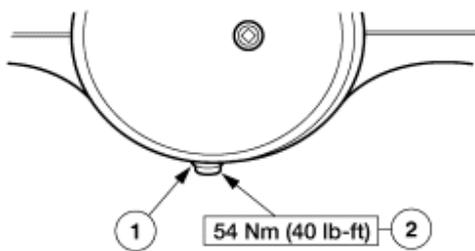


3. Chock the wheels.

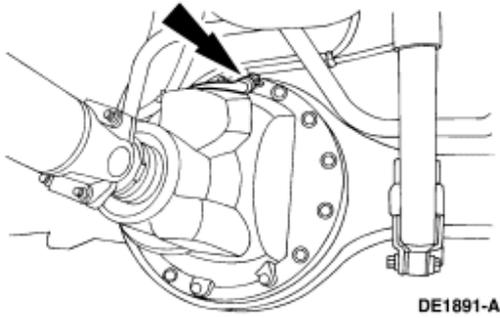


4. Drain the axle lubricant into a suitable container.

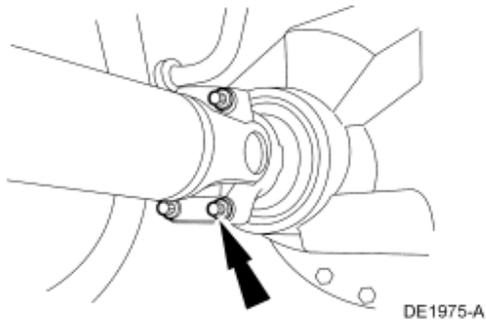
1. Remove the drain plug.
2. Clean and install the drain plug when the lubricant has drained.



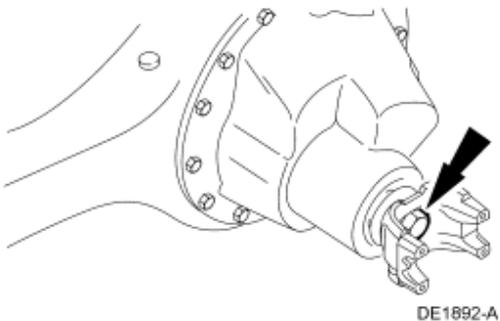
5. Disconnect the rear anti-lock brake sensor electrical connector.



6. Index-mark and disconnect the driveshaft, and position it aside. For additional information, refer to [Section 205-01](#).



7. Loosen the pinion hex nut if drive pinion disassembly is necessary.

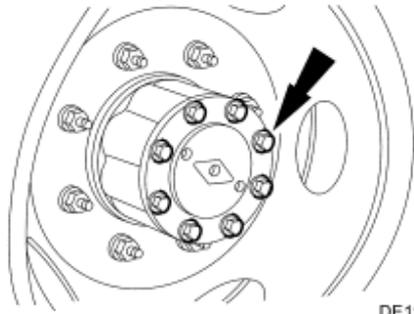


8. **⚠ WARNING:** Do not strike the axle shaft flange directly with a steel hammer or sledge. This will crack and splinter the flange. Failure to follow these instructions may result in personal injury.

⚠ CAUTION: Do not pry or chisel the axle shaft flange away from the hub. This will damage the sealing surface.

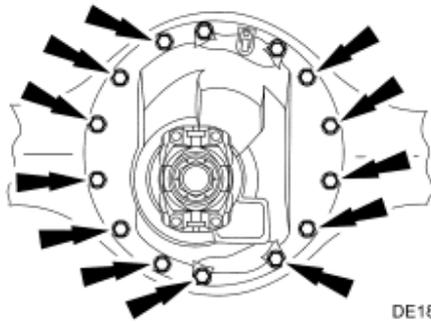
NOTE: Mark the left or right axle shaft flange for proper orientation during installation.

Remove the axle shafts. For additional information, refer to [Section 205-02C](#).



DE1976-A

9. Remove all but the two top carrier-to-axle housing retaining bolts, noting the length and position of each bolt.

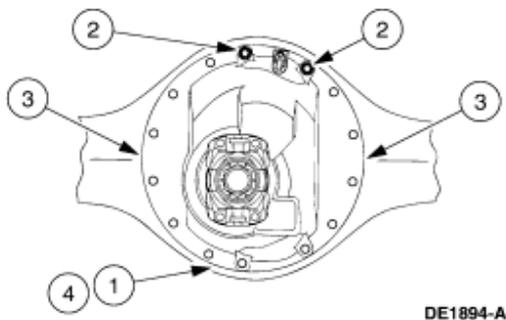


DE1893-A

10.  **WARNING:** Secure the 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.

Remove the carrier from the axle housing.

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



DE1894-A

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

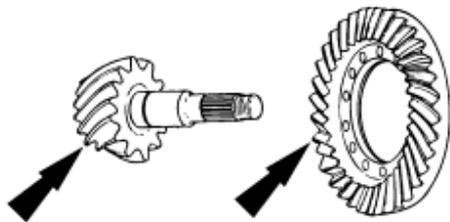
⚠ CAUTION: Use only soft, clean, lintless towels to dry the components.

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

Clean and dry the components as necessary.

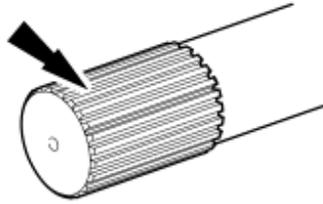
12. **NOTE:** The gear set shown removed for clarity.

Inspect the gear set for pitting, scoring, wear and damage.



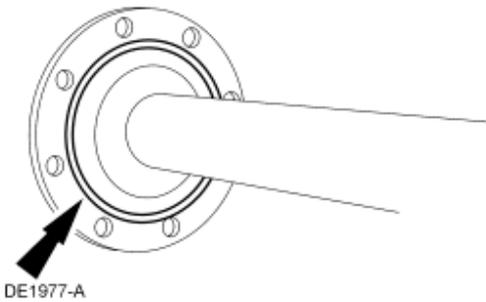
DE1895-A

13. Inspect the splines for wear, cracking and distortion from twisting.



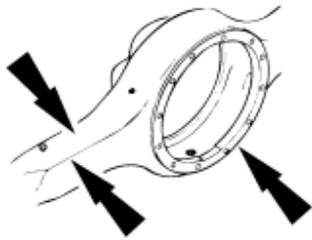
DE1896-A

14. Inspect the axle flange O-ring.



DE1977-A

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



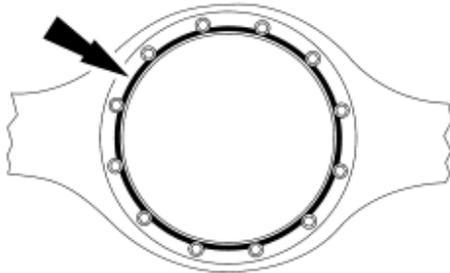
DE1897-A

16. If carrier disassembly is necessary, refer to [Differential Case and Ring Gear](#) in this section.

Installation

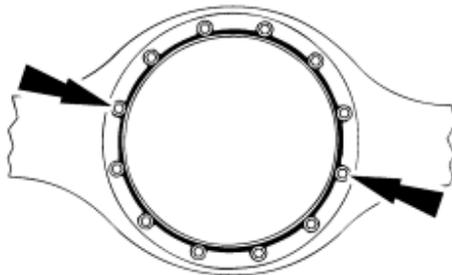
1.  **CAUTION:** The gasket material must cure for one hour before filling the axle with lubricant.

Apply a continuous bead of Ford Gasket Maker F8AZ-19B508-AB or equivalent meeting Ford specification WSK-M2G348-A5 onto the axle housing mounting flange and around each bolt hole.



DE1898-A

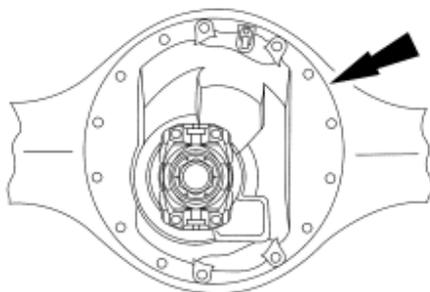
2. Thread two studs into the axle housing 180 degrees apart. This will eliminate rotation of the carrier assembly after it makes contact with the gasket material.



DE1899-A

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

Position the carrier into the axle housing.

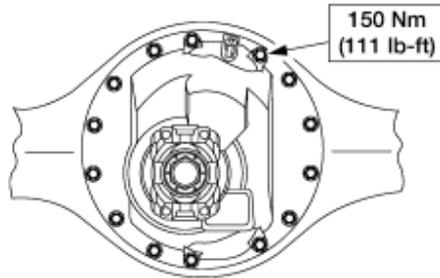


DE1900-A

4. **⚠ CAUTION: Make sure the bolt threads are clean.**

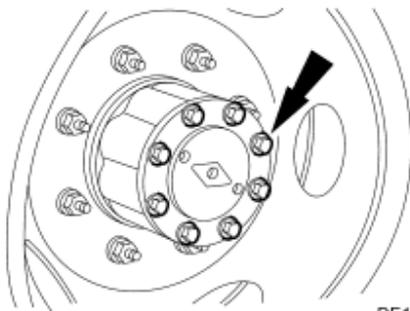
Apply Threadlock 262 E2FZ-19554-B or equivalent meeting Ford specification WSK-M2G351-A6 to the bolt threads, and install the bolts.

- Remove the two alignment studs only after installing several of the bolts.
- Tighten the bolts in a cross pattern.



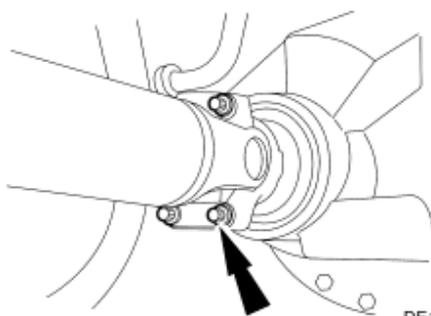
A0041305

5. Install the axle shafts. For additional information, refer to [Section 205-02C](#).



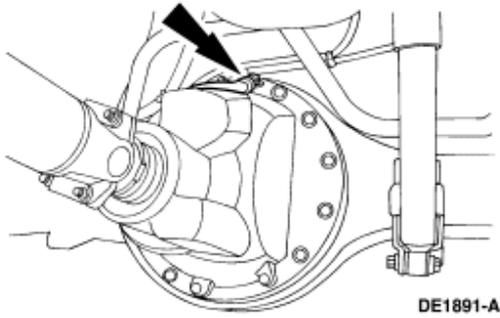
DE1976-A

6. Connect the driveshaft. For additional information, refer to [Section 205-01](#).

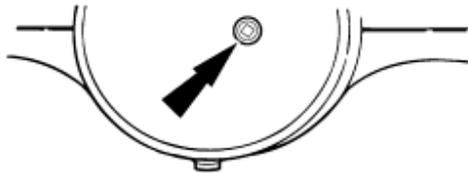


DE1975-A

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



8. Remove the fill plug.

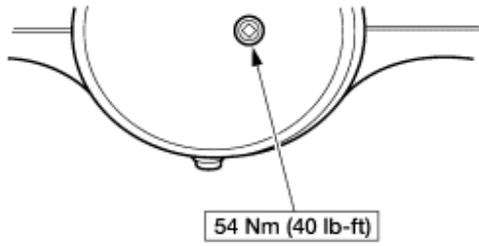


9.  **CAUTION:** A lubricant level close enough to the bottom of the fill hole to be seen or touched is not sufficient. The lubricant must be level with the fill hole.

Fill the axle with Motorcraft SAE 80W-90 Premium Rear Axle Lubricant XY-80W90-QL or equivalent meeting Ford specification WSP-M2C197-A until the lubricant is level with the fill hole.

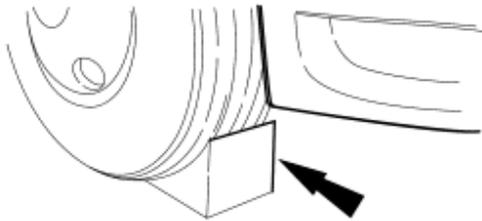


10. Clean and install the fill plug.



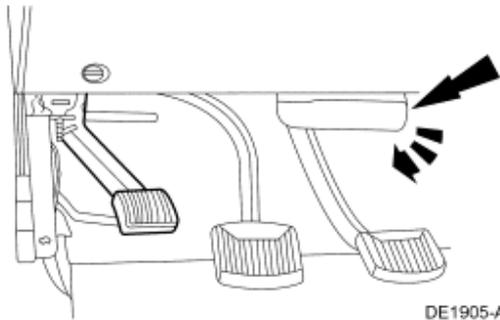
A0041303

11. Remove the wheel chocks.



DE1889-A

12. Release the parking brake.



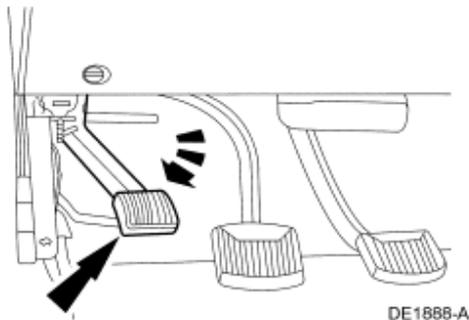
DE1905-A

Axle Assembly

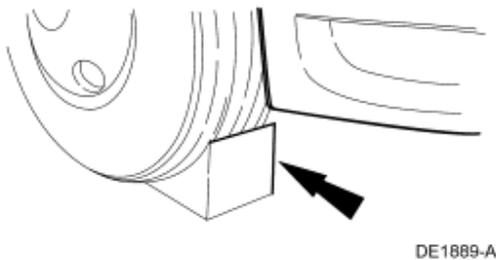
Special Tool(s)	
 ST2006-A	Wheel Dolly 014-00030 or Equivalent

Removal

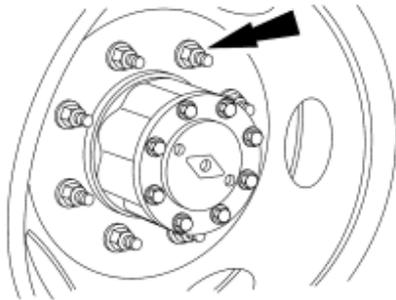
1. Set the parking brake.



2. Chock the front wheels.

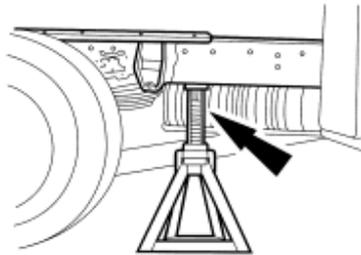


3. Loosen, but do not remove, the rear wheel lug nuts.



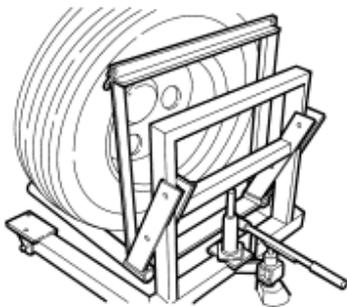
DE1978-A

4. Raise and support the rear of the vehicle high enough so that it will clear the axle assembly when removing it.



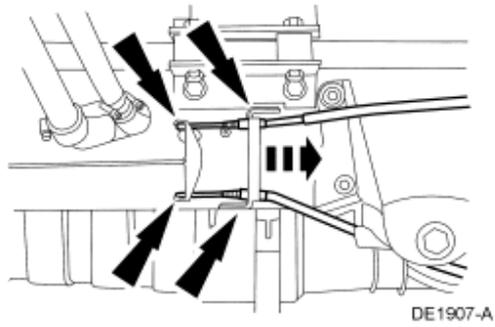
DE1906-A

5. Remove the rear wheels using the Wheel Dolly.

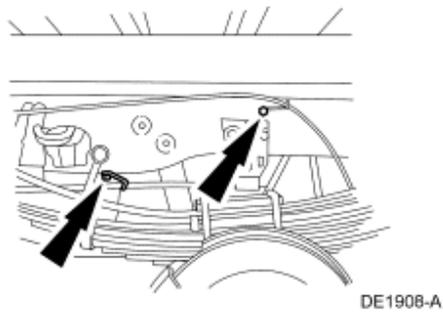


DE1001-A

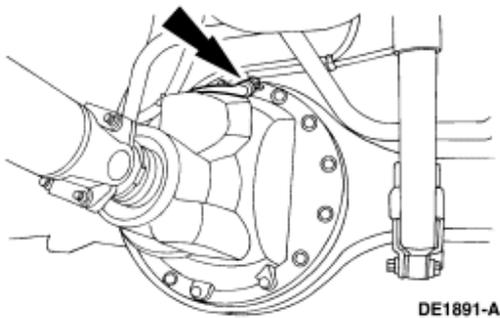
6. Release the parking brake cable tension, and disconnect the cables at the equalizer and the anchor plate; refer to [Section 206-05](#).



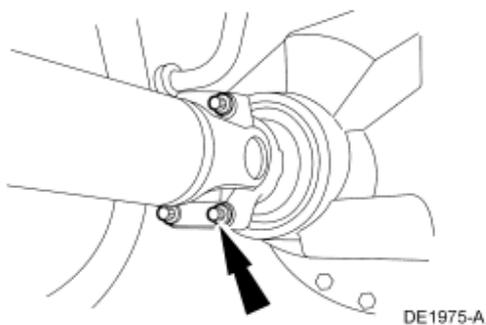
7. Remove the frame anchors, and position the parking brake cables aside.



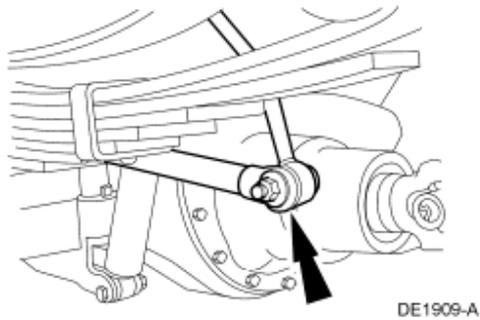
8. Disconnect the rear anti-lock brake sensor electrical connector. Release the harness clips and position the harness aside.



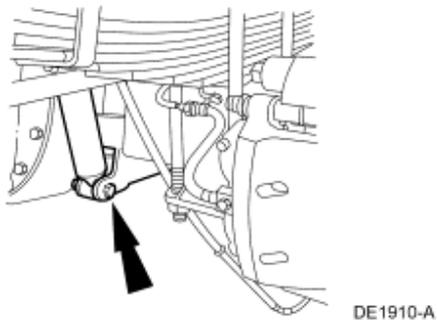
9. Index and disconnect the driveshaft, and position it aside; refer to [Section 205-01](#).



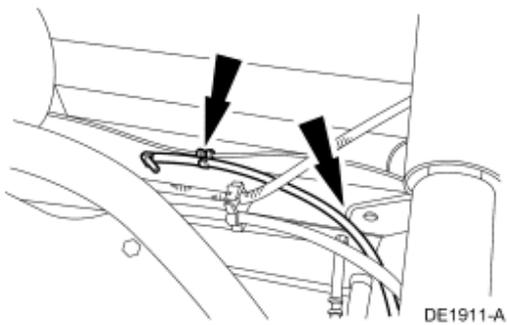
10. Disconnect the sway bar at the sway links.



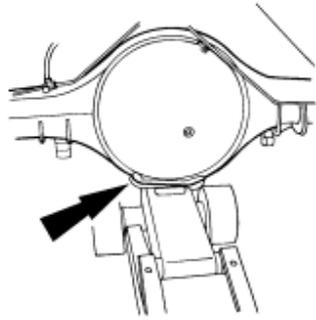
11. Disconnect the shock absorbers at the axle.



12. Disconnect the hydraulic brake hose and axle vent hose at the crossmember. Plug the brake hose and brake line, and position the hoses aside.



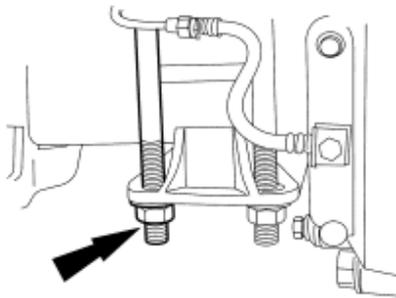
13. Support the axle with a suitable floor jack.



DE1912-A

14. **NOTE:** Mark the front of each spring seat cap for proper orientation during installation.

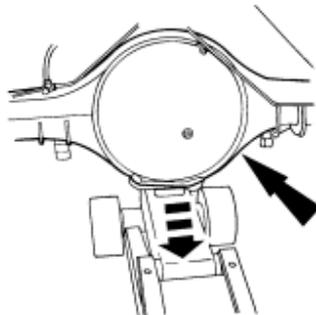
Remove the U-bolt nuts, the spring seat caps and the U-bolts.



DE1913-A

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

Carefully lower the axle and remove it.



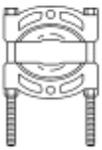
DE1914-A

Installation

1. Follow the removal procedure in reverse order.
 - Refer to [Section 204-02](#) for the shock absorber, the sway bar and the U-bolt torque specifications.
 - Refer to [Section 204-04](#) for the wheel lug nut torque specifications.
2. Bleed the brakes; refer to [Section 206-00](#).

3. Make sure the axle lubricant level is proper; refer to Specifications in this section.
-

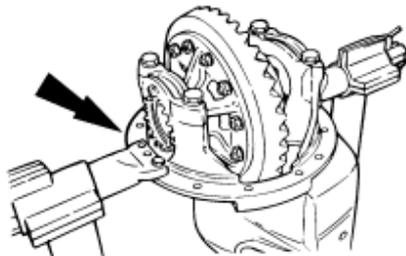
Differential Case and Ring Gear

Special Tool(s)	
 ST1368-A	Puller, Bearing 205-D064 (D84L-1123-A) or equivalent
 ST2003-A	Lifting Sling (1" x 5') 100-D008 (D87L-1000-A) or equivalent

Material	
Item	Specification
Threadlock 262 E2FZ-19554-B	WSK-M2G351-A6

Disassembly

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



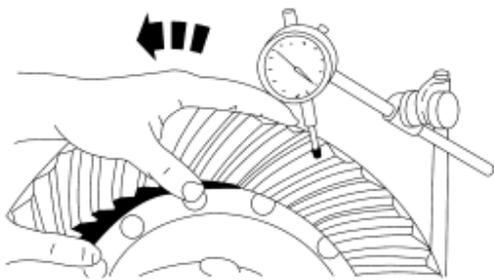
DE1915-A

2.  **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.

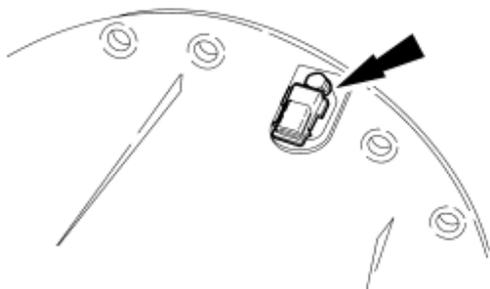
Measure and record the differential ring gear and pinion backlash.

- Check the backlash in four equally spaced positions around 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.



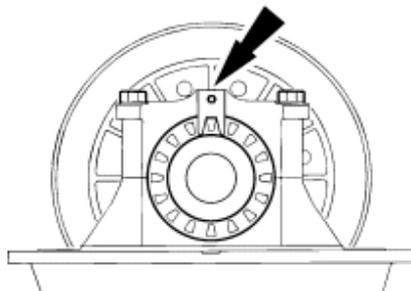
DE1916-A

3. Remove the rear anti-lock brake sensor.



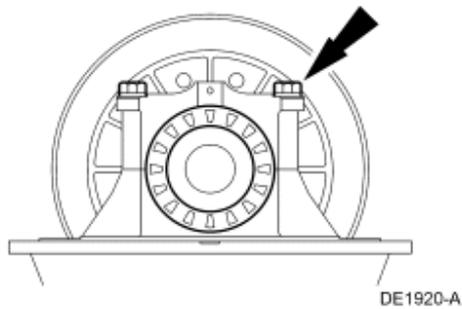
DE1917-A

4. Remove the adjusting ring locks.

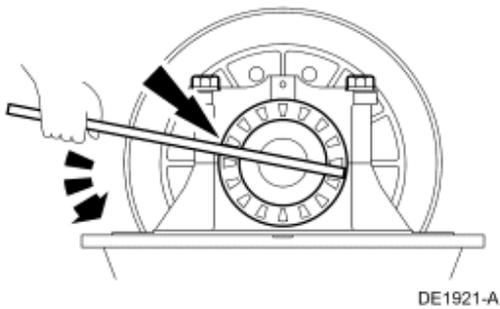


DE1918-A

5. Loosen, but do not remove, the four bolts.

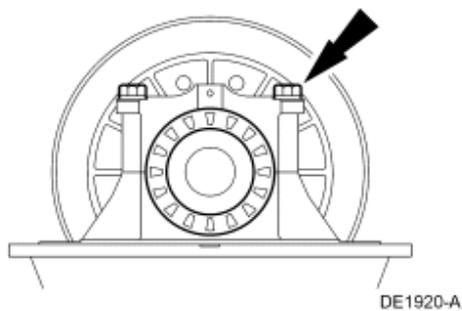


6. Relieve the bearing preload.
- Loosen each differential bearing adjusting ring.



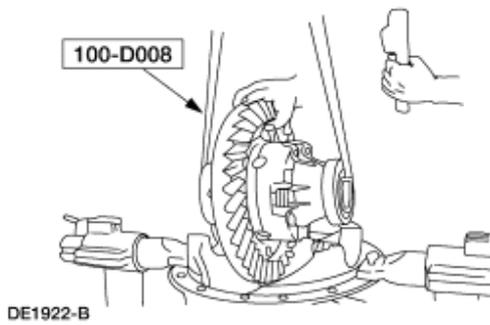
7. **NOTE:** The differential bearing caps are match marked at the factory.

Remove the bolts, bearing caps and adjusting rings.

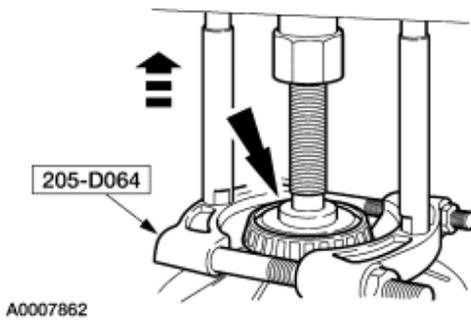


8.  **CAUTION: Do not damage the differential ring gear and pinion.**

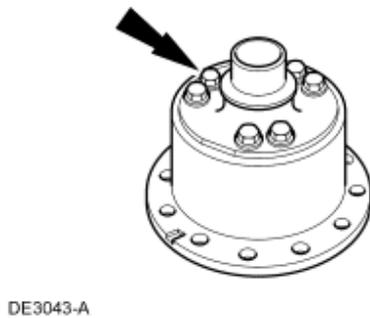
Using the special tool, carefully lift the differential subassembly out of the carrier.



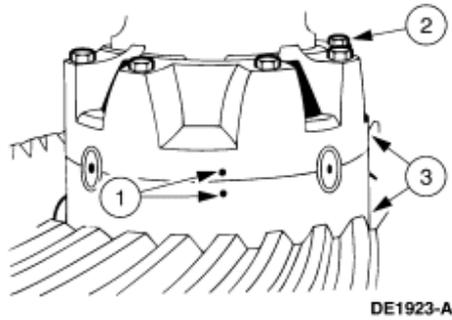
9. Using the special tool, and a suitable puller, remove the differential side bearings if worn or damaged.



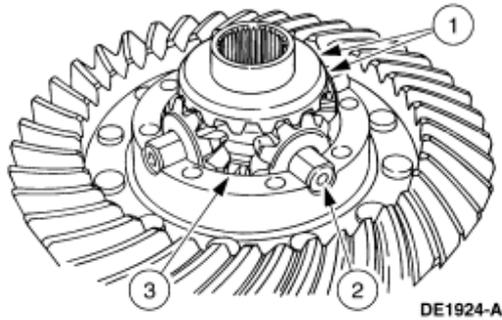
10. The Truetrac® differential assembly is non-repairable. Discard the entire assembly if it is worn or damaged.



11. On the conventional differential assembly, separate the differential case halves.
 1. Match mark the case halves.
 2. Remove the bolts.
 3. Separate the case halves.



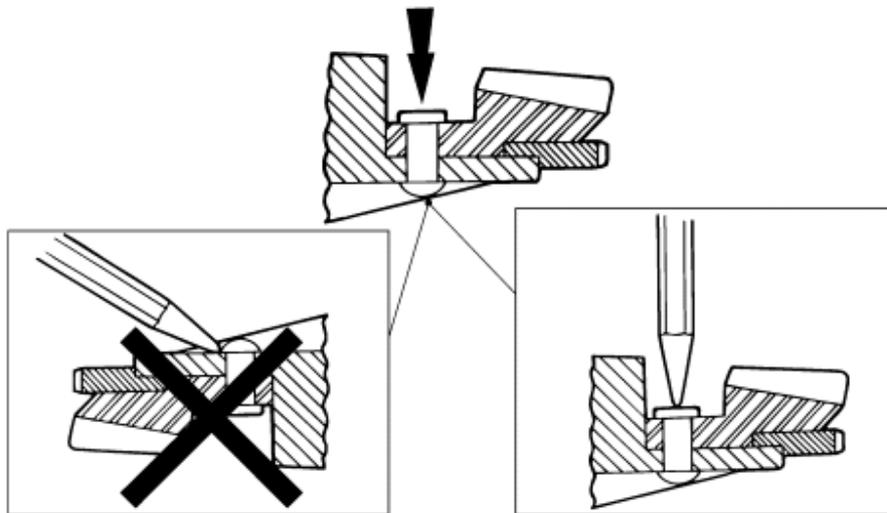
12. On the conventional differential assembly, remove the gear assembly.
1. Remove the thrust washer and differential side gear.
 2. Remove the differential cross shaft with the pinion mates and the thrust washers.
 3. Remove the differential side gear and thrust washer.



13. **⚠ CAUTION: Do not use a chisel to remove the rivet heads. This will damage the differential case.**

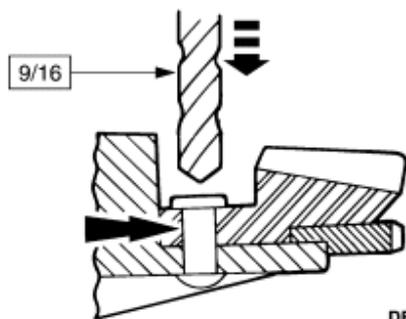
⚠ CAUTION: Use a soft hammer to strike the punch.

If discarding the pinion or differential ring gear, carefully center punch each differential ring gear rivet.



DE1926-A

14. Drill the rivet heads to the depth shown using the specified size drill bit.



DE1927-A

15. Separate the differential ring gear from the case.

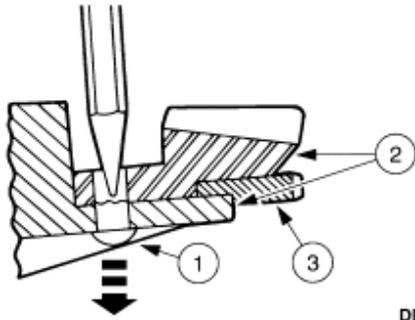
1.  **CAUTION: Use a soft hammer to strike the punch.**

Drive out the remaining rivet portions with a rounded type punch.

2. Separate the differential ring gear from the case.

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

If necessary, remove the anti-lock speed sensor ring and discard it.



DE1928-A

16. **⚠ 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.

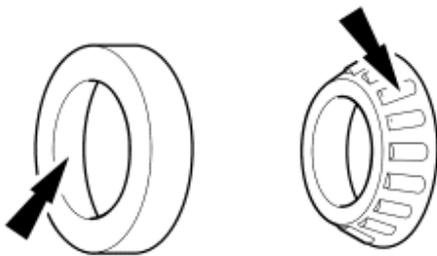
⚠ CAUTION: Never spin-dry bearings with compressed air. This will damage the mating surfaces due to a lack of lubrication.

⚠ CAUTION: After drying, lightly coat the parts with rust inhibitor or clean lubricant to prevent damage from corrosion. Wrap all parts 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.

Clean and dry the components.

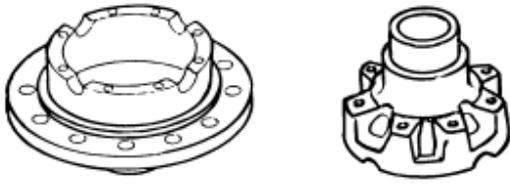
17. Inspect the bearing surfaces for pitting, wear and overheating.



DE1929-A

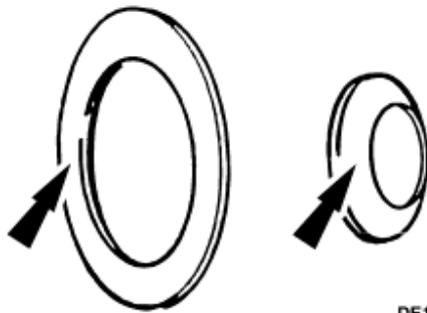
18. Inspect the following:

- the differential case machine surfaces.
- the differential ring gear mounting holes for deformities, such as egg shaping.
- all surfaces for nicks and cracks.



DE1930-A

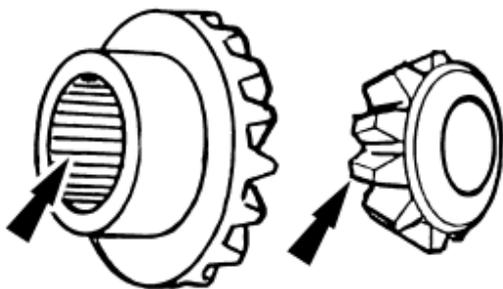
19. Inspect the thrust washers for scoring and cracking.



DE1931-A

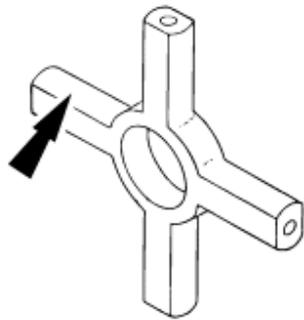
20.  **CAUTION: Discard all gears in sets if one or more sustains wear or damage.**

Inspect the gears for pitting, scoring, wear and damage.



DE1932-A

21. Inspect the shafts for nicks and scores.

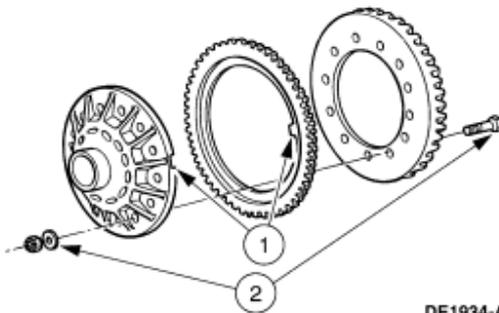


DE1933-A

22. Refer to [Drive Pinion](#) in this section if disassembly is necessary.

Assembly

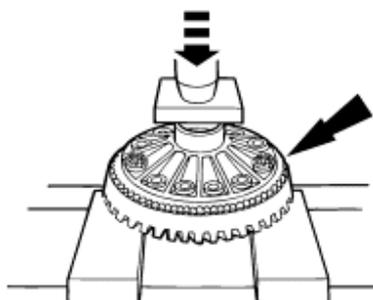
1. Assemble the differential ring gear and, if removed, a new anti-lock speed sensor ring to the differential case.
 1. Align the tab on the sensor ring with the notch in the case flange.
 2. Bolt the differential ring gear to the case in three places, 120 degrees apart.



DE1934-A

2. **NOTE:** Proceed to the next step of this procedure if not installing a new anti-lock speed sensor ring.

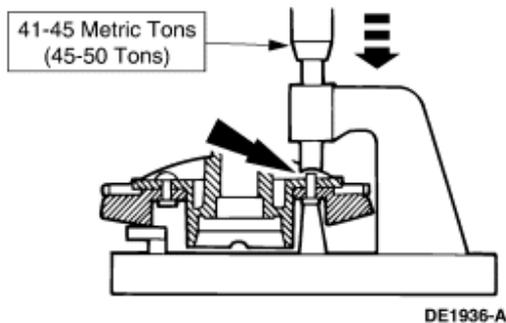
Press the anti-lock speed sensor ring on the case flange.



DE1935-A

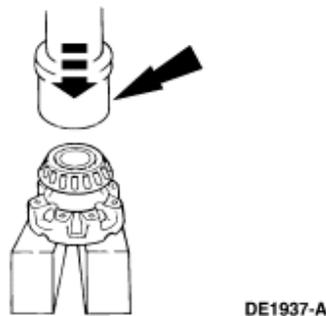
3. **⚠ CAUTION: Compress the rivet before removing the bolts from the differential ring gear and case to prevent differential ring gear runout.**

Install each rivet, using a suitable hydraulic or mechanical press and riveting fixture and applying the force specified.



4. **⚠ CAUTION: Place the differential side bearing cups on the differential side bearings after pressing the bearings on the case. This will prevent bearing damage during the remaining assembly process.**

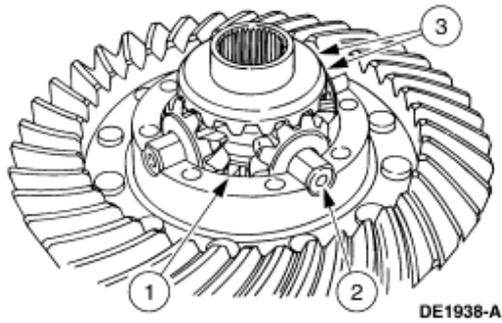
Press the differential side bearings on the differential case halves, and place the bearing cups on the bearings.



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

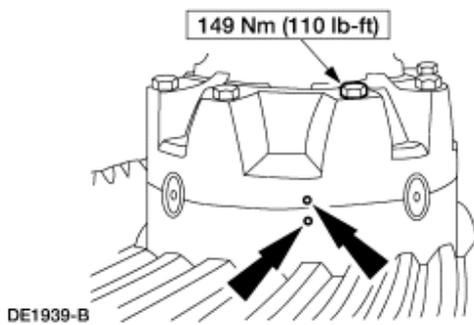
On the conventional differential, install the gear assembly.

1. Position the thrust washer and the differential side gear into the case half.
2. Position the differential cross shaft with the pinion mates and the thrust washers into the case half.
3. Position the differential side gear and thrust washer on the differential pinion mates.



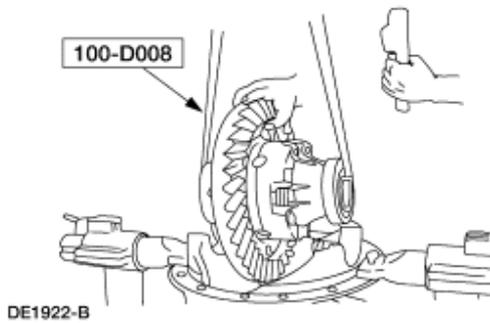
6. **⚠ CAUTION: Align the match marks.**

On the conventional differential, assemble the differential case halves.



7. **⚠ CAUTION: Do not damage the differential ring gear and pinion.**

Using the special tool, carefully position the differential subassembly into the carrier.



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

⚠ CAUTION: Align the match marks.

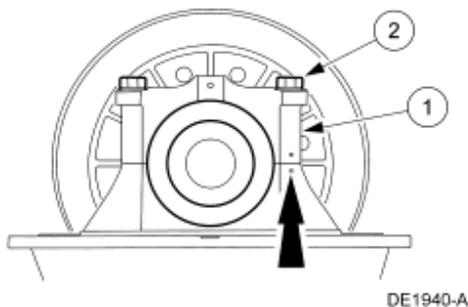
Install the differential bearing caps.

1. Position the bearing cap onto the leg.

2.  **CAUTION: The bolt threads must be clean.**

Apply Threadlock 262 to the bolt threads, and install the bolts.

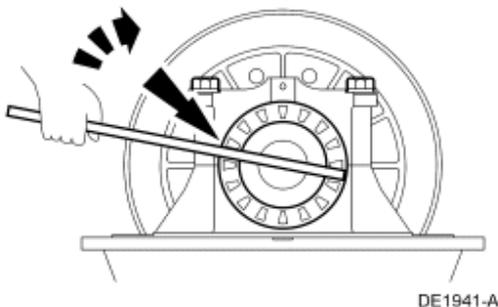
- Tighten the bolts enough to eliminate visible space between the bearing cap and leg. Do not tighten the bolts to the appropriate torque at this time.



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

Install the differential bearing adjusting rings.

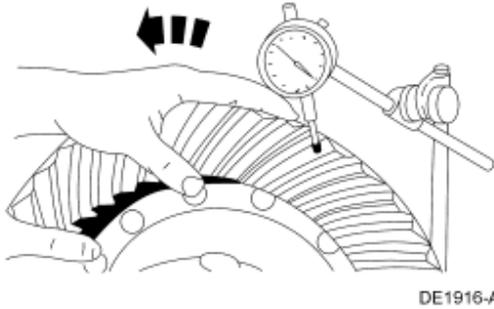
- Tighten both adjusting rings until there is zero end play, and some backlash between the differential ring gear and pinion. Make sure the adjusting ring tooth aligns so that installation of the adjusting ring lock is possible.



10. Set the backlash at zero.

- **NOTE:** The adjusting ring tooth must always align so that installation of the adjusting ring lock is possible.

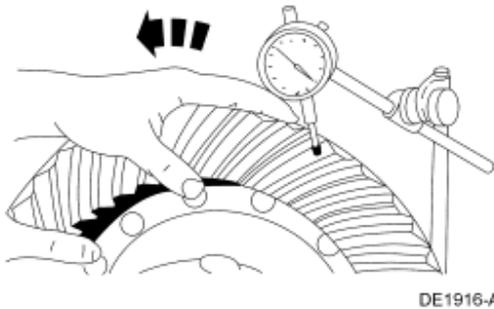
Loosen the adjusting ring on the tooth side of the differential ring gear one tooth, and tighten the opposite adjusting ring one tooth. Repeat this process until backlash is at zero.



11. Set the backlash and the bearing preload to specifications.

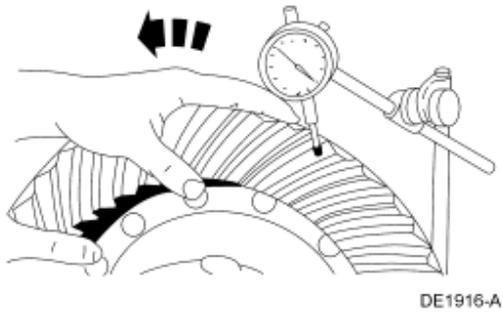
- With a new matched set installed, set the backlash to the specification etched in the differential ring gear.
- With the original matched set installed, set the backlash to the specification recorded prior to disassembly.
- **NOTE:** The adjusting ring tooth must always align so that installation of the adjusting ring lock is possible.

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



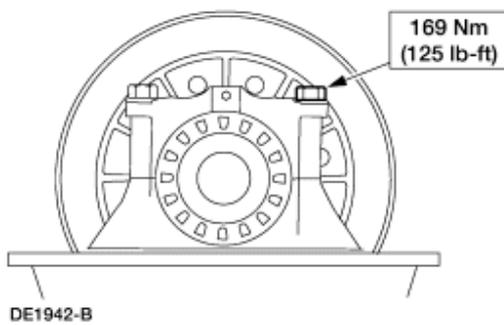
12. Check the differential ring gear and pinion backlash in four equally spaced positions around the differential ring gear.

- The acceptable backlash tolerance is ± 0.0508 mm (0.002 inch) from the backlash etched in the differential ring gear.
- If the backlash tolerance varies more than 0.080 mm (0.003 inch) between the four positions, remove the differential and determine the cause.

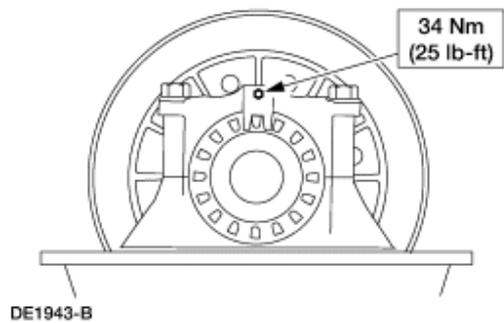


13. Tighten the bolts.

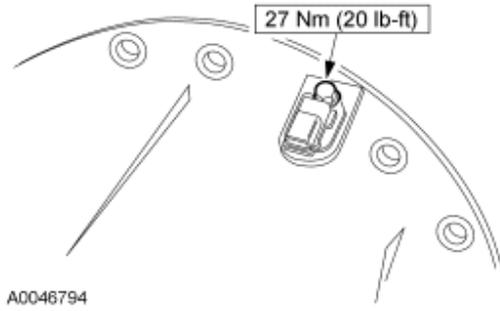
- Check the differential ring gear and pinion backlash, as described in the previous step, after tightening the bolts.



14. Install the adjusting ring locks.

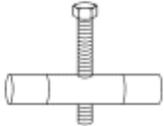


15. Install the rear anti-lock brake sensor.



16. Install the carrier. For additional information, refer to [Differential Carrier](#) in this section.

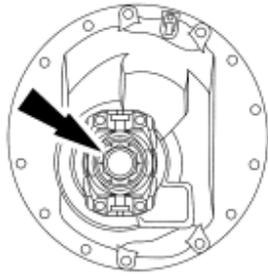
Drive Pinion

Special Tool(s)	
 ST2225-A	Installer, Drive Pinion Oil Seal 205-S438
 ST2226-A	Installer, Yoke 205-S434
 ST2224-A	Remover, Yoke 205-433

Material	
Item	Specification
Stud and Bearing Mount E0AZ-19554-BA	WSK-M2G349-A1

Disassembly

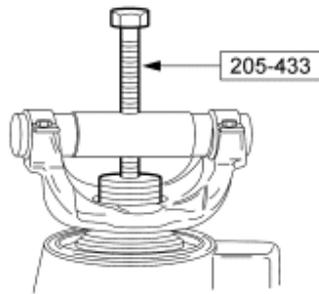
1. Remove the hex nut.



DE1961-A

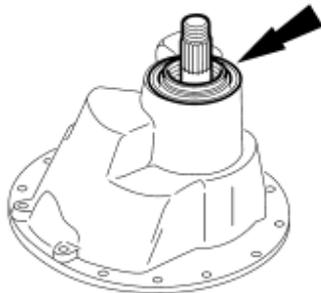
2. **⚠ CAUTION: Hammering on the pinion flange will close in the bearing bores and misalign the flange lugs. This will result in premature failure of the journal needle bearings. Serious damage will also occur internally to the differential ring gear and pinion set or pinion bearings by hammering on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

Using the special tool, remove the pinion flange.



A0007863

3. Remove the pinion seal.

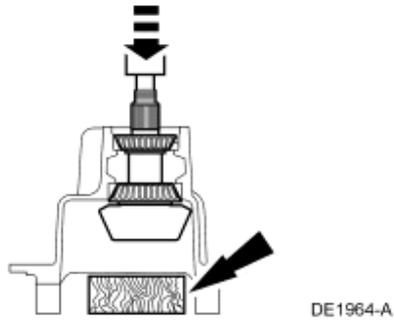


DE1963-A

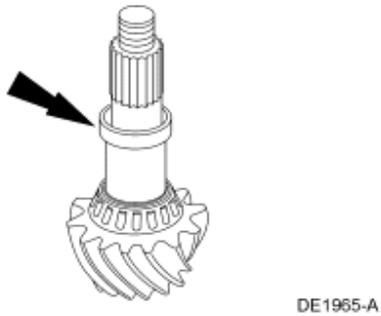
4. **⚠ CAUTION: Position a block of wood under the pinion to avoid damage to the gear teeth.**

NOTE: The outer bearing is press fit.

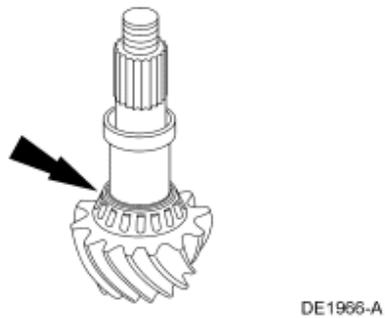
Press the pinion through the outer pinion bearing, and remove the pinion.



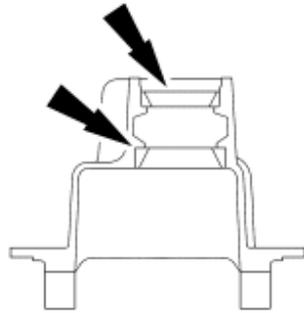
5. Remove the pinion preload spacer.
 - Measure and record the spacer thickness. Set the spacer aside for use in assembly.



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



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



DE1967-A

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

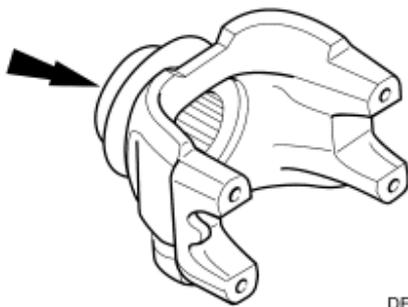
⚠ CAUTION: Use soft, clean, lintless towels to dry the components.

⚠ 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 parts with rust inhibitor or clean lubricant to prevent damage from corrosion. Wrap all parts that are going to be in storage for a prolonged period in wax paper.

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 flange.

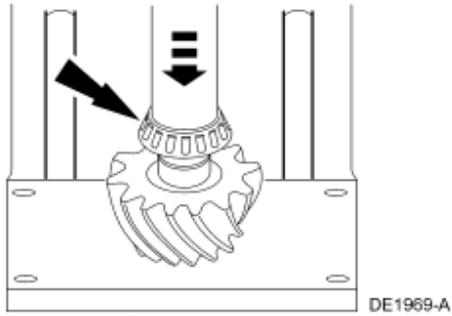


DE1968-A

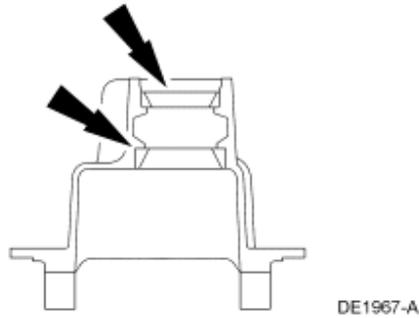
Assembly

Initial Assembly

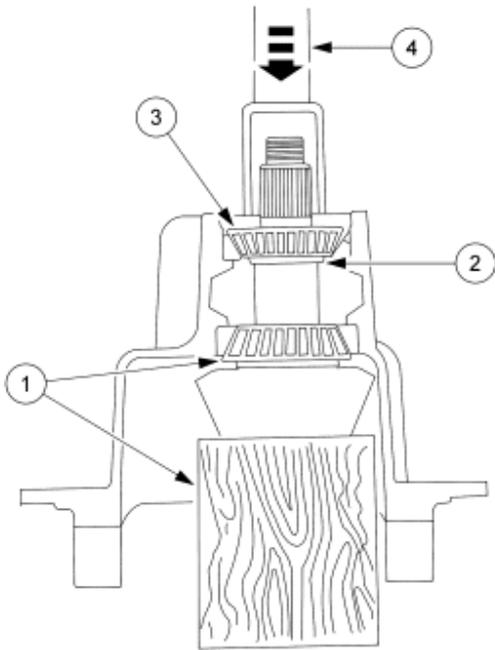
1. Press the inner pinion bearing onto the pinion.



2. Press the inner and outer pinion bearing cups into the carrier until seated.
 - Use a 0.0381-mm (0.0015-inch) feeler gauge to verify the bearing cups have completely seated in the bearing bores.
 - Lubricate the bearing cups and cone.



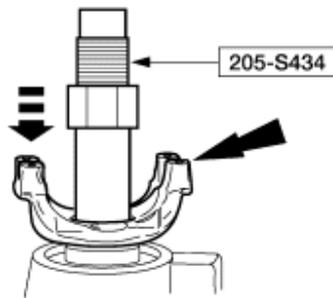
3. Seat the outer pinion bearing on the pinion.
 1. Seat the inner pinion bearing into the cup by positioning a 152.4 x 152.4 x 152.4-mm (6 x 6 x 6-inch) block of wood under the pinion.
 2. Place the original pinion preload spacer onto the pinion.
 3. Place the outer pinion bearing onto the pinion.
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



DE1970-A

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

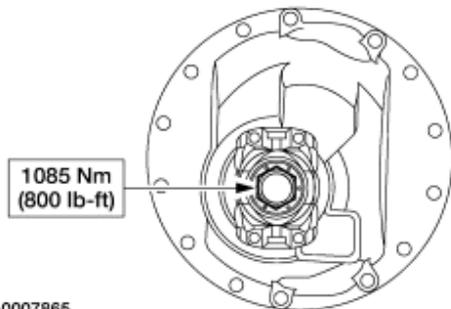
Using the special tool, install the pinion flange.



A0007864

5. Install the hex nut.

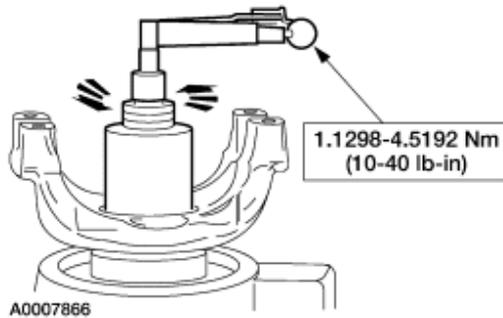
- Using a suitable torque multiplier, tighten the hex nut.



A0007865

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.

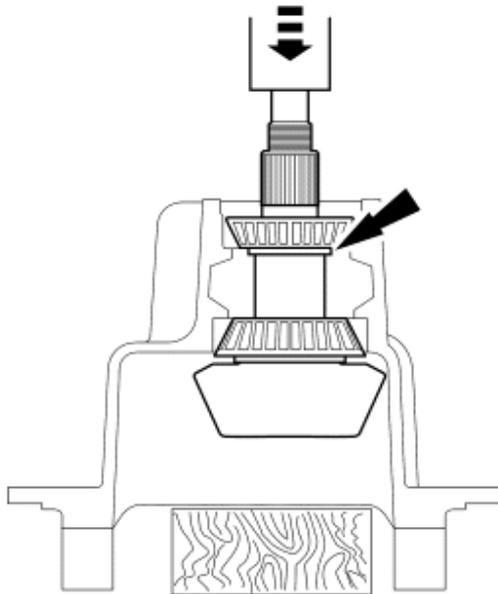


Pinion bearing preload adjustment

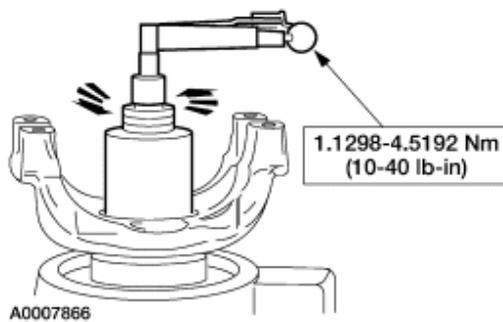
7. **NOTE:** Also refer to the following illustration.

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).
- 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.

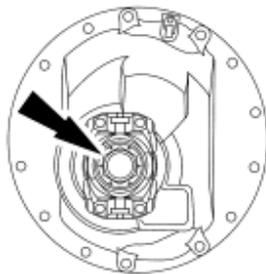


DE1974-A



Final assembly

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

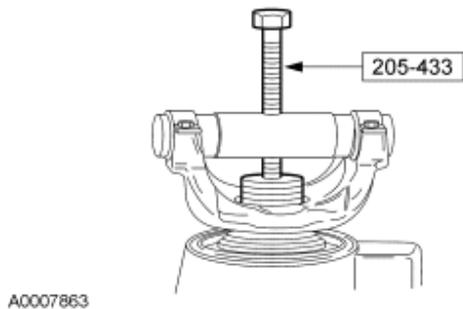


DE1961-A

9.  **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**

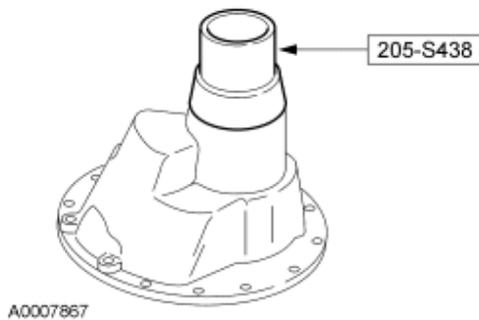
needle bearings. Serious damage will also occur internally to the differential ring gear and pinion or pinion bearings by hammering on external parts. Remove and install the pinion flange using only the procedures in this section.

Using the special tool, remove the pinion flange.

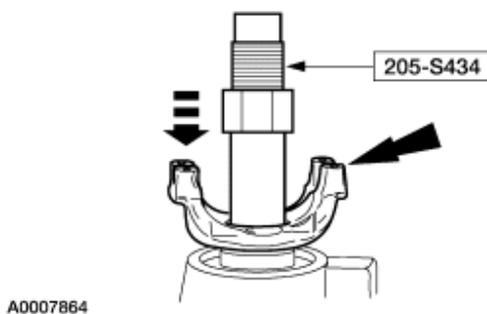


10. Using the special tool, install the pinion seal.

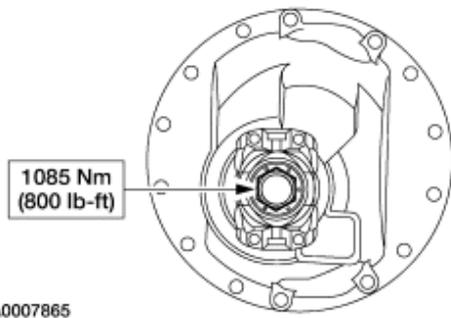
- A rotational torque of 1.6947-5.0841 Nm (15-45 lb-in) is acceptable with the pinion seal installed.



11. Using the special tool, install the pinion flange.



12. Apply Stud and Bearing Mount to the pinion threads, and install a new hex nut. Using a suitable torque multiplier, tighten the nut.



A0007865

13. Assemble the carrier. For additional information, refer to [Differential Case and Ring Gear](#) in this section.
-

SECTION 205-02C:
Wheel Hubs and Bearings — Full Floating Axle — Dana

[SPECIFICATIONS](#)

DESCRIPTION AND OPERATION

[Wheel Hubs and Bearings](#)

DIAGNOSIS AND TESTING

[Wheel Hubs and Bearings](#)

REMOVAL AND INSTALLATION

[Axle Shaft](#)

[Hub](#)

[Bearings, Cups and Seals](#)

SECTION 205-02C: Wheel Hubs and Bearings —
Full Floating Axle — Dana

1999 F-Super Duty 250-550
Workshop Manual

SPECIFICATIONS

Procedure revision date:
01/26/2000

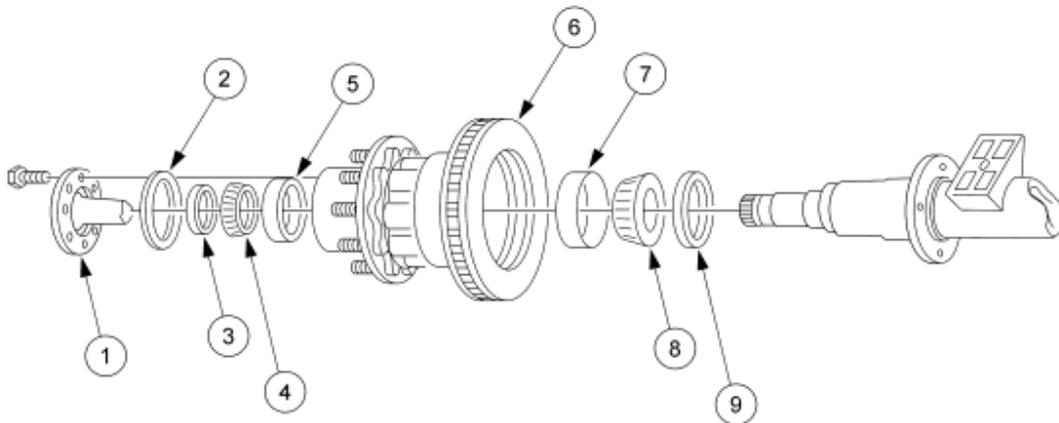
General Specifications	
Item	Specification
Lubricant	
Premium Long-Life Grease XG-1-C	ESA-M1C75-B

Torque Specifications		
Description	Nm	Lb-Ft
Rear hub nut (To set bearings, back off the hub nut 90 degrees, retighten.)	95 24 ^a	70 18
Axle shaft bolts	133	98
Rear hub bolts	89-119	66-88

^a Maximum torque to rotate the hub is 2.3 Nm (20 lb-in) when the end play is zero.

Wheel Hubs and Bearings

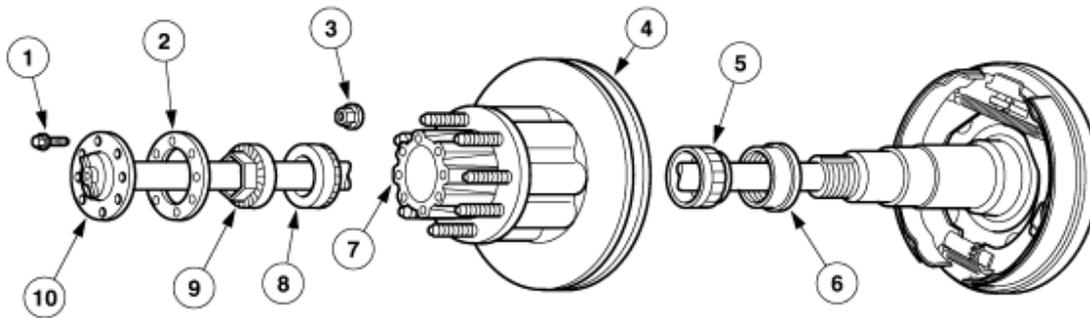
F-350



DE1979-A

Item	Part Number	Description
1	4234	Axle shaft
2	—	O-ring (part of 4234)
3	1124	Hub nut
4	1240	Outer rear wheel bearing
5	1239	Rear wheel bearing outer cup
6	1109	Rear hub and rotor assembly
7	1243	Rear wheel bearing inner cup
8	1244	Inner rear wheel bearing
9	1175	Rear hub seal

F-450 and F-550



A0014597

Item	Part Number	Description
1	4A140	Axle shaft bolt
2	1001	Rear axle shaft gasket
3	1012	Wheel nut
4	2C026	Brake disc
5	1244	Inner rear wheel bearing
6	1175	Hub seal
7	1109	Rear hub (includes bearing cups)
8	1240	Outer rear wheel bearing
9	1A124	Hub nut
10	4234	Axle shaft

The rear hub (1109) is supported or floats on the axle spindle on two opposing tapered roller bearings. A rear hub seal is installed behind the inner rear wheel bearing to prevent rear axle lubricant from leaking onto the rotor. The rear hub is retained on the spindle by a ratcheting hub nut tabbed to a slot on the spindle.

The rear wheel bearings are packed with a lithium base grease, Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B, to provide initial lubrication until axle lubricant flows into the rear hubs and the inner rear wheel bearings during vehicle operation.

SECTION 205-02C: Wheel Hubs and Bearings — Full
Floating Axle — Dana

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Workshop Manual

DIAGNOSIS AND TESTING

[Procedure revision date:](#)
[01/26/2000](#)

Wheel Hubs and Bearings

Refer to [Section 205-00](#).

SECTION 205-02C: Wheel Hubs and Bearings — Full
Floating Axle — Dana

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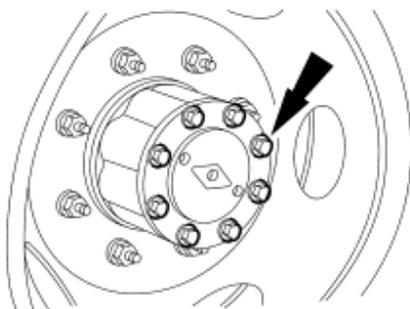
REMOVAL AND INSTALLATION

[Procedure revision date:](#)
[01/26/2000](#)

Axle Shaft

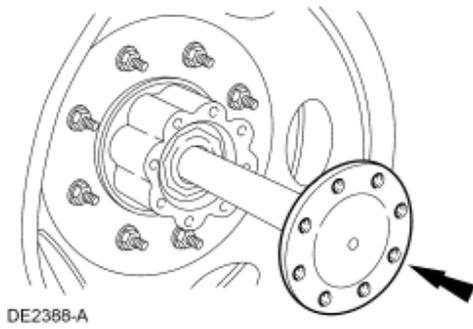
Removal

1. Set the parking brake.
2. Remove the axle shaft bolts.
 - Place a drain pan under the rear hub.

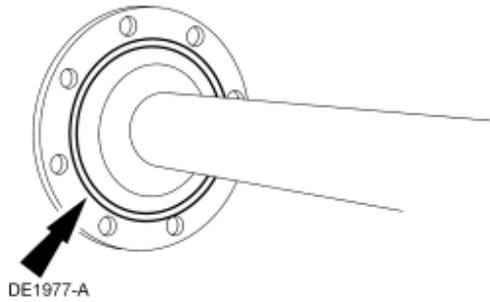


DE1976-A

3. Remove the axle shaft (4234).



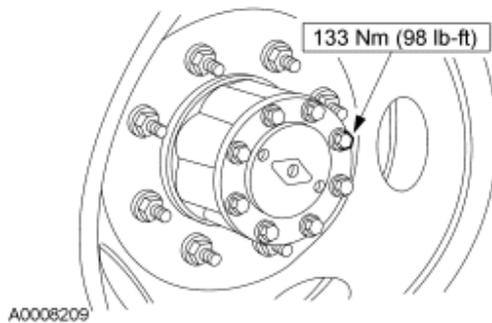
4. Inspect the following components:
- The O-ring for damage. Replace as necessary.
 - The axle shaft for cracked material around the holes or oversized holes. Replace as necessary.



Installation

1. **NOTE:** Lubricate the O-ring with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.

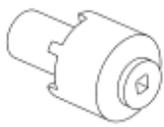
Follow the removal procedure in reverse order.



REMOVAL AND INSTALLATION

Procedure revision date:
01/26/2000

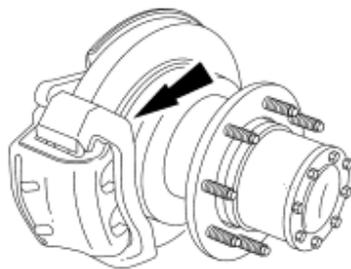
Hub

Special Tool(s)	
 ST1868-A	Socket, Wheel Hub Nut (F-350 only) 205-282 (T88T-4252-A)

Removal

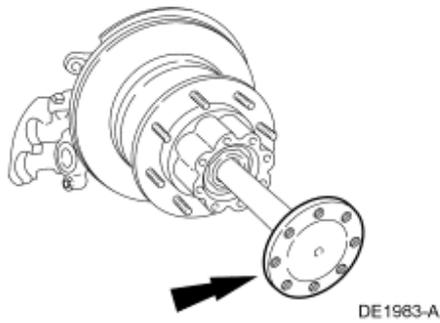
All vehicles

1. Remove the tire and wheel assembly. For additional information, refer to [Section 204-04](#).
2. Remove the anchor plate. For additional information, refer to [Section 206-04](#).



DE1982-A

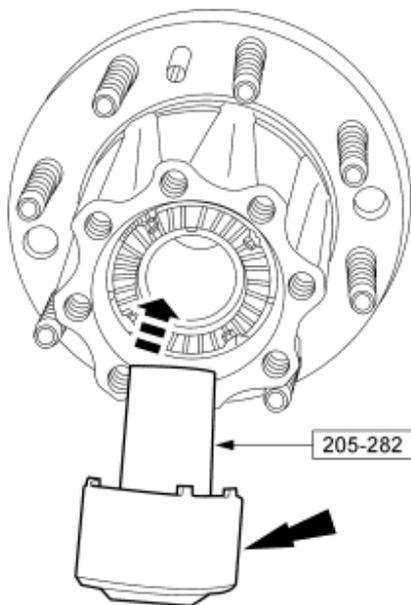
3. Remove the axle shaft (4234). For additional information, refer to [Axle Shaft](#) in this section.



F-350

4. **NOTE:** Make sure that the drive tangs on the special tool engage the four slots of the hub nut.

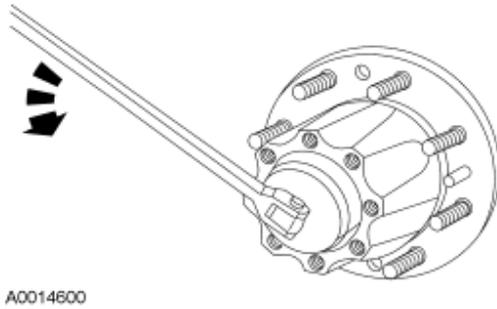
Using the special tool, remove the hub nut (1124).



A0011726

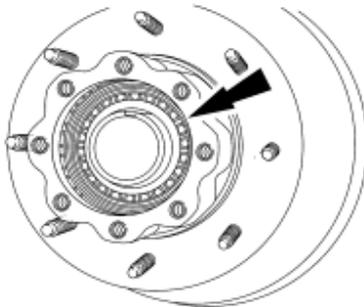
F-450 and F-550

5. Using a suitable socket, remove the hub nut (1A124).

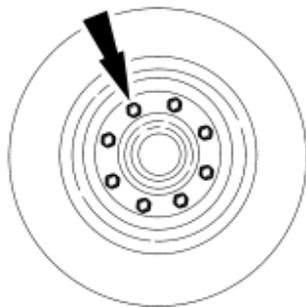


All vehicles

6. Remove the outer rear wheel bearing (1240).



7. Remove the rear hub and brake disc assembly.
8. Remove the bolts and separate the rear hub (1109) from the rear brake disc (2C026).



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

Installation

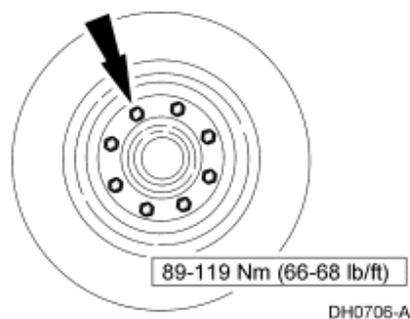
1.  **WARNING:** Install a new rear hub seal (1175) after removing the rear hub from the axle. A damaged or worn seal can permit bearing lubricant to reach the

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.

Install a new rear hub seal. For additional information, refer to [Bearings, Cups and Seals](#) in this section.

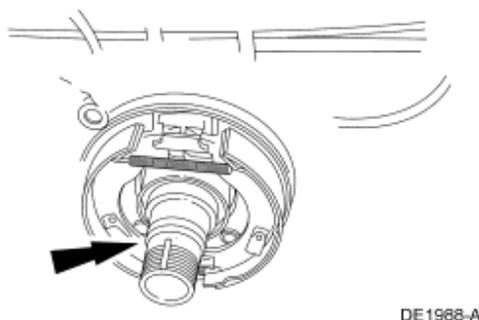
2. Position the rear brake disc on the rear hub and install the bolts.



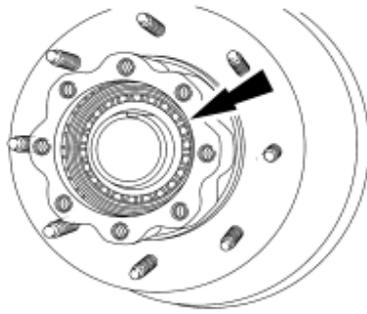
3. **⚠ CAUTION:** Thoroughly clean the spindle. Wrap the spindle threads with electrician's tape to prevent damage while installing the rear hub and brake disc assembly.

⚠ CAUTION: Lightly coat the spindle and pack each rear wheel bearing with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.

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.



DE1985-A

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

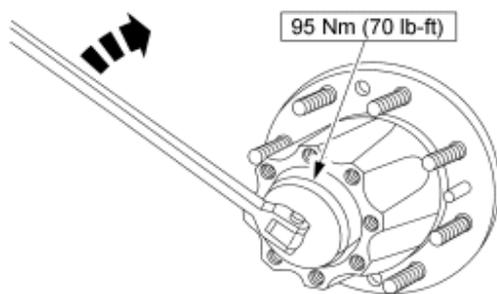


A0011805

7. **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.

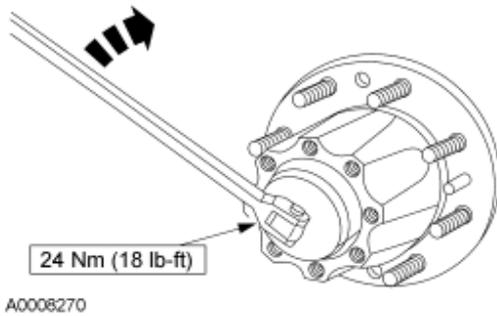
To adjust the bearings, tighten the nut to specification.



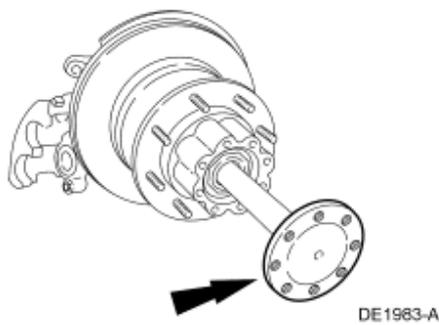
A0008269

8. Back off the nut 90 degrees.
9. Tighten the nut to specification.

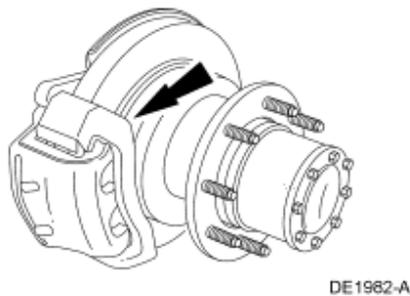
- To verify that there is no side-to-side end play, attach a magnetically mounted dial indicator to the spindle end and place the dial indicator tip on the outboard surface of the hub. Check for side-to-side end play.
- Final bearing adjustment has zero end play. The maximum torque to rotate the hub is 2.3 Nm (20 lb-in) when end play is zero.



10. Install the axle shaft (4234). For additional information, refer to [Axle Shaft](#) in this section.



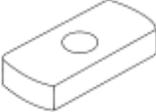
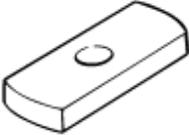
11. Install the anchor plate. For additional information, refer to [Section 206-04](#).



12. Install the tire and wheel assembly. For additional information, refer to [Section 204-04](#).

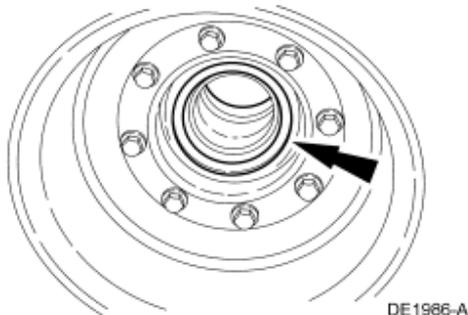
Bearings, Cups and Seals

Special Tool(s)	
 ST1255-A	Adapter for 303-224 (Handle) 205-153 (T80T-4000-W)
 ST1869-A	Drawbar, Rear Axle 205-098 (T75T-1176-A) (Dana 80)
	Installer, Wheel Hub Inner Bearing Cup 205-442 (Dana S135)
	Installer, Wheel Hub Outer Bearing Cup 205-444 (Dana S135)
	Installer, Wheel Hub Inner Oil Seal 205-445 (Dana S135)

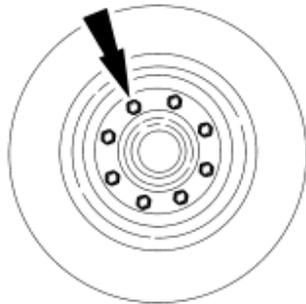
 <p>ST1870-A</p>	<p>Installer, Rear Wheel Hub Bearing Cup 205-278 (T88T-1175-C) (Dana 80)</p>
	<p>Remover, Wheel Hub Inner Bearing Cup 205-441 (Dana S135)</p>
	<p>Remover, Wheel Hub Outer Bearing Cup 205-443 (Dana S135)</p>
 <p>ST1872-A</p>	<p>Remover, Rear Wheel Hub Bearing Cup 205-275 (T88T-1175-A) (Dana 80)</p>
 <p>ST1871-A</p>	<p>Remover, Rear Wheel Hub Bearing Cup 205-277 (T88T-1175-B) (Dana 80)</p>

Removal

1. Remove the rear hub and brake disc assembly. For additional information, refer to [Hub](#) in this section.
2. Remove the rear hub seal (1175) and the inner rear wheel bearing (1244). Discard the rear hub seal.

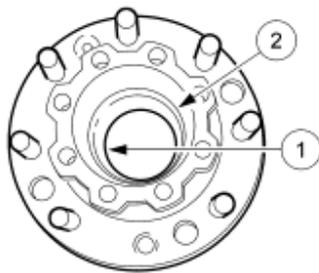


3. If not done previously, remove the bolts and separate the rear hub (1109) from the brake disc.



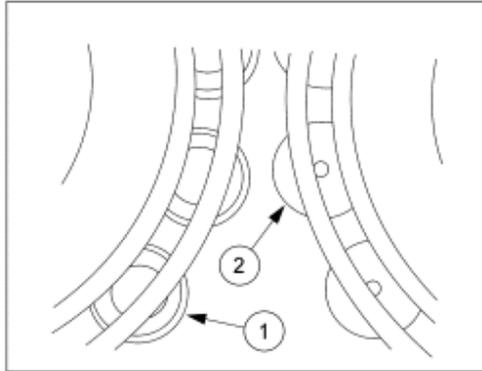
DH0705-A

4. Clean all the old grease and axle lubricant out of the rear hub.
5. Remove the inner and outer bearing cups.
 1. For model 80, use special tools 205-277 and 205-153 to remove the inner bearing cup. For model S135, use special tools 205-441 and 205-151 to remove the inner bearing cup.
 2. For model 80, use special tools 205-275 and 205-153 to remove the outer bearing cup. For model S135, use special tools 205-443 and 205-153 to remove the outer bearing cup.



DE1992-A

6. 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
7. Inspect the bearing races and rollers for pitting, galling or erratic wear patterns. Check the rollers for end wear. Discard the bearings, is necessary.
 1. A typical new bearing roller
 2. A worn bearing roller

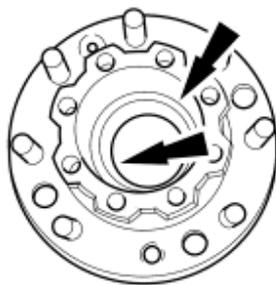


DE1989-A

Installation

Model 80

1. Using the special tools 205-098 and 205-278, install the inner and outer bearing cups.
 - Check if a 0.038-mm (0.0015-inch) feeler gauge can be inserted between the cups and the rear hub at any point around each cup. Reseat the bearing cups, if necessary.

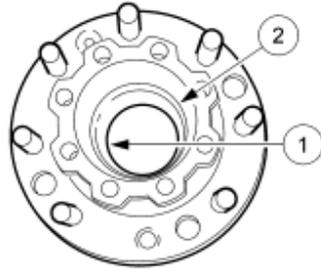


DE2389-A

Model S135

2. Install the inner and outer bearing cups.
 1. Use special tools 205-442 and 205-153 to install the inner bearing cups.
 2. Use special tools 205-444 and 205-153 to install the outer bearing cups.

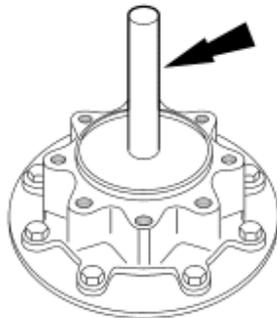
- Check if a 0.038-mm (0.0015-inch) feeler gauge can be inserted between the cups and the rear hub at any point around each cup. Reseat the bearing cups, if necessary.



DE1992-A

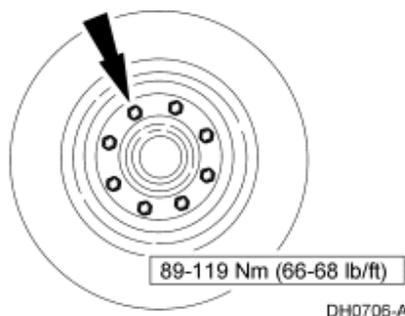
All axles

3. Install the inner rear wheel bearing in the rear hub.
4. Install a new rear hub seal.
 - For model 80, use a suitable seal installer.
 - For model S135, use special tools 205-445 and 205-153.



DE2390-A

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



DH0706-A

6. Install the rear hub and brake disc assembly. For additional information, refer to [Hub](#) in this section.

SECTION 205-02D:
Rear Drive Axle/Differential — Ford 10.50-Inch Ring Gear

[SPECIFICATIONS](#)

DESCRIPTION AND OPERATION

[Rear Drive Axle and Differential](#)

[Description](#)

DIAGNOSIS AND TESTING

[Rear Drive Axle and Differential](#)

IN-VEHICLE REPAIR

[Axle Shaft](#)

[Drive Pinion Flange](#)

[Pinion Seal](#)

[Differential Housing Cover](#)

[Drive Pinion](#)

[Differential Case](#)

REMOVAL AND INSTALLATION

[Axle Assembly](#)

DISASSEMBLY AND ASSEMBLY

[Differential Case and Ring Gear—One Piece, Conventional](#)

[Differential Case and Ring Gear—Two-Piece, Conventional](#)

[Differential Case and Ring Gear—One-Piece, Traction-Lok](#)

[Differential Case and Ring Gear—Two-Piece, Traction-Lok](#)

SECTION 205-02D: Rear Drive Axle/Differential —
Ford 10.50-Inch Ring Gear

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SPECIFICATIONS

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General Specifications	
Item	Specification
Lubricants and Sealants	
SAE 75W-140 Synthetic Rear Axle Lubricant F1TZ-19580-B	WSL-M2C192-A
Additive Friction Modifier C8AZ-19B546-A	EST-M2C118-A
Premium Long-Life Grease XG-1-C	ESA-M1C75-B
Clear Silicone Rubber D6AZ-19562-AA	ESB-M4G92-A
Threadlock and Sealer E0AZ-19554-AA	WSK-M2G351-A5

Backlash Specifications	
Description	Specification
Backlash Between Ring Gear and Pinion Teeth	0.203-0.381 (0.008-0.015) maximum 0.305-0.381 (0.012-0.015) preferred
Ring Gear Maximum Backlash Variation Between Teeth	0.102 (0.004)

Rotational Torque Ranges	
Description	Specification
Pinion bearing preload (used pinion bearing)	0.9-1.5Nm (8-14 lb-in)
Pinion bearing preload (new pinion bearing)	1.8-3.3Nm (16-29 lb-in)
Driver handle	2.2Nm (20 lb-in)
Initial minimum breakaway torque (Traction-Lok®)	27Nm (20lb-ft)

Clearance Specifications	
Description	Specification
Differential Case Maximum Runout	0.076 (0.003)

Pinion Flange Maximum Radial Runout in Assembly	0.305 (0.012 T.I.R.)
RABS Sensor Air Gap	0.127-1.143 (0.005-0.045)

Torque Specifications			
Description	Nm	lb-ft	lb-in
Differential bearing cap bolt	119	88	—
Differential pinion shaft lock bolt	30	23	—
Oil filler plug	20-40	15-30	—
Rear axle housing vent	11-24	8-18	—
Rear brake hose	15-20	12-15	—
Axle housing cover bolts	38-52	29-39	—
Rear spring plate nuts	251	186	—
Ring gear bolts	136-163	101-120	—
Shock absorber bolts	63	47	—
Traction-Lok® clutch gauge nut	6.7	—	60
Brake junction block retainer nut	18	14	—
2-piece differential case half retaining bolts	122	90	—

SECTION 205-02D: Rear Drive Axle/Differential —
Ford 10.50-Inch Ring Gear

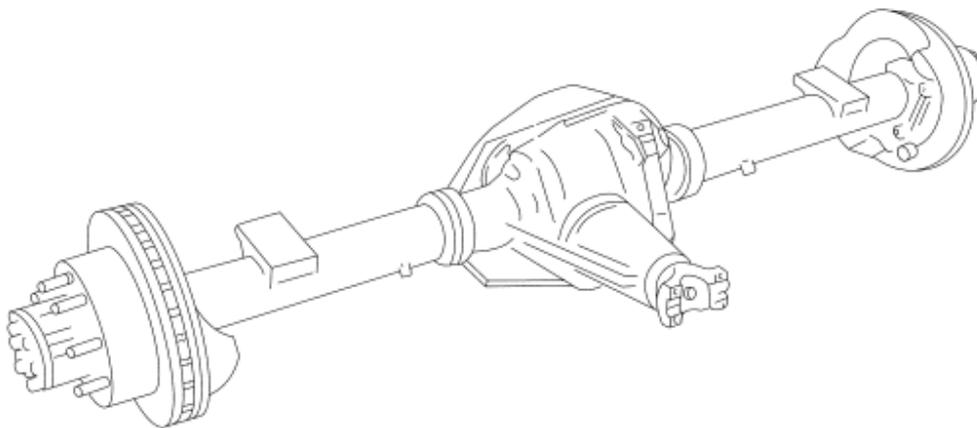
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DESCRIPTION AND OPERATION

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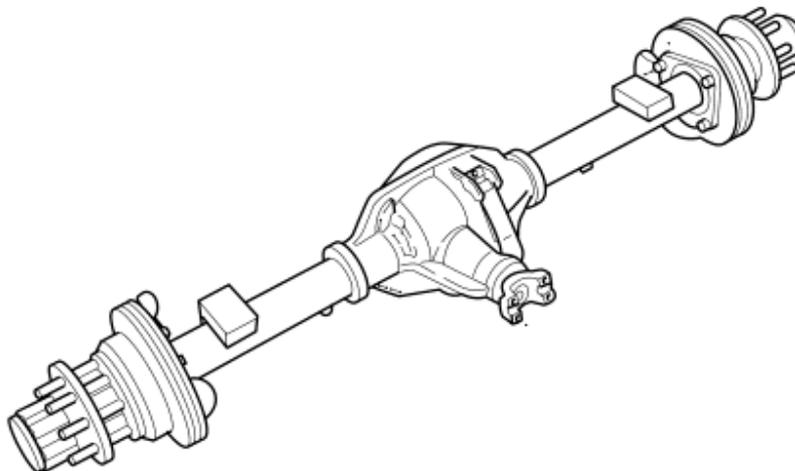
Rear Drive Axle and Differential

Ford 10.50-Inch Axle, Single Rear Wheel



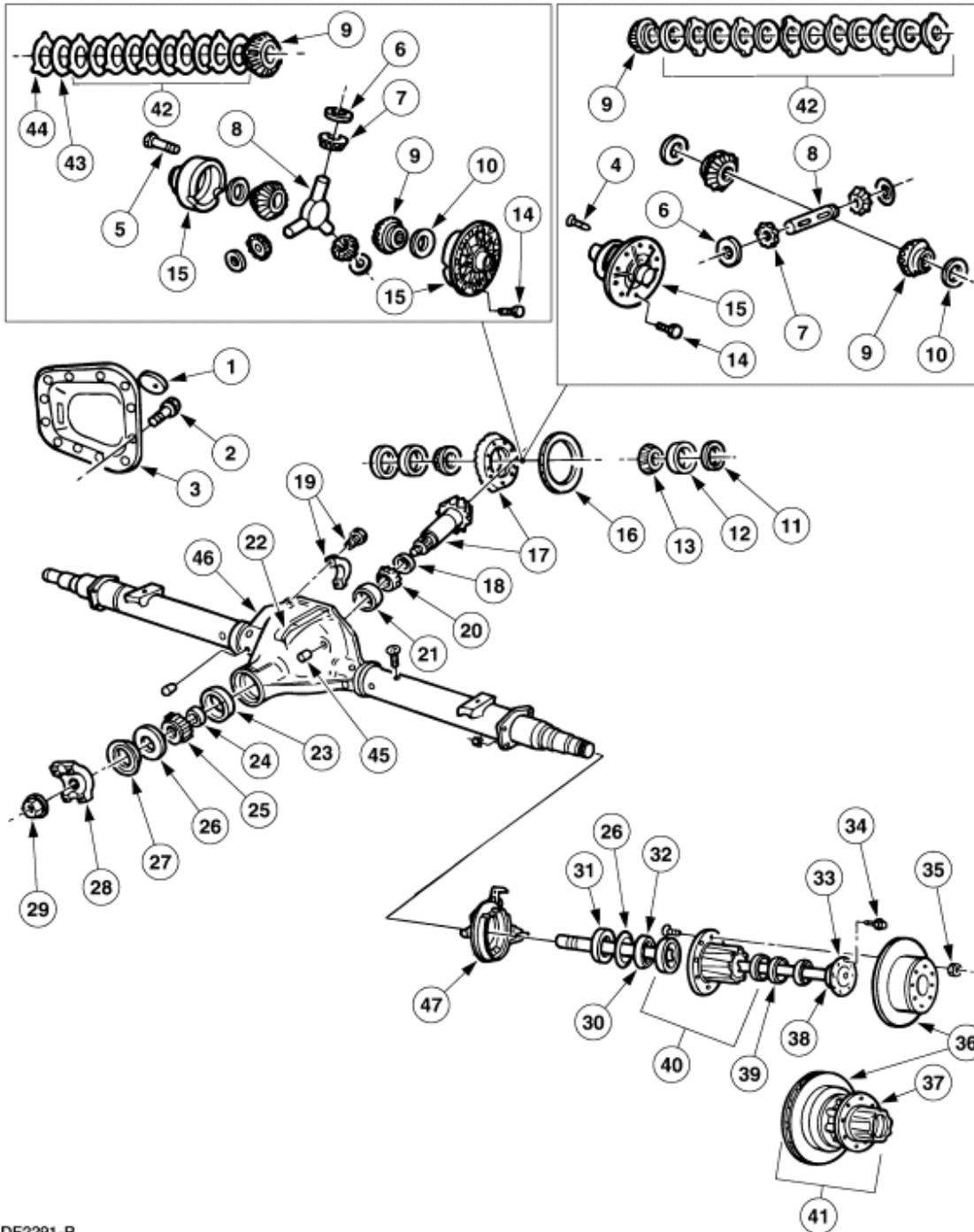
DE2354-A

Ford 10.50-Inch Axle, Dual Rear Wheel



DE2264-A

Rear Axle — 10.50-Inch Ring Gear, Traction-Lok®



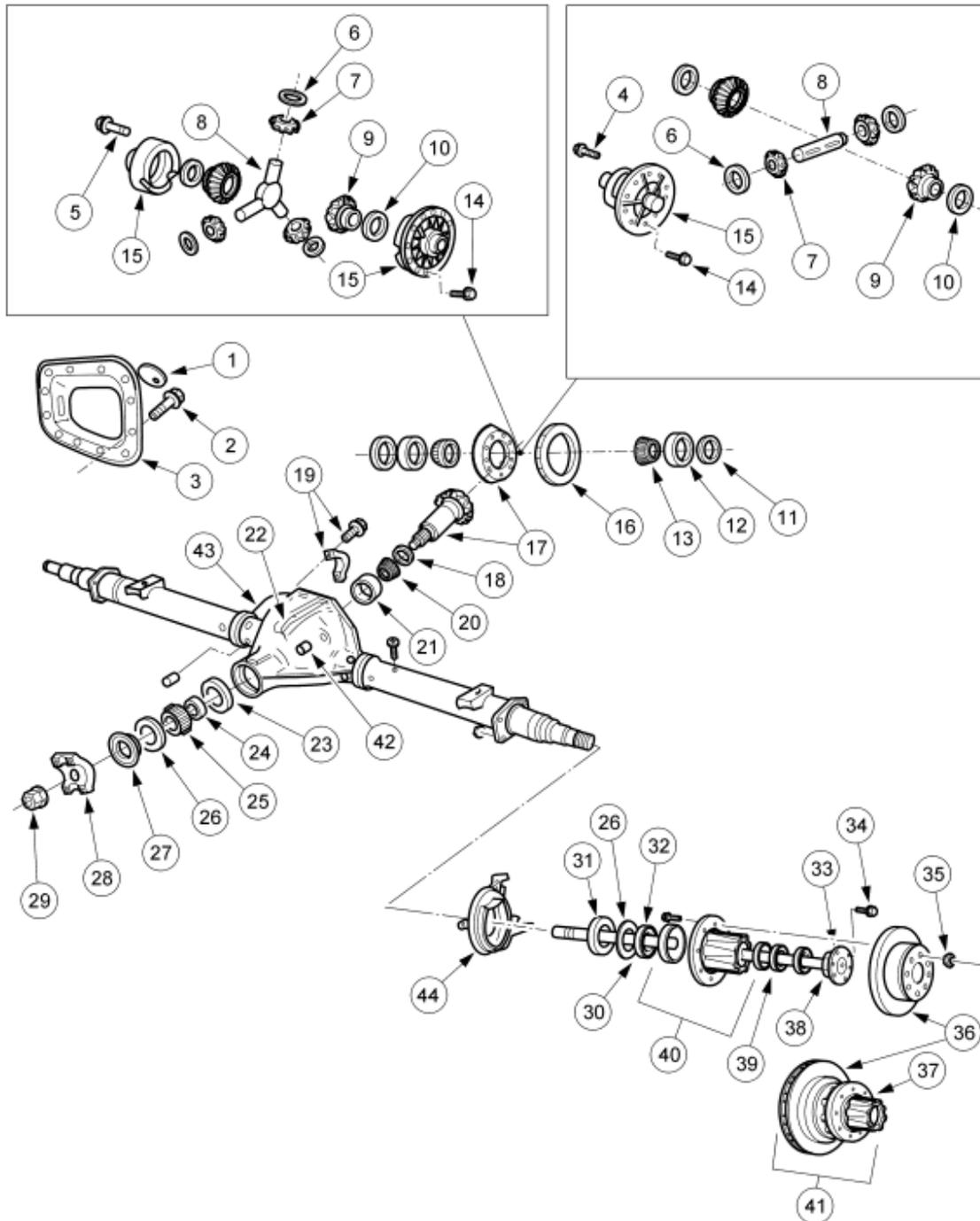
DE2291-B

Item	Part Number	Description
1	—	Rear axle identification tag (Part of 4001)
2	4346	Differential housing cover bolt
3	4033	Differential housing cover
4	4241	Differential pinion shaft lock bolt
5	391973-S1300	Differential case bolt

6	4230	Differential pinion thrust washer
7	4215	Differential pinion gear
8	4211	Differential pinion shaft
9	4236	Differential side gear
10	4228	Differential side gear thrust washer
11	4067	Differential bearing shim
12	4222	Differential bearing cup
13	4221	Differential bearing
14	4216	Ring gear bolt
15	4204	Differential case
16	4B409	Anti-lock speed sensor ring
17	4209	Ring gear and pinion
18	4663	Drive pinion bearing adjustment shim
19	—	Bearing cap and bolt (part of 4010)
20	4630	Pinion bearing— (inner)
21	4628	Inner axle pinion bearing cup
22	9E731	RABS sensor
23	4616	Outer pinion bearing cup
24	4662	Collapsible spacer
25	4621	Pinion bearing (outer)
26	4670	Rear axle drive pinion shaft oil slinger
27	4676	Rear axle drive pinion seal
28	4851	Pinion flange
29	389546-S100	Pinion nut
30	1244	Rear wheel bearing inner cone and roller
31	1177	Wheel bearing oil seal
32	1107	Lug bolt
33	4234	Axle shaft
34	N811648-S100	Axle shaft nut
35	1012	Lug nut
36	2C026	Rear disc brake rotor
37	1109	Rear hub
38	390258-S	Gasket
39	1240	Bearing

40	1A034	Hub and bearing cup
41	1113	Rear brake hub and drum (DRW only)
42	4947	Differential clutch pack
43	4A324	Rear axle differential clutch shim
44	4214	Differential clutch spring
45	390943-S100	Filler plug
46	4010	Rear axle housing
47	2209	Brake adapter plate

Rear Axle — 10.50-Inch Ring Gear, Conventional



DE2447-A

Item	Part Number	Description
1	—	Rear axle identification tag (Part of 4001)
2	4346	Differential housing cover bolt
3	4033	Differential housing cover
4	4241	Differential pinion shaft lock bolt
5	391973-S1300	Differential case bolt

6	4230	Differential pinion thrust washer
7	4215	Differential pinion gear
8	4211	Differential pinion shaft
9	4236	Differential side gear
10	4228	Differential side gear thrust washer
11	4067	Differential bearing shim
12	4222	Differential bearing cup
13	4221	Differential bearing
14	4216	Ring gear bolt
15	4204	Differential case
16	4B409	Anti-lock speed sensor ring
17	4209	Ring gear and pinion
18	4663	Drive pinion bearing adjustment shim
19	—	Bearing cap and bolt (part of 4010)
20	4630	Pinion bearing— (inner)
21	4628	Inner axle pinion bearing cup
22	9E731	RABS sensor
23	4616	Outer pinion bearing cup
24	4662	Collapsible spacer
25	4621	Pinion bearing (outer)
26	4670	Rear axle drive pinion shaft oil slinger
27	4676	Rear axle drive pinion seal
28	4851	Pinion flange
29	389546-S100	Pinion nut
30	1244	Rear wheel bearing inner cone and roller
31	1177	Wheel bearing oil seal
32	1107	Lug bolt
33	4234	Axle shaft
34	N811648-S100	Axle shaft nut
35	1012	Lug nut
36	2C026	Rear disc brake rotor
37	1109	Rear hub
38	390258-S	Gasket
39	1240	Bearing

40	1A034	Hub and bearing cup
41	1113	Rear brake hub and drum (DRW only)
42	390943-S100	Filler plug
43	4010	Rear axle housing
44	2209	Brake adapter plate

Description

The Ford 10.50-inch rear axle assembly is an integral type housing, hypoid gear design with the centerline of the ring gear set below the pinion centerline.

The hypoid ring gear and pinion consists of a 10.50-inch diameter ring gear and an overhung drive pinion. The pinion is positioned by selected pinion shims and supported by two opposed tapered roller bearings. Pinion bearing preload is adjusted by the pinion nut and a collapsible spacer.

The rear axle housing consists of a cast center section with two steel tubes and a stamped steel rear cover. The differential housing cover uses a silicone sealant as a gasket.

The differential case is a one or two-piece design depending upon the application. The differential pinion shaft in the one-piece differential case design (2-pinion) is retained with a threaded bolt. The two-piece differential case 3-pinion spider is retained by the case halves which are bolted together.

The rear axle drive pinion receives its power from the engine through the transmission and driveshaft. The drive pinion rotates the differential case through engagement with the ring gear, which is bolted to the case outer flange.

Inside the 2-piece differential case, three differential pinion gears are mounted on a three-post shaft. Inside the 1-piece differential case, two differential pinion gears are mounted on a straight shaft. These differential pinion gears are engaged with the differential side gears to which the axle shafts are splined. Therefore, as the differential case turns, it rotates the axle shafts and rear wheels. When it is necessary for one wheel and axle shaft to rotate faster than the other, the faster turning differential side gear causes the differential pinion gears to roll on the slower turning differential side gear to allow differential action between the two axle shafts.

The 10.50-inch rear axle uses SAE 75W-140 Synthetic Rear Axle Lubricant F1TZ-19580-B or equivalent meeting Ford specification WSL-M2C192-A.

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Ford 10.50-Inch Ring Gear

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Rear Drive Axle and Differential

For additional information, refer to [Section 205-00](#).

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Ford 10.50-Inch Ring Gear

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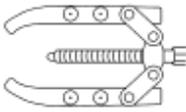
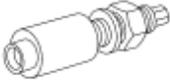
IN-VEHICLE REPAIR

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Axle Shaft

For additional information, refer to [Section 205-02E](#).

Drive Pinion Flange

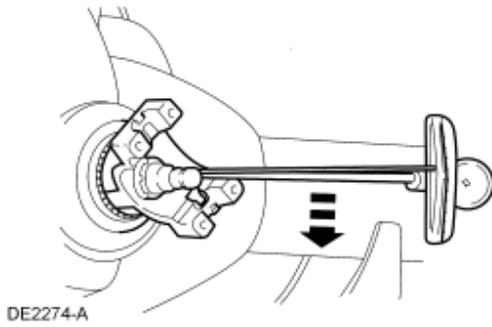
Special Tool(s)	
 ST1260-A	2-Jaw Puller 205-D026 (D80L-1002-L) or Equivalent
 ST1734-A	Companion Flange Replacer 205-233 (T85T-4851-AH)
 ST1864-A	Flange Holder 205-012 (T57T-4851-B)

Removal

1. **NOTE:** The rear wheels and brake calipers must be removed to prevent brake drag during drive pinion bearing preload adjustment.

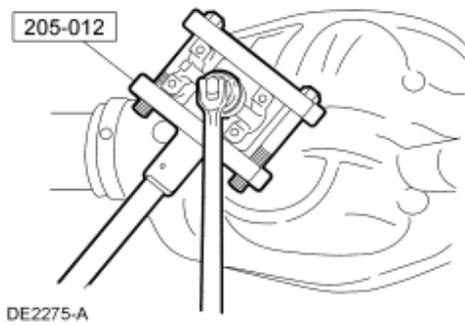
Remove the rear brake calipers. For additional information, refer to [Section 206-04](#).

2. Remove the driveshaft (4602). For additional information, refer to [Section 205-01](#).
3. Install a Nm (inch-pound) torque wrench on the pinion nut, and record the rotational torque required to maintain rotation of the pinion through several revolutions.

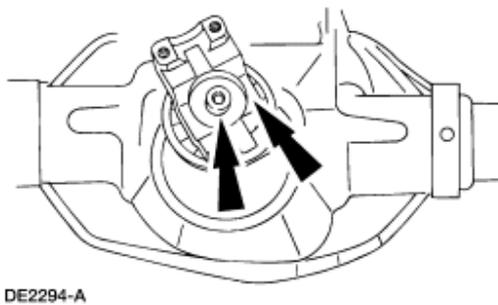


4. **⚠ CAUTION:** After removal of the pinion nut, discard it. A new nut must be used for installation.

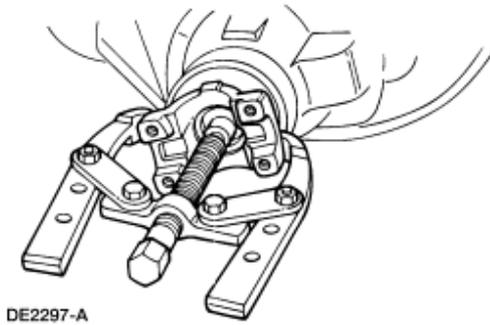
Use the Flange Holder to hold the pinion flange while removing the pinion nut.



5. Mark the pinion flange in relation to the drive pinion stem to ensure proper alignment during installation.



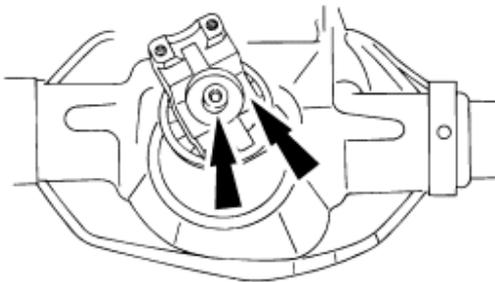
6. Use the 2-Jaw Puller to remove the pinion flange.



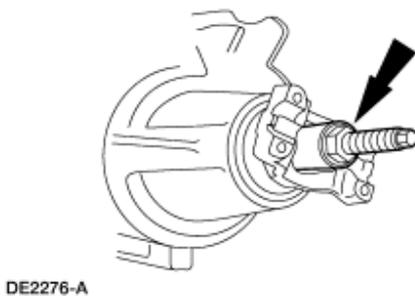
Installation

1. Lubricate the pinion flange splines.
 - Use SAE 75W-140 High Performance Rear Axle Lubricant F1TZ-19580-B or equivalent meeting Ford specification WSL-M2C192-A.
2. **NOTE:** Disregard the scribe marks if a new pinion flange is being installed.

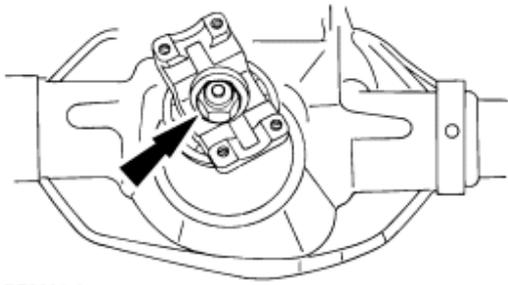
Align the pinion flange with the drive pinion shaft.



3. With the pinion flange in place in the rear axle housing (4010), install the pinion flange using the Companion Flange Replacer.



4. Position the new pinion nut.

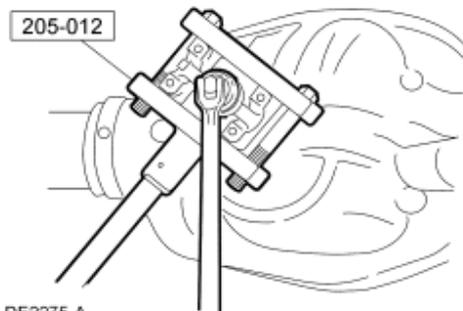


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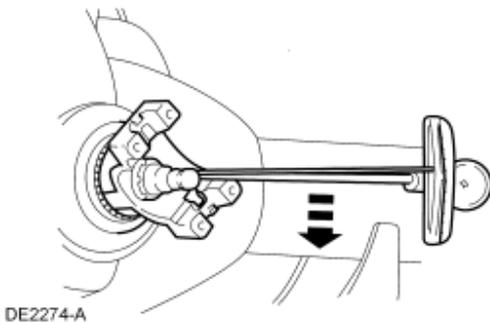
5.  **CAUTION: Under no circumstances is the pinion nut to be backed off to reduce preload. If reduced preload is required, a new collapsible spacer and pinion nut must be installed.**

Use the Flange Holder to hold the pinion flange while tightening the pinion nut.

- Tighten the pinion nut, rotating the pinion occasionally to make sure the cone and roller bearings are seating properly. Take frequent cone and roller bearing torque preload readings until the original recorded preload reading is obtained by rotating the pinion with a Nm (inch-pound) torque wrench.
- If the original recorded preload is lower than specifications, tighten to the appropriate specification for used bearings. If the preload is higher than specification, tighten the nut to the original reading as recorded. Refer to Torque Specifications in this section.



DE2275-A



DE2274-A

6. Install the driveshaft. For additional information, refer to [Section 205-01](#).

7. Install the brake calipers. For additional information, refer to [Section 206-04](#).
-

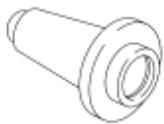
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Pinion Seal

Special Tool(s)	
 ST1325-A	Pinion Seal Replacer 205-208 (T83T-4676-A)

Removal

1. Remove the pinion flange. For additional information, refer to [Drive Pinion Flange](#) in this section.
2. Force up on the metal flange of the rear axle drive pinion seal (4676). Install gripping pliers to the seal flange and strike with a hammer until the rear axle drive pinion seal is removed.

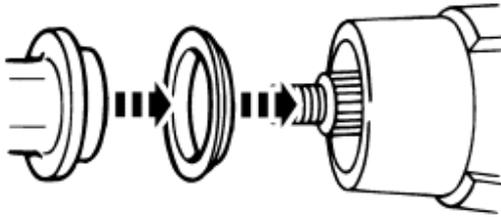


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Installation

1. Lubricate the new pinion seal.
 - Use Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.
2.  **CAUTION: If the rear axle drive pinion seal becomes misaligned during installation, remove the rear axle drive pinion seal and replace it with a new seal.**

Use the Pinion Seal Replacer to install the rear axle drive pinion seal.



DE0351-B

3. Install the pinion flange. For additional information, refer to [Drive Pinion Flange](#) in this section.

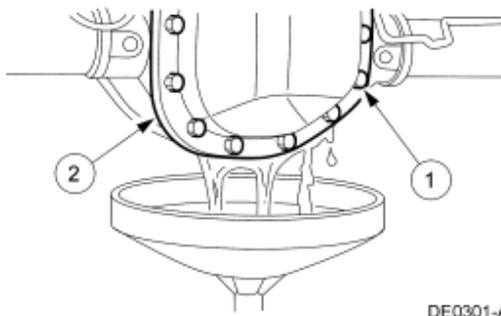
SECTION 205-02D: Rear Drive Axle/Differential —
Ford 10.50-Inch Ring Gear
IN-VEHICLE REPAIR

1999 F-Super Duty 250-550
Workshop Manual
[Procedure revision date:](#)
[01/26/2000](#)

Differential Housing Cover

Removal

1. Raise and support the vehicle; for additional information, refer to [Section 100-02](#).
2. Remove the differential housing cover (4033).
 1. Remove the 12 differential housing cover bolts, and drain the lubricant from the rear axle housing (4010).
 2. Remove the differential housing cover.

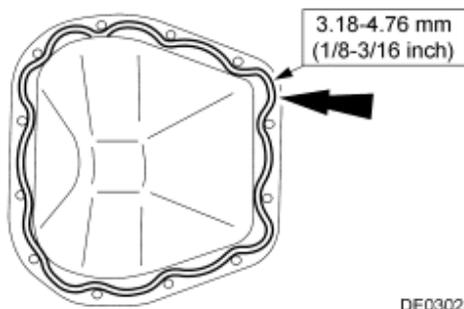


Installation

1.  **CAUTION:** Make sure the machined surfaces on both the rear axle housing and the differential housing cover are clean and free of oil before applying the new silicone sealant. The inside of the rear axle (4001) must be covered when cleaning the machined surface to prevent contamination.

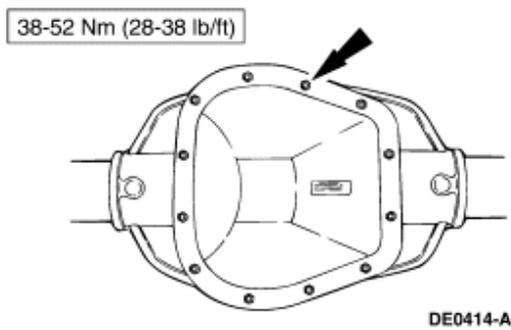
Clean the gasket mating surface of the rear axle and the differential housing cover.

2. Apply a new, continuous bead of sealant to the differential housing cover.
 - Use Clear Silicone Rubber D6AZ-19562-AA or equivalent meeting Ford specifications ESB-M4G92-A.



3. **NOTE:** The differential housing cover must be installed within 15 minutes of application of the silicone, or new sealant must be applied. If possible, allow 1 hour before filling with lubricant to ensure the silicone sealant has properly cured.

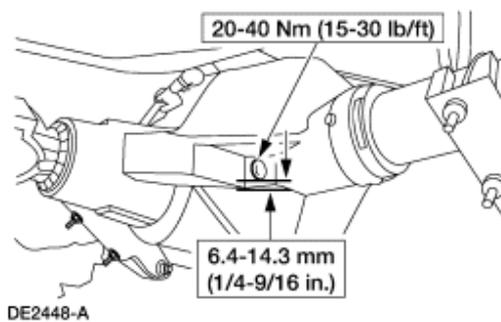
Install the differential housing cover and tighten the differential housing cover bolts.



4. **NOTE:** Service refill capacities are determined by filling the rear axle with the specified lubricant to the specified level below the bottom of the filler hole.

Fill the rear axle with specified lubricant, and install the filler plug.

- For Traction-Lok® axles, first fill the rear axle with 236.5 ml (8 ounces) of specified Ford Additive Friction Modifier C8AZ-19B546-A or equivalent meeting Ford specification EST-M2C118-A.

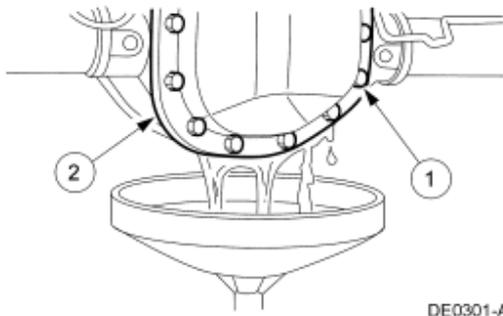


5. Lower the vehicle.

Differential Housing Cover

Removal

1. Raise and support the vehicle; for additional information, refer to [Section 100-02](#).
2. Remove the differential housing cover (4033).
 1. Remove the 12 differential housing cover bolts, and drain the lubricant from the rear axle housing (4010).
 2. Remove the differential housing cover.

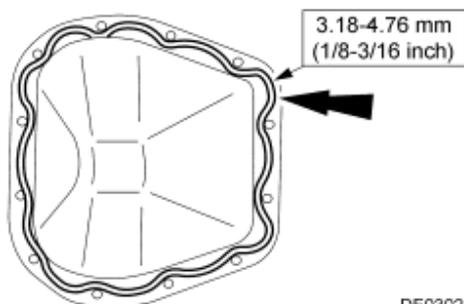


Installation

1. **⚠ CAUTION: Make sure the machined surfaces on both the rear axle housing and the differential housing cover are clean and free of oil before applying the new silicone sealant. The inside of the rear axle (4001) must be covered when cleaning the machined surface to prevent contamination.**

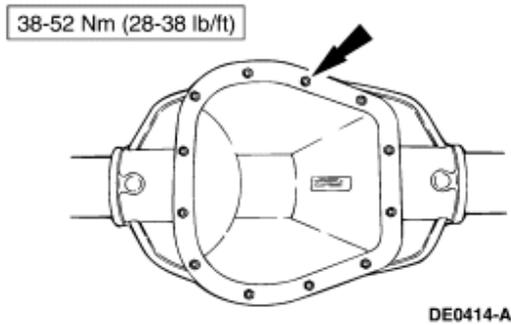
Clean the gasket mating surface of the rear axle and the differential housing cover.

2. Apply a new, continuous bead of sealant to the differential housing cover.
 - Use Clear Silicone Rubber D6AZ-19562-AA or equivalent meeting Ford specifications ESB-M4G92-A.



3. **NOTE:** The differential housing cover must be installed within 15 minutes of application of the silicone, or new sealant must be applied. If possible, allow 1 hour before filling with lubricant to ensure the silicone sealant has properly cured.

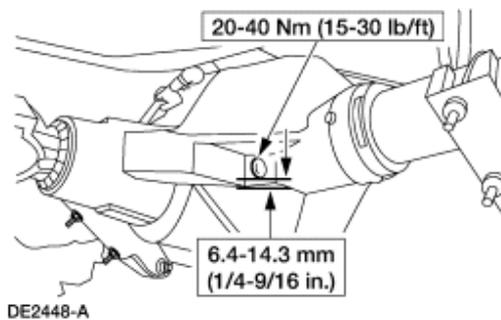
Install the differential housing cover and tighten the differential housing cover bolts.



4. **NOTE:** Service refill capacities are determined by filling the rear axle with the specified lubricant to the specified level below the bottom of the filler hole.

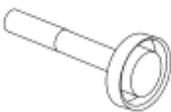
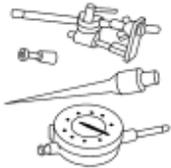
Fill the rear axle with specified lubricant, and install the filler plug.

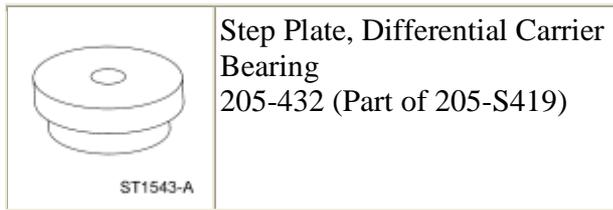
- For Traction-Lok® axles, first fill the rear axle with 236.5 ml (8 ounces) of specified Ford Additive Friction Modifier C8AZ-19B546-A or equivalent meeting Ford specification EST-M2C118-A.



5. Lower the vehicle.
-

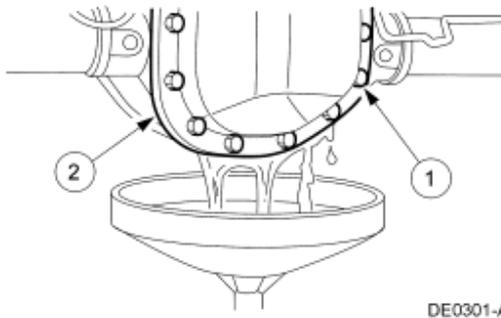
Differential Case

Special Tool(s)	
 <p>ST2473-A</p>	<p>Installer, Differential Carrier Bearing 205-D044 (D81T-4221-A) or equivalent</p>
 <p>ST2251-A</p>	<p>Remover, Differential Carrier Bearing 205-S419 (Forcing Screw)</p>
 <p>ST1214-A</p>	<p>Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent</p>
 <p>ST1485-A</p>	<p>Installer, Differential Shim 205-228 (T85T-4067-AH)</p>
 <p>ST2249-A</p>	<p>Collets, Differential Carrier Bearing 205-430 (Part of 205-S419)</p>
 <p>ST2250-A</p>	<p>Retaining Ring, Differential Carrier Bearing 205-431 (Part of 205-S419)</p>

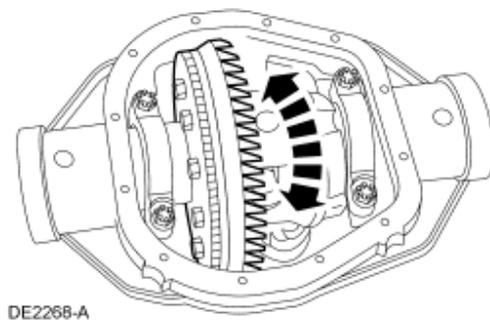


Removal

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the differential housing cover.
 1. Remove the 12 differential housing cover bolts and drain the lubricant from the rear axle housing.
 2. Remove the differential housing cover.

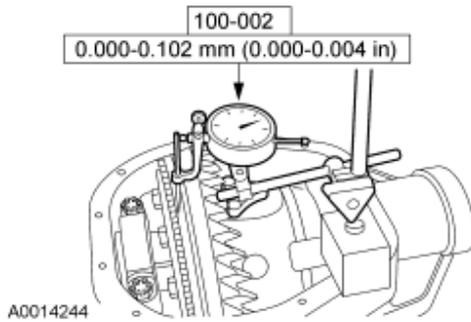


3. Remove the axle shafts. For additional information, refer to [Axle Shaft](#) in this section.
4. Wipe the lubricant from the internal working parts, and visually inspect the parts for wear or damage.
5. Rotate the differential case to see if there is any roughness which would indicate damaged bearings or gears.



6. **NOTE:** There is a space between the anti-lock speed sensor ring and the ring gear for measuring ring gear backface runout.

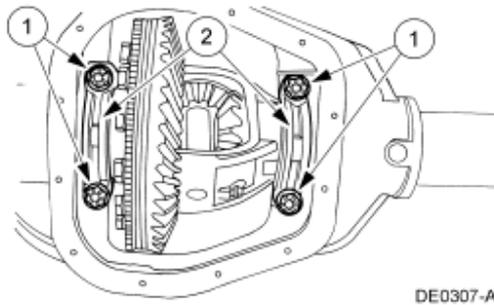
Positioning the special tool, inspect ring gear backlash and ring gear backface runout.



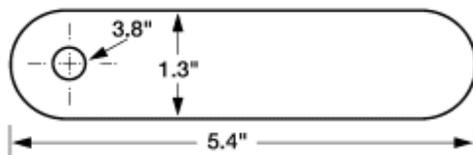
7. **⚠ CAUTION:** Mark the position of the bearing caps, as arrows may not be visible. The bearing caps must be installed in their identical locations and positions.

Loosen the differential case.

1. Remove the bearing cap bolts.
2. Remove the bearing caps.



8. To simplify the installation, fabricate two differential case retaining straps from metal stock as shown.

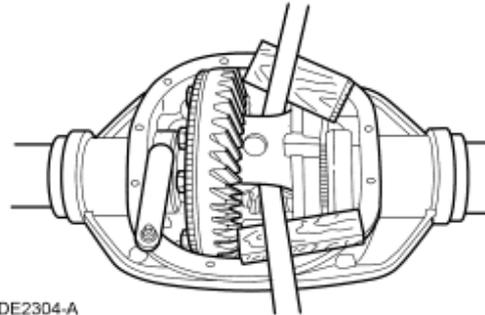


DE2452-A

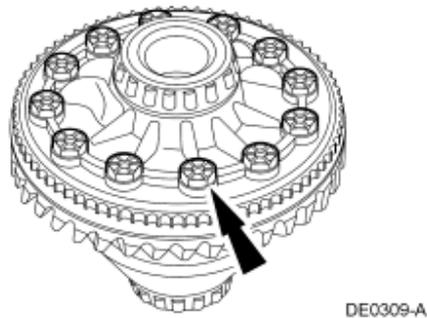
9. **⚠ WARNING:** Be careful not to allow the differential case to fall.

⚠ CAUTION: Place a wood block between the pry bar and the rear axle housing to protect the machined surface from damage.

Use the pry bar and the wood block to remove the differential case from the rear axle housing.



10. Remove the ring gear bolts.



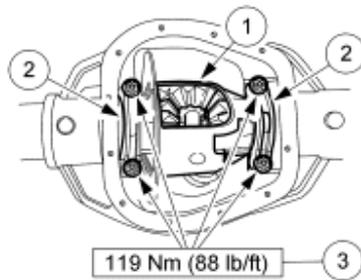
11. **⚠ CAUTION:** Care should be taken not to damage the ring bolt hole threads.

NOTE: The anti-lock speed sensor ring cannot be reused once removed.

Insert a punch in the bolt holes. Drive off the ring gear and, if necessary, the anti-lock speed sensor ring.



12. Install the differential case without the ring gear.
 1. Position the differential case assembly, including bearing clips and shims, in the housing.
 2. Install the differential bearing caps.
 3. Install the differential bearing cap bolts.

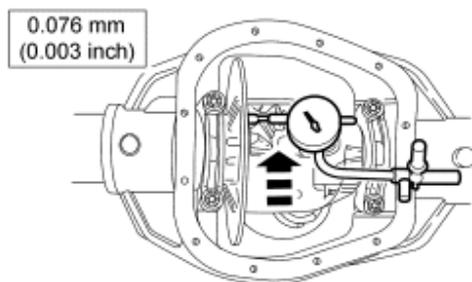


DE2314-A

13. **NOTE:** Rotate the differential case to make sure the differential bearings are properly seated.

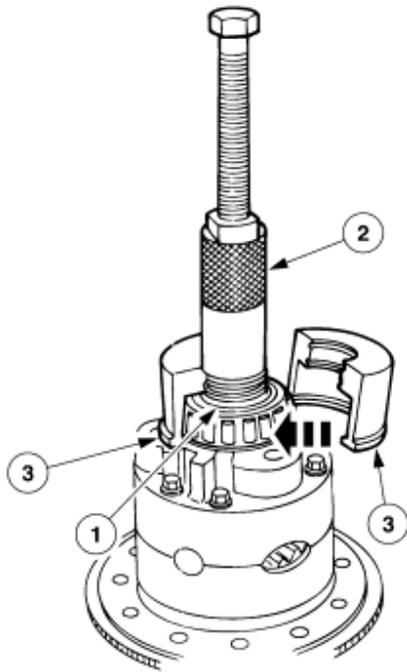
NOTE: If runout is within specification, install a new ring gear and pinion. If runout exceeds specification, the ring gear is true and the concern is due to either a damaged differential case or differential bearings. Inspect the differential bearings. If the differential bearings are not damaged, replace both the differential case and the differential bearings.

Measure the differential case runout by rotating the differential case.



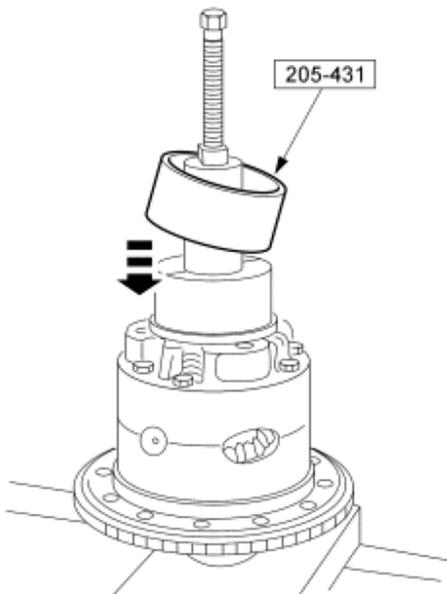
DE1631-A

14. Remove the differential case from the rear axle housing, and prepare to remove the differential bearings.
 1. Position the Step Plate.
 2. Position the Carrier Bearing Remover (Forcing Screw) and the Remover and Replacer Tube.
 3. Position the Side Carrier Bearing Collets.



DE2299-A

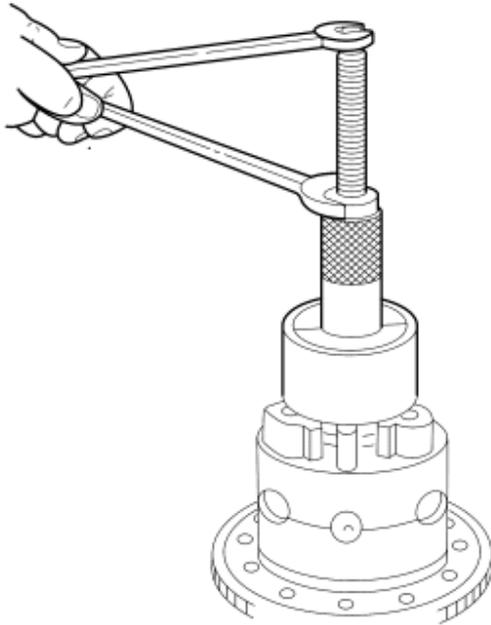
15. Position the special tool.



A0014242

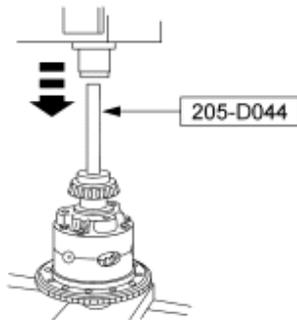
16. Using two wrenches, remove the differential bearing.

- Repeat the procedure for the other differential bearing.



DE2301-A

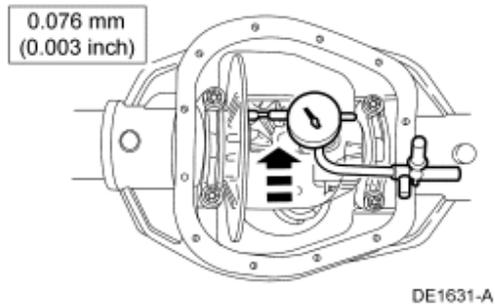
17. Using the special tool, install the new differential bearings on the differential case.



A0014243

18. Measure the differential case runout without the ring gear.

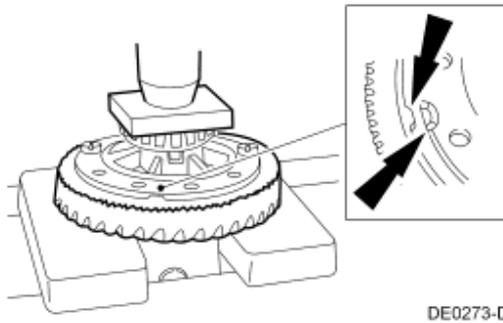
- Check the case runout again with the new differential bearings. If the runout is now within the specification shown, use the new differential bearings for assembly. If the runout is still excessive, the differential case is damaged and must be replaced.



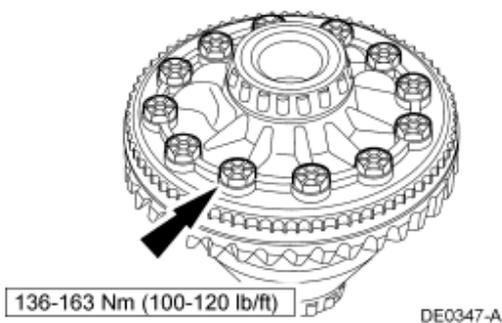
Installation

All vehicles

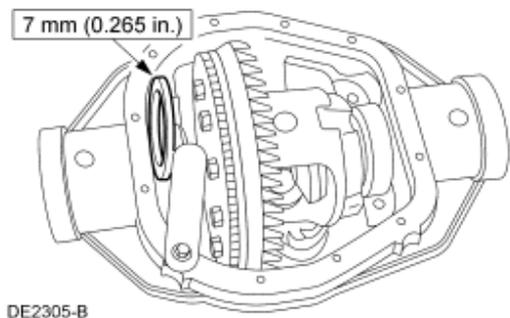
1. Press the ring gear and, if removed, a new anti-lock speed sensor on the differential case.



2. Install the ring gear bolts.
 - Apply Stud and Bearing Mount E0AZ-19554-BA or equivalent meeting Ford specification WSK-M2G349-A1 to the ring gear bolts.



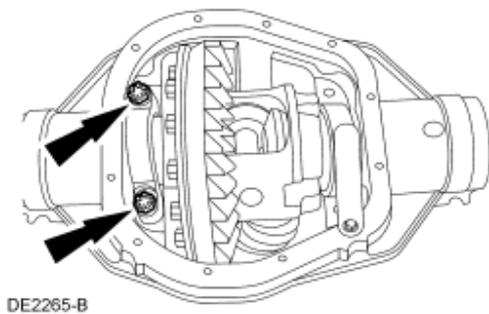
3. With the pinion depth set and the pinion installed, place the differential case in the rear axle housing.
 - Install a shim on the left side as shown in the illustration.



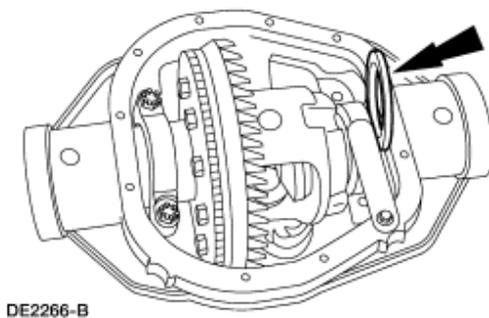
4.  **CAUTION: The bearing caps must be installed in their original locations and positions.**

NOTE: Apply pressure toward the left side to make sure the left bearing is seated.

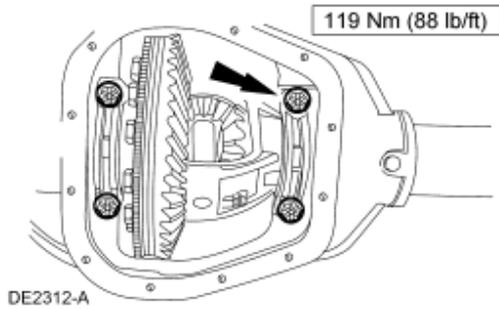
Install the left bearing cap, and loosely install the bearing cap bolts.



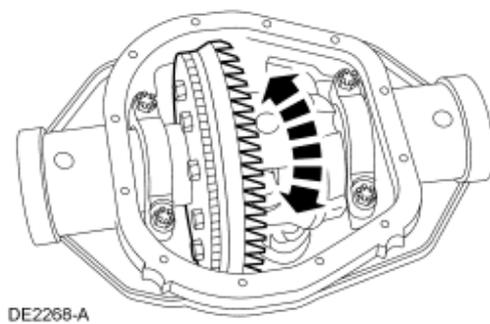
5. Install progressively larger shims on the right side until the largest shim selected can be assembled by hand.



6. Install the right side bearing cap, and tighten the bolts.

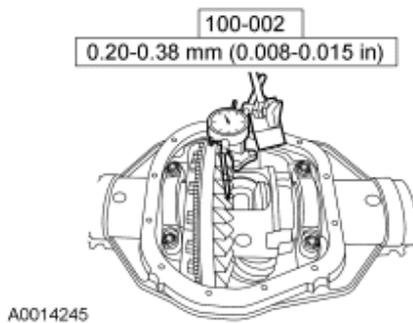


7. Rotate the differential case to make sure it rotates freely.



Measuring backlash

8. Using the special tool, measure ring gear backlash.
 - If the backlash is within specification, go to Backlash within specification in this procedure. The specification shown is the full allowable range. For the preferred range, refer to Specifications in this section.
 - If a zero backlash condition occurs, go to Zero backlash in this procedure.
 - If the backlash is not within specification, go to Backlash not within specification in this procedure.



Zero backlash

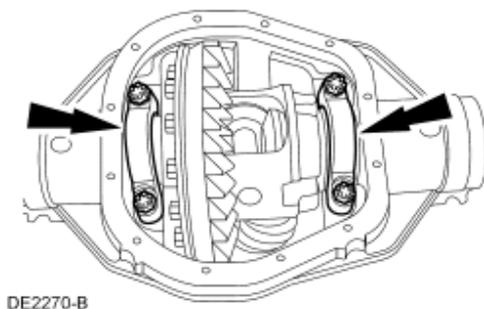
9. If a zero backlash condition occurs, add a 0.50 mm (0.020 inch) shim to the RH side and subtract 0.50 mm (0.020 inch) from the LH side to allow backlash indication. Check backlash. Repeat Step 8.

Backlash Change Required		Thickness Change Required	
mm	Inch	mm	Inch
0.025	0.001	0.050	0.002
0.050	0.002	0.050	0.002
0.076	0.003	0.101	0.004
0.101	0.004	0.152	0.006
0.127	0.005	0.152	0.006
0.152	0.006	0.203	0.008
0.177	0.007	0.254	0.010
0.203	0.008	0.254	0.010
0.228	0.009	0.304	0.012
0.254	0.010	0.355	0.014
0.279	0.011	0.355	0.014
0.304	0.012	0.406	0.016
0.330	0.013	0.457	0.018
0.335	0.014	0.457	0.018
0.381	0.015	0.508	0.020

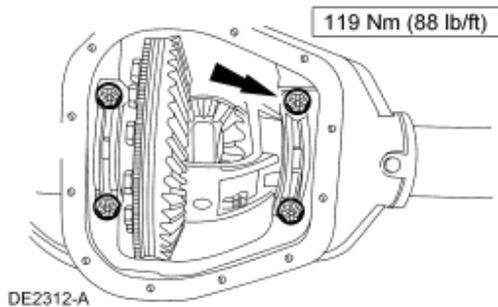
10.

Backlash not within specification

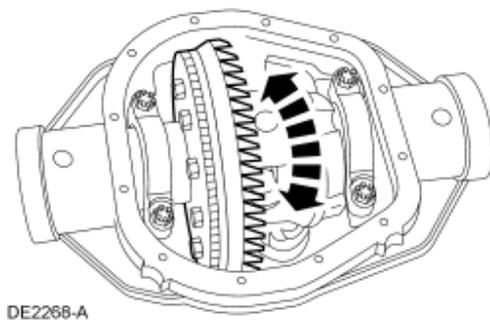
10. To increase or decrease backlash, remove the bearing caps, and install a thicker shim and a thinner shim as shown.
- If backlash is not within specification, correct by increasing the thickness of one differential bearing shim and decreasing the thickness on the other differential bearing shim by the same amount.



11. Install the bearing caps and bearing cap bolts.

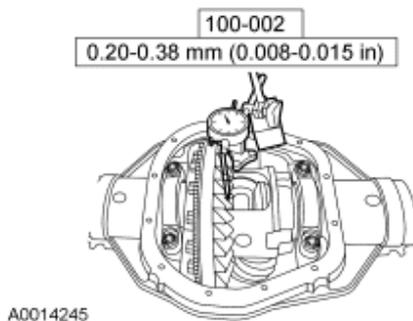


12. Rotate the differential several times to make sure the differential bearings are properly seated.



13. Using the special tool, recheck the backlash.

- If backlash is within specification, go to Backlash within specification in this procedure. If not, repeat Step 8.
- The specification shown is the full allowable range. For the preferred range, refer to Specifications in this section.

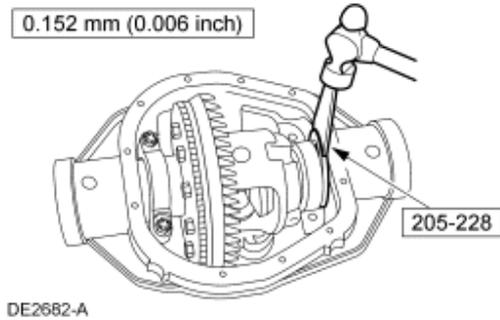


Backlash within specification

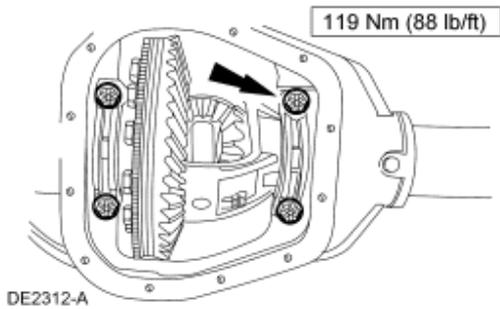
14. Remove the bearing caps and bolts.

- To establish differential bearing preload, increase both left and right shim sizes by the specification shown in the illustration.

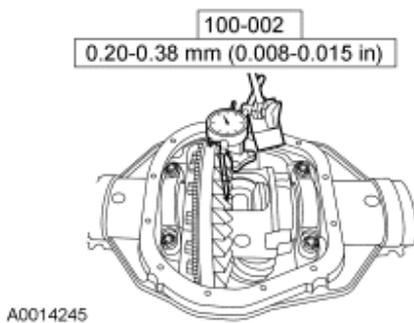
- Using the special tool, ensure the differential bearing shims are fully seated and the assembly turns freely.



15. Install the bearing caps and bearing cap bolts.



16. Using the special tool, verify the backlash.
 - The specification shown is the full allowable range. For the preferred range, refer to Specifications in this section.
 - For further adjustments, refer to [Section 205-00](#).

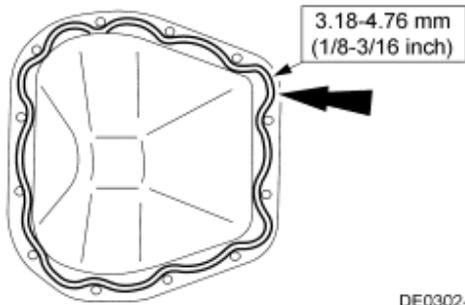


17. Install the axle shafts; for additional information, refer to [Axle Shaft](#) in this section.

18. **⚠ CAUTION: Make sure the machined surfaces on both the rear axle housing and the differential housing are clean and free of oil before applying the new silicone sealant. The inside of the rear axle must be covered when cleaning the machined surface to prevent contamination.**

Clean the gasket mating surface of the rear axle and the differential housing cover.

19. Apply a new, continuous bead of sealant to the differential housing cover.
 - Use Clear Silicone Rubber D6AZ-19562-AA or equivalent meeting Ford Specifications ESB-M4G92-A.

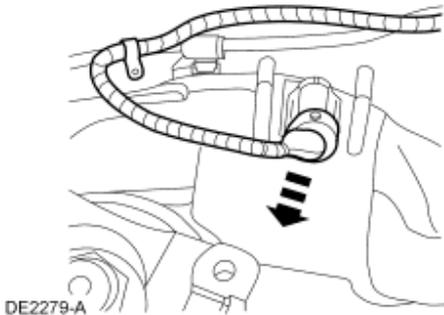


DE0302-B

Axle Assembly

Removal

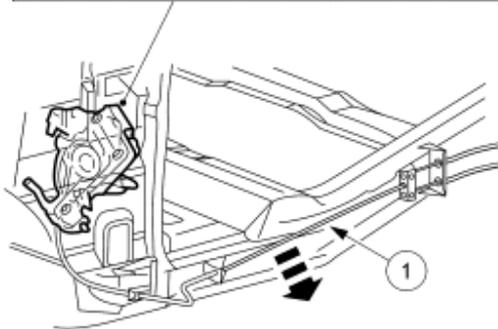
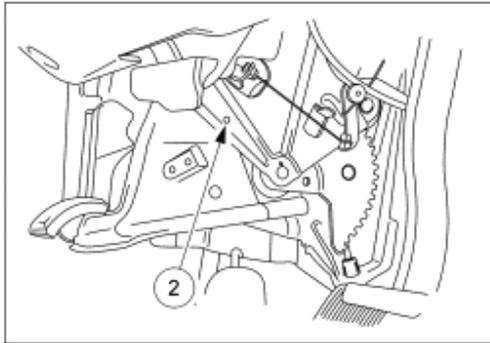
1. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
2. Remove the wheels and tires. For additional information, refer to [Section 204-04](#).
3. Remove the driveshaft. For additional information, refer to [Section 205-01](#).
4. Disconnect the rear anti-lock brake sensor.



5. **NOTE:** Make sure the parking brake control is fully released.

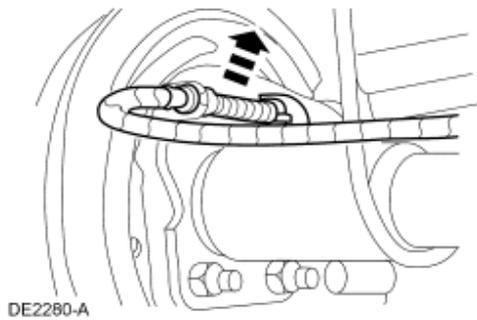
Release the tension on the parking brake system.

1. Have an assistant pull the front parking brake cable and conduit to its full range.
2. Insert a suitable retainer.



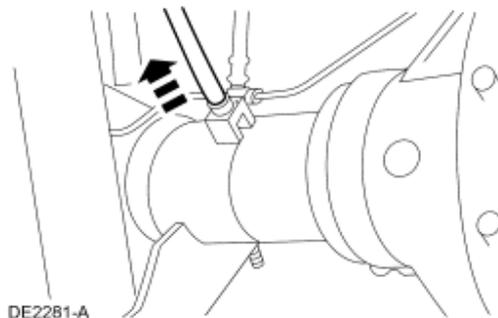
DH0795-A

6. Disconnect the parking brake cable at the parking brake lever.



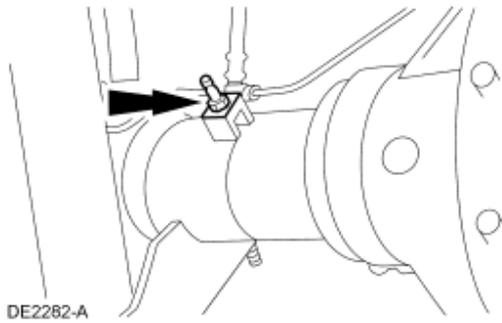
DE2280-A

7. Remove the vent hose at the brake hose junction block.



DE2281-A

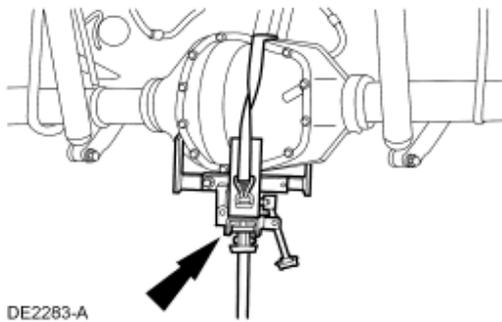
8. Remove the brake hose junction block from the rear axle housing and let it hang.



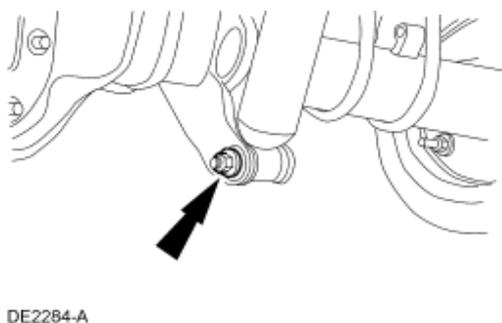
9. Remove the brake lines from the rear axle housing but not from the disc brake calipers and let the tubing hang.
10. Remove the disc brake calipers from the rear disc brake rotors and wire them aside. Refer to [Section 206-04](#).

11.  **WARNING:** Strap the axle securely to the jack.

Use a suitable transmission jack to support the axle.

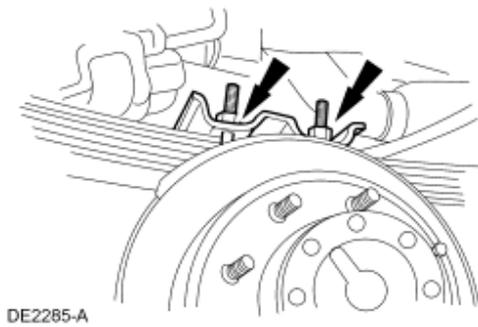


12. Remove the lower shock absorber nuts and bolts.



13. **NOTE:** Once the rear spring plate nuts and bolts are removed, they must be replaced.

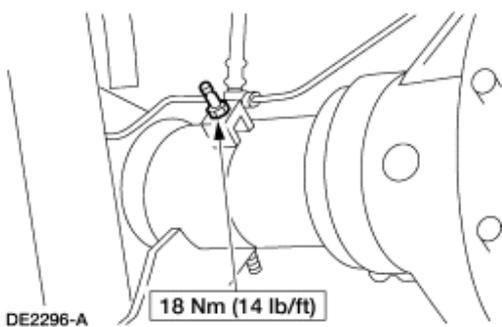
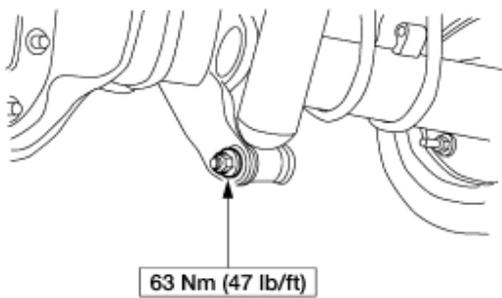
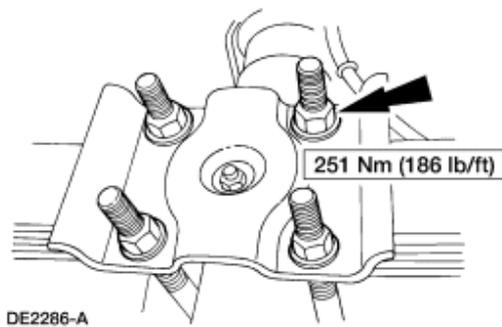
Remove the rear spring plate U-bolts and nuts.



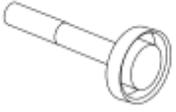
14. Lower the axle from the vehicle.

Installation

1. Follow the removal procedure in reverse order.
 - Install the brake calipers. For additional information, refer to [Section 206-04](#).

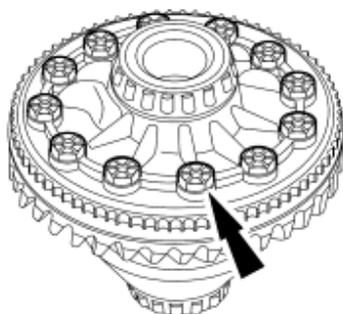


Differential Case and Ring Gear—One Piece, Conventional

Special Tool(s)	
 ST2473-A	Installer, Differential Carrier Bearing 205-D044 (D81T-4221-A) or equivalent

Disassembly

1. Remove the differential case. For additional information, refer to [Differential Case](#) in this section.
2. Remove the ring gear bolts.

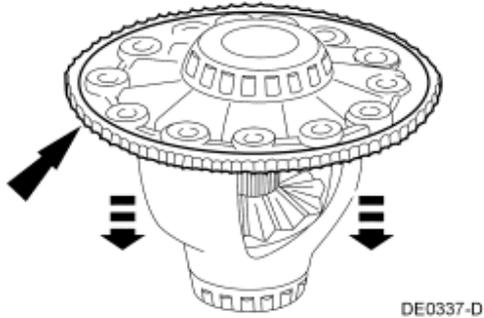


3. Insert a punch in the bolt holes and drive the ring gear off.

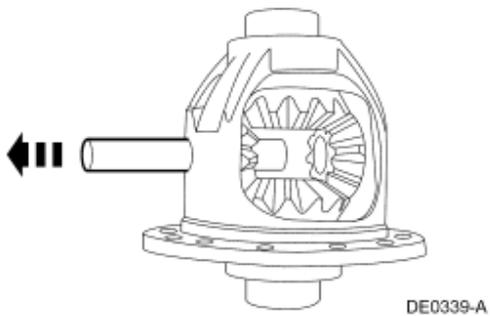


4. **NOTE:** The anti-lock speed sensor ring cannot be reused once removed.

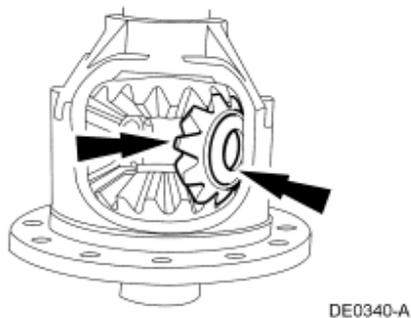
Remove the anti-lock speed sensor ring.



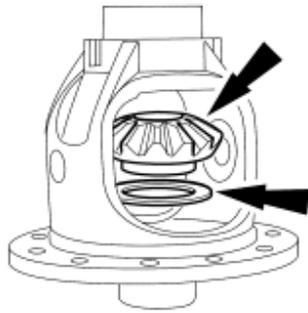
5. If required, remove the differential bearings. For additional information, refer to [Differential Case](#) in this section.
6. Remove the differential pinion shaft lock bolt and the differential pinion shaft.



7. Rotate and remove the differential pinion gears and differential pinion thrust washers.



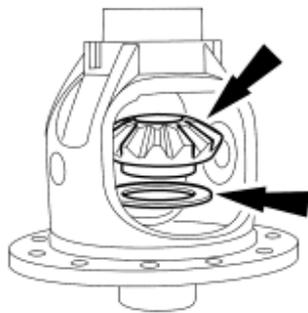
8. Remove the differential side gears and the differential side gear thrust washers.



DE0341-A

Assembly

1. Position the differential side gear thrust washers on the differential side gears.
 - Use Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B to lubricate the differential side gear thrust washers and the differential side gear journals.



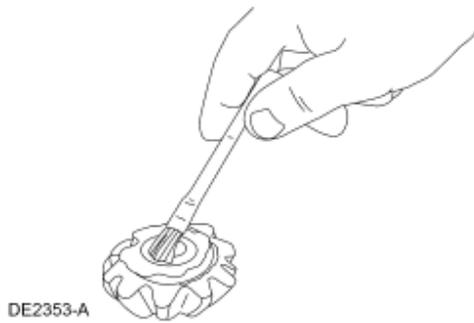
DE0341-A

2. Position the differential side gears.

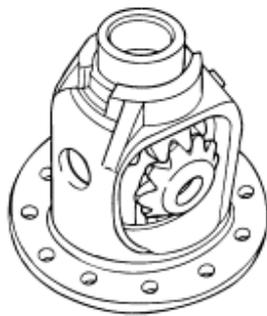


DE0342-A

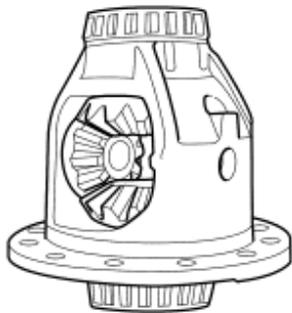
3. Assemble the differential pinion thrust washers and the differential pinion gears.
 - Lubricate with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.



4. Engage the differential pinion gears opposite the differential side gears.

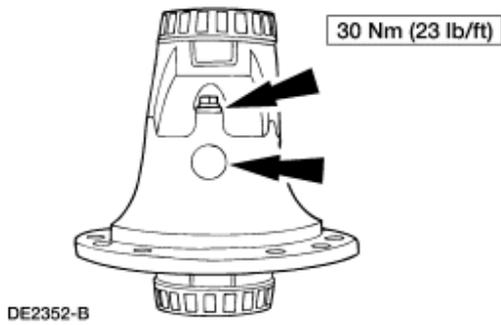


5. Rotate the differential pinion gears to align the differential pinion shaft bore.

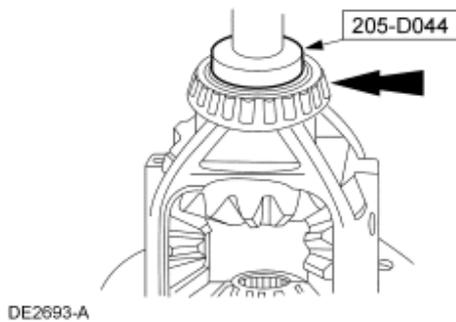


6. **⚠ CAUTION: If a new pinion shaft lock bolt is not available, use Stud and Bearing Mount E0AZ-19554-BA or equivalent meeting Ford specification WSK-M2G349-A1 and tighten to specification.**

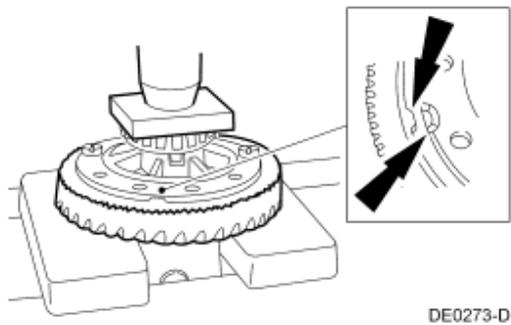
Insert the differential pinion shaft, and install a new differential pinion shaft lock bolt.



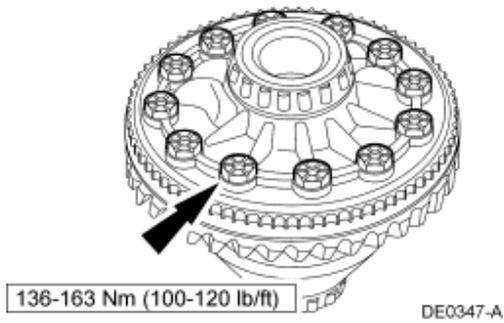
- Using the special tool, install the differential bearings.



- Press the new anti-lock speed sensor ring and the ring gear on the differential case.



- Install the ring gear bolts and tighten.
 - Apply Stud and Bearing Mount E0AZ-19554-BA or equivalent meeting Ford specification WSK-M2G349-A1 to the ring gear bolts.



10. Install the differential case. For additional information, refer to [Differential Case](#) in this section.

SECTION 205-02D: Rear Drive Axle/Differential —
 Ford 10.50-Inch Ring Gear
 DISASSEMBLY AND ASSEMBLY

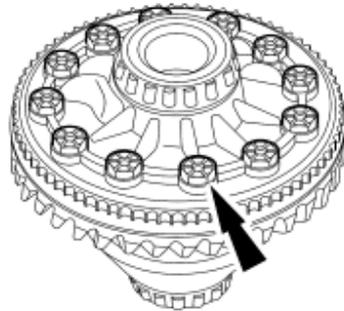
1999 F-Super Duty 250-550
 Workshop Manual
[Procedure revision date:](#)
[01/26/2000](#)

Differential Case and Ring Gear—Two-Piece, Conventional

Special Tool(s)	
<p>ST1257-A</p>	Holding Fixture, Drive Pinion Flange 205-126 (T78P-4851-A)
<p>ST2203-A</p>	Preload Gauge, Differential Clutch 205-447

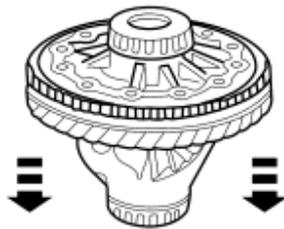
Disassembly

1. Remove the differential case (4204). For additional information, refer to [Differential Case](#) in this section.
2. Remove the ring gear bolts.



DE0309-A

3. Insert a punch in the bolt holes and drive off the ring gear.



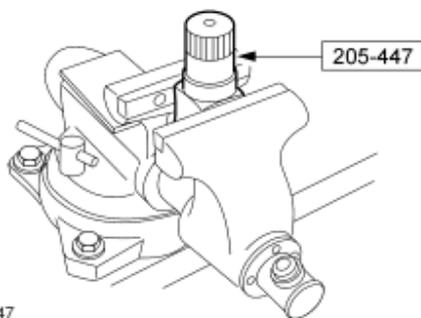
DE0310-B

4.  **CAUTION: The anti-lock speed sensor ring cannot be reused once removed.**

NOTE: Remove the anti-lock speed sensor ring only if required.

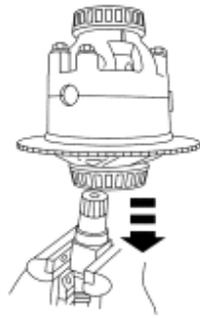
Remove the anti-lock speed sensor ring.

5. Position the special tool in a vise.



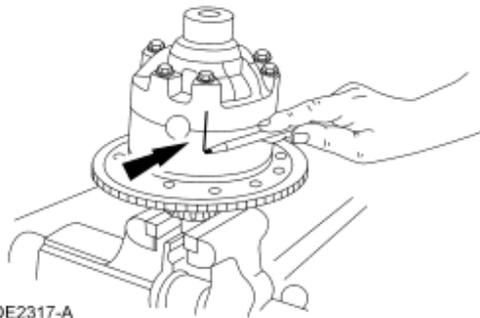
A0014247

6. Position the differential case on the special tool.



DE2316-A

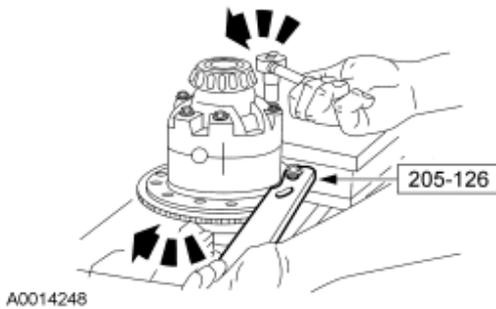
7. Index mark the differential case halves.



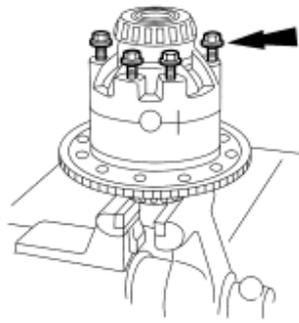
DE2317-A

8. **NOTE:** Attach the special tool with a bolt and nut.

Install the special tool on the differential case as shown and loosen the differential case bolts.

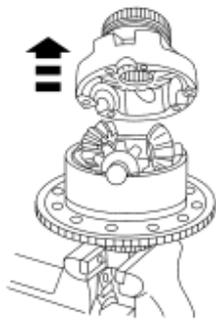


9. Remove the differential case bolts.



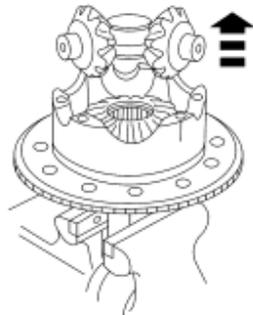
DE2319-A

10. Remove the right differential case half and differential side gear (4236).



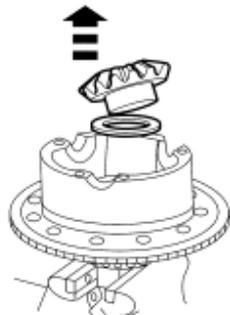
DE2320-A

11. Remove the differential pinion shaft (4211) and differential pinion gears (4215).



DE2321-A

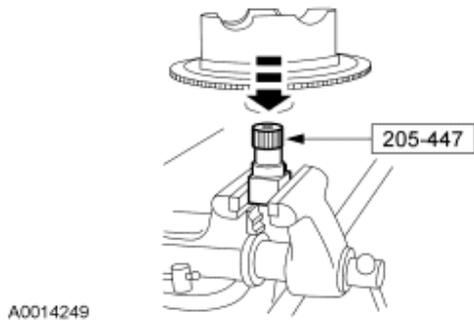
12. Remove the left differential side gear and the differential side gear thrust washers (4228).



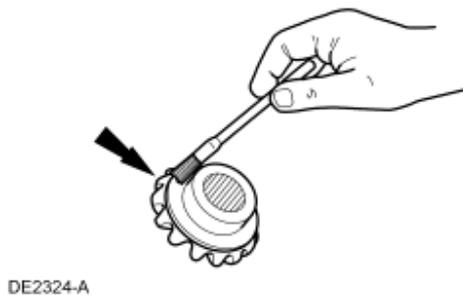
DE2322-A

Assembly

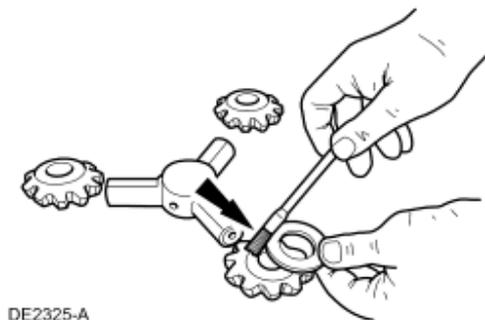
1. Position left differential case half (ring gear side) on the special tool.



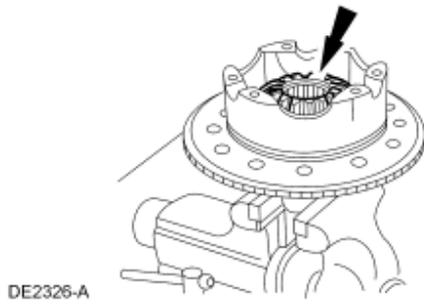
2. Lubricate the differential side gears and the differential side gear thrust washers with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.



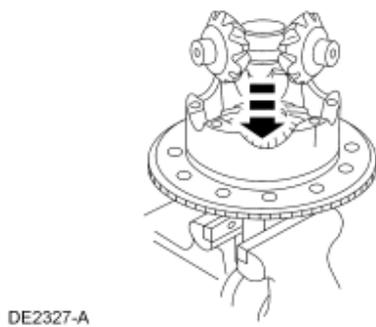
3. Lubricate the differential pinion gears, pinion gear thrust washers and the differential pinion shaft with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.



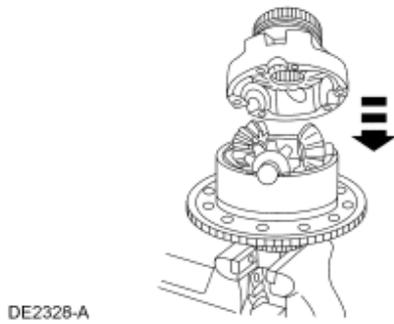
4. Install the left differential side gear.



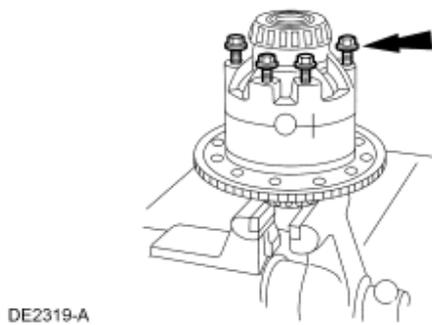
5. Install the differential pinion shaft and the differential pinion gears.



6. Position the right differential case half with the index marks aligned.

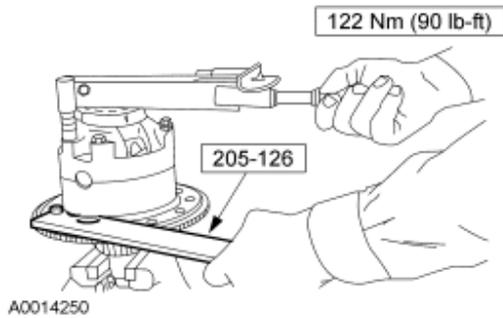


7. Position the differential case retaining bolts.

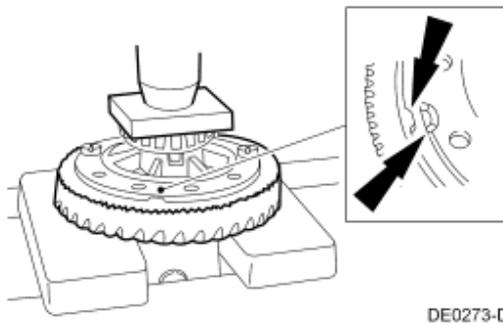


8. **NOTE:** Use the special tool as shown to keep the differential case from turning.

Tighten the retaining bolts.

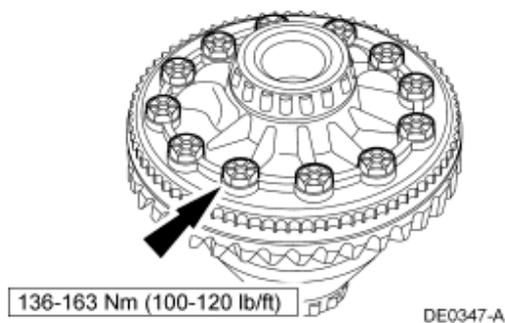


9. Press the new anti-lock speed sensor ring, if removed, and the ring gear on the differential case.



10. **NOTE:** Apply Stud and Bearing Mount E0AZ-19554-BA or equivalent meeting Ford specification WSK-M2G349-A1 to the ring gear bolts.

Install the ring gear bolt and tighten.



11. Install the differential case. For additional information, refer to [Differential Case](#) in this section.

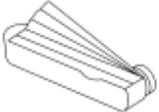
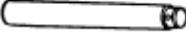
SECTION 205-02D: Rear Drive Axle/Differential —
Ford 10.50-Inch Ring Gear

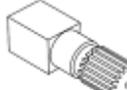
1999 F-Super Duty 250-550
Workshop Manual

DISASSEMBLY AND ASSEMBLY

[Procedure revision date:](#)
[01/26/2000](#)

Differential Case and Ring Gear—One-Piece, Traction-Lok

Special Tool(s)	
 ST1271-A	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent
 ST1858-A	Rotator, Differential 205-246 (T86T-4205-A)
 ST1749-A	Rotator, Limited Slip Differential 205-DS059 (D83T-4205-C) or equivalent
 ST1543-A	Step Plate 205-D019 (D80L-630-8) or equivalent
 ST1374-A	Gauge, Differential Clutch 205-135 (T80P-4946-A)

 <p>ST1372-A</p>	<p>Gauge, Differential (Traction-Lok) 205-380 (T97T-4946-B)</p>
 <p>ST2203-A</p>	<p>Preload Gauge, Differential Clutch 205-446</p>
 <p>ST2203-A</p>	<p>Preload Gauge, Differential Clutch 205-447</p>

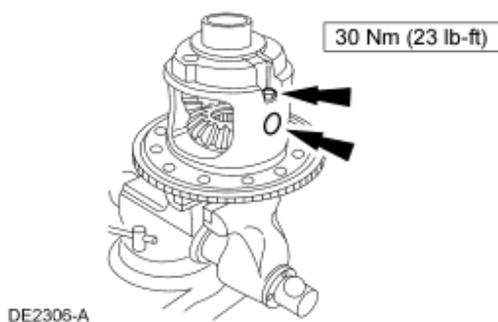
Disassembly

1. Remove the differential case (4204); for additional information, refer to [Differential Case](#) in this section.
2. **NOTE:** The differential bearings (4221) need not be removed to overhaul the Ford limited slip differential. If bearing removal is required; for additional information, refer to [Differential Case](#) in this section.

NOTE: The anti-lock speed sensor ring cannot be reused once removed.

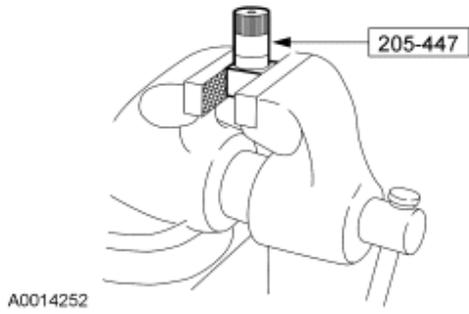
Remove the differential pinion shaft lock bolt, and remove the differential pinion shaft (4211).

- If required, remove the ring gear and anti-lock speed sensor ring.

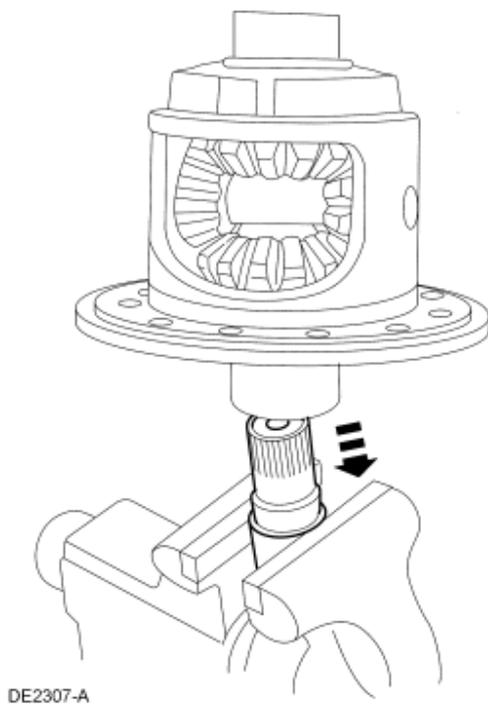


3. **NOTE:** This tool does not have the 1/2-inch drive hole.

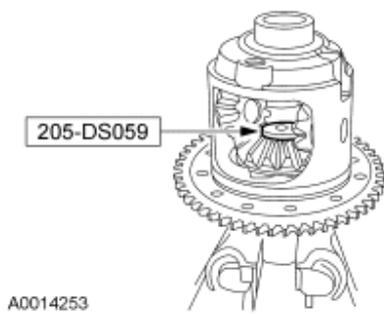
Install the special tool in a suitable vise.



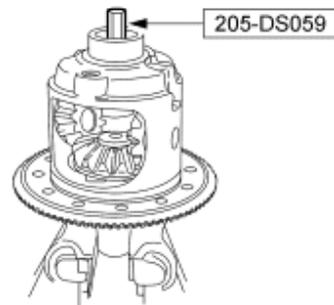
4. Install the differential case on the tool.



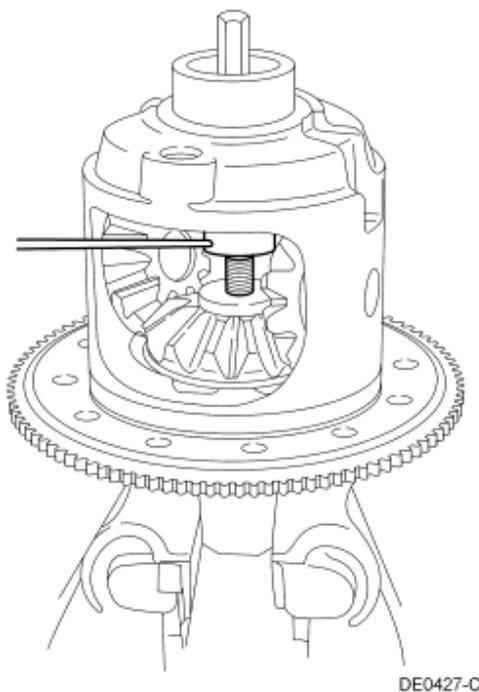
5. Install the special tool in the bottom side gear bore.
 - Apply a small amount of grease to the centering hole of the special tool.



6. Install the nut in the upper differential side gear (4236). Hold the nut in position while installing the hex screw. Tighten the hex-head screw until contact is made with the Step Plate.



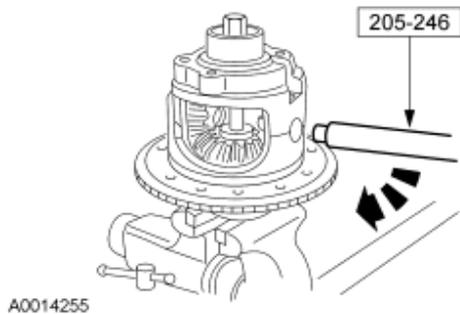
7. Insert a suitable dowel bar in the hole of the nut. Tighten the forcing screw to force the differential side gear away from the differential pinion gears (4215). The dowel bar is used to keep the nut from turning when the forcing screw is tightened.



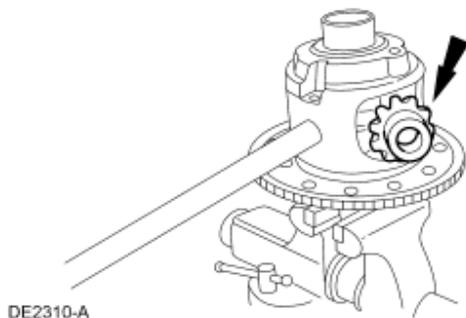
8. **⚠ WARNING: Keep fingers/hands away from pinion gears when rotating the differential case with the differential rotating tool.**

NOTE: Differential pinion thrust washers (4230) cannot be removed independently of the differential pinion gears and so must be removed simultaneously with the differential pinion gears.

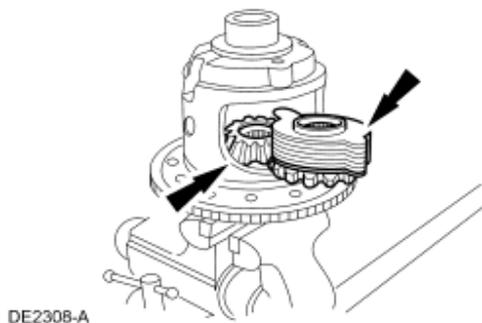
Insert the special tool in the pinion shaft bore, and turn the differential case to "walk" the differential pinion gears and differential pinion thrust washers out to the differential case windows.



9. Remove the differential pinion gears and differential pinion thrust washers.



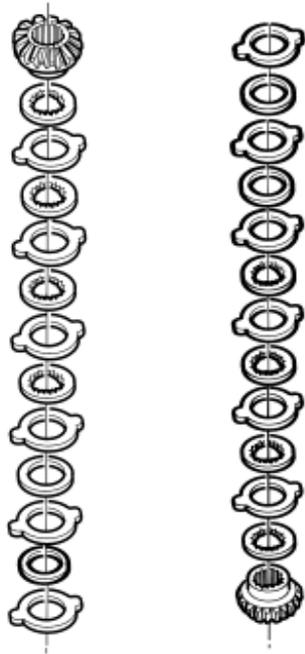
10. Remove the differential side gears and differential clutch packs (4947), and tag them RIGHT and LEFT with the shim.



11. **⚠ CAUTION:** When separating the clutch plates and clutch discs, note the sequence in which they are disassembled. They must be reassembled in the same sequence.

⚠ CAUTION: Do not use acids or solvents when cleaning the differential clutch pack. Wipe components with a clean, lint-free cloth only.

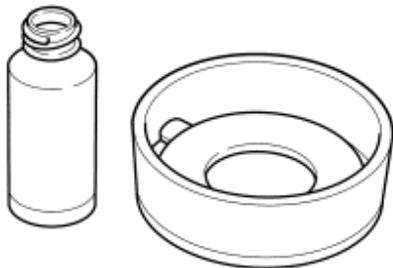
Separate the differential clutch discs and clutch plates for cleaning and inspection. Refer to the disassembled view of the limited slip differential case in the Description and Operation portion of this section.



DE1781-B

Assembly

1. Prelubricate each steel clutch plate and soak all friction plates in Additive Friction Modifier C8AZ-19B546-A or equivalent meeting Ford specification EST-M2C118-A for at least 15 minutes.



DE0330-B

2. **NOTE:** Do not mix the differential clutch packs or shims from one side with the other.

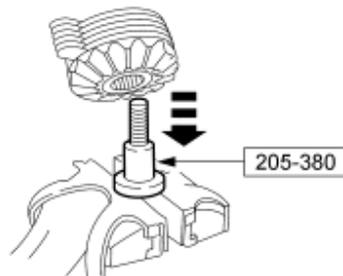
NOTE: The Belleville spring is a dished plate.

Assemble the differential clutch packs (without the shims and Belleville springs) on the respective differential side gears.



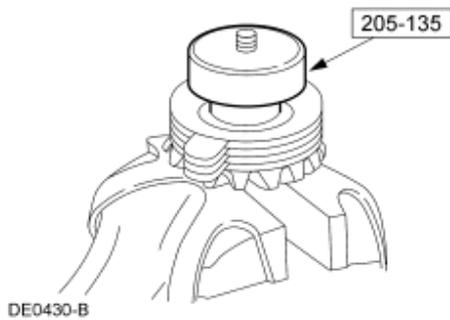
DE1782-B

3. Clamp the bolt head of the special tool in a vise. Install the differential clutch pack and the differential side gear (without the shim or the Belleville spring) on the gauge.

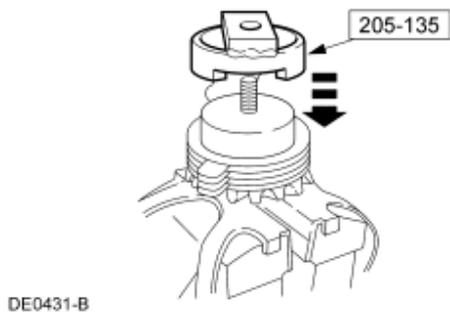


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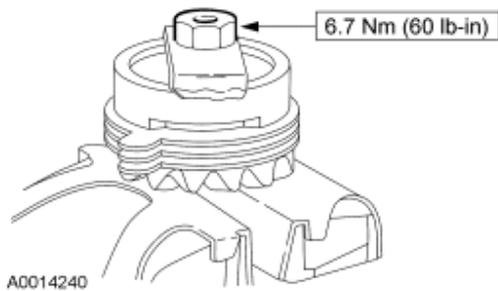
4. Position the special tool on top of the differential clutch pack.



5. Install the special tool over the disc and differential clutch pack.



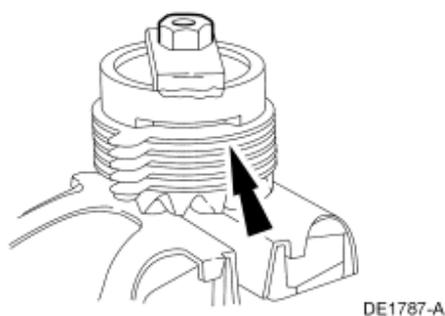
6. Install the nut of the gauge over the top and base stud.



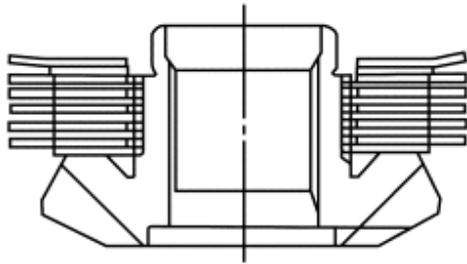
7. Use the Feeler Gauge Set and select the thickest blade that will enter between the tool and the differential clutch pack. The reading will be the thickness of the new clutch shim. Select the correct shim size, and remove the special tools.

Part Number	Description
F75Z-4A324-DA	0.030 Inch
F75Z-4A324-EA	0.035 Inch
F75Z-4A324-FA	0.040 Inch
F75Z-4A324-GA	0.045 Inch
F75Z-4A324-HA	0.050 Inch
F75Z-4A324-JA	0.055 Inch
F75Z-4A324-KA	0.060 Inch

- 8.

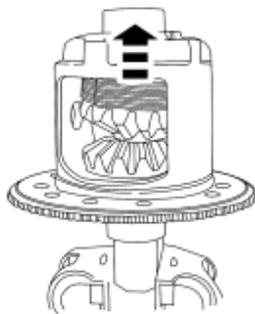


8. Place the shim and Belleville spring on the differential clutch pack.
 - The dished or concave side of the Belleville spring must face up and against the thrust face of the differential case.
 - Refer to the exploded view in the Description and Operation portion of this section.



DE1780-A

9. Insert the differential clutch packs with shims and Belleville springs and differential side gears into the differential case.
- Hold the upper differential clutch pack and side gear assembly in place to prevent it from falling out of the differential case.



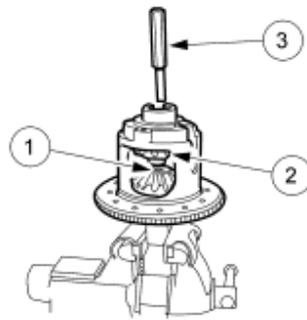
DE0331-B

10. **NOTE:** Apply a small amount of grease to the Step Plate bore.

NOTE: If necessary, insert the dowel bar in the nut bore to keep the nut from turning as the hex screw is tightened.

Assemble the forcing screw, nut and Step Plate to the differential case.

1. Position the Step Plate in the bottom side gear bore.
2. Position the nut in the top side gear bore and hold it in place.
3. Install the hex-head screw and tighten it two turns after it contacts the bottom Step Plate.

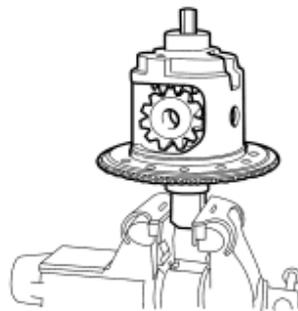


DE0332-C

11. **NOTE:** Prelubricate both sides of the differential pinion thrust washers with SAE 75W-140 High Performance Rear Axle Lubricant F1TZ-19580-B or equivalent meeting Ford specification WSL-M2C192-A.

NOTE: Make sure the differential pinion gears are 180 degrees apart so they will align correctly with the pinion shaft bore.

Position the differential pinion gears and differential pinion thrust washers in the window of the differential case so they mesh with the differential side gear teeth.

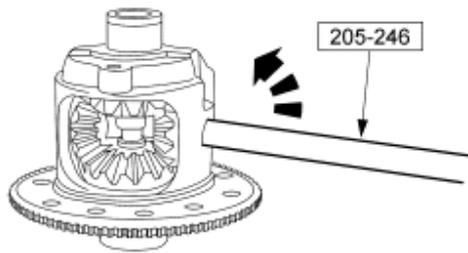


DE0333-B

12. **⚠ WARNING: Keep fingers/hands away from pinion gears when rotating the differential case with the differential rotating tool.**

NOTE: It will probably be necessary to loosen or tighten the forcing screw to allow the differential pinion gears and differential side gears to rotate.

Insert the special tool into the pinion shaft bore, and turn the differential case. This will cause the differential pinion gears to engage the differential side gears and "walk" into the differential case. Rotate the differential case until the pinion mating shaft holes are lined up exactly with the holes in the differential pinion gears.

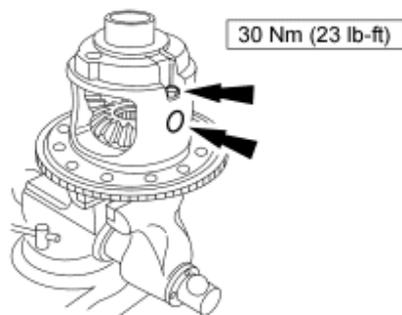


A0013614

13. **⚠ CAUTION: If a new pinion shaft lock bolt is not available, use Stud and Bearing Mount E0AZ-19554-BA or equivalent meeting Ford specification WSK-M2G349-A1 and tighten to specification.**

Loosen the forcing screw, and remove the Step Plate and nut from the side gear bores. Install the differential pinion shaft in the differential case.

- Install a new differential pinion shaft lock bolt.

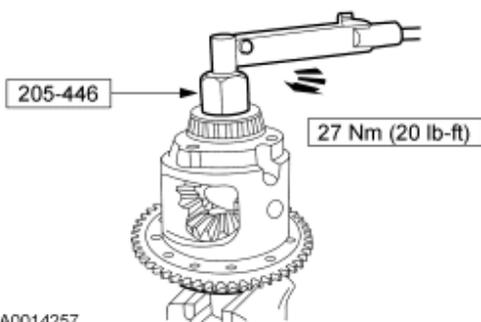


DE2306-A

14. Replace the differential bearings, if removed.

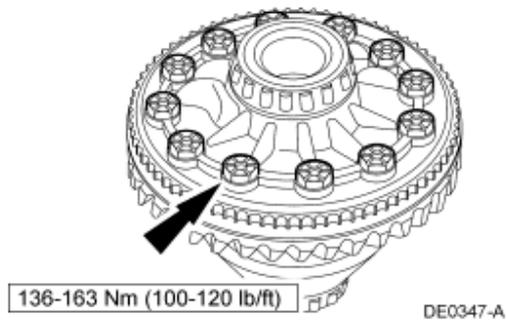
15. Check the torque required to rotate one differential side gear.

- Install the special tool with the (1/2-inch drive hole) as shown.
- The initial break-away torque, if original clutch plates are used, must be within specification. The rotating torque required to keep the differential side gear turning with new clutch plates may vary.



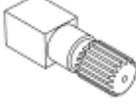
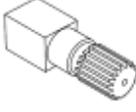
A0014257

16. Install the ring gear and, if removed, a new anti-lock speed sensor ring on the differential case and tighten the retaining bolts.



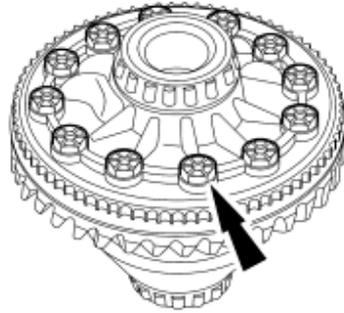
17. Install the differential case; for additional information, refer to [Differential Case](#) in this section.
-

Differential Case and Ring Gear—Two-Piece, Traction-Lok

Special Tool(s)	
 ST1374-A	Gauge, Differential Clutch 205-135 (T80P-4946-A)
 ST1372-A	Gauge, Differential (Traction-Lok) 205-389 (T97T-4946-A)
 ST2203-A	Preload Gauge, Differential Clutch 205-446
 ST2203-A	Preload Gauge, Differential Clutch 205-447

Disassembly

1. Remove the differential case (4204); for additional information, refer to [Differential Case](#) in this section.
2. Remove the ring gear bolts.

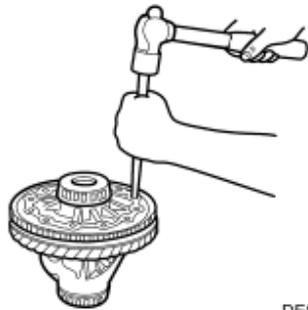


DE0309-A

3. **NOTE:** The anti-lock speed sensor ring cannot be reused once removed.

Insert a punch in the bolt holes and drive the ring gear off.

- If necessary, remove the anti-lock speed sensor ring and discard it.

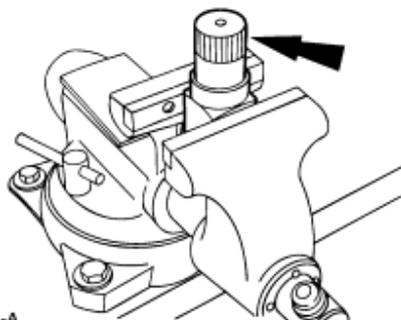


DE0310-A

4. If the differential bearings (4221) require removal, refer to [Differential Case](#) in this section.

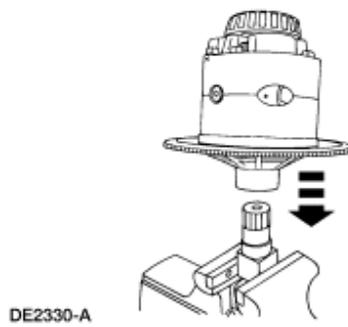
5. **NOTE:** This tool does not have the 1/2-inch drive hole.

Position the Traction-Lok Torque Tool Set in a vise.

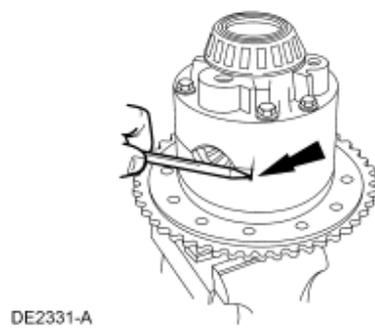


DE2315-A

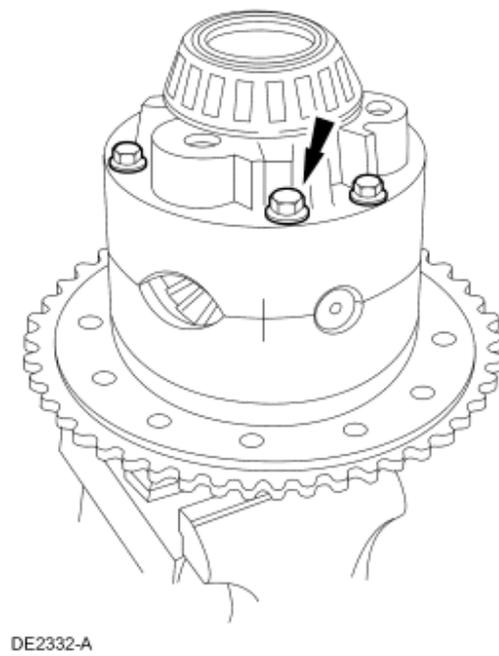
6. Position the differential case on the Traction-Lok Torque Tool Set.



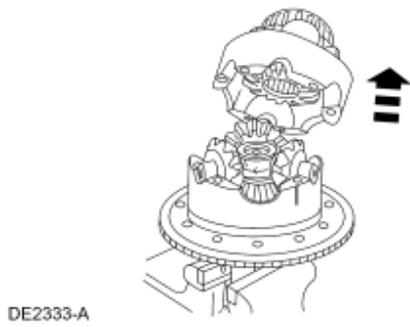
7. Index mark the differential case halves.



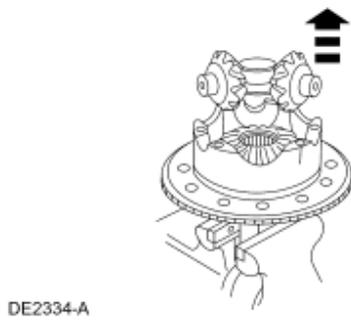
8. Remove the differential case bolts.



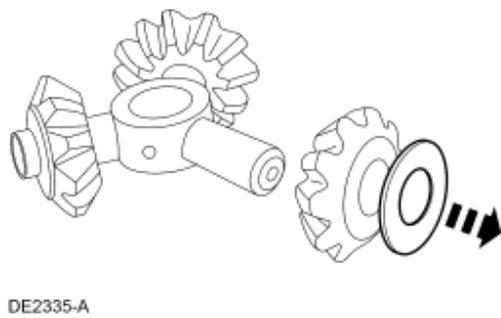
9. Remove the right differential case half and differential side gear (4236).



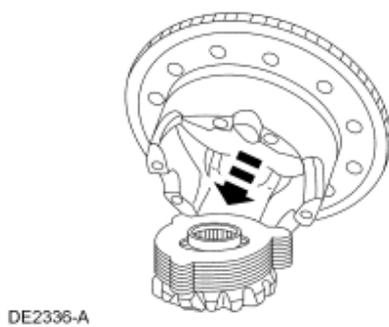
10. Remove the differential pinion shaft (4211) and differential pinion gears (4215).



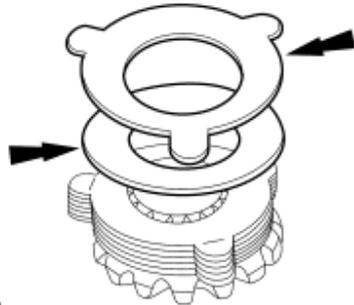
11. Remove the differential pinion gears from the differential pinion shaft.



12. Remove both differential side gears and differential clutch packs (4947) from each differential case half.



13. Remove the Belleville spring and shim(s) from both differential clutch packs.



DE2337-A

Assembly

1. Prelubricate each clutch disc and soak the clutch friction plate for at least 15 minutes in Additive Friction Modifier C8AZ-19B546-A or equivalent meeting Ford specification EST-M2C118-A.



DE2338-A

2.  **CAUTION: Do not mix the differential clutch packs or shims from one side with the other.**

NOTE: The Belleville spring is a dished plate.

Assemble the differential clutch packs (without the shims and Belleville springs) on the respective differential side gears.

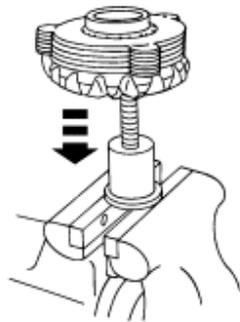


DE2339-A

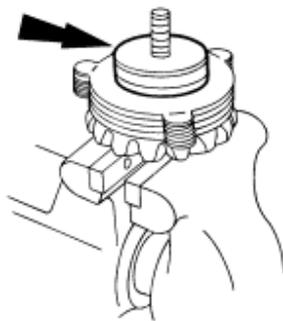
3. **NOTE:** Use the Traction-Lok Clutch Gauge Mandrel for the procedure. Refer to the Special Tool(s) Chart.

Clamp the bolt head of the Traction-Lok Clutch Gauge in a vise.

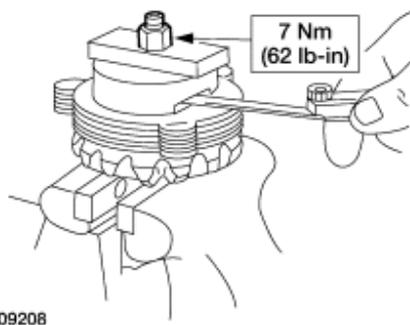
- Install the differential clutch pack and the differential side gear (without the shim or the Belleville spring) on the gauge.



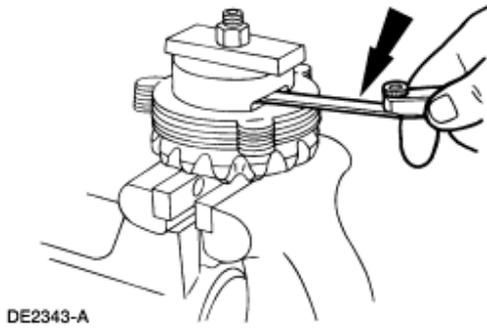
4. Position the Traction-Lok Clutch Gauge disc on top of the differential clutch pack.



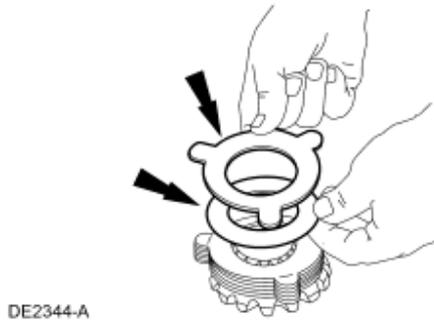
5. Install the Traction-Lok Clutch Gauge housing over the disc and tighten the nut.



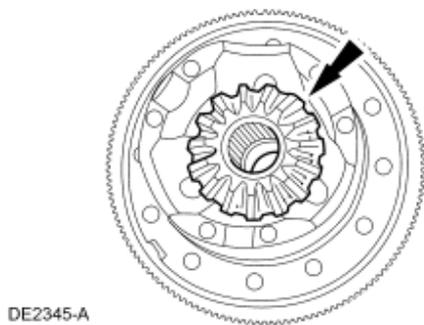
6. Use a feeler gauge and select the thickest blade that will enter between the tool and the differential clutch pack.
 - The reading will be the thickness of the new clutch shim.
 - Select the correct shim size, and remove the Traction-Lok Clutch Gauge.



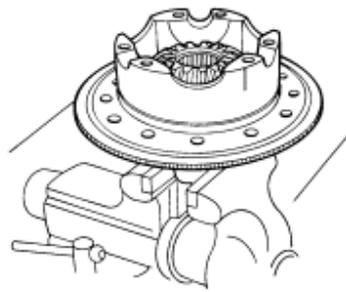
7. Place the selected shim and Belleville spring on the differential clutch pack.
 - The dished or concave side of the Belleville spring must be face up and against the thrust face of the differential case.



8. Install the differential side gear and differential clutch pack into the left case half (ring gear side).



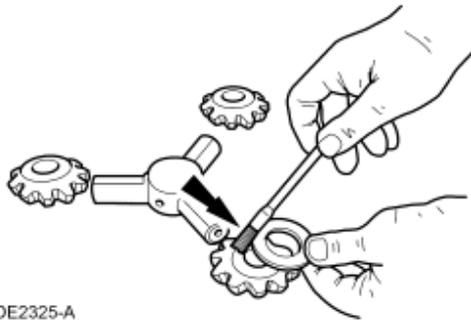
9. Position left differential case half on the Traction-Lok Torque Tool Set.



DE2346-A

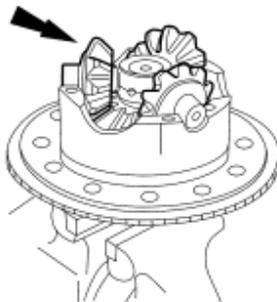
10. Lubricate the differential pinion gears, pinion gear thrust washers and the differential pinion shaft with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.

- Install the differential pinion gears in the differential pinion shaft.



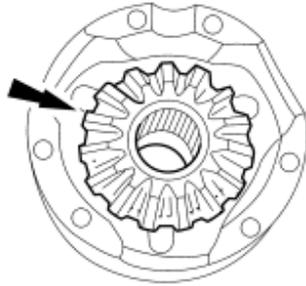
DE2325-A

11. Install the differential pinion shaft and the differential pinion gears.



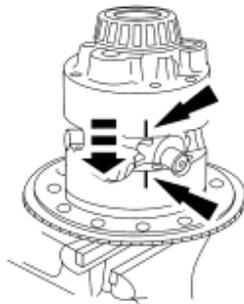
DE2347-A

12. Install the right differential clutch pack and differential side gear into the right case half.



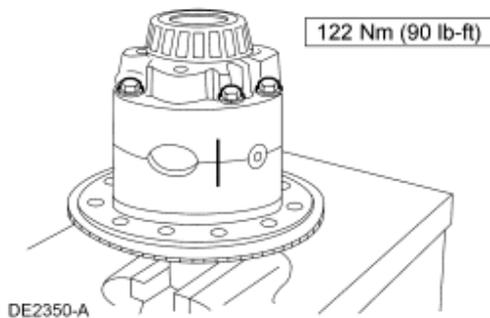
DE2348-A

13. Position the right differential case half with the index marks aligned.



DE2349-A

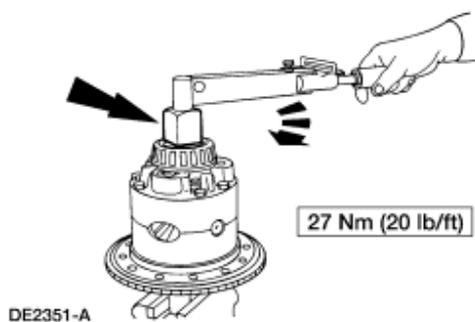
14. Install the retaining bolts and tighten.



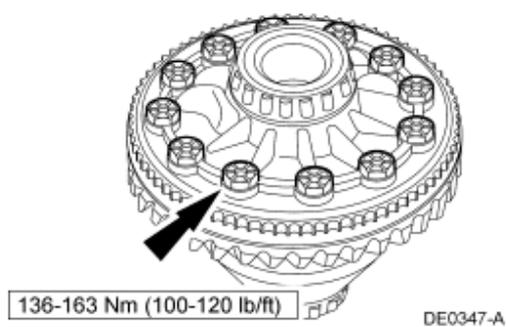
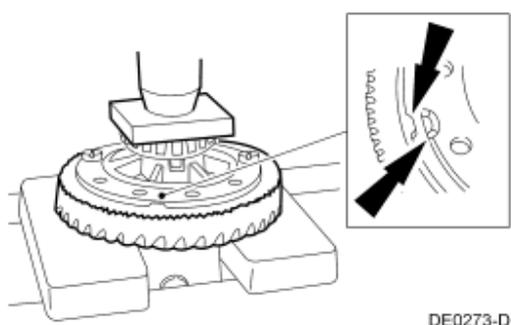
DE2350-A

15. Check the torque required to rotate one differential side gear.

- Install the Traction-Lok Torque Tool Set with the 1/2-inch drive hole as shown.
- The initial break-away torque, if the original clutch plates are used, must be within specification. The rotating torque required to keep the differential side gear turning with new clutch plates may vary.



16. Install the ring gear and, if removed, a new anti-lock speed sensor ring on the differential case and tighten the retaining bolts.



17. Install the differential case. For additional information, refer to [Differential Case](#) in this section.
-

**SECTION 205-02E:
Wheel Hubs and Bearings — Full Floating Axle — Ford**

[SPECIFICATIONS](#)

DESCRIPTION AND OPERATION

[Wheel Hubs and Bearings](#)

DIAGNOSIS AND TESTING

[Wheel Hubs and Bearings](#)

REMOVAL AND INSTALLATION

[Axle Shaft](#)

[Bearings, Cups and Seals](#)

[Hub](#)

SECTION 205-02E: Wheel Hubs and Bearings — Full
Floating Axle — Ford

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Workshop Manual

SPECIFICATIONS

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General Specifications	
Item	Specification
SAE 75W-140 High Performance Rear Axle Lubricant F1TZ-19580-B	WSL-M2C192-A
Premium Long-Life Grease XG-1-C	ESA-M1C75-B
Stud and Bearing Mount EOAZ-19554-BA	WSK-M2G349-A1

Torque Specifications		
Description	Nm	Lb-Ft
Axle Shaft Retaining Bolts	109	80

Hub Nut ^a	—	—
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^a Refer to text.

SECTION 205-02E: Wheel Hubs and Bearings — Full
Floating Axle — Ford

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DESCRIPTION AND OPERATION

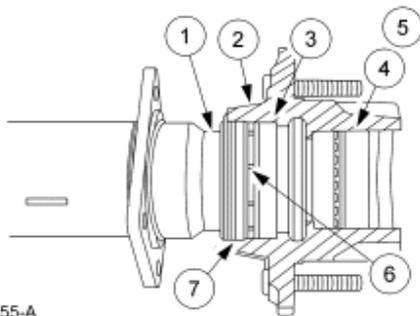
[Procedure revision date:](#)
[01/26/2000](#)

Wheel Hubs and Bearings

The full-floating rear axle features disc brakes. The disc brake calipers must be removed to remove rotors and hubs. The rotor on the single rear wheel design can be removed without removing the hub. Dual rear wheel axles require that the hub and rotor be removed as a unit.

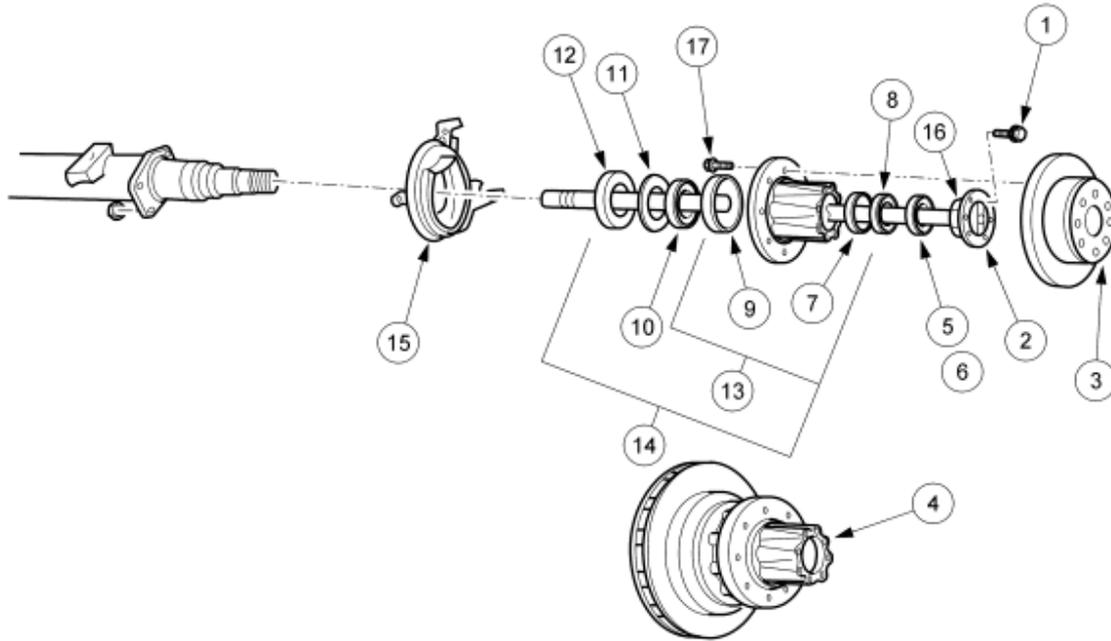
Both DRW and SRW hubs feature a cartridge type seal that must be replaced anytime the hub is removed.

The rear hub is supported or floats on the axle spindle on two opposed tapered roller bearings. It is retained on the spindle by a ratcheting nut that is tabbed to a slot on the spindle.



Item	Part Number	Description
1	—	Spindle (Part of 4010)
2	1109	Hub
3	1244	Inner Bearing
4	1A124	Hub Nut (RH)
5	1A125	Hub Nut (LH)
6	4670	Slinger

7	1177	Hub Seal
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DE2356-B

Item	Part Number	Description
1	N811648-S100	Axle Shaft Bolts
2	4234	Axle Shaft
3	2C026	Rotor (SRW)
4	2C026	Hub and Rotor (DRW)
5	1A124	Hub Nut (RH)
6	1A125	Hub Nut (LH)
7	1239	Outer Bearing Cup
8	1240	Outer Cone and Roller
9	1243	Inner Bearing Cup
10	1244	Inner Bearing
11	4670	Slinger
12	1177	Hub Seal
13	1A034	Rear Hub Assy (with Cups)
14	1109	Rear Hub Assy (Complete)
15	2209	Parking Brake Assy
16	390258-S	O-Ring

17	W704709-S428	Wheel Studs
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SECTION 205-02E: Wheel Hubs and Bearings — Full
Floating Axle — Ford

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DIAGNOSIS AND TESTING

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[01/26/2000](#)

Wheel Hubs and Bearings

For additional information, refer to [Section 205-00](#).

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Floating Axle — Ford

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DIAGNOSIS AND TESTING

[Procedure revision date:](#)
[01/26/2000](#)

Wheel Hubs and Bearings

For additional information, refer to [Section 205-00](#).

Axle Shaft

Removal

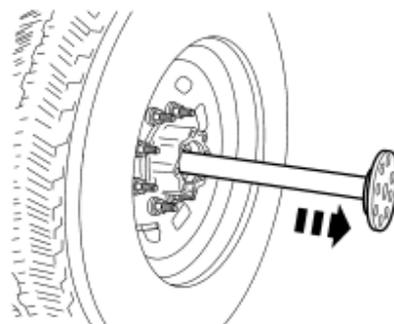
1. **NOTE:** The wheels and tires do not have to be removed in order to remove the axle shafts.

Loosen and remove the retaining bolts.



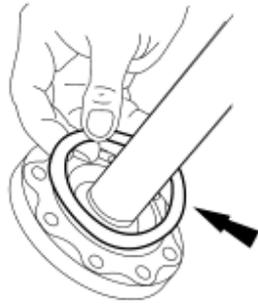
DE2288-A

2. Remove the axle shaft.



DE2357-A

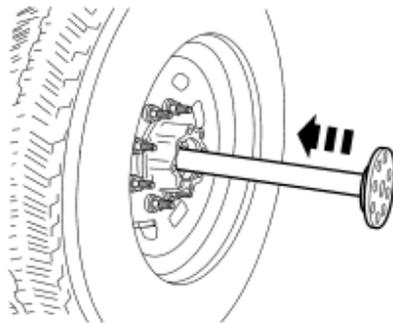
3. Inspect the axle shaft O-ring seal for cracks, nicks or wear and replace it if required.



DE2358-A

Installation

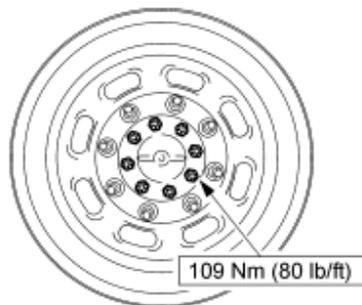
1. Install the axle shaft.



DE2359-A

2. **NOTE:** Coat the threads of the retaining bolts with Stud and Bearing Mount EOAZ-19554-BA or equivalent meeting Ford specification WSK-M2G349-A1.

Install the retaining bolts and tighten.



DE2360-B

Axle Shaft

Removal

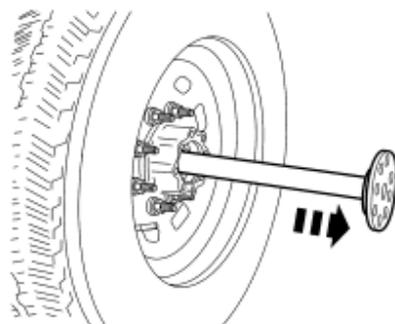
1. **NOTE:** The wheels and tires do not have to be removed in order to remove the axle shafts.

Loosen and remove the retaining bolts.



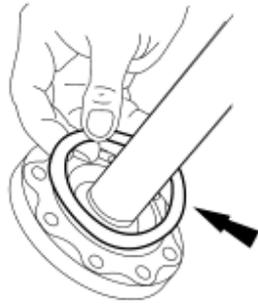
DE2288-A

2. Remove the axle shaft.



DE2357-A

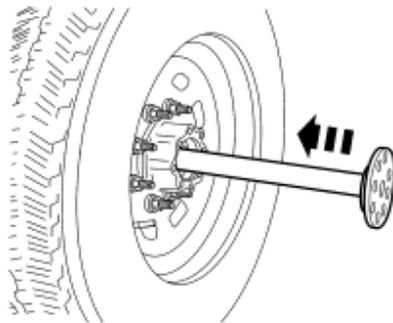
3. Inspect the axle shaft O-ring seal for cracks, nicks or wear and replace it if required.



DE2358-A

Installation

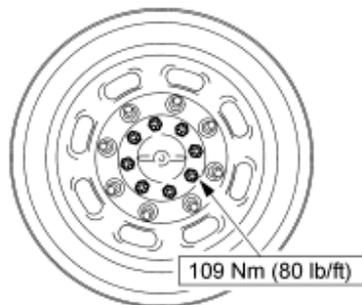
1. Install the axle shaft.



DE2359-A

2. **NOTE:** Coat the threads of the retaining bolts with Stud and Bearing Mount EOAZ-19554-BA or equivalent meeting Ford specification WSK-M2G349-A1.

Install the retaining bolts and tighten.

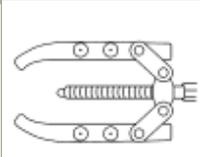
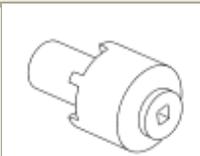


DE2360-B

REMOVAL AND INSTALLATION

[Procedure revision date:](#)
[01/26/2000](#)

Hub

Special Tool(s)	
 ST1260-A	2-Jaw Puller 205-D026 (D80L-1002-L) or Equivalent
 ST1868-A	Ford Axle Locknut Socket 205-448
 ST1543-A	Step Plate 205-D018 (D80L-630-7) or Equivalent

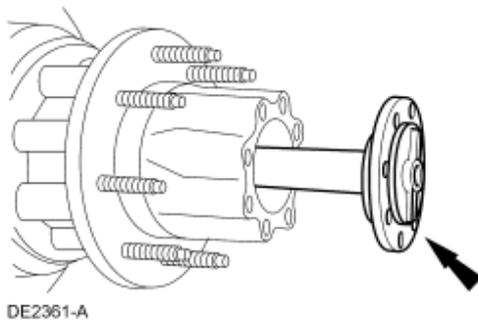
Removal

1. Set the parking brake.
2. Loosen the retaining bolts.



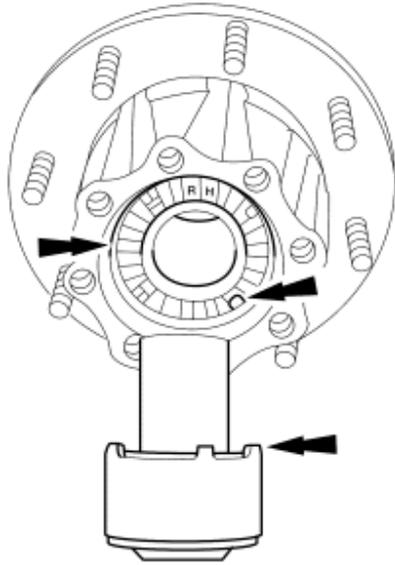
DE2288-A

3. Raise the vehicle to the desired working height, keeping the axle parallel with the floor; for additional information, refer to [Section 100-02](#).
4. Release the parking brake.
5. Remove the wheel(s); for additional information, refer to [Section 204-04](#).
6. Remove the brake caliper and rotor on the single rear wheel axle; for additional information, refer to [Section 206-04](#).
7. Remove the retaining bolts and axle shaft.



8.  **CAUTION: The hub nuts are right-hand thread (right hub) and left-hand thread (left hub). Each hub nut is stamped RH or LH.**

Install the Ford Axle Locknut Socket so that the drive tangs of the tool engage the four slots in the hub nut.



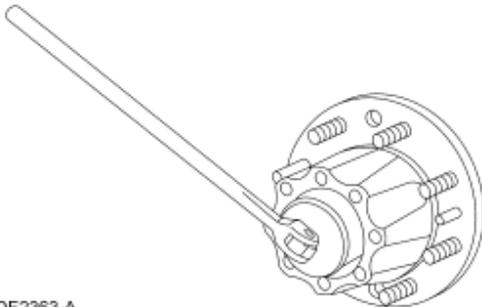
DE2362-A

9.  **CAUTION: Discard the hub nut if the hub nut comes apart during removal.**

 **CAUTION: Under no circumstances are power tools to be used when performing these operations.**

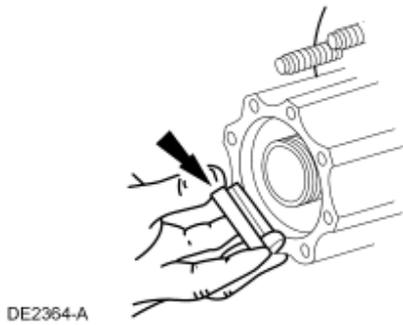
NOTE: The hub nut will ratchet during this operation.

Remove the hub nut (counterclockwise for right-hand thread; clockwise for left-hand thread).

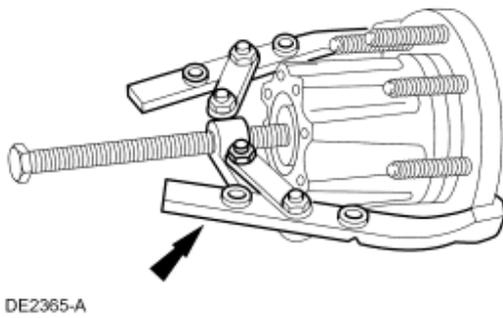


DE2363-A

10. Install the Step Plate.

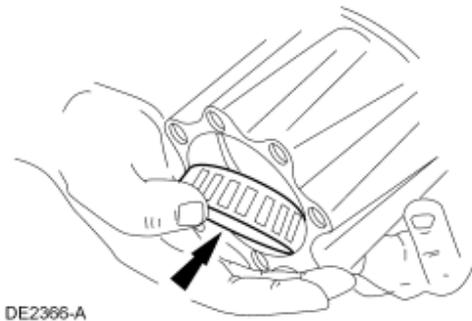


11. Install the 2-Jaw Puller and loosen the rear hub to the point of removal.



12. **⚠ CAUTION: Do not drop the outer hub bearing when removing the hub.**

Remove the rear hub assembly.



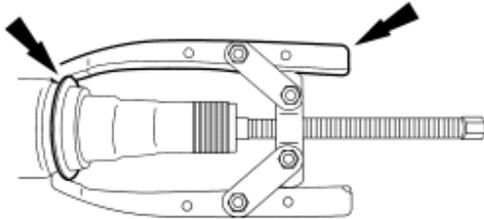
13. **⚠ CAUTION: Install a new hub seal each time the hub assembly is removed.**

NOTE: The inner bearing is located behind the hub seal.

Pack each bearing and replace the hub seals; for additional information, refer to [Bearings, Cups and Seals](#) in this section.

14. **⚠ CAUTION: Use extreme care not to scratch or gouge the seal or bearing surfaces.**

If after hub removal, the hub seal or seal inner sleeve remains on the spindle, remove it as shown using the Step Plate and the 2-Jaw Puller.



DE2367-A

15. Inspect the seal surface and inner shoulder for scratches and damage.
 - Remove all scratches, gouges or galling damage with #600 or finer crocus cloth.

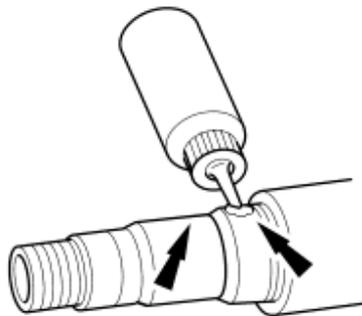


DE2368-A

Installation

1. **NOTE:** Clean the spindle thoroughly after removing the rear hub.

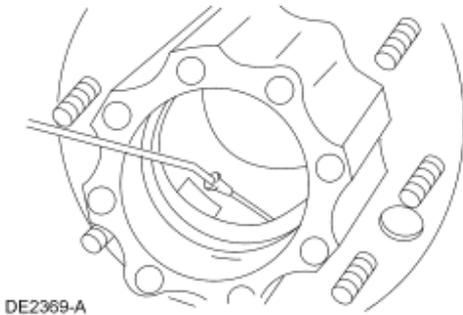
Coat the spindle with axle lubricant.



DE2370-A

2. **⚠ CAUTION: The hub bearings must be prelubed prior to installation.**

Fill the hub cavity with 29.6 ml (1 oz) of SAE 75W-140 High Performance Rear Axle Lubricant F1TZ-19580-B or equivalent meeting Ford specification WSL-M2C192-A.



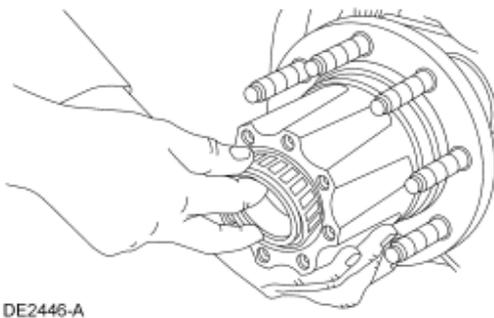
3. **⚠ CAUTION: Use extreme care not to damage the hub seal by allowing it to contact the spindle during installation.**

NOTE: Coat the spindle and hub seal inside diameter with SAE 75W-140 High Performance Rear Axle Lubricant FITZ-19580-B or equivalent meeting Ford specification WSL-M2C192-A.

NOTE: Installing the rear hub in this manner causes the outer bearing to act as a pilot making the installation easier.

Push the rear hub and outer bearing onto the spindle as an assembly.

- Hold the outer bearing seated and use the bearing as a pilot.

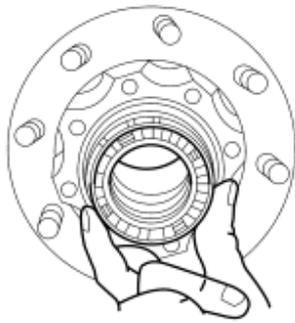


4. **⚠ CAUTION: Install a new hub nut if the hub nut comes apart during installation.**

⚠ CAUTION: Make sure the hub nut tab is located in the keyway prior to thread engagement.

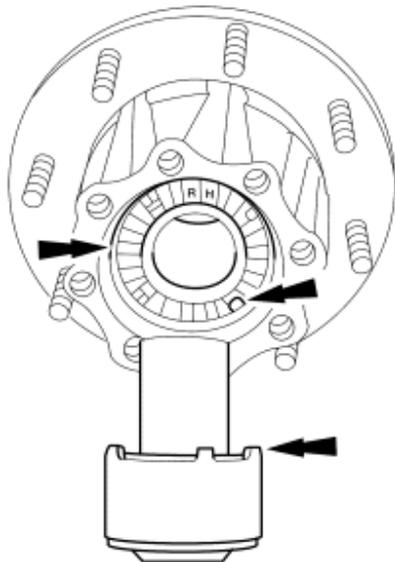
Install the hub nut on the spindle.

- Turn the hub nut clockwise for right-hand thread or counterclockwise for left-hand thread.



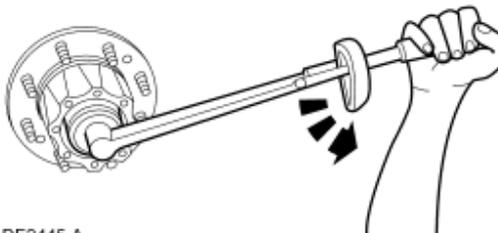
DE2371-A

5. Position the Ford Axle Locknut Socket on the hub nut.



DE2362-A

81 Nm (60 lb/ft)

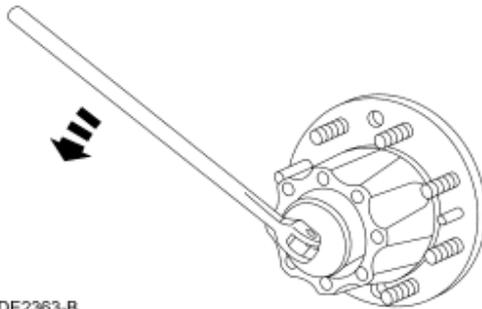


DE2445-A

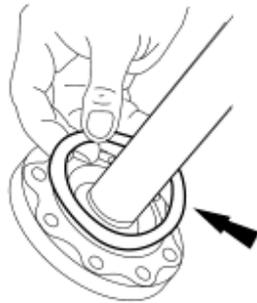
6.  **CAUTION:** Under no circumstances are power tools to be used when performing these operations.

NOTE: The hub nut will ratchet as torque is applied.

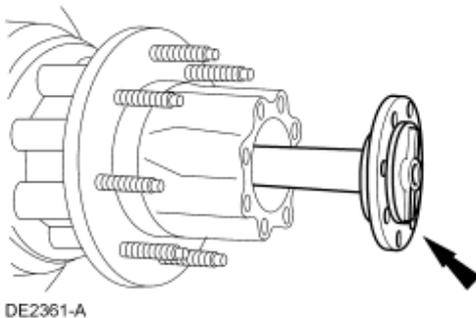
Tighten the hub nut, rotating the rear hub occasionally while tightening.



7. Adjust hub nuts as follows:
 - For new bearings, ratchet back five teeth or notches (1/8 turn) on the hub nut. Five notches must be felt during this operation in order to have performed it correctly.
 - For used bearings, ratchet back seven teeth or notches (1/6 turn) on the hub nut. Seven notches must be felt during this operation to have performed it correctly.
8. Inspect the axle shaft O-ring seal for cracks, nicks or wear and replace it if required.

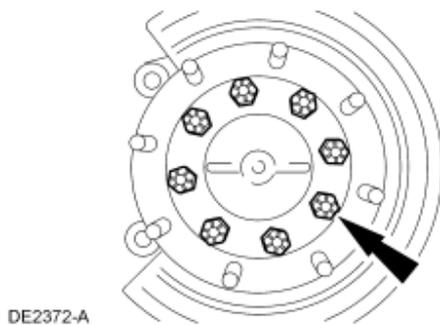


9. Install the axle shaft.



10. **NOTE:** Coat the threads of the retaining bolts with Stud and Bearing Mount EOAZ-19554-BA or equivalent meeting Ford specification WSK-M2G349-A1.

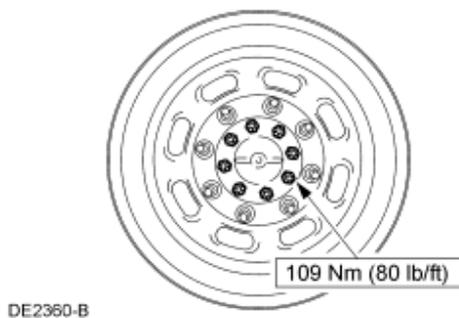
Install and tighten the retaining bolts until they seat.



11. **⚠ CAUTION: Remember, the last step of this procedure is to tighten the axle shaft bolts to specification, after the wheel lug nuts have been tightened.**

Install the brake rotor and caliper on the single rear wheel axles; for additional information, refer to [Section 206-04](#).

12. Install the wheels and tires but do not tighten the lug nuts to specification at this time.
13. Check the axle lubricant level; for additional information, refer to [Section 205-02D](#).
14. Lower the vehicle.
15. Tighten the wheel lug nuts; for additional information, refer to [Section 204-04](#).
16. Tighten the axle shaft retaining bolts.



**SECTION 205-03:
Front Drive Axle/Differential**

[SPECIFICATIONS](#)

DESCRIPTION AND OPERATION

[Front Drive Axle and Differential](#)

DIAGNOSIS AND TESTING

[Front Drive Axle](#)

GENERAL PROCEDURES

[Axle and Differential Drain and Refill](#)

IN-VEHICLE REPAIR

[Drive Pinion Seal](#)

REMOVAL AND INSTALLATION

[Axle Assembly](#)

DISASSEMBLY AND ASSEMBLY

[Axle](#)

[Differential Case](#)

General Specifications	
Item	Specification
Lubricants and Sealants	
SAE 90 Premium Rear Axle Lubricant C2AZ-19580-F	ESW-M2C105-A
High Temperature 4x4 Front Axle and Wheel Bearing Grease E8TZ-19590-A	ESA-M1C198-A
Clear Silicone Rubber D6AZ-19562-AA	ESB-M4G92-A or ESE-M4G195-A

Lubricant Fill Level Checks	
Item	Specification
Axle lubricant	2.8 liters (5.9 pints)

Backlash Specifications	
Item	Specification
Backlash between ring gear and pinion	0.13-0.20 mm (0.005-0.008 in)
Maximum ring gear backlash variation	0.05 mm (0.002 in)

Rotational Torque Ranges	
Item	Specification
Pinion bearing preload ^{a b c d}	1.7-3.4 Nm (15-30 lb-in)

^a Never back off the pinion nut to reduce preload. If preload reduction is necessary, install a new collapsible spacer and pinion nut.

^b Take frequent pinion bearing torque preload readings.

^c For new pinion bearing installation, tighten the pinion nut to a rotating torque of 1.7-3.4 Nm (15-30 lb-in) (217-678 Nm [160-500 lb-ft]).

^d For original pinion bearing installation, the reading must be 0.56 Nm (5 lb-in) more than the initial reading taken during the disassembly procedure.

Torque Specifications		
Description	Nm	lb-ft
Pinion nut ^{a b c d}	217-678	160-500
Bolt retaining the front driveshaft to the front axle flange	35	26
Nut retaining the u-bolt to the axle	133	99
Nut and bolt retaining the trackbar to the axle	174	129
Bolt retaining the stabilizer bar bracket to the axle	47	35
Bolt retaining the differential bearing cap to the differential housing	109	80
Bolt retaining the differential housing cover to the differential housing	47	35
Bolt retaining the ring gear to the differential case (model 50)	136	100
Bolt retaining the ring gear to the differential case (model 60)	183	135
Fill plug	27	20

^a Never back off the pinion nut to reduce preload. If preload reduction is necessary, install a new collapsible spacer and pinion nut.

^b Take frequent pinion bearing torque preload readings.

^c For new pinion bearing installation on model 50 and 60 axles, tighten the pinion nut to a rotating torque of 1.7-3.4 Nm (15-30 lb-in) (217-678 Nm [160-500 lb-ft]).

^d For original pinion bearing installation, the reading must be 0.56 Nm (5 lb-in) more than the initial reading taken during the disassembly procedure.

SECTION 205-03: Front Drive
Axle/Differential
DIAGNOSIS AND TESTING

1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Front Drive Axle

For additional information, refer to [Section 205-00](#).

SECTION 205-03: Front Drive
Axle/Differential
GENERAL PROCEDURES

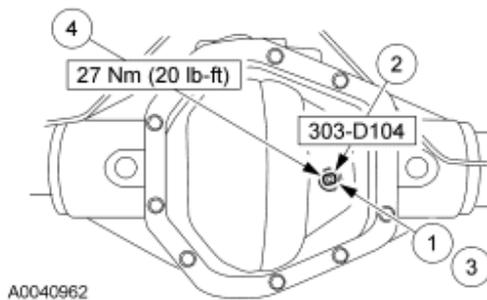
1999 F-Super Duty 250-550 Workshop
Manual
[Procedure revision date: 01/26/2000](#)

Axle and Differential Drain and Refill

Special Tool(s)	
	Oil Suction Gun 303-D104 (D94T-9000-A) or equivalent

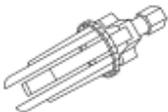
Material	
Item	Specification
SAE 90 Premium Rear Axle Lubricant C2AZ-19580-F	ESW-M2C105- A

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Drain and refill the axle lubricant.
 1. Remove the fill plug.
 2. Using the special tool, remove the axle lubricant through the fill hole.
 3. Fill the axle with the specified type and quantity of lubricant.
 4. Install the fill plug.



3. Lower the vehicle.
-

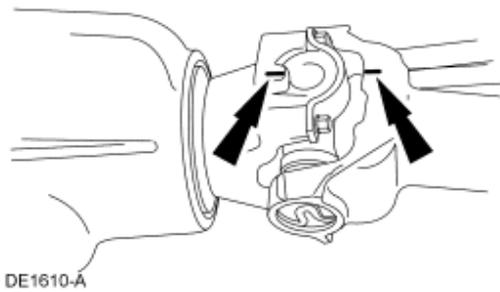
Drive Pinion Seal

Special Tool(s)	
 <p>ST1884-A</p>	<p>Holding Fixture, Drive Pinion Flange 205-012 (T57T-4851-B)</p>
 <p>ST1213-A</p>	<p>Remover, Bushing 307-001 (TOOL-1175-AC) or equivalent</p>
 <p>ST1512-A</p>	<p>Remover, Drive Pinion Flange 205-018 (T65L-4851-B)</p>
 <p>ST1351-A</p>	<p>Slide Hammer 100-001 (T50T-100-A)</p>

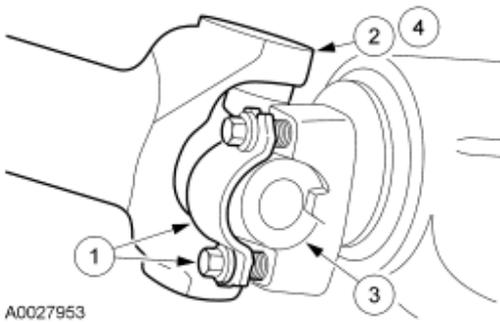
Material	
Item	Specification
SAE 90 Premium Rear Axle Lubricant C2AZ-19580-F	ESW-M2C105-A

Removal

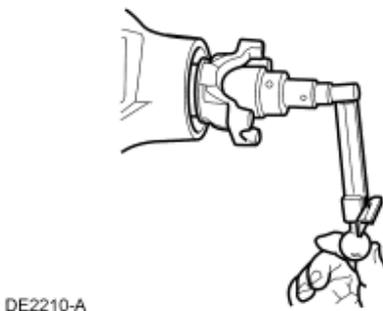
1. With the vehicle in NEUTRAL, raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Index-mark the front driveshaft and the front axle flange to maintain driveline balance.



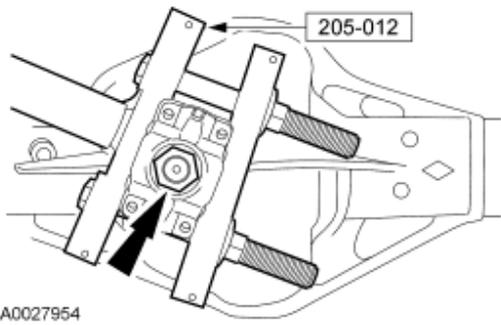
3. Disconnect the front driveshaft from the front axle flange, and position it aside.
 1. Remove and discard the four bolts and two retainers.
 2. Disconnect the front driveshaft from the front axle flange.
 3. Tape the bearing cups to the spider to prevent them from falling off the spider.
 4. Position the driveshaft aside.



4. Measure the pinion bearing torque preload. Record the reading.
 - Rotate the pinion with a Nm (lb-in) torque wrench. Record the torque necessary to maintain rotation of the pinion through several revolutions.

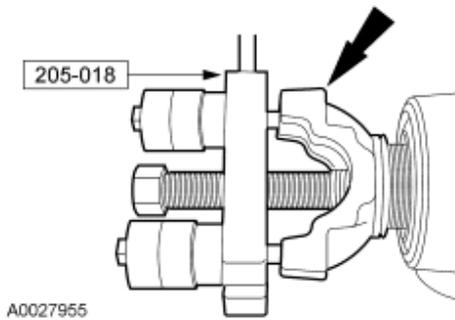


5. Remove and discard the nut and washer.
 - Use the special tool to prevent the flange from turning while removing the nut.

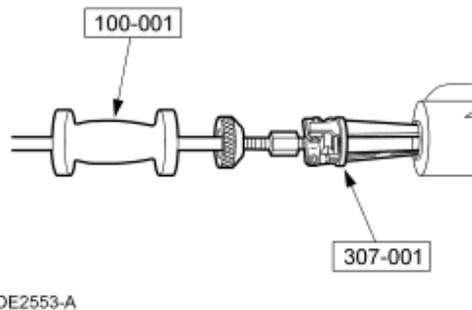


6. **NOTE:** Index-mark the flange and the pinion shaft.

Using the special tool, remove the flange.



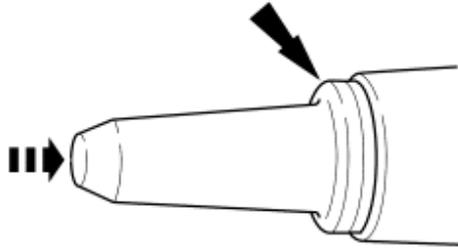
7. Using the special tools, remove the pinion seal. Discard the seal.



8. Clean and inspect the following:
- The seal mounting surface.
 - The flange lugs and the flange end that contacts the bearing cone.
 - Verify that the flange nut counterbore and the seal contact surfaces are smooth and free of nicks.

Installation

1. Using a suitable driver, install the pinion seal.
 - Lightly coat the pinion seal lip with lubricant.

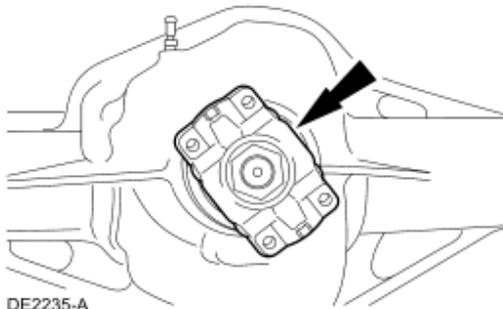


A0008790

2. **⚠ CAUTION: Never use a metal hammer on the pinion flange or install the flange with power tools. If necessary, use a plastic hammer to tap on a tight fitting flange.**

NOTE: Align the index marks.

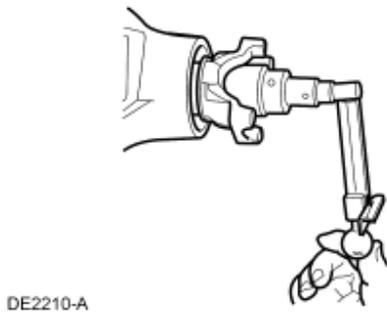
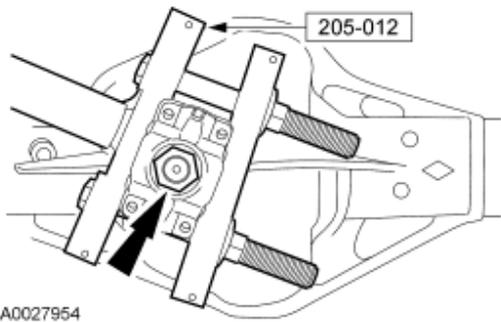
Lightly coat the flange splines and seal mating area with lubricant, then install the flange with a new washer and nut.



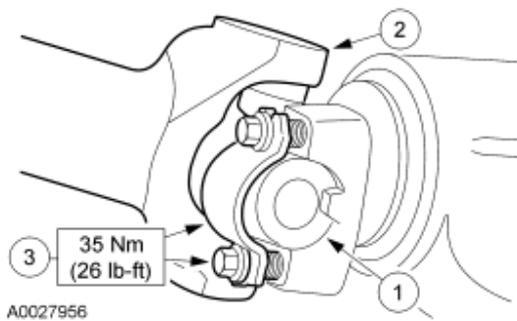
3. **⚠ CAUTION: Never back off the pinion nut to reduce preload. If preload reduction is necessary, install a new collapsible spacer and pinion nut.**

Tighten the nut.

- Use the special tool to prevent the flange from turning while tightening the nut. Remove the special tool when taking pinion bearing torque preload readings.
- Take frequent pinion bearing torque preload readings.
- The final reading must be 0.56 Nm (5 lb-in) more than the initial reading taken during removal.



4. Connect the front driveshaft to the front axle flange.
 1. Remove the tape from the bearing cups.
 2. Connect the front driveshaft to the front axle flange.
 3. Install the two new retainers and four new bolts.

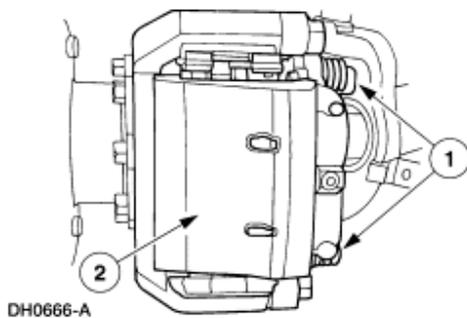


5. Check and, if necessary, fill the axle with the specified lubricant. For additional information, refer to Specifications in this section.
 6. Lower the vehicle.
-

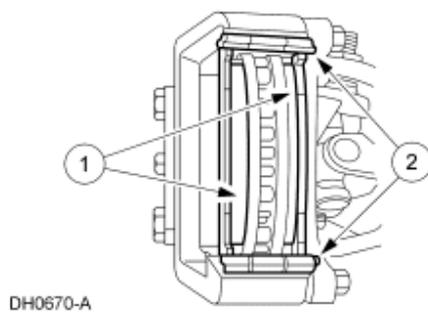
Axle Assembly

Removal

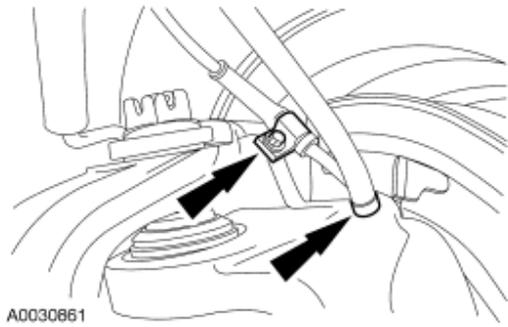
1. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).



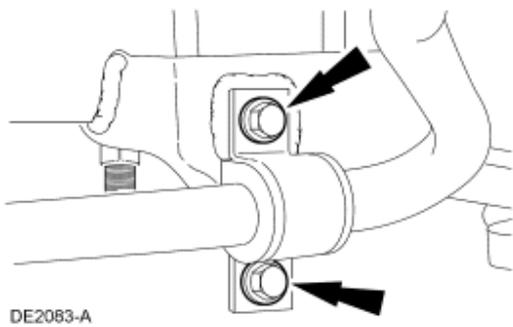
2. Remove the disc brake calipers.
 1. Remove the bolts.
 2. Lift the disc brake caliper from the disc brake caliper anchor plate.
 - Using mechanics wire, position the disc brake caliper aside.



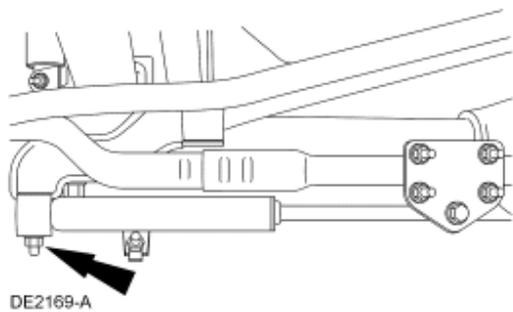
3. Remove the disc brake pads.
 1. Remove the disc brake pads.
 2. Remove the front disc brake caliper anchor rail clips.



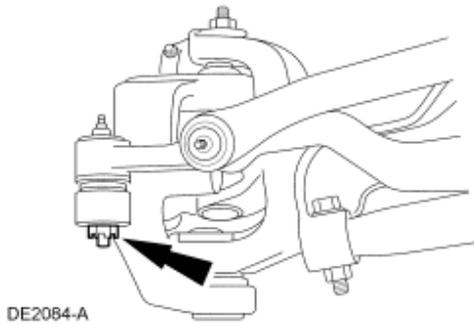
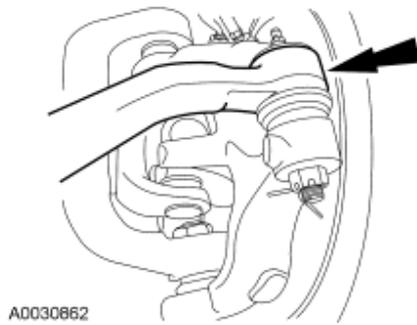
4. Disconnect the power vacuum hub hose from the knuckle, then disconnect the ABS sensor.
5. Remove the front stabilizer bar-to-axle retaining bolts.



6. If equipped, disconnect the steering damper at the axle. For additional information, refer to [Section 211-03](#).



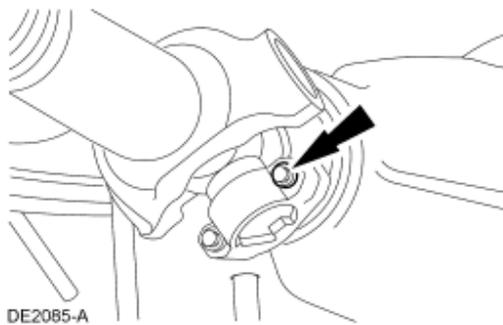
7. Disconnect the steering linkage at the steering knuckles, and position it aside. For additional information, refer to [Section 211-03](#).



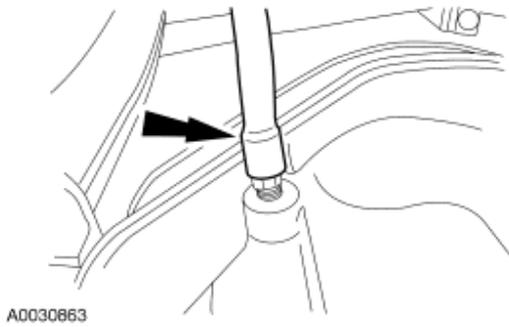
8.  **CAUTION: Index-mark the driveshaft to the companion flange to maintain proper driveline balance.**

Disconnect the driveshaft at the front axle, and position it aside. For additional information, refer to [Section 205-01](#).

- Wrap electrical tape around the bearing cups.



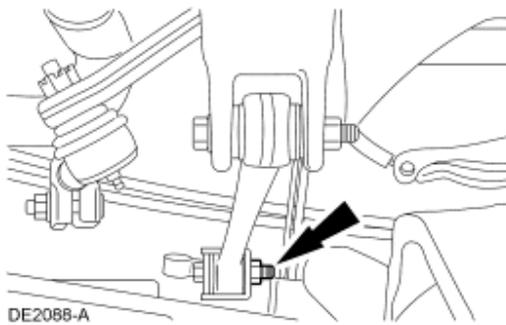
9. Disconnect the vent tube and plug the fitting.



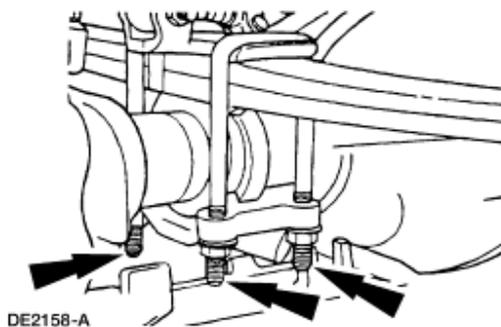
10. **NOTE:** It is necessary to load the suspension to remove the trackbar. Load the springs by allowing most of the front vehicle weight to rest on the axle.

Support the axle with a suitable jack, and lower the vehicle enough to relieve the tension on the trackbar. Then, disconnect the trackbar at the axle, and position it aside.

- Relieve the load on the suspension after disconnecting the trackbar.
- Leave the jack supporting the axle for removal from the vehicle.



11. Remove the U-bolts securing the axle to the springs.

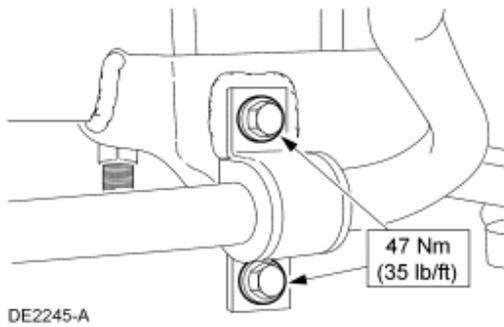
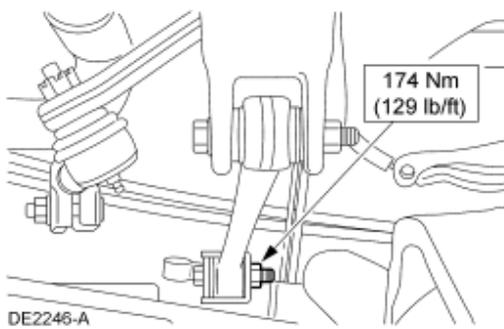
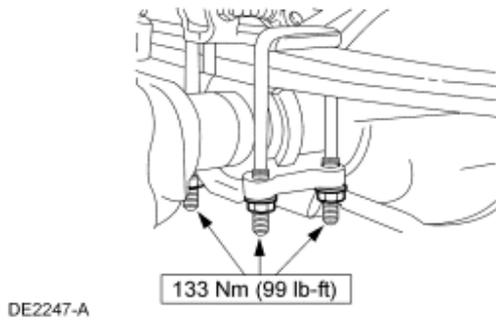


12. Lower and remove the axle.

Installation

1. Follow the removal procedure in reverse order.

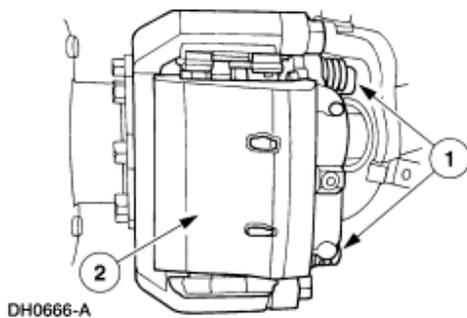
- Check and, if necessary, fill the axle with the specified lubricant. For additional information, refer to Specifications in this section.



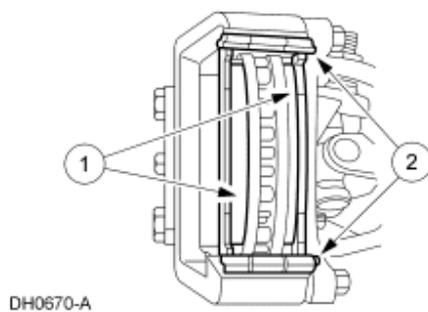
Axle Assembly

Removal

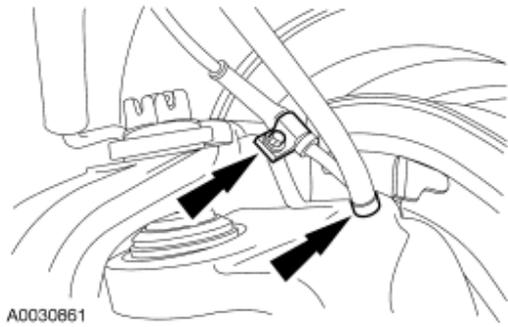
1. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).



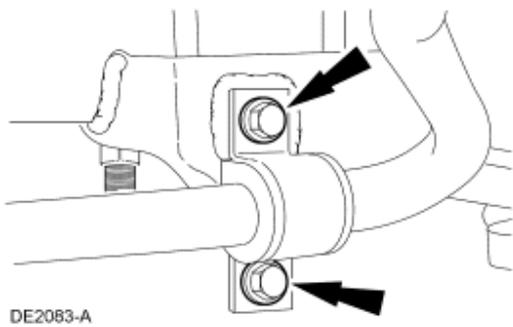
2. Remove the disc brake calipers.
 1. Remove the bolts.
 2. Lift the disc brake caliper from the disc brake caliper anchor plate.
 - Using mechanics wire, position the disc brake caliper aside.



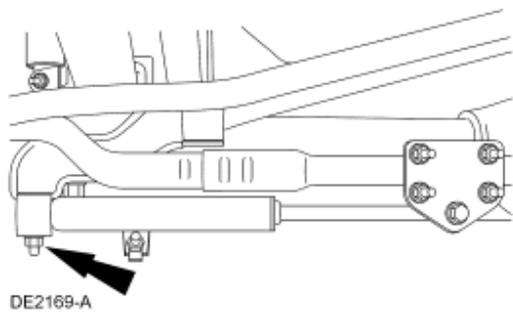
3. Remove the disc brake pads.
 1. Remove the disc brake pads.
 2. Remove the front disc brake caliper anchor rail clips.



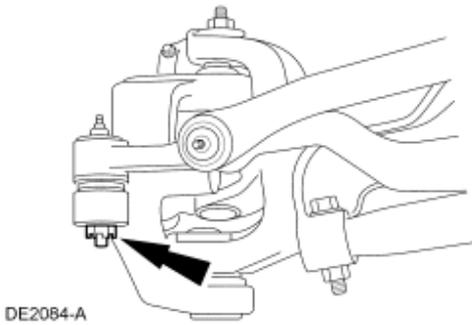
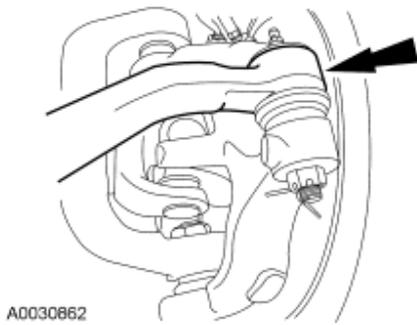
4. Disconnect the power vacuum hub hose from the knuckle, then disconnect the ABS sensor.
5. Remove the front stabilizer bar-to-axle retaining bolts.



6. If equipped, disconnect the steering damper at the axle. For additional information, refer to [Section 211-03](#).



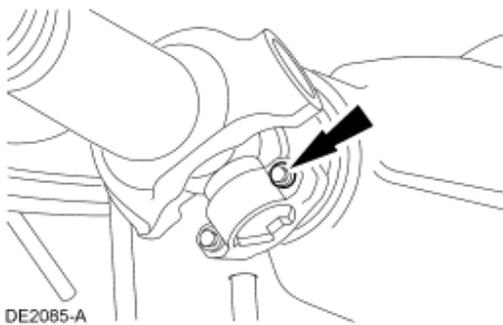
7. Disconnect the steering linkage at the steering knuckles, and position it aside. For additional information, refer to [Section 211-03](#).



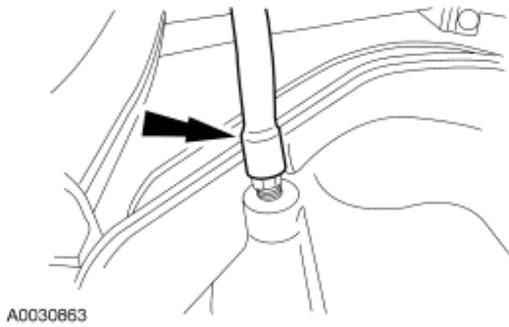
8.  **CAUTION: Index-mark the driveshaft to the companion flange to maintain proper driveline balance.**

Disconnect the driveshaft at the front axle, and position it aside. For additional information, refer to [Section 205-01](#).

- Wrap electrical tape around the bearing cups.



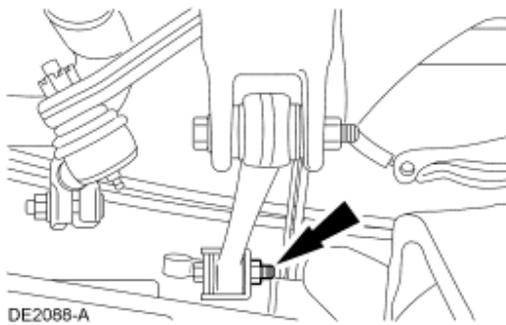
9. Disconnect the vent tube and plug the fitting.



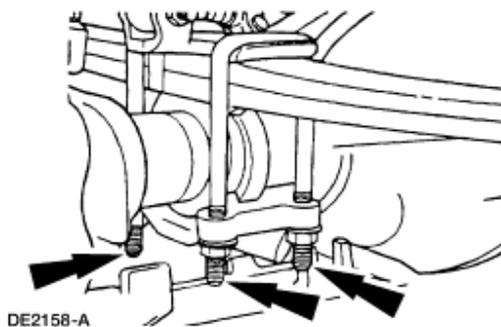
10. **NOTE:** It is necessary to load the suspension to remove the trackbar. Load the springs by allowing most of the front vehicle weight to rest on the axle.

Support the axle with a suitable jack, and lower the vehicle enough to relieve the tension on the trackbar. Then, disconnect the trackbar at the axle, and position it aside.

- Relieve the load on the suspension after disconnecting the trackbar.
- Leave the jack supporting the axle for removal from the vehicle.



11. Remove the U-bolts securing the axle to the springs.

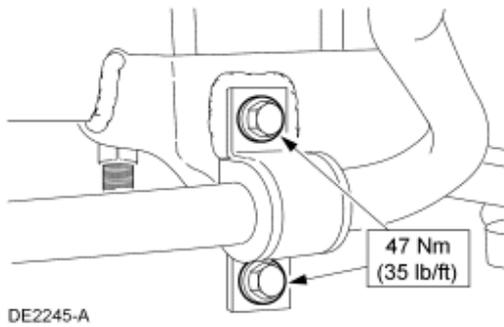
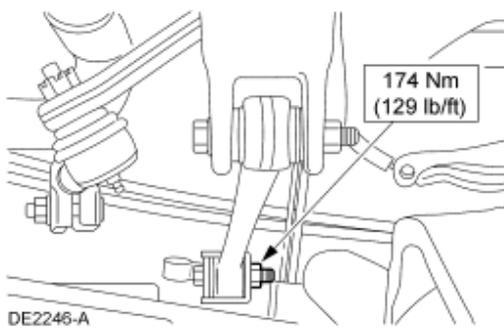
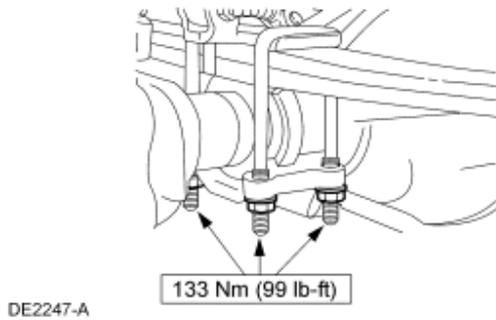


12. Lower and remove the axle.

Installation

1. Follow the removal procedure in reverse order.

- Check and, if necessary, fill the axle with the specified lubricant. For additional information, refer to Specifications in this section.



Differential Case

Special Tool(s)	
 ST1347-A	Puller, Drive Pinion/Differential Carrier 205-D036 (D81L-4220-A) or equivalent

Disassembly

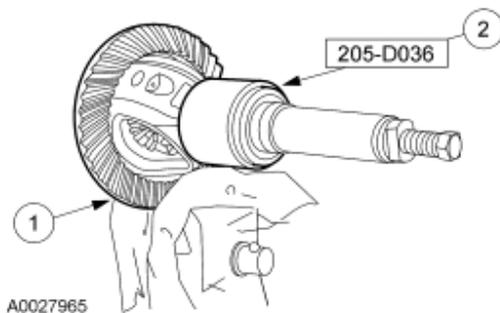
1.  **CAUTION: Do not reuse the bearings after removing them from the differential case (4204).**

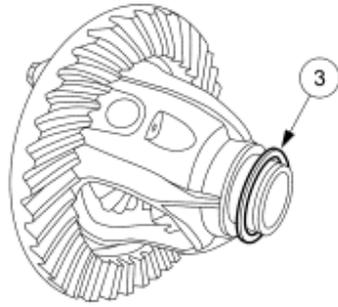
Remove the differential bearings and the shims.

1. Place the differential (4026) into a vise with soft jaws.
2. Using the special tool, remove the differential bearing.
3.  **CAUTION: Discard any damaged shims at time of assembly.**

Remove the differential bearing shims (4067).

- Wire the shims, the bearing cone, and the cup together. Identify from which side they were removed.
 - Repeat the procedure for the opposite side.





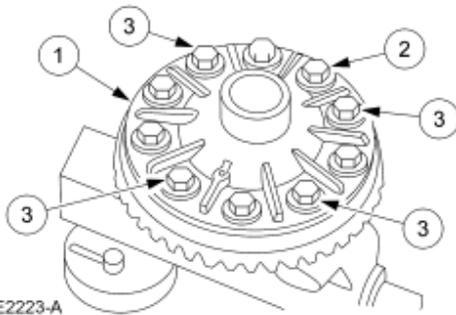
DE2222-A

2.  **CAUTION: Discard the bolts after removing them from the differential case.**

 **CAUTION: Place shop towels under the ring gear to prevent ring gear damage.**

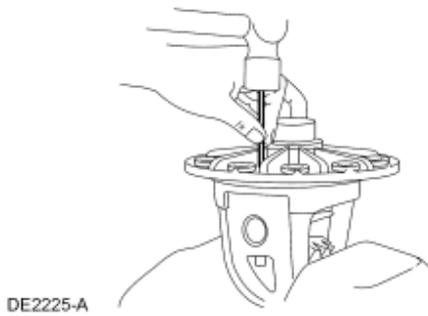
Remove the ring gear.

1. Place the differential case into a vise with soft jaws.
2. Remove and discard all but four of the bolts. Leave four loosely assembled bolts spaced apart from each other.
3. Tap each bolt head alternately with a soft face hammer to loosen the ring gear. Remove the bolts and the ring gear. Discard the bolts.

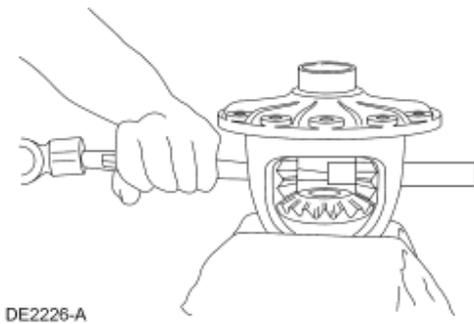


DE2223-A

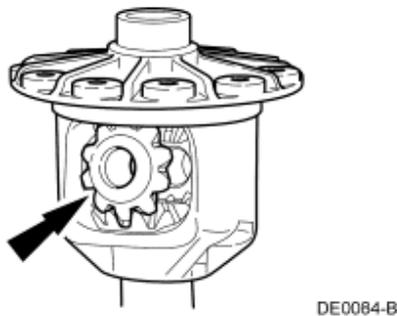
3. Using a hammer and a small drift, drive out the differential pinion shaft lock pin (4241).



4. Remove the differential pinion shaft (4211).



5. Remove the differential pinion gears (4215) and thrust washers, and the differential side gears (4236) and thrust washers.



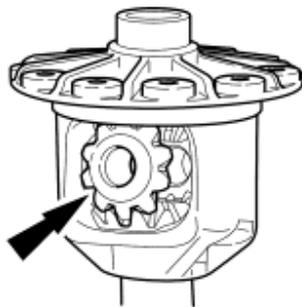
6.  **CAUTION: Always use new solvent when cleaning the bearings.**
 **CAUTION: Do not spin dry the bearings with compressed air.**
 **CAUTION: Oil the bearings immediately, to prevent rusting.**
 **CAUTION: If upon inspection, any component has score marks/chips, thoroughly clean the differential housing.**

Carry out the following inspection.

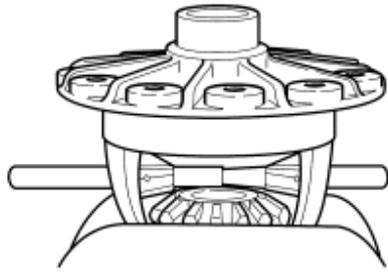
- Thoroughly clean all parts.
- Inspect all parts for damage.
 - Discard the complete differential if excessive wear is visible on all parts.
 - Discard both differential pinion gears and both differential side gears if any one of these gears are worn/damaged.
 - Verify that the differential bearing bores are smooth. Remove any nicks/burrs from the mounting surfaces of the differential housing.

Assembly

1. Place the differential case into a vise with soft jaws.
2. Apply axle and wheel bearing grease to the following.
 - The differential side gear thrust washers.
 - The differential side gear hubs and thrust faces.
 - The differential pinion thrust washers.
 - The differential pinion gears.
 - Assemble the gears and their respective washers.
3. Lubricate the gears with lubricant, then install them into the differential case.
 - Install and hold the differential side gears and thrust washers in the differential case. Then, install the differential pinion gears and thrust washers, and rotate them until the pinion shaft bore in the case and gears align.
 - If hand rotation of the gears is not possible, install an axle shaft into the differential side gear, and turn the shaft with a pipe wrench.
 - If necessary, use a drift to align the pinion shaft bores.

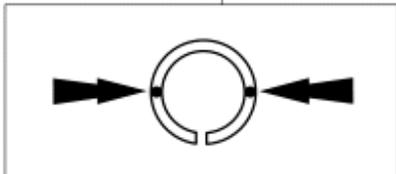


4. Install the differential pinion shaft, aligning the lock pin bore in the differential case and the pinion shaft.



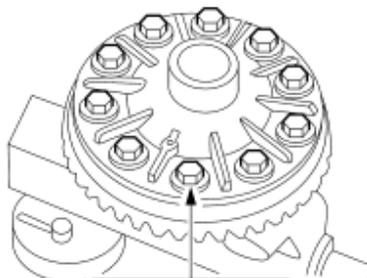
DE0085-B

5. Install the differential pinion shaft lock pin.
 - Peen the differential case metal over the lock pin, in two places, 90 degrees from the slot in the lock pin.



DE0086-B

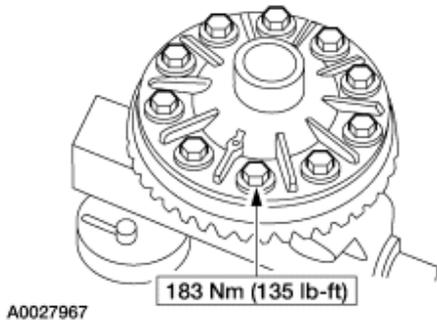
6. On model 50 axles, assemble the ring gear to the differential case, and alternately and evenly tighten the new bolts.



A0027966

136 Nm (100 lb-ft)

7. On model 60 axles, assemble the ring gear to the differential case, and alternately and evenly tighten the new bolts.



8. Install the differential bearings only after determining the appropriate amount of differential bearing shims to install. For additional information, refer to [Axle](#) in this section.
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