Front Axle 33

Group Index, Alphabetical

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General Information

General Description

NOTE: For front axle troubleshooting procedures, refer to **Section 33.01**.

The front axle requires periodic servicing to maintain accurate wheel alignment. If the front axle is damaged enough to affect the camber angle it must be replaced. For axle removal and installation instructions, see **Subject 160**.

Correct front axle wheel alignment is needed to ensure long tire life, ease of handling, and steering stability.

Three factors are involved in wheel alignment: camber angle, caster angle, and wheel toe-in.

Camber angle (Fig. 1) is the vertical tilt of the wheel as viewed from the front of the vehicle. Camber angle is measured in degrees, and is not adjustable. Positive camber is the outward tilt of the wheel at the top. Excessive positive camber in one wheel causes the vehicle to pull in the opposite direction, rapidly wearing the outboard side of the tire tread. Negative camber is the inward tilt of the wheel at the top. Excessive negative camber in one wheel causes the vehicle to pull in the same direction that the negative-camber wheel is on, wearing the inboard side of the tire tread. If camber angles are not correct, the tires will wear smooth around the edge on one side. See Fig. 2.

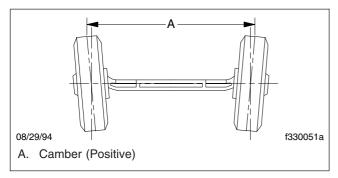


Fig. 1, Camber Angle (front view)

Caster angle (**Fig. 3**) is the tilt of the knuckle pin (or kingpin) as viewed from the side. Caster angle is measured in degrees and it is adjustable. A positive caster angle is the tilt of the top of the knuckle pin toward the rear of the vehicle. A negative caster angle is the tilt of the top of the knuckle pin toward the front of the vehicle. Caster angles are based on the design load of the vehicle. An incorrect caster

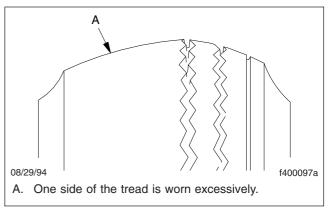


Fig. 2, Tire Damage Due to Excessive Camber

angle does not cause tire wear. However, a positive caster angle that exceeds specifications could cause vehicle shimmy, road shock, and an increased steering effort. A negative caster angle that does not meet specifications could cause unstable steering. The vehicle may wander and weave, and extra steering effort may be necessary. After leaving a turn, the tendency to return to and maintain a straight-ahead position is reduced. Too much or too little caster in one wheel can cause erratic steering when the service brakes are applied to stop the vehicle.

Wheel toe-in (**Fig. 4**) is the distance in inches that the front of the wheels are closer together than the rear of the wheels, as viewed from the top. Wheel toe-in is adjustable. If it is not adjusted correctly, the vehicle could pull to one side while driving. Wheel shimmy and cupped tire treads (indentations on the road contact surface of the treads) could occur. Also, rapid or severe tire wear on the steering axle could occur, usually in a feather-edged pattern. See **Fig. 5**.

Advanced wear patterns can be seen, but less severe wear patterns are detected only by rubbing the palm of your hand flat across the tire tread.

Feather-edging more often affects the front tire on the passenger's side of the vehicle, and is usually more apparent on the outside grooves of the tire.

If any of the conditions listed above occur, the vehicle could need a front end wheel alignment, and possibly, drive axle alignment. However, in some cases these conditions are not wheel alignment related; refer to **Section 33.01** for other possible causes.

If excessive tire tread wear has resulted from incorrect wheel alignment, replace the damaged tires. For 33.00 Front Axle

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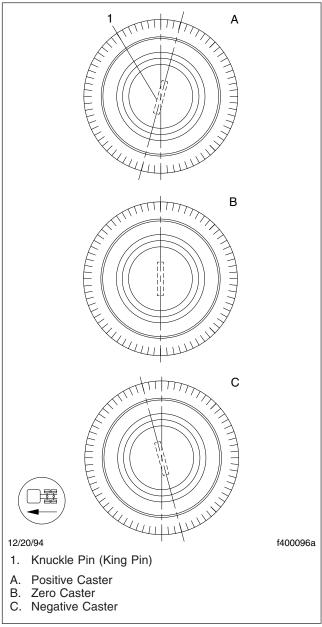


Fig. 3, Caster Angle

minimum tread wear specifications, refer to Group 40 of the *Business Class M2 Maintenance Manual*.

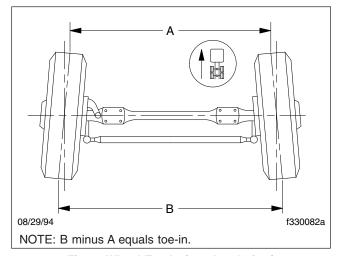


Fig. 4, Wheel Toe-In (overhead view)

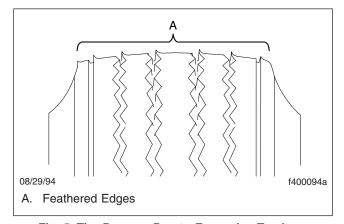


Fig. 5, Tire Damage Due to Excessive Toe-In or Incorrect Drive Axle Alignment

Preliminary Checks

Preliminary Checks

IMPORTANT: When aligning the front axle, it is essential that the rear axle(s) be checked for correct alignment at the same time. Alignment of the rear axle(s) has a direct impact on how the vehicle tracks. Refer to **Section 35.00**, Specifications 400.

- Steering axle wheel assemblies should be balanced, especially for vehicles that travel at sustained speeds of more than 50 mph (80 km/h).
 Off-balance wheel assemblies cause vibrations that result in severely shortened life for tires, and steering suspension parts.
- Do not mix tires of different size, type, or weight.
 Tire wear should be even and not worn to limits exceeding government specifications. Refer to Group 40 of this manual and Group 40 of the Business Class M2 Maintenance Manual for more information. Replace any tire that is excessively worn.
- Check the inflation pressure of the tires. Refer to Group 40 of this manual for recommended pressures. An underinflated tire causes tread wear completely around both tire shoulders. An overinflated tire causes tread wear in the center of the tire. See Fig. 1.

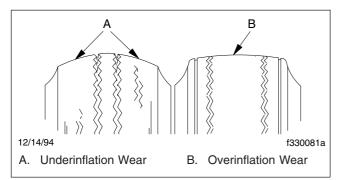


Fig. 1, Tire Damage Due to Underinflated or Overinflated Tires

- 4. Check for out-of-round wheels, rims, or wheel stud holes. Replace the wheel if any of these conditions exist.
- On each side of the vehicle, check the height of the chassis above the ground. Sagging, fatigued, or broken suspension springs create a lopsided vehicle appearance. This causes an unbalanced

- weight distribution. Anything that changes the ratio of weight on the springs affects the alignment angles and also the tire tread contact area. Replace damaged springs as instructed in **Group 32** of this manual.
- On a vehicle equipped with a Freightliner Air-Liner® rear suspension, check the ride height and make any necessary adjustments until it is within specification. See **Group 32** for instructions.
- 7. Inspect the front axle beam (also called the axle center) for bends or twists. If the axle beam is bent or twisted over 1/2 degree, replace it before aligning the front axle wheels.
- Check for damaged, worn, or bent steering gear or linkage parts. Make sure the steering gear is centered. Replace damaged components, and adjust the steering gear, using the instructions in Group 46 of this manual.
- Check the steering angle, and adjust the axle steering stops, as needed. Refer to Subject 110.
- Check the tie-rod ends for correct adjustment, tightness, and damage. Refer to Group 46 of the Business Class M2 Maintenance Manual for instructions.
- Check the front wheel bearings for wear and incorrect adjustment. Refer to Section 33.01 for instructions.

33.00

Steering Angle Checking and Adjusting

Checking and Adjusting

Steering (or turning) angle is the degree of front wheel movement from a straight-ahead position to either an extreme right or left position. Although front wheel movement can be limited by the amount of internal travel in the steering gear, it generally depends on how much clearance there is between chassis components and the tire and wheel assemblies. All axles have adjustable stopscrew-and locknut-type axle stops (Fig. 1), which are located on the rear side of each front axle spindle.

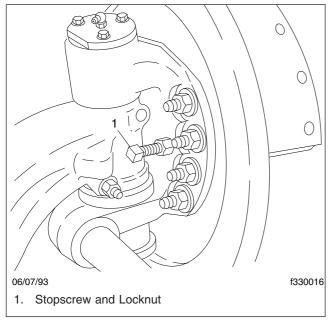


Fig. 1, Axle Stop

IMPORTANT: For vehicle alignment to be accurate, the shop floor must be level in every direction. The turn plates for the front wheels must rotate freely without friction, and the alignment equipment must be calibrated every three months by a qualified technician from the equipment manufacturer. Freightliner dealers must have proof of this calibration history.

 Make sure the steering gear is in the center of travel when the wheels are in a straight-ahead position. Center the gear, using the instructions in **Group 46**. Bottoming of the steering gear must not occur when making an extreme right or left turn. If using stationary turn-plates or turntables (Fig. 2), drive the vehicle on the plates; the tires must be exactly straight ahead. Apply the parking brakes.

If using portable gauges, apply the parking brakes, chock the rear tires, and raise the front of the vehicle. Place a turn-plate or turntable under each tire. With the tires exactly straight ahead, lower the vehicle so that the tires rest on the center of the gauges.

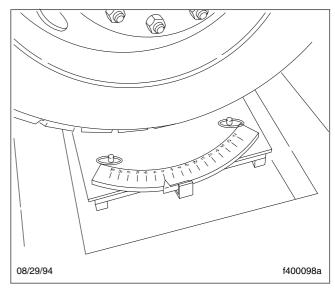


Fig. 2, Turn-Plate (Turntable), Stationary Type

- Remove the lockpins from the gauges, and adjust the dials so that the pointers on both gauges read zero.
- 4. With the brakes fully applied, turn the steering wheel clockwise to the end of travel. Have someone check both sides of the vehicle for interference at the tires and wheels. There must be at least 0.50 inch (13 mm) clearance from any fixed object, and 0.75 inch (19 mm) from any moving object.

If necessary, loosen the stopscrew locknut; adjust the stopscrew to contact the axle when the maximum turning angle of the wheels is determined

Tighten the locknut to the value in the torque table under **Specifications 400**.

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Steering Angle Checking and Adjusting

- Repeat the step above with the steering wheel turned counterclockwise. Adjust the axle stop, as needed.
- If equipped with power steering, adjust the steering gear so that pressure is released ahead of the axle stop. This will prevent possible damage to the steering or axle components. For poppet valve adjustment instructions, refer to **Group 46**.
- Drive the vehicle off the turn-plates or turntables, or remove them from under the tires and lower the vehicle.

Measuring and Adjusting Front Axle Wheel Alignment Angles

Measuring and Adjusting

IMPORTANT: For vehicle alignment to be accurate, the shop floor must be level in every direction. The turn plates for the front wheels must rotate freely without friction, and the alignment equipment must be calibrated every three months by a qualified technician from the equipment manufacturer. Freightliner dealers must have proof of this calibration history.

Precision instruments and equipment are needed for accurately measuring and adjusting wheel alignment. Refer to the operating instructions provided by the wheel alignment equipment manufacturer.

Before checking or correcting wheel alignment, make sure the vehicle is at curb weight. Curb weight is the weight of the unloaded vehicle complete with accessories and full fuel tanks.

If a road test is necessary, the route should be one that allows full left and right turns and full stops. It should also include a length of straight, level road to check the steering wheel position during straight-ahead driving.

During the road test, note any steering effort and possible roughness. Check for looseness, too much wheel play, any tendency for the vehicle to lead in one direction, and for pull during stopping.

Note the position of the steering wheel while driving on a straight, level road. When the steering gear is centered, the steering wheel spokes should be at the 3 and 9 o'clock positions, or within 10 degrees of that position. See **Fig. 1**.

If there are any problems, refer to **Section 33.01**.

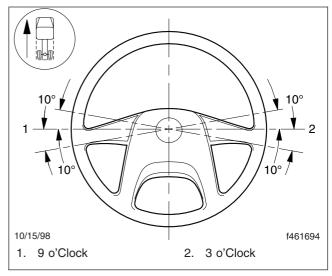


Fig. 1, Steering Wheel Position

Camber Angle Checking

Checking

IMPORTANT: Do all the preliminary checks in **Subject 100** before checking the camber angle.

Camber angle is the vertical tilt of the wheels as viewed from the front of the vehicle. See Fig. 1.

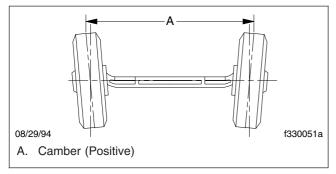


Fig. 1, Camber Angle

IMPORTANT: For vehicle alignment to be accurate, the shop floor must be level in every direction. The turn plates for the front wheels must rotate freely without friction, and the alignment equipment must be calibrated every three months by a qualified technician from the equipment manufacturer. Freightliner dealers must have proof of this calibration history.

- Apply the parking brakes, and chock the rear tires.
- Raise the front of the vehicle until the tires clear the ground. Place safety stands under the axle; make sure the stands will support the weight of the cab, frame, and front axle.
- 3. Before measuring camber, check the front wheel bearings for wear and incorrect adjustment. Try moving the wheel on the axle spindle (steering knuckle) either by grasping the front tire on the top and bottom, or by using a bar for leverage. If movement between the brake drum and the backing plate or other axle-mounted reference point is 0.05 inch (1 mm) or more, the bearings may be worn or incorrectly adjusted. Inspect the wheel bearings for damage using the instructions in **Section 33.01**. If needed, replace or adjust the bearings.
- 4. Remove the safety stands, and lower the vehicle to the ground.

- 5. Using the alignment equipment manufacturer's instructions, measure the front wheel camber.
- Compare the camber angles with those shown in the appropriate table in **Specifications 400**. Differences between the measurements taken in the step above and the angles in the table are caused by damaged (bent) axle components.

Incorrect camber angles could be caused by damage in one or more of the following front axle components: the knuckle pin, the knuckle pin bushings, the axle spindle, or the axle beam. Replace twisted or otherwise damaged components. Don't try to straighten twisted or bent components; replace them with new components. If a bent or twisted front axle knuckle pin, axle spindle, or axle beam has been straightened, the axle warranty will be voided.

WARNING

Do not attempt to straighten any twisted or bent front axle component. This could crack or weaken the component, possibly resulting in a collapsed front axle, loss of a wheel, and serious personal injury.

7. Remove the chocks from the tires.

Caster Angle Checking and Adjusting

Checking and Adjusting

IMPORTANT: Do all the preliminary checks in **Subject 100**before checking the camber angle.

Caster angle is the tilt of the knuckle pin (or kingpin) as viewed from the side. See **Fig. 1**.

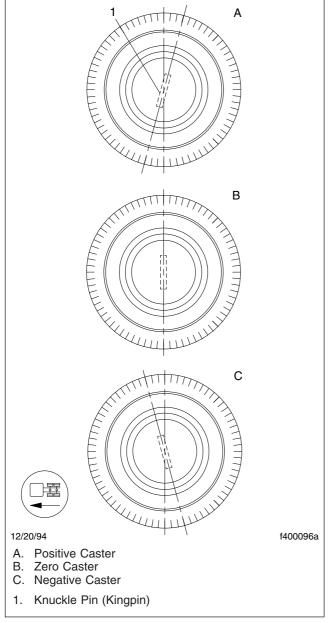


Fig. 1, Caster Angle

IMPORTANT: For vehicle alignment to be accurate, the shop floor must be level in every direction. The turn plates for the front wheels must rotate freely without friction, and the alignment equipment must be calibrated every three months by a qualified technician from the equipment manufacturer. Freightliner dealers must have proof of this calibration history.

Using the alignment equipment manufacturer's operating instructions, measure the front wheel caster.

Compare the caster angles with those shown the appropriate table in **Specifications 400**. If needed, adjust the caster angle by placing wedge-shaped shims between the axle spacer and the axle beam, as follows (see **Fig. 2**):

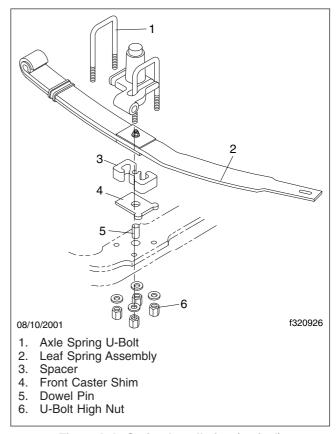


Fig. 2, Axle Spring Installation (typical)

IMPORTANT: Extreme angle shims cannot be used to correct caster angles that vary by more than 2 degrees from the values in the table. Weak or broken leaf springs, or worn shackle

Caster Angle Checking and Adjusting

bushings, can cause extreme deviations to caster angles. Replace damaged parts before doing caster adjustments.

- Apply the parking brakes, and chock the front and rear tires.
- 2. Back off the U-bolt nuts from the U-bolts on one side of the front axle. See Fig. 2.
- 3. Raise the spring away from the axle enough to allow removal of the front caster shim.
- Remove the shim, and install one that will provide the correct caster angle, as specified in the table in **Specifications 400**. Install the dowel pin and check penetration.

IMPORTANT: Place front caster shims between the axle beam and the axle spacer, or between the axle beam and the shock absorber bracket. See **Fig. 2**.

- 5. Lower the vehicle onto the axle.
- 6. Coat the threaded ends of the U-bolts with chassis lube or an antiseize compound, such as Loctite® 242. Tighten the U-bolt nuts to the value in the appropriate table in **Specifications 400**.

U-bolt nuts need periodic retightening. Refer Group 32 of the *Business Class M2 Maintenance Manual* for recommended intervals.



CAUTION -

Failure to periodically retighten the U-bolt nuts could result in spring breakage and abnormal tire wear.

- 7. Using the steps above, replace the shim on the other side of the axle.
- 8. Do a final caster angle check.
- 9. Remove the chocks from the tires.

Wheel Toe-In Checking and Adjusting

Checking and Adjusting

IMPORTANT: When checking wheel toe-in, it is essential that the rear axle(s) be checked for correct alignment at the same time. Alignment of the rear axle(s) has a direct impact on how the vehicle tracks. Refer to **Section 35.00**, Specifications 400.

Using the alignment equipment manufacturer's operating instructions, measure the wheel toe-in. See Fig. 1. Compare the measurement with that shown in the appropriate table in **Specifications 400**. If corrections are needed, go to the applicable (tie rod adjustment) step below.

IMPORTANT: For vehicle alignment to be accurate, the shop floor must be level in every direction. The turn plates for the front wheels must rotate freely without friction, and the alignment equipment must be calibrated every three months by a qualified technician from the equipment manufacturer. Freightliner dealers must have proof of this calibration history.

- Apply the parking brakes, and chock the rear tires.
- 2. Raise the front of the vehicle until the tires clear the ground. Place safety stands under the axle. Make sure the stands will support the weight of the cab, axle, and frame.
- 3. Using spray paint or a piece of chalk, mark the entire center rib of each front tire.
- 4. Place a scribe or pointed instrument against the marked center rib of each tire, and turn the tires. The scribes must be held firmly in place so that a single straight line is scribed all the way around each tire.
- Place a turn-plate or turntable under each tire. Remove the safety stands from under the axle, then lower the vehicle. Remove the lockpins from the gauges; make sure the tires are exactly straight ahead.

NOTE: If turn-plates or turntables are not available, lower the vehicle. Remove the chocks from the rear tires and release the parking brakes. Move the vehicle backward and then forward about 6 feet (2 meters).

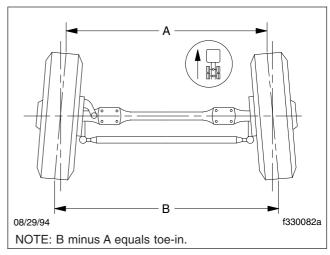


Fig. 1, Wheel Toe-In (Overhead View)

- Place the trammel bar at the rear of the front tires; locate the trammel pointers at spindle height, and adjust the pointers to line up with the scribe lines. Lock in place. Make sure that the scale is set on zero.
- 7. Place the trammel bar at the front of the tires as shown in **Fig. 2**. Adjust the scale end so that the pointers line up with the scribe lines. See **Fig. 3**.
- 8. Read the toe-in from the scale. Compare the toe-in with the value in the appropriate table in **Specifications 400**. If corrections are needed, go to the next step.
- Loosen the tie rod (cross tube) clamp nuts, and turn the tie rod as needed.

If the vehicle is not on turn-plates or turntables, move the vehicle backward and then forward about 6 feet (2 meters). This is important when setting the toe-in on vehicles equipped with radial tires.

Do a final wheel toe-in check to make sure that it is correct.

Make sure the steering wheel is centered.

Tighten the clamp nuts to the values in the appropriate table in **Specifications 400**.

10. If not already done, remove the chocks from the rear tires. Road test the vehicle.

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Wheel Toe-In Checking and Adjusting

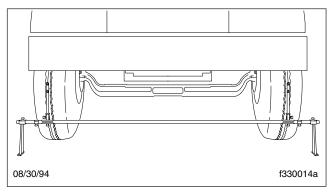


Fig. 2, Trammel Bar Positioning

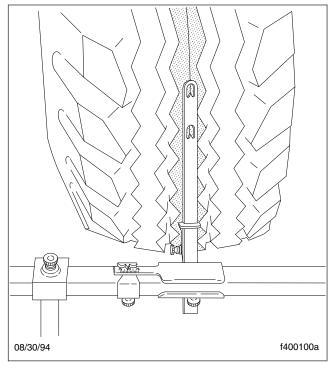


Fig. 3, Calculating Wheel Toe-In

Front Axle Removal and Installation

Removal

NOTE: This procedure involves removing the axle from underneath the front of the vehicle. If you cannot support the vehicle high enough for the axle to clear the bumper, then you will need to remove the bumper.

- 1. Park the vehicle on a level surface, set the parking brakes, then chock the rear tires.
- 2. Tilt the hood.
- 3. If needed, remove the front bumper. See **Group 31** for instructions.
- 4. Raise the vehicle, then support the frame rails with safety stands.

WARNING

When draining the air system, don't look into the air jets or direct them toward another person, as dirt or sludge particles may be in the airstream. Don't disconnect pressurized hoses because they may whip as air escapes from the line. Failure to take all necessary precautions while working on the air brake system can cause personal injury.

- 5. Drain the air tanks.
- 6. Remove the front tires.
- 7. If so equipped, disconnect the ABS sensors from the axle knuckles. Pull the sensors straight out.
- Disconnect the air lines from the front brake chambers.
- Remove the brake drums. See Group 42 for instructions.
- 10. Remove the hubs. Refer to the applicable subject in **Section 33.01** for instructions.
- 11. Disconnect the steering drag link from the axle steering arm. See **Group 46** for instructions.
- 12. Remove the U-bolts and nuts holding the axle to the leaf springs. See Fig. 1.
 - 12.1 Take the weight off the leaf springs by raising the axle.
 - 12.2 On one side of the axle, remove all the U-bolt nuts and washers, then remove the two U-bolts.

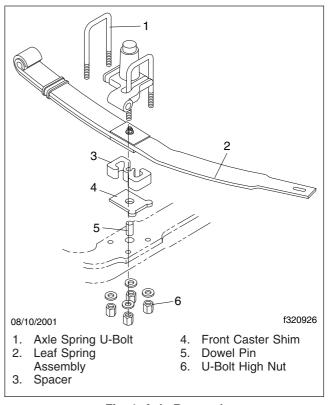


Fig. 1, Axle Removal

- 12.3 Repeat the procedure on the other side of the axle.
- Remove the axle stops from the top of the leaf springs.
- 14. Remove the axle spacers from the top of the axle beam.
- 15. Using a suitable axle jack, remove the axle by sliding it out from the front of the vehicle.
- 16. Remove the brake shoes, cam, and spider. See **Group 42** for instructions.

Installation

- From the front of the vehicle, and using a suitable axle jack, roll the axle into place under the leaf springs.
- 2. Install the axle spacers.

Front Axle Removal and Installation

- Slowly raise the axle up to the bottom of the leaf springs, making sure the dowels on top of the axle beam line up with the holes in the axle spacers.
- Install the axle stops onto the tops of the leaf springs.
- Install the U-bolts.
 - 5.1 Using a suitable clamp (such as a large C-clamp) compress one of the U-bolts, then install it on one side of the axle. Do the same for the second U-bolt.
 - 5.2 Install the U-bolt nuts and washers. Tighten the nuts finger-tight.
 - 5.3 Repeat the procedure on the other side of the axle.
- 6. Tighten the U-bolt nuts.

For 3/4–16 U-bolt nuts: In a diagonal pattern, tighten the U-bolt nuts successively 80 lbf·ft (108 N·m), 200 lbf·ft (270 N·m), then 300 lbf·ft (406 N·m).

For 7/8–16 U-bolt nuts: In a diagonal pattern, tighten the U-bolt nuts successively 60 lbf·ft (81 N·m), 200 lbf·ft (270 N·m), then 460 lbf·ft (624 N·m).

- 7. Install the brake spider, cam, and brake shoes. See **Group 42** for instructions.
- If so equipped, install the ABS sensors in the axle knuckles.
- 9. Connect the air lines to the brake chambers.
- Connect the drag link to the steering arm. See Group 46 for instructions.
- 11. Install the tires.
- If it was removed, install the bumper. See Group 31 for instructions.
- Raise the vehicle, then remove the safety stands.
- 14. Lower the vehicle.
- 15. Do complete alignment procedures, including caster, camber, wheel toe-in, and rear axle alignment. Refer to the applicable subjects in this section for instructions. For rear axle alignment procedures, refer to Section 35.00.
- 16. Lower the hood.

17. Remove the chocks from the rear tires.

Specifications

IMPORTANT: When aligning the front axle, it is essential that the rear axle(s) be checked for correct alignment at the same time. Alignment of the rear axle(s) has a direct impact on how the vehicle tracks. Refer to **Section 35.00**.

NOTE: The alignment specifications below are for unloaded vehicles. These specifications will vary as weight is added to the vehicle and transferred to the front axle.

Alignment Specifications

Caster

IMPORTANT: Caster settings for the left and right sides *must* be within 1/2 degree of each other. It is necessary for only one side to be within the specifications given in **Table 1**, **Table 2**, **Table 3**, and **Table 4**.

Caster Target and Limits, Hunter Equipment		
Target: degrees	Limits: degrees	
+3-1/2	+2 to +5	

Table 1, Caster Target and Limits, Hunter Equipment

	ts, Bee Line Equipment LC4000)
Target: degrees	Limits: degrees
+3-1/2	+3 to +6-1/2

Table 2, Caster Target and Limits, Bee Line Equipment (except LC4000)

Caster Target and Limits, Bee Line LC4000		
Target: degrees	Limits: degrees	
+3-1/2	+2-1/4 to +4-3/4	

Table 3, Caster Target and Limits, Bee Line LC4000

Caster Target and	Limits, Beissbarth
Target: degrees	Limits: degrees
+3-1/2	+3 to +6-1/2

Table 4, Caster Target and Limits, Beissbarth

Toe-In

Toe-In Target and Limits, Hunter Equipment		
Target: degrees	Limits: degrees	
+0.09	0.00 to +0.18	

Table 5, Toe-In Target and Limits, Hunter Equipment

Toe-In Target and Limits, Bee Line Equipment			
Target: in (mm) Limits: in (mm)			
+1/16 (+1.6) 0 to +1/8* (0 to +3.2)			

 $^{^{\}star}$ If adjustment is required, set the toe-in as close as possible to +1/16 inch (+1.6 mm).

Table 6, Toe-In Target and Limits, Bee Line Equipment

Camber

Camber, Detroit and Meritor Axles			
Axle Model	Axle Model Left Camber: degrees		
All	-1/4 ± 7/16	-1/4 ± 7/16	

Table 7, Camber, Detroit and Meritor Axles

Camber, Dana/Eaton Axles			
Axle Model	Axle Model Left Camber: degrees		
All E Series	+1/4 ± 7/16	0 ± 7/16	

Table 8, Camber, Dana/Eaton Axles

Camber, Hendrickson Axles			
Axle Model Left Camber: Ri degrees		Right Camber: degrees	
STEERTEK	0 ± 1	0 ± 1	

Table 9, Camber, Hendrickson Axles

Specifications

Torque Values

Tie Rod Clamp Nut Torque Values				
		Plain Nut Torque*: lbf·ft (N·m)	Locknut Torque*: lbf·ft (N·m)	
Detroit	All	5/8–11	60-80 (81-108)	60-80 (81-108)
Meritor	All	5/8–11	FO 60 (60 91)	FO 60 (69 91)
Hendrickson	STEERTEK	5/0-11	50–60 (68–81)	50–60 (68–81)
Dana/Eaton	All E Series	5/8–18	_	40-60 (55-81)

^{*} All torque values in this table apply to parts lightly coated with rust-preventive type oil.

Table 10, Tie Rod Clamp Nut Torque Values

Miscellaneous Torque Values			
Description	Torque: lbf·ft (N·m)		
U-Bolt Nuts 7/8-14	400 (542)		
U-Bolt Nuts 7/8-16	460 (624)		
U-Bolt Nuts 3/4-16	300 (406)		
U-Bolt Nuts 5/8-18	200 (271)		
Meritor Stopscrew Locknut	50-65 (68-88)		
Dana/Eaton Stopscrew Locknut	90-120 (122-163)		

Table 11, Miscellaneous Torque Values

Front Axle Wheel Hubs, Brake Drums, and Wheel Bearings

33.01

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General Information

General Information

A wheel end assembly consists of a wheel hub, wheel bearings, wheel studs, and brake drum or, for disc brakes, a rotor and caliper. See **Fig. 1** and **Fig. 2**. M2 vehicles are typically equipped with one of the following:

 A ConMet PreSet® hub and double spindle nut system.

Most M2s are equipped with PreSet hubs, which have the bearings and oil seal preinstalled. To install a new hub, mount it on the axle spindle, and secure it with a double spindle nut. For instructions, see **Subject 130**. A spacer between the inner and outer bearings adjusts the bearings to the correct end play and preload when the retaining nut is tightened.

• A ConMet PreSet hub and Axilok® spindle nut.

Some ConMet PreSet hubs use an Axilok nut (see **Subject 150**). As with ConMet PreSet hubs that use the double spindle nut, the bearings and oil seal are pre-installed and a spacer between the inner and outer bearings adjusts the bearings to the correct end-play and preload when the retaining nut is tightened.

 A ConMet PreSet Plus[™] hub and spindle nut system.

The ConMet PreSet Plus system is specially designed for easy and reliable hub removal and installation. As with ConMet PreSet hubs, the spacer between the inner and outer bearings adjusts the bearings to the correct end play and preload when the nut is tightened. For instructions, see **Subject 210**.

 The traditional hub and bearings, and a double spindle nut system.

With traditional wheel ends, the bearings and oil seal must be assembled with the hub when the hub is installed on the axle spindle. First the oil seal is placed on the spindle (some brands of oil seal are installed in the hub bore), then the inner bearing and the hub are mounted on the axle spindle. Then, the outer bearing is mounted in the hub bore. A nut is installed on the axle spindle end and tightened and loosened to adjust the bearings. Finally, a locking device and jam nut are installed to se-

cure the hub and bearings on the axle. For instructions, see **Subject 130**.

 The traditional hub and bearings, and a Pro-Torq® nut system.

This system is the same as the above traditional hub and bearing system, but in place of the four-piece bearing-lock system, it has one adjusting nut and a lockring device. For instructions, see **Subject 190**.

 The Meritor Easy Steer Plus® Axle, Model MFS-12-143D.

This axle has the hubs, bearings, and oil seals factory-installed on the axle spindles. The hubs can be removed and installed on the axle, and the studs can be replaced, but the wheel bearings and oil seal are not serviceable in the field. To install a new hub, mount it on the axle spindle, and secure it. For instructions, see **Subject 140**.

Wheel Hub

The wheel and the brake drum are mounted on an aluminum or iron wheel hub. Both the inner and outer wheel bearing cups and the wheel studs are press-fit in the hub.

Tapered Wheel Bearings

A traditional tapered wheel bearing assembly consists of a cone, tapered rollers, a roller cage, and a separate cup that is press-fit in the hub. See **Fig. 3**. All components carry the load, with the exception of the cage, which spaces the rollers around the cone.

ConMet PreSet and PreSet Plus hubs have special bearing assemblies.

Wheel Studs

A headed wheel stud (**Fig. 4**) is used on front axle disc wheel hub assemblies and has either serrations on the stud body or a flat area on the stud's head to prevent the stud from turning in the wheel hub.

On vehicles equipped with ball-seat or stud-piloted wheels, the end of the stud that faces away from the vehicle is stamped with an "L" or "R," depending on which side of the vehicle the stud is installed. Studs stamped with an "L" are left-hand threaded and are installed on the left side of the vehicle. Studs

General Information

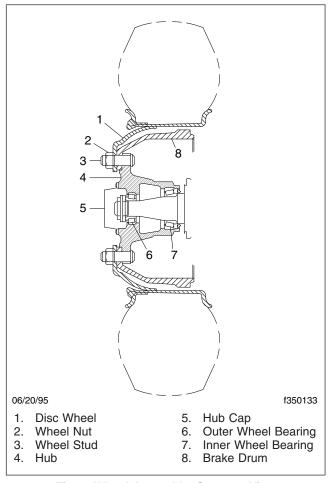


Fig. 1, Wheel Assembly, Cutaway View

stamped with an "R" are right-hand threaded and are installed on the right side of the vehicle.

Brake Drum

The brake drum and lining work together as a mated friction pair, with the drum responsible for both heat absorption and dissipation. Lining performance and life largely depend on the condition of the drum and whether it can adequately absorb and dissipate heat generated by braking action. The brake drum is mounted on the outboard face of the hub and fits over the wheel studs.

General Information

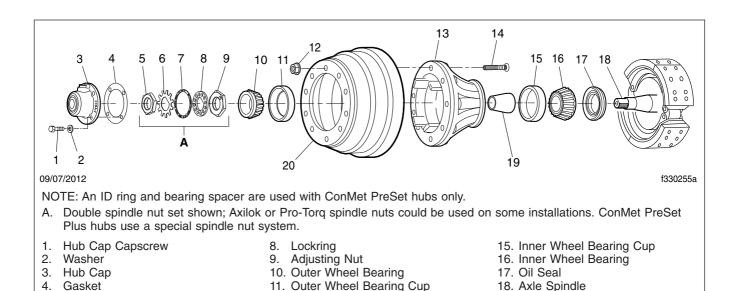
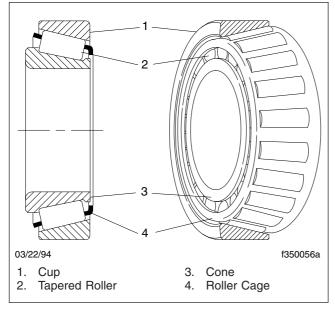


Fig. 2, Typical Wheel End Assembly, Front Axle with Drum Brakes

12. Wheel Nut

14. Wheel Stud

13. Hub

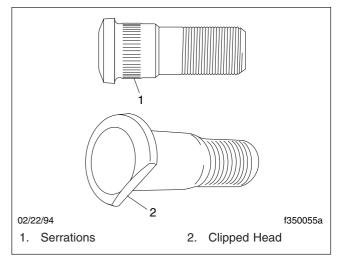


5. Jam Nut

7. ID Ring

6. Bend-Type Locking Washer

Fig. 3, Tapered Wheel Bearing Assembly



19. Bearing Spacer

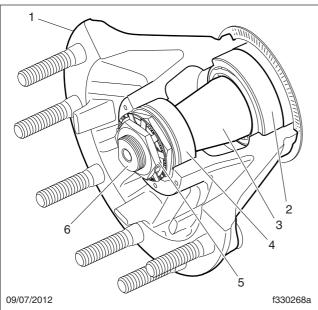
20. Brake Drum

Fig. 4, Typical Wheel Studs

General Information

ConMet PreSet® and PreSet Plus™ steer axle hubs are equipped with a special tubular spacer inside the hub, between the inner and outer bearings. See Fig. 1.

When installing a PreSet or PreSet Plus hub with the spacer and special PreSet bearings, the correct end play is set automatically and wheel bearing adjustment is unnecessary.



NOTE: PreSet Plus hubs use a special spindle nut system.

- 1. Hub
- 2. Inner Bearing
- 3. Bearing Spacer
- 4. Outer Bearing
- 5. Retaining Nut (double spindle nut system)
- 6. Axle Spindle

Fig. 1, ConMet PreSet Hub, Cut-Away View

For vehicles equipped with ConMet PreSet hubs, it is highly recommended to **stay with the PreSet system** to optimize bearing and seal life. However, if you are replacing the bearings for a PreSet hub, and the special PreSet bearings are not available, standard wheel bearings can be used. In this case, the bearing spacer must be removed and the bearings adjusted manually. See the installation instructions for more information.

Wheel ends equipped with ConMet PreSet Plus hubs must use PreSet Plus components. Do not substitute non-PreSet-Plus components on these installations.

Removal

For typical wheel end and axle assemblies, see Fig. 2 and Fig. 3.

- 1. Chock the rear tires.
- Raise the front of the vehicle until the tires clear the ground. Then place safety stands under the axle.

A WARNING

Never work under a vehicle that is supported only by a jack. Jacks can slip, causing the vehicle to fall. This could result in a person being pinned under or crushed by the vehicle, causing severe personal injury or death. Always use safety stands to support the vehicle.

For drum brakes, back off the slack adjuster to release the front axle brake shoes.

WARNING

Breathing brake lining dust (asbestos or nonasbestos) could cause lung cancer or lung disease. OSHA has set maximum levels of exposure and requires workers to wear an air purifying respirator approved by MSHA or NIOSH. Wear a respirator at all times when servicing the brakes, starting with removal of the wheels and continuing through assembly.

- Remove the wheel and tire assembly. See Group 40 for instructions.
- 5. For drum brakes, remove the brake drum. See **Subject 160** for instructions.

For disc brakes, remove the brake caliper. See **Section 42.32** for instructions.

NOTE: Oil will spill as the hub cap and wheel hub are removed. Place a suitable container under the axle spindle to catch any spilled oil, and avoid contaminating the brake shoes with oil. Dispose of the oil properly.

6. Remove the capscrews, washers, and hub cap. Remove and discard the hub cap gasket.

- 7. Remove the wheel bearing locking device:
 - For an Axilok spindle nut, see Subject 150; then go to the next step.
 - For a Pro-Torq spindle nut, see Subject 190; then go to the next step.
 - If the axle is equipped with a double spindle nut system, see Subject 130; then go to the next step.
 - For ConMet PreSet Plus hubs, see Subject 210; then go to the next applicable step.

IMPORTANT: If working with Meritor Easy Steer Plus® hubs, remove the nut(s) and locking device, then remove the wheel end (hub, bearings, and oil seal) as a unit.

---- NOTICE ----

Be careful not to let the outer wheel bearing drop from the axle spindle. Dropping the bearing can warp the cage or damage the rollers, ruining the bearing. On vehicles equipped with WABCO ABS, use care when working with the hubs. To prevent damage to the tone wheel, do not drop the hub, or lay it down in a way that would damage the tone wheel.

8. Move the hub about ½ inch (13 mm) to jar loose the outer wheel bearing (allow the hub-only assembly to rest on the axle spindle; be careful not to damage the axle spindle threads). Then, carefully remove the outer wheel bearing; handle the bearings with clean, dry hands. Wrap the bearings in either clean oil-proof paper or lint-free rags.

- NOTICE $-\!-$

Do not spin bearing rollers at any time. Dirt or grit can scratch the roller surface and cause rapid wear of the bearing assembly. Treat used bearings as carefully as new ones.

- Remove the hub from the axle spindle. Be careful not to damage the axle spindle threads as the assembly is removed.
- Remove the inner wheel bearing; handle the bearings with clean, dry hands. Wrap the bearings in clean, oil-proof paper or lint-free rags. If the inner wheel bearing remains in the hub after

- the hub is removed, place a protective cushion where it will catch the bearings, and use a hardwood drift and a light hammer to gently tap the bearing (and seal, if necessary) out of the cup.
- Remove the oil seal from the axle spindle, if not already removed. See Section 33.02 for additional information.

NOTE: For vehicles equipped with disc brakes, instructions for removing the brake rotor are given in **Section 42.32**.

Installation

For typical wheel end and axle assemblies, see Fig. 2 and Fig. 3.

NOTE: For vehicles equipped with disc brakes, instructions for installing the brake rotor are given in **Section 42.32**.

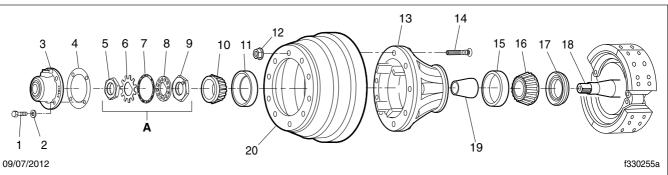
 Using cleaning solvent, remove the old oil from the axle spindle (steering knuckle) and the disassembled parts. Allow the parts to dry, or dry them with clean, absorbent, and lint-free cloth or paper. Wrap a protective layer of friction tape on the axle spindle threads.

For PreSet hubs that are being reused, the bearing spacer must be replaced. For PreSet Plus hubs, the bearing spacer must be cleaned and inspected before being reused; see **Subject 110**. If the bearing spacer is worn or damaged, replace it with a new one.

– NOTICE ——

Make sure that both bearing assemblies are coated with fresh oil. Use only fresh oil on the bearing assemblies; old oil could be contaminated with dirt or water (both are corrosives) and could cause damage to both wheel bearing assemblies and the wheel hub.

- Coat both bearing assemblies with fresh oil. Install the inner wheel bearings and oil seal.
 Handle the bearings with clean, dry hands. See
 Section 33.02 for oil seal installation instructions.
- 3. Wipe a film of axle oil on the axle spindle to prevent rust from forming behind the inner wheel bearing. Do not lubricate the seal journal.



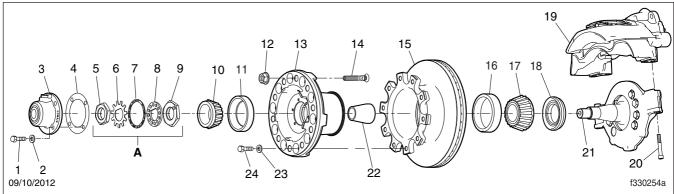
NOTE: An ID ring and bearing spacer are used with ConMet PreSet hubs only.

- A. Double spindle nut set shown; Axilok or Pro-Torq spindle nuts could be used on some installations. ConMet PreSet Plus hubs use a special spindle nut system.
- 1. Hub Cap Capscrew
- 2. Washer
- 3. Hub Cap
- 4. Gasket
- 5. Jam Nut
- 6. Bend-Type Locking Washer
- 7. ID Ring

- 8. Lockring
- 9. Adjusting Nut
- 10. Outer Wheel Bearing
- 11. Outer Wheel Bearing Cup
- 12. Wheel Nut
- 13. Hub
- 14. Wheel Stud

- 15. Inner Wheel Bearing Cup
- 16. Inner Wheel Bearing
- 17. Oil Seal
- 18. Axle Spindle
- 19. Bearing Spacer
- 20. Brake Drum

Fig. 2, Typical Wheel End Assembly, Front Axle with Drum Brakes



NOTE: An ID ring and bearing spacer are used with ConMet PreSet hubs only.

- A. Double spindle nut set shown; Axilok or Pro-Torq spindle nuts could be used on some installations. ConMet PreSet Plus hubs use a special spindle nut system.
- 1. Hub Cap Capscrew
- 2. Washer
- 3. Hub Cap
- 4. Gasket
- 5. Jam Nut
- 6. Bend-Type Locking Washer
- 7. ID Ring
- 8. Lockring

- 9. Adjusting Nut
- Outer Wheel Bearing
- 11. Outer Wheel Bearing Cup
- 12. Wheel Nut
- 13. ConMet PreSet Hub
- 14. Wheel Stud
- 15. Brake Rotor
- 16. Inner Wheel Bearing Cup
- 17. Inner Wheel Bearing
- 18. Oil Seal
- 19. Brake Caliper
- 20. Caliper Mounting Capscrew
- 21. Axle Spindle
- 22. Bearing Spacer
- 23. Washer
- 24. Capscrew

Fig. 3, Typical Wheel End Assembly, Front Axle with Disc Brakes

If present, remove the temporary plastic bearing cover from the front of the hub.

- NOTICE -

Do not use the bearing spacer with standard wheel bearings. To do so may result in too much bearing end-play, which could damage the wheel bearings, oil seals, the axle spindle, and the hub.

If using PreSet bearings, ensure the tubular spacer is in the PreSet hub.

If replacing PreSet bearings with non-PreSet bearings, remove the tubular spacer from inside the hub. Save it for future use to convert the hub back to the PreSet system.

— NOTICE —

When installing a hub, remember the following:

- On vehicles equipped with WABCO ABS, use care when installing the hubs. To prevent damage to the tone wheel, do not drop the hub or lay it down in a way that would damage the tone wheel.
- Do not remove the outer wheel bearing once the hub is installed on the axle. Removing the outer bearing could cause the oil seal to become misaligned, which could cause damage to the wheel bearings, the hub, and the axle spindle.
- 6. Mount the hub assembly on the axle spindle.
- 7. Remove the friction tape, then adjust (if needed) and secure the bearings:
 - For an Axilok spindle nut, see Subject 150; then go to the next step.
 - For a Pro-Torq spindle nut, see Subject 190; then go to the next step.
 - For Meritor Easy Steer Plus axle ends, see Subject 140; then go to the next step.
 - If the axle is equipped with a double spindle nut system, see Subject 130; then go to the next step.
 - For ConMet PreSet Plus hubs, see Subject 210; then go to the next applicable step.

- Place the hub cap and a new gasket in position, then install the washers and capscrews. In a star pattern, tighten the capscrews 15 lbf·ft (20 N·m).
- If applicable, add fresh oil to the wheel hub to the level indicated on the hub cap. For recommended axle lubricants, see Specifications 400.

A WARNING

Failure to add oil to the wheel hub after the hub has been serviced will cause the wheel bearings to overheat and seize during vehicle operation. Seized bearing rollers can cause sudden damage to the tire or axle, possibly resulting in personal injury and property damage.

- Rotate the hub to distribute the oil, then check the level at the hub cap. Add lubricant as needed.
- For drum brakes, install the brake drum on the wheel hub. See Subject 160 for instructions.
 - For disc brakes, install the brake caliper. See **Section 42.32** for instructions.
- 12. Install the wheel and tire assembly. See **Group 40** for instructions.

WARNING

If the wheel nuts cannot be tightened to minimum torque values, the wheel studs have lost their locking action, and the wheel hub flange is probably damaged. In this case, replace it with a new wheel hub assembly. Failure to replace the wheel hub assembly when the conditions described above exist could result in the loss of a wheel or loss of vehicle control, and possible personal injury.

- Adjust the front axle brakes. For instructions, see Group 42.
- 14. Remove the safety stands from under the axle and lower the vehicle.

Wheel Hub Assembly Inspection

 Inspect the wheel hub mounting flange. A loose wheel assembly will cause the flange to be worn, jagged, or warped. See Fig. 1. Replace the wheel hub if any of these conditions exist.

Inspect the flange surface around the wheel studs. Improperly torqued wheel nuts will cause worn or cracked stud grooves on the hub. See Fig. 2. If wear spots or cracks appear anywhere on the hub, or if the hub is otherwise damaged, replace it with a new one.

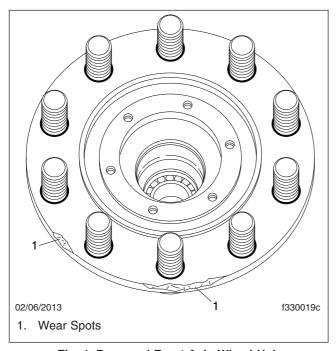


Fig. 1, Damaged Front Axle Wheel Hub

- Remove all of the old oil from the wheel hub cavity. Inspect the inner surface of the hub for cracks, dents, wear, or other damage. Replace the wheel hub if damage exists.
- 3. Remove all the old grease or oil from the surfaces of the wheel bearing cups. Inspect the wheel bearing cups for cracks, wear, spalling, or flaking. See **Fig. 3**. Replace the cups if damaged in any way. For instructions, see **Subject 120**.
- 4. Inspect the wheel nuts on disc wheel installations, or the rim nuts on spoke-wheel installa-

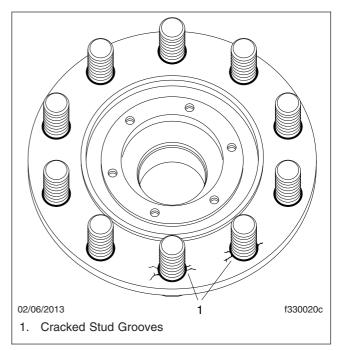


Fig. 2, Damaged Front Axle Wheel Hub

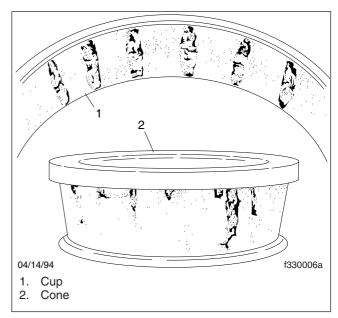


Fig. 3, Spalling (Flaking) of Wheel Bearing Assembly

tions. Damaged nuts (Fig. 4), usually caused by inadequate tightening, must be replaced with new ones.

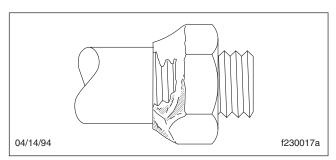


Fig. 4, Damaged Wheel Stud Nut

 Inspect the wheel or rim studs. Replace studs that are stripped, broken, bent, or otherwise damaged. For instructions, see Subject 180.

Wheel Bearing Inspection

Wheel bearings should be very closely inspected at the time of disassembly. Optimal inspection conditions are possible only after the bearings have been thoroughly cleaned using nonflammable solvent and a stiff brush. Before inspecting, clean the bearings.

- Remove the wheel hub and bearing cones. For instructions, see Subject 100.
- Using nonflammable solvent and a stiff brush, clean all the oil from the bearings and hub cavity.
 Do not use gasoline or heated solvent.
- Allow the cleaned parts to dry, or dry them with a clean absorbent cloth or paper. Clean and dry your hands and all tools used in the maintenance operation. Oil will not stick to a surface that is wet with kerosene or diesel fuel, and the kerosene or diesel fuel may dilute the lubricant.

- NOTICE —

Do not spin the bearing rollers at any time. Dirt or grit can scratch the roller surface and cause premature wear of the bearing assembly. Treat a used bearing as carefully as a new one.

- 4. After the bearings are cleaned, inspect the assemblies, which include the rollers, cones, cups, and cages. If any of the following conditions exist, replace the bearing assemblies:
 - Large ends of rollers worn flush to the recess, or radii at the large ends of the rollers worn sharp. These are indications of advanced wear. See Fig. 5.

- Visible step wear, particularly at the small end of the roller track. Deep indentations, cracks, or breaks in the cone surfaces.
 See Fig. 6.
- Bright rubbing marks on the dark phosphate surfaces of the bearing cage. See
 Fig. 7.
- Water etch on any bearing surface. Water etch appears as gray or black stains on the steel surface, and it greatly weakens the affected area. If water etch is present, replace the bearing seals.
- Etching or pitting on functioning surfaces.
 See Fig. 8.
- Spalling (flaking) of the bearing cup, roller, or cone surfaces. See Fig. 3.

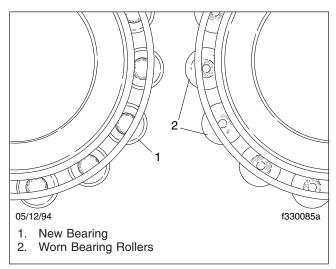


Fig. 5, Wheel Bearing Roller Wear

After inspection, brush the bearings with fresh axle lubricant.

Brake Drum Inspection

New brake drums are purposely undersized to allow for turning (remachining), since in mounting drums on the hub, there can be some eccentricity. If a new drum is installed, the protective coating on the inner friction surface must be removed with a solvent, prior to drum installation, then rinsed with hot water. Use a clean rag to remove any oily residue or metal chips from the friction surface.

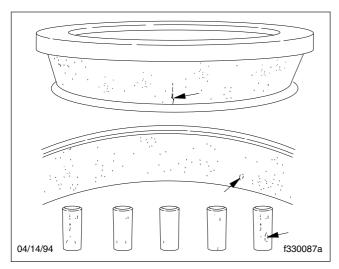


Fig. 6, Indentations, Cracks, or Breaks in Bearing Surfaces

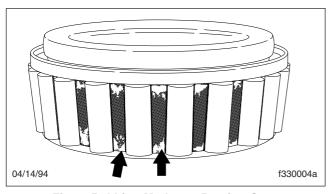


Fig. 7, Rubbing Marks on Bearing Cage

If a drum must be turned or replaced, the other same-axle drum must be similarly turned or replaced to provide the same braking power on both wheels. Turned drums should not exceed the maximum allowable diameter, which is stamped on the outside surface of the drum. See **Fig. 9** for a typical location of this stamp.

NOTE: Drums that have been turned should then be cleaned by using fine emery cloth followed with a hot water wash. Drums that have been renewed using emery cloth should also be followed with a hot water wash.

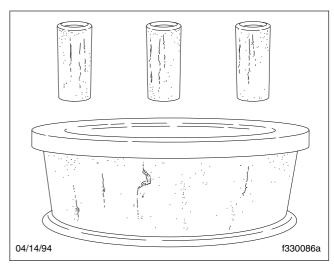


Fig. 8, Etching (Pitting) on Bearing Surfaces

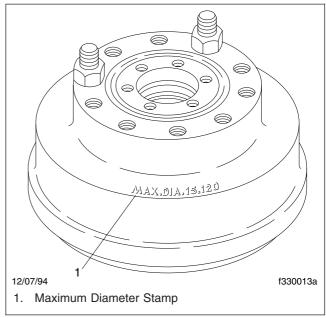


Fig. 9, Outboard Mounted Hub and Drum Assembly

NOTICE -

Failure to replace drums when worn or turned to limits exceeding the maximum allowable diameter will result in drum weakness and reduced braking capacity, which can lead to distortion, higher drum temperatures, and ultimately, drum breakage.

If the drums are turned or replaced, replace the brake linings. See **Group 42** in this manual for instructions.

- Inspect the inner friction surface. If a veneered (highly glossed) or glazed surface exists, renew the drum by using 80-grit emery cloth or by turning the drums.
- 2. Inspect for heat checking, which is a form of buckling (cracking) resulting from a temperature differential in the drum wall between a relatively cool exterior and a hot friction surface. Heat checking is normal on all drums and may not impair performance and lining life if the network of fine hairline cracks remains small. Examine heat checks of drums frequently to be certain the checks have not widened into drum weakening cracks (substantial cracks extending to the open edge of the drum). Replace the same-axle drums if substantial cracks are present, or if widening of the fine hairline cracks occurs.

NOTE: If normal heat checking as described above is present, inspect the drums at least every 12,000 miles (19 300 km) thereafter. Inspect the drums (using a flashlight from the inboard side of the wheels) every 6000 miles (9700 km). Inspect more often under adverse operating conditions.

3. Check for a contaminated inner friction surface. If fluids are present, such as oil or grease, remove the contaminants. Locate and correct the source of the contamination. If the brake drums are contaminated with fluids, the brake linings will also be affected. Since oil or grease saturated linings cannot be salvaged, they must be replaced. For brake lining replacement procedures, see Group 42.

A WARNING

If the brake drums are contaminated with fluids, replace the brake linings. Failure to replace fluid contaminated brake linings could result in a partial loss of braking capacity, which could lead to personal injury or property damage.

4. Measure the inside diameter of the drum. If the measured diameter is greater than the maximum allowable diameter, replace the same-axle drums and linings.

NOTE: It may be necessary to remove the brake dust shield to measure the roundness of the drum

- 5. Ensure the roundness of the drum is within acceptable limits, as follows. Set the measuring tip of a dial indicator against the working surface of the drum between the brake shoes as far outboard as possible. Zero the gauge, then turn the drum one revolution and note the highest and lowest measurements.
 - If the difference is 0.010 inch (0.25 mm) or less, proceed to the next step. If the difference is more than 0.010 inch (0.25 mm), mark the drum and hub to record their relative positions, and remove the drum. Clean the mating surfaces of the hub and drum, and re-install the drum rotated 90 degrees from its earlier position. Tighten four wheel nuts 50 lbf·ft (68 N·m), and repeat the measurement. If the difference is more than 0.010 inch (0.25 mm), the drum is out of round beyond acceptable limits and all drums on the axle must be re-machined or replaced.
- Inspect the outside surface of the drum. Remove any accumulation of mud, dirt, or rust; foreign matter acts as an insulator, trapping heat within the drum.
- 7. Check for hard, slightly raised dark-colored spots on the inner friction surface or for a bluish cast on the brake parts, both of which are caused by high temperatures. If the drums' maximum allowable diameters have not been exceeded, remachine both same-axle drums. If the spots or discoloration cannot be removed, or if remachining is not possible, replace the drums. Also replace the brake shoe return springs.

Bearing Spacer Cleaning and Inspection, PreSet Plus™ Hubs



Do not repair or recondition a damaged or worn bearing spacer; replace it. Using repaired, reconditioned, damaged, or worn components can cause wheel end failure, which can result in serious injury and property damage.

Axle Components Cleaning and Inspection

1. Use a cleaning solvent to clean the bearing spacer; do not use gasoline. Remove the solvent completely with clean, absorbent cloth or paper.

NOTE: PreSet Plus bearing spacers have undergone a heat-treating process that discolors the ends; see Fig. 10. This type of discoloration is normal for heat-treated spacers.

2. Inspect the bearing spacer for signs of wear or damage. Look for a sharp ring of standing metal that has been worn into the spacer at either end; see Fig. 11. If the spacer is worn or damaged, replace it.

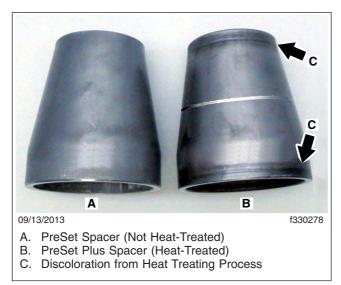
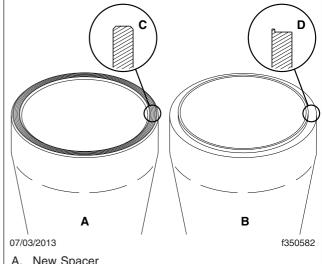


Fig. 10, PreSet and PreSet Plus Bearing Spacers



- A. New Spacer
- B. Worn Spacer
- C. Machined Surfaces with Chamfers and Grooves
- D. Sharp Edge Worn into Machined End

Fig. 11, Comparison of New and Worn Bearing Spacers

Wheel Bearing Cup Removal and Installation, Ferrous Hubs

Removal

Wheel bearing cups on ferrous hubs are removed and installed by driving them out and pressing them in without heating the hub.

- Using a solvent, completely remove all grease, oil, and other debris from the outer and inner surfaces of the wheel hub assembly.
- Using a mild-steel rod through the opposite end of the hub, drive against the inner edge of the bearing cup. Alternately drive on opposite sides of the cup to avoid cocking the cup and damaging the inside of the hub.

Installation

- 1. Using a solvent, completely remove all grease, oil, and other debris from the outer and inner surfaces of the wheel hub assembly, including the bearing cup bores.
- 2. Inspect the bearing cup bores of the hub for warpage or uneven surfaces. If a bearing cup bore is damaged, replace the wheel hub assembly.
- 3. Coat the replacement bearing cup hub contact surface with a film of grease.
- 4. Position the cup in the hub and press it into place, using a suitable driving tool. Cups must seat against the shoulder in the hub.
- 5. Wipe off the accumulation of grease left after the bearing cup has been seated. Then, using a clean lint-free cloth dampened with kerosene or diesel fuel oil, clean the inner surface of the bearing cup. Wipe the surface dry using a clean, absorbent, and lint-free cloth or paper.

Double Spindle Nut Removal, Installation, and Adjustment

General Information

ConMet PreSet hubs may use a double spindle nut system. A plastic ID ring between the adjusting nut and locking washer indicates that a ConMet Preset hub has been installed. See Fig. 1.

Other installations may have a different nut-locking system. See Fig. 2 and Fig. 3.

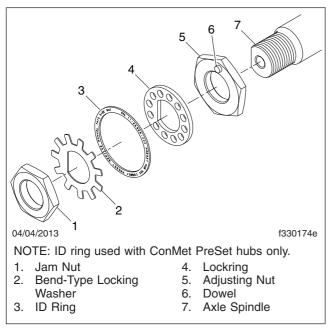


Fig. 1, Double Spindle Nut Set, With Locking Washer and Lockring

Removal

Once a double spindle nut set is removed, discard the bend-type locking washer, if used. Inspect the fasteners for visible damage prior to reuse.

Installation

Instructions for installing a double spindle nut set for both PreSet and non-PreSet type bearings are provided in this subject. See the pertinent instructions for the type you are installing.

NOTE: Torque values vary by spindle size (see Fig. 4).

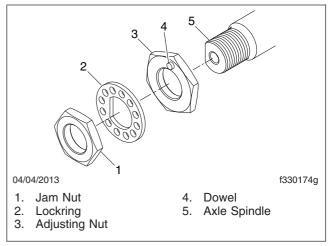


Fig. 2, Double Spindle Nut Set, With Lockring and Doweled Adjusting Nut

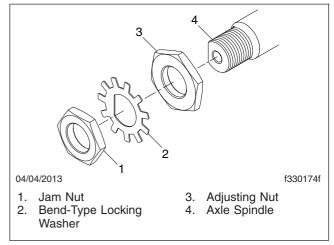


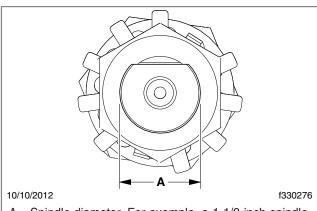
Fig. 3, Double Spindle Nut Set, With Locking Washer Only

Using PreSet Bearings

- 1. Install the adjusting nut onto the axle spindle, and tighten it as follows:
 - For 1-1/8 inch spindles: 150 lbf-ft (203 N·m).
 - For 1-1/2 inch and larger spindles: 300 lbf-ft (407 N·m).

NOTE: The gaps between holes in the lockring are spaced unevenly, so to fit the tab on the adjusting nut into one of the holes with minimal turning of the adjusting nut, gauge the distance

Double Spindle Nut Removal, Installation, and Adjustment



A. Spindle diameter. For example, a 1-1/8 inch spindle has a 1-1/8 inch diameter at the threaded end of the spindle.

Fig. 4, Spindle Size

on one side of the lockring, then the other, and choose the side that requires the adjusting nut to be advanced the least. Do not back off the nut.

- Install the lockring (as described in the note above), ID ring (for ConMet PreSet hubs only), and bend-type locking washer.
- 3. Install the jam nut, and tighten it as follows:
 - For 1-1/8 inch spindles: 100 lbf-ft (135 N·m).
 - For 1-1/2 inch and larger spindles: 200 lbf-ft (271 N·m).
- Bend the tabs on the locking washer at 6 o'clock and 12 o'clock to lock the jam nut in place. See Fig. 5.
- 5. Rotate the hub in both directions. It should turn freely with no dragging or binding.

Using Non-PreSet Bearings

For ConMet PreSet hubs, when there is no bearing spacer installed and non-PreSet type bearings are being used, proper wheel bearing adjustment is critical to the performance of the bearings, wheel seals, and other related wheel end components.

- Install the adjusting nut, as follows.
 - 1.1 Install the adjusting nut on the spindle, and tighten it finger-tight.

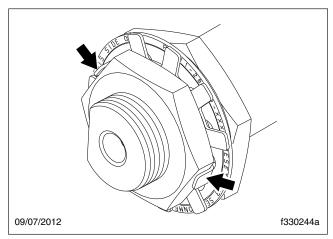


Fig. 5, Tabs Bent to Lock the Jam Nut

- 1.2 Rotate the hub once, and tighten the adjusting nut 90 to 110 lbf-ft (122 to 150 N·m).
- 1.3 Back off the adjusting nut one-half turn.
- 1.4 Rotate the hub assembly a few turns, and tighten the adjusting nut 50 lbf·ft (68 N·m).
- 1.5 Rotate the hub assembly one turn, and back off the adjusting nut as follows.
 - For 1-1/8 inch spindles, back off the adjusting nut three-eighths turn.
 - For 1-1/2 inch and larger spindles, back off the adjusting nut one-eighth turn.

NOTE: The gaps between holes in the lockring are spaced unevenly, so to fit the tab on the adjusting nut into one of the holes with minimal turning of the adjusting nut, gauge the distance on one side of the lockring, then the other, and choose the side that requires the adjusting nut to be advanced the least. Do not back off the nut.

- 2. Install the lockring (as described in the note above) and bend-type locking washer.
- Install the jam nut, and tighten it to the applicable torque value in Table 1.
- Measure the end play; see Subject 190 for instructions.

Double Spindle Nut Removal, Installation, and Adjustment

WARNING

Correct wheel-bearing end play is crucial to the safe and sound operation of the vehicle. If the end play is not correct, the wheel bearings could fail and cause the loss of the wheel and hub assembly and result in an accident causing property damage, serious injury, or death. Use a dial indicator to measure the end play.

- The end play must be between 0.001 and 0.005 inch (0.03 and 0.13 mm). If the end play is not within this range, adjust the end play as follows.
 - 5.1 Remove the jam nut and locking device, and back off or tighten the inner adjusting nut.
 - 5.2 Install the locking device and jam nut as described earlier, and measure the end

- play. If the end play is not between 0.001 and 0.005 inch (0.03 and 0.13 mm), turn the adjusting nut again.
- 5.3 Measure the end play.

If the end play is not between 0.001 and 0.005 inch (0.03 and 0.13 mm), repeat the adjustment procedure until the correct end play is achieved.

IMPORTANT: The correct end play **must** be achieved before completing the hub assembly installation procedure.

- 6. Once the end play is between 0.001 and 0.005 inch (0.03 and 0.13 mm), bend two tabs on the locking washer at 6 o'clock and 12 o'clock to lock the jam nut in place. See **Fig. 5**.
- 7. Rotate the hub in both directions. It should turn freely with no dragging or binding.

Jam Nut Torque Values (Non-PreSet Bearings)				
Nut Lock Type	Nut Size	Permissible Torque Range: lbf·ft (N·m)		
Locking Washer and Lockring (see Fig. 1)	1-1/8	150–225 (205–305)		
or	1-1/2 to 2-1/2	200–300 (270–405)		
Lockring and Doweled Adjusting Nut (see Fig. 2)	2-5/8 and over	250-400 (340-540)		
Locking Washer Only (see Fig. 3)	1-1/8 to 2-1/2	100–150 (135–205)		
Locking Washer Only (see Fig. 3)	2-5/8 and over	100–200 (135–270)		

Table 1, Jam Nut Torque Values (Non-PreSet Bearings)

Meritor Easy Steer Plus Hub Installation and Adjustment

Installation and Adjustment

- 1. With the hub mounted on the axle spindle, install the inner (adjusting) nut and tighten it 600 lbf-ft (815 N·m).
- 2. Install the locking device (nut-lock, lockwasher, or both).
- 3. Install the jam nut and tighten 250 lbf·ft (340 N·m).
- 4. Bend two opposing tangs of the nut-lock as needed, to lock the jam nut and adjusting nut.
- 5. Install the hub cab and tighten 350 lbf·ft (475 $N \cdot m$).

Axilok Spindle Nut Removal, Installation, and Adjustment

General Information

Axilok® spindle nuts may be used on ConMet PreSet hubs. See Fig. 1 and Fig. 2. These nuts can be damaged if they are not removed or installed correctly. Use the following guidelines when removing and installing Axilok retaining nuts.

- Use only the correct size, six-point socket to remove or install Axilok spindle nuts. Do not use a worn or loose-fitting socket. Do not use a 12-point socket.
- Do not use hammers, chisels, pliers, wrenches, or power tools to remove or install Axilok nuts.
- Do not use an Axilok nut if the locking clips are damaged or missing, or if the retainer cage tab or D-flat is damaged or missing.
- Never try to repair a damaged Axilok nut; always replace it with a new one.
- Always start an Axilok installation by hand. A
 good-fitting six-point socket will completely disengage the nut's locking clips, allowing it to
 spin freely by hand. See Fig. 3. Use an accurately calibrated torque wrench to tighten the
 nut to its final torque value.

Installation

Instructions for installing an Axilok nut for both Pre-Set and non-PreSet type bearings are provided in this subject. See the pertinent instructions for the type you are installing.

Using PreSet Bearings



Follow the guidelines at the beginning of this subject when installing an Axilok nut. Axilok retaining nuts secure the hub assemblies on the axle. If the Axilok nut is not correctly installed, the hub could separate from the axle, resulting in severe personal injury or death.

- 1. Apply a few drops of oil through one of the holes in the Axilok retainer cage to reduce friction between the retainer cage and nut.
- 2. By hand, install the Axilok nut onto the axle spindle. See **Fig. 1** and **Fig. 2**.

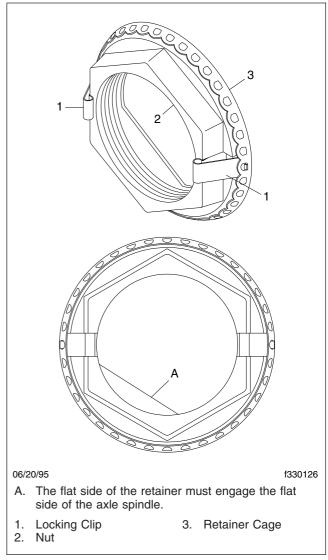
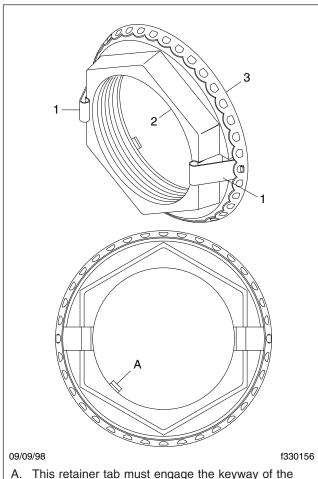


Fig. 1, Axilok Retaining Nut, Meritor Front Axle

- 3. Tighten the retaining nut 250 lbf-ft (339 N·m). The nut should lock in place when you remove the wrench. If it does not, advance the nut until it does. **Do not back it off**.
- 4. Ensure that both locking clips are present and engaged in the retainer cage. See **Fig. 3**. If the locking clips are not engaged, the nut is not locked in position and can rotate freely.

Axilok Spindle Nut Removal, Installation, and Adjustment



 This retainer tab must engage the keyway of the axle spindle.

1. Locking Clip

2. Nut

- 3. Retainer Cage
- Fig. 2, Axilok Retaining Nut, Eaton Front Axle

Using Non-PreSet Bearings

For ConMet PreSet hubs, when there is no bearing spacer installed and non-PreSet type bearings are being used, proper wheel bearing adjustment is critical to the performance of the bearings, wheel seals, and other related wheel end components.

A WARNING

Follow the guidelines at the beginning of this subject when installing an Axilok nut. Axilok retaining nuts secure the hub assemblies on the axle. If the Axilok nut is not correctly installed,

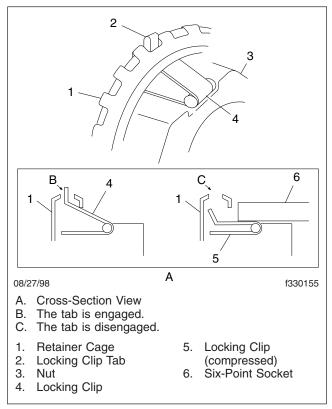


Fig. 3, Axilok Nut, Checking the Position of the Locking Clip

the hub could separate from the axle, resulting in severe personal injury or death.

- Apply a few drops of oil through one of the holes in the Axilok retainer cage to reduce friction between the retainer cage and nut. See Fig. 1 and Fig. 2.
- Install the Axilok nut and adjust the wheel bearings, as follows.
 - 2.1 By hand, install the Axilok nut onto the axle spindle and turn it against the bearing while spinning the hub.
 - 2.2 Tighten the nut 90 to 110 lbf·ft (122 to 149 N·m) while spinning the hub in both directions.
 - 2.3 Loosen the nut to zero torque, and spin the hub a few turns.
 - 2.4 Tighten the nut 50 lbf-ft (68 N·m) while spinning the hub in both directions. Back off the nut one-eighth to one-sixth turn.

Axilok Spindle Nut Removal, Installation, and Adjustment

- 2.5 Remove the wrench from the nut, and verify whether both locking clips are present and engaged in the retainer cage. See Fig. 3. If the locking clips are not engaged, advance the Axilok until they are.
- Measure the end play; see Subject 200 for instructions.

WARNING

Correct wheel-bearing end play is crucial to the safe and sound operation of the vehicle. If the end play is not correct, the wheel bearings could fail and cause the loss of the wheel and hub assembly and result in an accident causing property damage, serious injury, or death. Use a dial indicator to measure the end play.

4. The end play must be between 0.001 and 0.005 inch (0.03 and 0.13 mm). If it is not within this range, remove the Axilok nut, and repeat the tightening sequence as described earlier in this procedure. Once the end play is correct, continue with your service procedure.

Outboard-Mounted Drum Removal and Installation

A WARNING

When replacing brake pads, shoes, rotors, or drums, always replace components as an axle set.

- Always reline both sets of brakes on an axle at the same time.
- Always replace both rotors/drums on an axle at the same time.
- Always install the same type of linings/pads or drums/rotors on both axle ends of a single axle, and all four axle ends of a tandem axle, at the same time. Do not mix component types.

Failure to do so could cause uneven braking and loss of vehicle control, resulting in property damage, personal injury, or death.

Removal

- Chock the rear tires to prevent vehicle movement. Apply the parking brakes.
- 2. Raise the front of the vehicle until the tires clear the ground. Then place safety stands under the axle.

WARNING

Never work under a vehicle that is supported only by a jack. Jacks can slip, causing the vehicle to fall. This could result in a person being pinned under or crushed by the vehicle, causing severe personal injury or death. Always use safety stands to support a vehicle.

3. Back off the slack adjuster to release the front axle brake shoes. See **Group 42** for instructions.

WARNING

Breathing brake lining dust (asbestos or nonasbestos) could cause lung cancer or lung disease. OSHA has set maximum levels of exposure and requires workers to wear an air purifying respirator approved by MSHA or NIOSH. Wear a respirator at all times when servicing the brakes, starting with removal of the wheels and continuing through assembly. 4. Remove the wheel and tire assembly. See **Group 40** for instructions.

To minimize the possibility of creating airborne brake lining dust, clean the dust from the brake drum, brake backing plate, and brake assembly, using an industrial-type vacuum cleaner equipped with a high-efficiency filter system. Then, using a rag soaked in water and wrung until nearly dry, remove any remaining dust. Don't use compressed air or dry brushing to clean the brake assembly.

- 5. Remove the brake drum.
- Inspect the drum. See Subject 110 for instructions.

Installation

- 1. Install the brake drum on the wheel hub.
 - 1.1 On hub-piloted drums, position the brake drum on the top step of the pilot pad. One of the hub's pilot pads should be at the 12 o'clock (top center) position. See Fig. 1.

IMPORTANT: If the drum is not positioned correctly, the pilot pad could be damaged when the wheel nuts are tightened.

1.2 Make sure that the pilot pads securely center the drum (space between drum and hub is equal all around the hub).

IMPORTANT: If damage to the pads prevents the drum from centering, replace the hub. If necessary to hold the drum in position, adjust the brakes before installing the wheels.

 Install the wheel and tire assembly. To ensure that the drum does not slip off the pilot pad, follow the proper nut tightening sequence. For instructions, see Group 40.

A WARNING

If the wheel nuts cannot be tightened to minimum torque values, the wheel studs have lost their locking ability, and the hub flange is probably damaged. In this case, replace it with a new wheel hub assembly. Failure to replace the wheel hub assembly when the conditions described

Outboard-Mounted Drum Removal and Installation

above exist, could result in the loss of a wheel or loss of vehicle control, and possible personal injury.

- 3. Adjust the front axle brakes. Refer to Group 42 of the *Business Class M2 Maintenance Manual*.
- 4. Raise the vehicle and remove the safety stands from under the axle. Lower the vehicle.

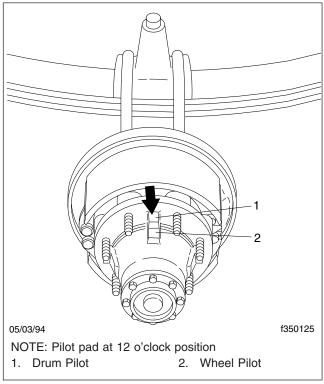


Fig. 1, Hub Pilot Pads

Wheel Bearing Cup Removal and Installation, Aluminum Hubs

Removal

To insure a tight fit, wheel bearing cups are purposely larger than the wheel hub bores they occupy. See **Fig. 1**. To remove the bearing cups, aluminum hub bores must be temporarily expanded by heating the hub in an oven (the bearing cups will also expand, but to a considerably lesser extent). If adequate heating facilities are not available, replace the hub, wheel stud, and bearing cup assembly.

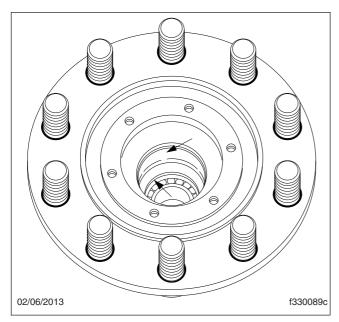


Fig. 1, Wheel Bearing Cup Locations

- Completely remove all grease, oil, and other debris from the outer and inner surfaces of the wheel hub assembly.
- Oven-heat the hub to a temperature range of 240° to 280°F (116° to 138°C). Make sure the oven thermostat is accurately set; if unsure, use an oven thermometer to check the temperature of the oven before placing the hub inside.

If adequate heating facilities are not available, replace the hub, wheel stud, and bearing cup assembly.



Do not use oxyacetylene equipment or similar equipment to heat the hub. Oxyacetylene equipment or similar equipment will cause cracks in

the hub that could cause loss of a wheel and loss of vehicle control, leading to personal injury or property damage.

3. Wearing heavy protective gloves, remove the hub from the oven. Place the hub on a suitable press so that the base is fully supported. Quickly press out the bearing cups.

Installation

To install the bearing cups, aluminum hubs must again be temporarily expanded using oven heating. When the hub is properly heated, the bearing cup and hub can be press-fit together, using a suitable press.

- Completely remove all grease, oil, and other debris from the outer and inner surfaces of the wheel hub assembly, including the bearing cup bores.
- Inspect the bearing cup bores of the hub for warpage or uneven surfaces. If a bearing cup bore is damaged, replace the wheel hub assembly.
- 3. Oven-heat the hub to a temperature range of 240° to 280°F (116° to 138°C). Make sure the oven thermostat is accurately set; if unsure, use an oven thermometer to check the temperature of the oven before placing the hub inside.

WARNING

Do not use oxyacetylene equipment or similar equipment to heat the hub. Oxyacetylene equipment or similar equipment will cause cracks in the hub that could cause loss of a wheel and loss of vehicle control, leading to personal injury or property damage.

- 4. Coat the replacement bearing cup hub contact surface with a film of grease.
- 5. Wearing heavy protective gloves, remove the hub from the oven.
- 6. Place the hub on a suitable press so that the base is fully supported. Quickly press-fit the bearing cup into the wheel hub until it is completely and evenly seated. Be careful not to shave the sides of the bearing cup bore as the bearing cup is seated. The accumulation of debris will prevent the cup from being seated and will also cause permanent damage to the wheel

Wheel Bearing Cup Removal and Installation, Aluminum Hubs

hub. If the sides of the bearing cup bore are damaged during installation, replace the wheel hub assembly.

- 7. Allow the wheel hub to cool before handling. Then, using a 0.0015-inch feeler gauge, check at several places for the seating of the bearing cup in the bearing cup bore. The gauge should not enter beneath the cup. If it does, there is probably dirt or debris preventing the cup from seating. Using the instructions above, remove the cup, then remove the foreign matter. Reinstall the cup.
- 8. Wipe off the accumulation of grease left after the bearing cup has been seated. Then, using a clean, lint-free cloth dampened with kerosene or diesel fuel oil, clean the inner surface of the bearing cup. Wipe the surface dry using a clean, absorbent, and lint-free cloth or paper.

Wheel Stud Replacement

Replacement

A WARNING

If a wheel stud breaks, the remaining studs are subjected to undue strain and could fail due to fatigue. When a broken stud is replaced, replace the stud on each side of it. See Fig. 1. If more than one stud is broken, replace all of the studs. Failure to replace the studs could result in the loss of a wheel or loss of vehicle control, possibly resulting in personal injury.

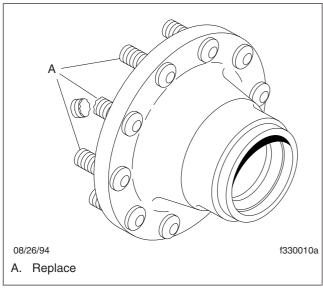


Fig. 1, Wheel Stud Replacement

- 1. Remove the wheel hub from the axle. For instructions, see **Subject 100**.
- 2. If a bent portion of a wheel stud will have to pass through the wheel stud bore, cut off the bent portion before removing the wheel stud.
- Place the wheel hub on a suitable press; make sure the hub flange is supported evenly around and next to the stud being removed. With steady movement, press the damaged stud out of the hub.



Do not use a drift and hammer or concentrated heat for removing and installing the wheel studs. Constant, smooth movement of the wheel stud is necessary to ensure the least amount of metal removal from the wheel stud bore. Concentrated heat will damage the hub. If the hub is damaged during wheel stud removal or installation, replace it.

- Apply a coating of clean axle grease to the entire shaft on headed studs.
- 5. With the hub on a suitable press, make sure the hub flange is supported evenly around and next to the stud being installed.
- 6. Position the stud in its hole. Be sure the flat edge of the head flange on clipped studs is in line with the shoulder on the hub.



If headed studs with serrations are being installed, position the teeth of the serrated portion in the notches carved by the original wheel studs during factory installation. If additional metal is scraped from the wheel stud bores, the locking action provided by the serrations will be greatly weakened. Loss of locking action will prevent achieving final torque of the wheel nuts during wheel installation. If final wheel nut torques during wheel installation cannot be achieved, replace the wheel hub assembly.

NOTE: If the left side of the vehicle is being serviced, the replacement wheel stud must be stamped with an "L" (left-hand threaded), and the nut's face must be stamped "Left" If the right side of the vehicle is being serviced, the replacement stud must be stamped with an "R" (right-hand threaded), and the nut's face must be stamped "Right." See Fig. 2.

- 7. With steady movement, press the new stud all the way into the hub.
- 8. Make sure the stud is fully seated and that its head (flange) is not embedded into the hub. If the head of the stud is embedded into the hub, replace the hub.

WARNING

Don't embed the wheel stud heads in the wheel hub. Wheel studs with heads embedded in the wheel hub will weaken the wheel hub flange. Weakness in the wheel hub can result in the loss of a wheel or loss of steering control, possibly resulting in personal injury.

Wheel Stud Replacement

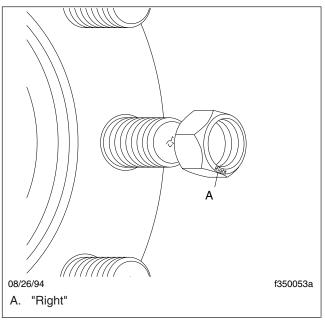


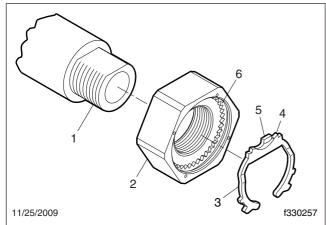
Fig. 2, Thread Stamp Location

- Wipe off any grease on the wheel studs and wheel hub. Install wheel nuts on dry wheel studs only.
- 10. Install the wheel hub on the axle. For instructions, see **Subject 100**.

Pro-Torq Spindle Nut Removal, Installation, and Adjustment

General Information

Pro-Torq® spindle nuts may be used on ConMet Pre-Set hubs. See **Fig. 1** and **Fig. 2**.



NOTE: "D-flat" spindle configuration shown; for a spindle with a keyway, the keeper has a keyway tab.

- 1. Axle Spindle
- 2. Pro-Torq Nut
- 3. Keeper Arm
- 4. Mating Teeth, Keeper
- 5. Keeper Tab
- 6. Mating Teeth, Nut

Fig. 1, Pro-Torq Spindle Nut and Keeper

Each time the Pro-Torq nut assembly is removed for maintenance purposes, replacing the "keeper" is recommended.

Removal



Do not place the nut on the spindle or tighten or loosen the nut on the spindle while the keeper is locked inside the nut. Doing so may damage the spindle threads and deform the keeper, and allow the nut to unthread during operation. Failure to follow this instruction could cause the hub to separate from the axle, resulting in severe personal injury or death.

 Insert the blade of a flathead screwdriver (or similar tool) in the slot of one of the keeper arms; see Fig. 3. Ensuring that the tool contacts the keeper and not the teeth of the nut, turn the tool

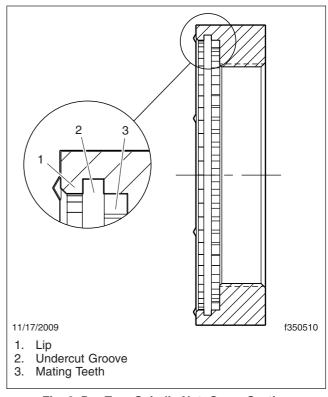


Fig. 2, Pro-Torq Spindle Nut, Cross Section

slightly and carefully pry the arm from the undercut groove of the nut.

- Repeat at the other arm, and remove the keeper from the nut.
- 3. Remove the Pro-Torq nut.

Installation

The following procedure applies to Pro-Torq steer axle nut 448-4836. The part number is stamped on the nut.



Do not place the nut on the spindle or tighten or loosen the nut on the spindle while the keeper is locked inside the nut. Doing so may damage the spindle threads and deform the keeper, and allow the nut to unthread during operation. Failure to follow this instruction could cause the hub to separate from the axle, resulting in severe personal injury or death.

Pro-Torq Spindle Nut Removal, Installation, and Adjustment

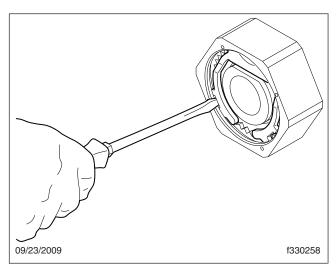


Fig. 3, Removing the Keeper

Instructions for installing a Pro-Torq spindle nut for both PreSet and non-PreSet type bearings are provided in this subject. See the instructions pertaining to the bearing type used with the hub you are securing.

Using PreSet Bearings

- 1. Ensure the keeper is removed from the nut.
- Install the Pro-Torq spindle nut, and tighten it 250 lbf-ft (339 N·m). Do not back it off.

WARNING

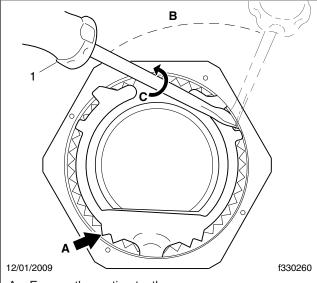
If the keeper has a keyway tab, do not bend or manipulate it in any way. Doing so may cause it to break off in service, which could lead to the hub separating from the axle and result in severe personal injury or death.

Install the keeper.

IMPORTANT: If the keeper cannot be engaged, advance the nut until it can be. Do not back off the nut.

- 3.1 With the correct side of the keeper facing out, insert the keeper tab in the undercut groove of the Pro-Torq nut, and engage the mating teeth.
- 3.2 Use a flathead screwdriver to carefully compress and guide each arm past the lip and into the undercut groove of the nut as

shown in **Fig. 4**. To secure the keeper it may be necessary to nudge the arms into the groove.



- A. Engage the mating teeth.
- B. Compress the arm.
- Turn the screwdriver to seat the keeper in the groove.
- 1. Flathead Screwdriver

Fig. 4, Installing the Keeper



Failure to secure the keeper and lock the Pro-Torq nut could cause the wheel assembly to come off the vehicle, resulting in severe personal injury or death.

 Inspect the installation; ensure the keeper is locked in the undercut groove of the nut.

Using Non-PreSet Bearings

For ConMet PreSet hubs, when there is no bearing spacer installed and non-PreSet type bearings are being used, proper wheel bearing adjustment is critical to the performance of the bearings, wheel seals, and other related wheel end components.

- 1. Ensure the keeper is removed from the nut.
- 2. Seat the bearings.

Pro-Torq Spindle Nut Removal, Installation, and Adjustment

2.1 Using a torque wrench, tighten the nut 200 lbf·ft (270 N·m). Spin the hub at least one full rotation.

NOTE: Torque is lost when the hub is spun.

- 2.2 Tighten the nut 200 lbf·ft (270 N·m). Spin the hub at least one full rotation.
- 2.3 Tighten the nut 200 lbf·ft (270 N·m), but do not spin the hub.
- Loosen the nut to zero torque. Do not spin the hub.
- 4. Adjust the bearing.
 - 4.1 Using a torque wrench, tighten the nut 100 lbf·ft (136 N·m). Spin the hub at least one full rotation.

NOTE: Torque is lost when the hub is spun.

- 4.2 Tighten the nut 100 lbf·ft (136 N·m). Spin the hub at least one full rotation.
- 4.3 Tighten the nut 100 lbf·ft (136 N·m).
- 4.4 Back off the nut one-quarter turn.

A WARNING

If the keeper has a keyway tab, do not bend or manipulate it in any way. Doing so may cause it to break off in service, which could lead to the hub separating from the axle and result in severe personal injury or death.

5. Install the keeper.

IMPORTANT: If the keeper cannot be engaged, advance the nut until it can be. Do not back off the nut.

- 5.1 With the correct side of the keeper facing out, insert the keeper tab in the undercut groove of the Pro-Torq nut, and engage the mating teeth.
- 5.2 Use a flathead screwdriver to carefully compress and guide each arm past the lip and into the undercut groove of the nut as shown in **Fig. 4**. To secure the keeper it may be necessary to nudge the arms into the groove.

WARNING

Failure to secure the keeper and lock the Pro-Torq nut could cause the wheel assembly to come off the vehicle, resulting in severe personal injury or death.

- 6. Inspect the installation; ensure the keeper is locked in the undercut groove of the nut.
- Measure the end play; see Subject 200 for instructions.

WARNING

Correct wheel-bearing end play is crucial to the safe and sound operation of the vehicle. If the end play is not correct, the wheel bearings could fail and cause the loss of the wheel and hub assembly and result in an accident causing property damage, serious injury, or death. Use a dial indicator to measure the end play.

8. The end play must be between 0.001 and 0.005 inch (0.03 and 0.13 mm). If it is not within this range, remove the Pro-Torq nut, and repeat the tightening sequence as described in previous steps. Once the end play is correct, continue your service procedure.

Wheel Bearing End Play Measurement

WARNING

Correct wheel-bearing end play is crucial to the safe and sound operation of the vehicle. If the end play is not correct, the wheel bearings could fail and cause the loss of the wheel and hub assembly and result in an accident causing property damage, serious injury, or death. Use a dial indicator to measure the end play.

IMPORTANT: Do not measure the wheel bearing end play with the wheel mounted on the hub; you cannot accurately measure or adjust bearing end play with the wheel mounted on the hub. Also, ensure that the brakes are not applied so that that drum and hub can move freely.

Measurement

Using a dial indicator, measure the end play as follows.

 Attach the magnetic base of a dial indicator to the end of the spindle, and place the measuring end of the indicator against the hub cap mounting flange. See Fig. 1.

IMPORTANT: Maintain continual pressure on the hub until you have taken both the inboard and outboard measurements. If you release the hub, an accurate measurement is not possible.

2. To seat the bearings, grip the hub at the three o'clock and nine o'clock positions, and push inward while oscillating it approximately 45 degrees. Maintain pressure on the hub, note the inboard measurement, and then pull the hub outward while oscillating it as before. Maintain pressure on the hub, and note the outboard measurement. See Fig. 2.

The end play is the difference between the two measurements.

NOTE: If the end play exceeds the limit, the hub may need to be serviced. See **Subject 110** and manufacturer literature for procedures.

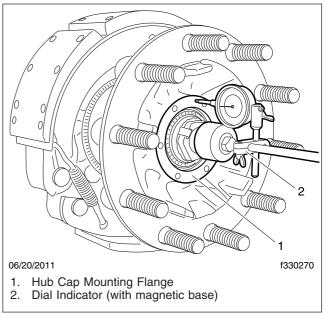


Fig. 1, Dial Indicator Setup

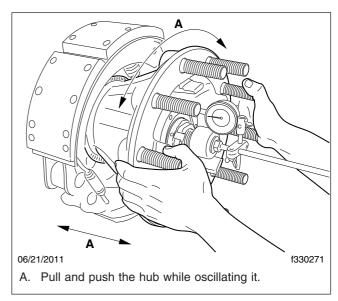


Fig. 2, Measuring End Play

ConMet PreSet Plus Spindle Nut Removal and Installation

General Information

ConMet PreSet Plus hubs use a special integrated spindle nut designed specifically for PreSet Plus hubs. See Fig. 1.

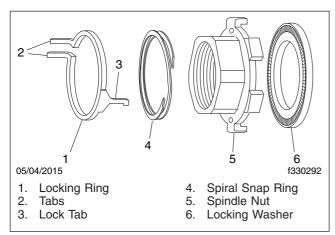


Fig. 1, PreSet Plus Spindle Nut System

Removal

1. To remove the red locking ring from the spindle nut assembly, compress the tabs and pivot the ring to unlock it from the nut.

IMPORTANT: Do not exceed 50 lbf·ft (68 N·m) of torque when removing a PreSet Plus hub using the spindle-nut system as a hub puller.

 Loosen the spindle nut. As the spindle nut is loosened, it can act as a hub puller. However, if the hub will not come off of the spindle without exceeding 50 lbf·ft (68 N·m) of torque, remove the spiral snap ring (see Fig. 2) and then the spindle nut assembly.

Installation



Each PreSet Plus hub assembly requires special bearings, a PreSet Plus bearing spacer, and the unique PreSet Plus spindle nut system. Wheel ends equipped with the PreSet Plus hub assembly must use these special components; do not use non-PreSet-Plus components with a PreSet Plus hub.

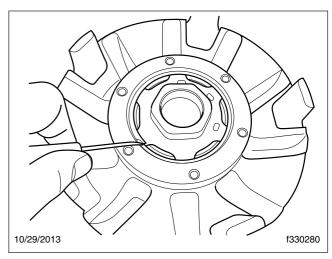


Fig. 2, Removing a Spiral Snap Ring

If a PreSet Plus hub is not correctly installed with the required components, the hub could separate from the axle, resulting in property damage, severe personal injury, or death.

The following instructions are for installing a PreSet Plus spindle nut. In some cases, the spindle nut components will have been removed along with the hub; in other cases, they will have been already installed in the hub. Use the pertinent instructions for your installation.

- 1. If the red locking snap ring is locked into the spindle nut, compress the tabs and pivot the ring to remove it from the nut. See Fig. 1.
- 2. If needed, begin installing the PreSet Plus spindle nut components, as follows.
 - 2.1 Seat the flat washer into the back of the spindle nut.
 - 2.2 Position the spindle nut and washer against the outer bearing.
 - 2.3 Install the spiral snap ring into the snap ring groove in the hub. Ensure that it fully seats into the groove in the hub. See Fig. 3 and Fig. 4.
- 3. Tighten the spindle nut 300 lbf-ft (407 N·m) while rotating the hub. Do not back off the spindle nut.

ConMet PreSet Plus Spindle Nut Removal and Installation

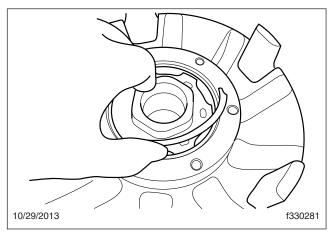


Fig. 3, Installing a Spiral Snap Ring

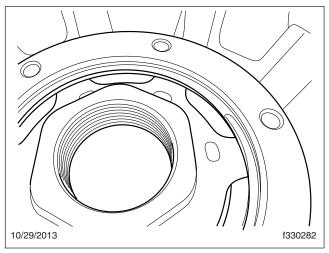


Fig. 4, Fully Seated Spiral Snap Ring

- NOTICE -

When bending the locking ring, be careful not to deform it permanently. If the locking ring is damaged or bent, replace it with a new one.

- 4. Install the locking ring, as follows.
 - 4.1 One of the holes in the face of the spindle nut will line up with a hole in the washer. Insert the lock tab of the locking ring through aligned holes.
 - 4.2 Using the handle tabs, seat the locking ring in the machined grooves of the spindle nut.

Hub Runout Measurements

If either the lateral or radial runout of the hub is beyond acceptable limits, replace the hub. For instructions, see **Subject 100** in this section.

Measurements

 Park the vehicle on a level surface, shut down the engine, and set the parking brake. Chock the tires.

WARNING

Breathing brake lining dust (asbestos or nonasbestos) could cause lung cancer or lung disease. OSHA has set maximum levels of exposure and requires workers to wear an air purifying respirator approved by MSHA or NIOSH. Wear a respirator at all times when servicing the brakes, starting with removal of the wheels and continuing through assembly.

- 2. Remove the wheel and tire assembly. See **Group 40** for instructions.
- 3. For drum brakes, remove the brake drum. See **Subject 160** for instructions.
- 4. Clean the hub surfaces where the measurements will be taken—see Fig. 1 and Fig. 2.
- To measure lateral runout, set up a dial indicator as shown in Fig. 1, then turn the hub one revolution and note the highest and lowest measurements.

For ConMet hubs, the acceptable lateral runout is 0.008 inch (0.2 mm); for other hubs, see the hub OEM for the acceptable lateral runout specification.

 To measure radial runout, set up a dial indicator as shown in Fig. 2, then turn the hub one revolution and note the highest and lowest measurements.

For ConMet hubs, the acceptable radial runout is 0.008 inch (0.2 mm); for other hubs, see the hub OEM for the acceptable radial runout specification.



Fig. 1, Setup to Measure Lateral Runout

Hub Runout Measurements



Fig. 2, Setup to Measure Radial Runout

Troubleshooting Tables

Problem — Noisy Bearings or Excessive Bearing Replacement Intervals

Problem — Noisy Bearings or Excessive Bearing Replacement Intervals		
Possible Cause	Remedy	
Not enough oil was used on the bearings, or the wrong type of oil was used.	Clean, then inspect the bearings for wear. Replace worn seals. Coat the bearing assemblies with fresh oil.	
Foreign matter or corrosive agents entered the bearing assembly. Dirt or metallic debris from the bearings was not removed.	Clean, then inspect the bearings for wear. Replace worn seals. Also clean the wheel hub, the axle spindle, and any other component in contact with the bearing lubricant.	
An incorrect adjustment of the wheel bearings is causing noise and wear.	Adjust the wheel bearings, following the applicable instructions in this section.	
Flat spots or dents on the roller surface were caused by skidding of the roller, or improper handling of the wheel bearing during installation.	Clean, then inspect the bearing rollers. Replace the bearing if damaged. Coat the replacement bearings with fresh oil. For lubricant specifications, see Specifications 400 .	

Problem — Broken Wheel or Rim Studs

Problem — Broken Wheel or Rim Studs		
Possible Cause	Remedy	
The wheel or rim nuts were overtightened.	Replace the wheel or rim studs. See Group 40 for the wheel or rim nut	
An incorrect nut tightening sequence was used.	tightening sequence.	
The wrong brake drums were installed.	Install new brake drums.	
Wheels are mismatched (hub-piloted wheels are mixed with stud-piloted wheels).	Install properly matched wheels.	
The vehicle is being overloaded.	Do not exceed the maximum load-carrying capacity of the vehicle.	

Problem — Damaged Hub

Problem — Damaged Hub		
Possible Cause	Remedy	
(Cracked hub) Local surface of an aluminum hub was heated higher than 350°F (177°C) during bearing cup removal.	Replace the hub assembly. When removing the bearing cup, oven-heat the hub.	
(Bent flange) Incorrect installation of the wheel studs, such as using a hammer and drift, or the hub flange was not fully supported on the press during wheel stud replacement.	Replace the hub assembly; see Subject 100 . Replace the wheel studs.	
The wrong brake drums were installed.	Install new brake drums.	
Insufficient tightening of the wheel nuts to the wheel hub.	Replace the hub assembly. See Subject 100 .	

Problem — Loss of Lubricant from the Wheel Hubs

Problem — Loss of Lubricant from the Wheel Hubs		
Possible Cause	Remedy	
The seals or gaskets are worn or damaged.	Replace worn or damaged parts.	

Problem — Vehicle Does Not Slow Down Quickly Enough When Brakes Are Applied

Problem — Vehicle Does Not Slow Down Quickly Enough When Brakes Are Applied	
Possible Cause	Remedy
Dirt or grease has built up on the brake linings (glazing), or the brake linings have worn excessively.	Install new brake linings on both sets of axle brake shoes. Clean, turn, or replace the drums.
The brake drums are worn, heat-checked or cracked.	Install new brake drums.

Problem — Service Brakes Grab or Pull

Problem — Service Brakes Grab or Pull	
Possible Cause	Remedy
For detailed information, see Group 42.	

Problem — Poor Lining-to-Drum Contact

Problem — Poor Lining-to-Drum Contact	
Possible Cause	Remedy
The inside surface of the brake drum is scored or grooved.	Install new brake linings on both sets of axle brake shoes. Install new brake drums or turn the drums.
The brake shoes are stretched or bent.	Replace the brake shoes.
Undersized linings were installed.	Install new brake linings on both sets of axle brake shoes.
An incorrect grind was used on the brake linings.	
The wrong brake drums were installed.	Install new brake drums.
An incorrect adjustment of the wheel bearings is causing wheel instability.	Adjust the wheel bearings following the applicable instructions in this section.

Problem — Brake Linings Are Tapered Across the Width

Problem — Brake Linings Are Tapered Across the Width	
Possible Cause	Remedy
The inside surface of the brake drum is scored or grooved.	Install new brake linings on both sets of axle brake shoes. Turn or replace the drums.
The brake shoes are bent.	Replace the brake shoes.
An incorrect adjustment of the wheel bearings is causing wheel instability.	Adjust the wheel bearings following the applicable instructions in this section

Problem — Brake Shoes on the Same Brake Are Wearing Unequally

Problem — Brake Shoes on the Same Brake Are Wearing Unequally	
Possible Cause Remedy	
The brake linings are not a matched set. Different friction codes or different brands of brake linings are installed.	Install a new matched set of brake linings on both sets of axle brake shoes. Clean, turn, or replace the drums.
The brake shoes are stretched.	Replace the brake shoes.

Problem — Shoes on Each Side of the Axle (Side-to-Side Brakes) Are Wearing Unequally

Problem — Shoes on Each Side of the Axle (Side-to-Side Brakes) Are Wearing Unequally	
Possible Cause	Remedy
The brake linings are not a matched set. Different friction codes or different brands of brake linings are installed.	Install a new matched set of brake linings on both sets of axle brake shoes. Clean, turn, or replace the drums.
The inside surface of the brake drum is in poor condition.	Turn or replace the drums.
The wheel bearings are out of adjustment.	Adjust the wheel bearings following the applicable instructions in this section.

Problem — Edge of the Lining Is Showing Wear

Problem — Edge of the Lining Is Showing Wear	
Possible Cause	Remedy
The brake lining is too wide.	Install new brake linings on both sets of axle brake shoes.
The brake linings are misaligned because of incorrectly drilled brake lining holes.	
Undersized brake drums were installed.	Install new brake drums.
The wheel bearings are out of adjustment.	Adjust the wheel bearings following the applicable instructions in this section.
There is an incorrect fit of the wheel onto the spindle due to the wrong wheel bearings.	Install new wheel bearings and adjust them following the applicable instructions in this section.
The brake shoes are bent.	Replace the brake shoes.

Problem — Brake Linings Are Scored or Grooved

Problem — Brake Linings Are Scored or Grooved	
Possible Cause	Remedy
Worn or scored brake drums have been causing poor contact with the brake linings.	Install new brake linings on both sets of axle brake shoes. Turn or replace the brake drums.
There is abrasive material between the lining and the drum.	

Problem — Brake Linings Are Loose

Problem — Brake Linings Are Loose	
Possible Cause	Remedy
The rivet holes in the brake shoes are to large.	Replace the brake shoes.
Incorrectly crimped rivets are working loose and allowing the linings to move.	Replace the rivets.
Rust has built up on the shoe table.	Clean the brake shoe table of all rust, dirt, scale, and paint.

Problem — Brake Lining Is Cracked at the Rivet Holes or Bolt Holes

Problem — Brake Lining Is Cracked at the Rivet Holes or Bolt Holes	
Possible Cause	Remedy
Overtightening of the lining bolts is causing cracks.	Install new brake linings. Replace the rivets or bolts with the correct size.
The wrong size counter bore for the rivet holes was made.	
The wrong rivets or bolts were used.	Replace the rivets or bolts with the correct size.
Incorrectly crimped rivets are working loose and allowing the linings to move.	Replace the rivets.
Rust has built up on the shoe table.	Clean the brake shoe table of all rust, dirt, scale, and paint.

Problem — Out-of-Round Rivet Holes or Bolt Holes

Problem — Out-of-Round Rivet Holes or Bolt Holes	
Possible Cause	Remedy
The rivets or bolts are loose.	Replace the brake shoes or linings.

Problem — Brake Drums Are Heat-Checked

Problem — Brake Drums Are Heat-Checked	
Possible Cause	Remedy
The brake drums are out-of-round.	Turn or replace the brake drums.
The wrong brake drums were installed.	Install new brake drums.
The wheel bearings are out of adjustment.	Adjust the wheel bearings following the applicable instructions in this section.
The brake linings are glazed (dirt or grease build-up) or are worn unevenly.	Install new brake linings on both sets of axle brake shoes. Clean, turn, or replace the drums.
The lining friction material for the operation of the vehicle is incorrect.	
There is a brake imbalance between the tractor and the trailer.	Do a brake balance test (tractor versus trailer). Contact the District Service Manager if help is needed.

Problem — Brake Drums Are Heavily Scored

Problem — Brake Drums Are Heavily Scored	
Possible Cause	Remedy
The brake linings are damaged.	Install new brake linings on both sets of axle brake shoes. Clean, turn, or replace the drums.
There is excessive wear on the linings.	
On the last brake reline, the drums were not turned.	Turn the brake drums.

Problem — Excessive Brake Lining Wear

Problem — Excessive Brake Lining Wear	
Possible Cause	Remedy
There is a brake imbalance between the tractor and the trailer.	Do a brake balance test (tractor versus trailer). Contact the District Service Manager if help is needed.

Problem — Hard Steering

Problem — Hard Steering	
Possible Cause	Remedy
Tire pressure is low in one or both front tires.	Inflate tires to the correct pressure.
Binding in the steering gear due to a lack of lubrication.	Test the steering system for binding with the front tires off the ground. For instructions, see Group 46 .
Too much caster angle in the front wheels.	Check the caster angle and adjust as needed.
The front suspension is sagging due to a damaged spring.	Repair or replace the spring as needed. For instructions, see Group 32 .
The axle spindle is bent.	Replace the spindle.
The frame is misaligned.	Check the frame alignment; correct, as needed.

Problem — Erratic Steering When the Brakes are Applied

Problem — Erratic Steering When the Brakes are Applied	
Possible Cause	Remedy
Tire pressure is low in one or both front tires.	Inflate the tires to the correct pressure.
One or more front axle spring U-bolt nuts are loose.	Check the U-bolt nuts for looseness. If loose, check the U-bolt for damage. Replace damaged parts; tighten loose nuts.
The brakes are not adjusted evenly.	Adjust the brakes on all axles. Also, check the operation of the slack adjusters.
Grease or oil contamination of the brake linings is reducing brake effectiveness.	Replace the brake linings and clean the drums. Find and correct the cause of grease or oil contamination.
The caster angle is wrong.	Check, and adjust as needed.
An axle spindle is bent.	Replace the axle spindle.

Problem — Erratic Steering When the Brakes are Applied	
Possible Cause	Remedy
The front axle wheel bearings are worn or were incorrectly adjusted.	Check the bearings for wear or damage; replace as needed.

Problem — Vehicle Pulls to One Side During Operation

Problem — Vehicle Pulls to One Side During Operation	
Possible Cause	Remedy
Tire pressure is low in one or both front tires.	Inflate the tires to the correct pressure.
One or more of the alignment measurements are incorrect.	Check all the alignment measurements. Correct as needed.
The wheels or tires are out-of-round.	Inspect the wheels and tires. Replace out-of-round parts.
The front axle wheel bearings are too tightly adjusted.	Check the bearings for wear or other damage. Replace the bearings if needed.
The front suspension is sagging due to a damaged spring.	Repair or replace the spring as needed. For instructions, see Group 32 .
The axle spindle is bent.	Replace the spindle.
The frame is misaligned.	Check the frame alignment; correct as needed.
The rear axle(s) is out of alignment.	Check, and if needed, adjust the rear axle alignment.

Problem — Front Wheel Wander

Problem — Front Wheel Wander	
Possible Cause	Remedy
One or more wheels or brake drums are out-of-balance.	Balance the wheels. Check for out-of-round brake drums; correct as needed.
One of the front springs is weak or broken.	Repair or replace the spring as needed. For instructions, see Group 32 .

Problem — Front Wheel Shimmy

Problem — Front Wheel Shimmy	
Possible Cause	Remedy
Tire pressure is low in one or both front tires.	Inflate the tires to the correct pressure.
One or more wheels or brake drums are out-of-balance.	Balance the wheels. Check for out-of-round brake drums, correct or replace as needed.
One or more tires are out-of-round or bulged.	Replace the tire.
The front axle wheel bearings are worn or were incorrectly adjusted.	Check the bearings for wear or other damage. Replace the bearings if needed.
Parts of the steering gear or linkage are worn.	Test for play in the steering gear and linkage with the front tires off the ground. Replace parts as needed.

Troubleshooting

Problem — Front Wheel Shimmy			
Possible Cause Remedy			
The axle spindle is bent.	Replace the spindle.		
One or more of the alignment measurements are incorrect.	Check all alignment measurements and correct as needed.		
The knuckle pin is loose due to worn bushings.	Inspect the knuckle pin and bushings for damage. Replace worn or damaged parts as needed.		
Shock absorbers are worn or damaged.	Check the shock absorbers and replace if needed.		

Problem — Vehicle Wanders

Problem — Vehicle Wanders			
Possible Cause	Remedy		
Tire pressure is low in one or both front tires.	Inflate the tires to the correct pressure.		
One or more of the alignment measurements are incorrect.	Check all of the alignment measurements; correct as needed.		
The rear axle(s) is out of alignment.	Check the rear axle alignment and adjust as needed.		
Parts of the steering gear or linkage are worn.	Test for play in the steering gear and linkage with the front tires off the ground. Replace parts as needed.		
A knuckle pin is loose due to worn bushings.	Inspect the knuckle pin and bushings for damage. Replace worn or damaged parts.		
The axle spindle is bent.	Replace the spindle.		

Problem — Cupped Tires

Problem — Cupped Tires			
Possible Cause	Remedy		
Tire pressure is too low or too high in one or both front tires.	Inflate or deflate the tires to the correct pressure.		
One or more wheels or brake drums are out-of-balance.	Balance the wheels. Check for eccentric brake drums; correct or replace as needed.		
The wheel toe-in in not correct.	Adjust the wheel toe-in.		
The brakes are not adjusted evenly.	Adjust the brakes on all axles. Also, check the operation of the slack adjusters.		
The front axle wheel bearings are worn or were not adjusted correctly.	Check the bearings for wear or other damage; replace them if needed.		
The camber angle is not within specifications.	Check the front wheel camber angle. If not correct, find and replace the damaged axle component.		

Troubleshooting

Problem — Steering Wheel Spokes Do Not Point at the 3 and 9 O'clock Positions

Problem — Steering Wheel Spokes Do Not Point at the 3 and 9 O'clock Positions			
Possible Cause	Remedy		
The steering gear is not centered.	Center the steering gear.		
If adjustable, the drag link is out of adjustment.	Adjust the drag link.		
The steering wheel was not installed (positioned) correctly on the steering column.	Reposition the steering wheel on the steering column.		
The pitman arm is not correctly aligned with the timing mark on the steering gear output shaft.	Reposition the pitman arm on the steering gear output shaft. For instructions, see Group 46 .		

Specifications

Detroit Axle Recommended Lubricant*			
Lubricant Type SAE Viscosity Grade			
Hypoid Gear Oil API Service Classification GL-5	80W-90		
Synthetic Gear Oil	75W-90		

^{*} The recommended lubricants listed in this table are for Detroit steer axles.

Table 1, Detroit Axle Recommended Lubricant

Dana Spicer® Axle Recommended Lubricant					
Lubricant Type Condition SAE Viscosity Grade					
Eaton Roadranger® Synthetic Axle Lubricants, or Equivalent with Military Specification MIL-L-2105D	Over-the-Road Service	75W–90			
	Off-Highway Equipment, or Under Extra Heavy Loads	80W-140			

Table 2, Dana Spicer Axle Recommended Lubricant

Meritor Axle Recommended Lubricant				
Lubricant Type	Ambient Temperature	SAE Viscosity Grade	Meritor Specification	
	+10°F (-12.2°C) and up*	85W-140	0-76-A	
	-15°F (-26.1°C) and up*	80W-140	0-76-B	
Hypoid Gear Oil API Service Classification GL-5	-15°F (-26.1°C) and up*	80W-90	0-76-D	
	-40°F (-40°C) and up*	75W–90	0-76-E	
	-40°F (-40°C) to +35°F (+2°C)	75W	0-76-J	
	-40°F (-40°C) and up*	75W-140	0-76-L	
0	-40°F (-40°C) and up*	75W–90	0-76-N	
Synthetic Gear Oil	-40°F (-40°C) and up*	-40°F (-40°C) and up* 75W-140	0-76-M	

 $^{^{\}star}$ There is no upper limit on these ambient temperatures, but axle sump temperature must never exceed 250°F (121°C).

Table 3, Meritor Axle Recommended Lubricant

Front Axle Oil Seals 33.02

Contents

Subject	Subject Number
General Information	050
Service Operations	
Seal Replacement, Chicago Rawhide	100
Seal Replacement, Dana Spicer	110
Seal Replacement, National	120
Specifications	400

33.02

General Information

General Information

Wheel oil seals (also called "oil bath seals" or "hub seals") work as a dam to keep oil in the hub cavity so that it constantly "bathes" the wheel bearings. The seals also protect the wheel bearings by keeping dirt, dust, and water out of the hub.

The oil seal fits between the hub bore and the axle spindle (see **Fig. 1**), and the sealing element either turns with the wheel (*hub-mounted seals*) and seals against the axle spindle, or the sealing element stays stationary with the axle spindle (*spindle-mounted seals*) and seals against the turning hub.

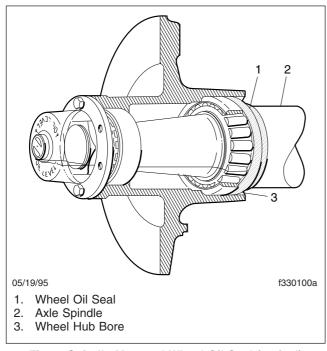


Fig. 1, Spindle-Mounted Wheel Oil Seal (typical)

Most wheel oil seals consist of four basic parts (Fig. 2):

- The outside edge (also called the outer "cup" or "case")
- The inside edge (also called the inner "cup" or "case")
- · The sealing element
- The garter spring

The outside edge is usually metal coated with rubber or another sealing agent so that it grips the hub bore tightly enough to prevent oil escaping between the outer edge of the seal and the hub bore.

The inside edge is usually metal or rubber with a metal ring within it to prevent the sealing element from wearing a groove in the axle spindle.

The sealing element is usually molded rubber, leather, or a synthetic such as nitrile or silicone. The element is molded into lips which will seal against the axle spindle or against the outside or inside edge described above. The innermost lip, called the "primary lip," keeps the oil inside the hub cavity. The outermost lip, called the "secondary lip," keeps dirt out of the hub cavity.

The garter spring is a coiled wire spring with its ends connected to make a loop. On hub-mounted seals, the spring runs around the outside of the sealing element to press the element inwards against the sealing surface. On spindle-mounted seals, the spring runs around the inside of the sealing element to press the element outward against the sealing surface.

Two brands of axle oil seals are used on this vehicle:

- Chicago Rawhide (Scotseal® and Scotseal Plus®)
- Dana Spicer (Outrunner[™])

Chicago Rawhide

The Chicago Rawhide Scotseal is a unitized, one-piece design consisting of a sealing element (packing) that is assembled between metal outer and inner cups. See Fig. 2. The sealing element consists of three sealing lips; a spring-loaded primary sealing lip that is factory pre-lubed and two dirt exclusion lips. The seal is press fit into the hub bore using Scotseal service installation tools. *Do not install the Scotseal directly onto the axle spindle.*

Although you install the Scotseal into the hub bore, the seal's element grips the axle spindle tightly enough that the sealing element stays stationary with the spindle and seals against the outer cup which turns with the hub.

The Chicago Rawhide Scotseal maintains a metal-tometal contact between the outer cup and the hub bore surface as well as a metal-to-metal contact between the sealing element inside edge and the axle spindle.

General Information

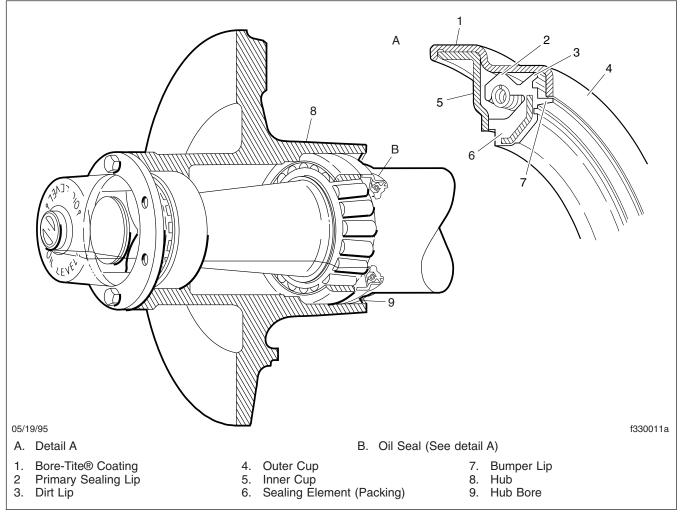


Fig. 2, Chicago Rawhide Scotseal

Dana Spicer

The Dana Spicer Outrunner has a rubber-coated outside edge and is installed in the hub bore using Dana Spicer installation tools. See **Fig. 3**.

Front Axle Oil Seals 33.02

General Information

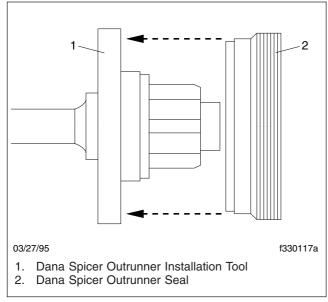


Fig. 3, Dana Spicer Outrunner Seal

33.02

Seal Replacement, Chicago Rawhide

Replacement

NOTE: This procedure applies to the Chicago Rawhide Scotseal®.

- 1. Remove the wheel, drum, and hub from the axle. For instructions, see **Section 33.01**, Subject 100.
- 2. Remove the oil seal from the hub.
- 3. Remove the inner wheel bearing assembly from the hub. Handling the bearings with clean dry hands, wrap the bearings in clean oil-proof paper or lint-free cloths. Occasionally, the inner wheel bearing cone assembly will remain in the hub after the seal is removed. In those cases, place a protective cushion to catch the bearing assembly. Using a hardwood drift and a light hammer, gently tap the bearing out of the inner wheel bearing cup.
- 4. Clean the spindle, spindle threads, seal bore, and the hub cavity. See Fig. 1 and Fig. 2.
- 5. Remove all burrs from the shoulder and the seal bore with an emery cloth or a file. Clean any metal filings from the components.

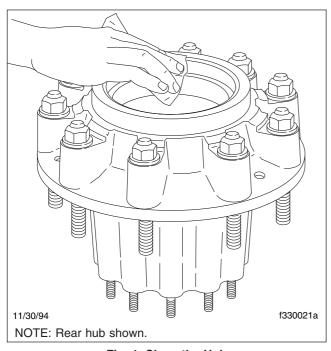


Fig. 1, Clean the Hub

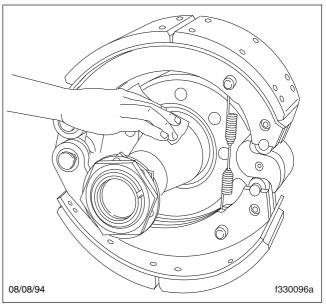


Fig. 2, Clean the Spindle



Do not spin bearing rollers at any time. Dirt or grit can scratch the roller surface and cause rapid wear of the bearing assembly. Treat used bearings as carefully as new ones.

IMPORTANT: Use extreme care in cleaning the wheel hub cavity and axle spindle. Dirt, metal filings, or other contaminants can scratch the bearing roller surfaces, and cause premature wear of the bearing assembly.

- 6. Inspect the bearings and hub components for wear or damage. Replace any worn or damaged components as necessary.
- 7. Coat the wheel bearing cones with oil.
- 8. Install the inner wheel bearing cone in the inner wheel bearing cup.
- Seat the small outside edge of the seal in the recess of the tool adaptor. See Fig. 3. The correct adaptor is identified on the box.
- Insert the centering plug of the tool in the bore of the inner bearing cone. See Fig. 4. The plug prevents cocking of the seal in the bore.
- 11. Hold the tool handle firmly, and strike it until the sound of the impact changes as the seal bottoms

Seal Replacement, Chicago Rawhide

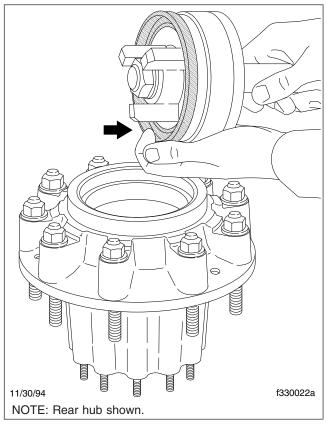


Fig. 3, Place the Seal on the Installation Tool

out. See **Fig. 5**. Hold the tool firmly to avoid bounce or unseating of the seal from the adaptor.

- 12. After the seal is bottomed in the bore, check for freedom of movement by manually moving the interior rubber part of the seal back and forth. A slight movement indicates a damage-free installation.
- Install the wheel hub on the axle, and adjust the wheel bearings. For instructions, see Section 33.01, Subject 100.

IMPORTANT: When starting the wheel on the spindle, center the hub carefully to avoid seal damage from the leading edge of the spindle.

- 14. Place the hubcap and a new gasket in position, then install the capscrews. Tighten the capscrews 15 lbf·in (20 N·m).
- Fill the hub with oil to the level shown on the hubcap. See Fig. 6. Do not overfill.

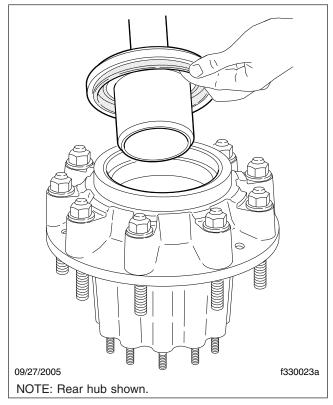


Fig. 4, Insert the Tool in the Hub Bore

- 16. Spin the wheel and check the oil level.
- 17. Adjust the brake shoe-to-drum clearance. For instructions, see Group 42 of the *Business Class M2 Maintenance Manual*.

Front Axle Oil Seals 33.02

Seal Replacement, Chicago Rawhide

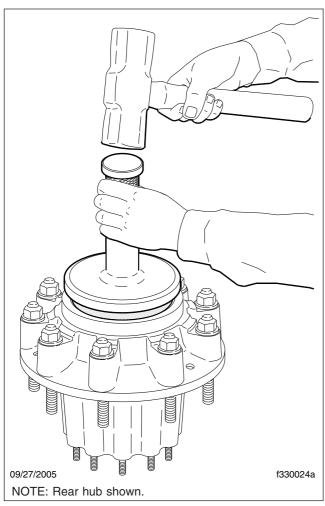


Fig. 5, Strike the Tool

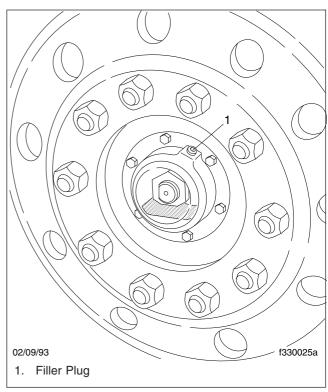


Fig. 6, Fill the Hub with Oil

Seal Replacement, Dana Spicer

Replacement

NOTE: This procedure applies to the Dana Spicer Outrunner[™] seal.

- 1. Remove the wheel, drum, and hub from the axle. For instructions, see **Section 33.01**, Subject 100.
- 2. Remove the oil seal from the hub.
- 3. Remove the inner wheel bearing assembly from the hub. Handling the bearings with clean dry hands, wrap the bearings in clean oil-proof paper or lint-free cloths. Occasionally, the inner wheel bearing cone assembly will remain in the hub after the seal is removed. In those cases, place a protective cushion to catch the bearing assembly. Using a hardwood drift and a light hammer, gently tap the bearing out of the inner wheel bearing cup.
- 4. Clean and inspect the bearings, the spindle, spindle threads, seal bore, and the hub cavity.

IMPORTANT: Use extreme care in cleaning the wheel hub cavity and axle spindle. Dirt, metal filings, or other contaminants can scratch the bearing roller surfaces, and cause premature wear of the bearing assembly.

- 4.1 Inspect the inner hub bore. Remove dirt and contaminants from all recesses and corners. Smooth any sharp edges with emery cloth, and fill in any grooves with filler. See Fig. 1.
- 4.2 Wipe the hub area with a clean shop cloth.
- 4.3 After removing the hub, inspect the spindle. Remove any sharp edges and burrs from the leading edges and the shoulder area. Repair deep gouges with filler and smooth with an emery cloth. See Fig. 2.
- 4.4 Wipe the seal and shoulder area with a clean shop cloth.



Do not spin bearing rollers at any time. Dirt or grit can scratch the roller surface and cause rapid wear of the bearing assembly. Treat used bearings as carefully as new ones.

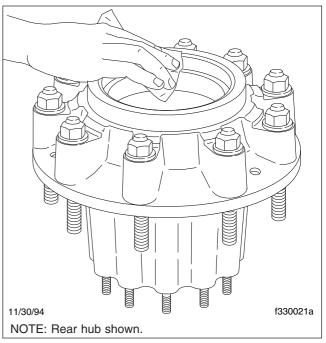


Fig. 1, Clean and Inspect the Hub Bore

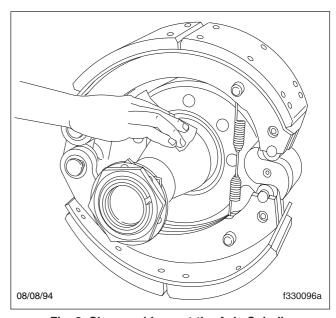


Fig. 2, Clean and Inspect the Axle Spindle

- 4.5 Inspect the bearings and hub components for wear or damage. Replace any worn or damaged components as necessary.
- 4.6 Coat the wheel bearing cones with oil.

Seal Replacement, Dana Spicer

5. Install the inner wheel bearing cone in the inner wheel bearing cup.

IMPORTANT: Use the Dana Spicer Outrunner installation tool with the centering tool when installing the seal. See Fig. 3.

6. Install the oil seal in the hub bore.

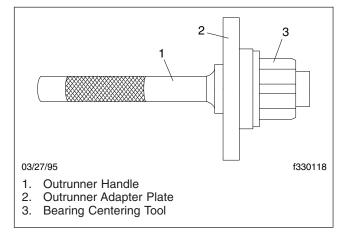


Fig. 3, Dana Spicer Outrunner Installation Tool



Do not use any silicone or permatex type bore sealant with this seal. The Dana Spicer Corporation recommends a light coating of bearing oil on the outer circumference of the seal.

Do not mix lubricants of different grades. Do not mix mineral and synthetic lubricants. Do not pack the bearings with grease when using an oil bath system. Failure to follow these installation guidelines will result in less than desired performance of the Outrunner seal, and installation-related failures are not covered under warranty.

6.1 Place the outrunner seal tool with the words "air side" facing the adaptor plate of the installation tool. See **Fig. 4**. Lubricate the seal outer circumference with wheel bearing oil.

IMPORTANT: Install the seal in the hub bore with the hub laid flat. Do not install the seal with the hub in the vertical (upright) position.

6.2 With the hub and the wheel assembly laid flat on the floor, place the inner bearing cone in the cup.

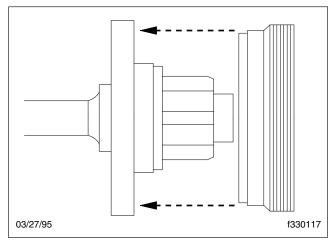


Fig. 4, Seal Placement on Tool

6.3 Position the oil seal in the hub bore. Before striking the handle of the installation tool, tap the adaptor plate around the outer edge to position the seal. See Fig. 5.

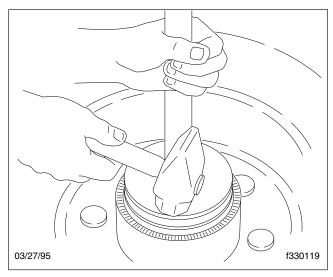


Fig. 5, Position the Seal

6.4 Hit the handle of the installation tool *gently*. See **Fig. 6**.

Because of the rubber outer circumference, the Outrunner seal is easier to install than seals with metal outer circumferences. When the adaptor plate bottoms out on the hub surface, the seal is in-

Seal Replacement, Dana Spicer

stalled correctly. You will hear a metal-to-metal sound.

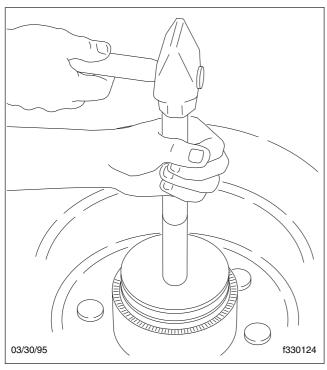


Fig. 6, Install the Seal

- 6.5 Check that the seal is not cocked, and that the unitized seal inner circumference and inner bearing turn freely.
- 6.6 Lubricate the inner circumference of the seal with a light film of clean bearing oil.
- 7. Install the wheel hub on the axle, and adjust the wheel bearings. For instructions, see **Section 33.01**, Subject 100.

IMPORTANT: When starting the wheel on the spindle, center the hub carefully to avoid seal damage from the leading edge of the spindle.

- 8. Place the hubcap and a new gasket in position, then install the capscrews. Tighten the capscrews 15 lbf·ft (20 N·m).
- 9. Fill the hub with oil to the level shown on the hubcap. See **Fig. 7**. Do not overfill.
- 10. Spin the wheel and check the oil level.

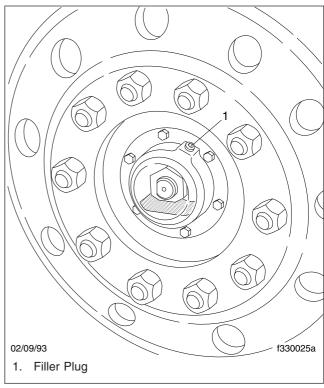


Fig. 7, Fill the Hub with Oil

11. Adjust the brake shoe-to-drum clearance. For instructions, see Group 42 of the *Business Class M2 Maintenance Manual*.

Seal Replacement, National

Replacement

NOTE: This procedure applies to the National® oil seal.

- If not already done, remove the hub from the axle spindle. For instructions, see Section 33.01, Subject 100.
- 2. Remove the old oil seal from the hub or axle spindle, as applicable. Be careful not to damage the axle spindle.
- 3. Inspect the hub chamfer and bore for burrs, nicks, roughness, deep scratches, and other imperfections. Clean any imperfections with an emery cloth. Wipe the surface clean.
- 4. If using a press, put the hub onto a centering fixture, inboard side up.
 - If you are manually installing the oil seal, put the hub (inboard side up) on a firm, level surface.
- Using approved gear oil, lubricate the inner bearing. For approved gear oil, see Section 33.01, Specifications, 400.
- 6. Install the inner bearing into the hub.
- 7. Put a light coating of gear oil on the inner and outer surfaces of the oil seal.
- 8. Install the adapter plate and bearing pilot on the steel handle, using the hexnut and washers provided. See **Fig. 1**.

- 9. Put the oil seal on the adapter plate, making sure the words "Air Side" on the oil seal are facing the adapter plate surface.
- 10. Making sure the oil seal is aligned straight with the hub bore, install it into the hub. See Fig. 2.
 - If using a press, press the oil seal into the hub with 3000 to 5000 psi (20 684 to 34 474 kPa) of pressure.
 - If manually installing the seal, strike the end of the installation tool with a heavy mallet. Continue striking until the sound changes.
- 11. Make sure the oil seal is correctly installed in the hub bore. The face of the seal (the side with the words "Air Side") should be flush with the face of the hub.
- Wipe off any excess oil from the face of the oil seal.
- 13. Install the hub on the axle spindle. For instructions, see **Section 33.01**, **Subject 100**.
- 14. Check the other side of the vehicle for front-axle oil seal leakage. If needed, repeat the procedure on the other side of the vehicle.

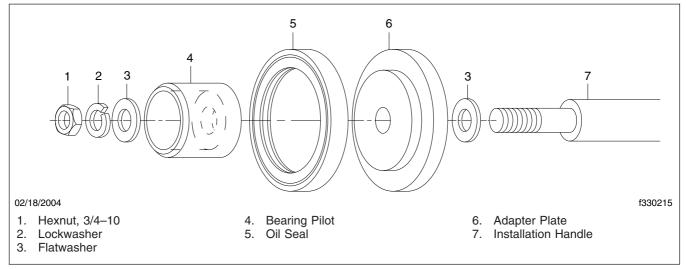


Fig. 1, Oil Seal and Installation Tools

Seal Replacement, National

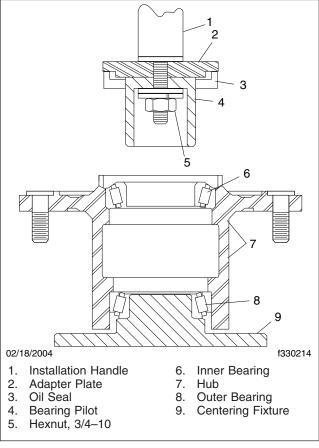


Fig. 2, Installing the Oil Seal Into the Hub (crosssectional view)

Front Axle Oil Seals 33.02

Specifications

National® Oil Seal Special Tool Guide, 8000-lb Steer Axles				
Vendor Part Number Description Qty.				
NA RD296	Steel Installation Handle	1		
NA RD421	Bearing Pilot	1		
NA RD272	Adapter Plate	1		
NA 370150A	National Oil Seal	As Needed		

Table 1, National Oil Seal Special Tool Guide, 8000-lb Steer Axles

	Bearing Centering Tool Interchange				
		Centering Tool Number			
Spindle Type	Bearing Cone	Dana® Spicer® Outrunner™	Chicago Rawhide	National®	
_	641	BCT-6	706	RD-406	
_	39581	BCT-2	702	RD-402	
_	557A	BCT-3	703	RD-403	
FL	6461A	BCT-8	708	RD-418	
_	H715345	BCT-16	716	RD-407	
_	HM212044	BCT-3	703	RD-403	
_	HM212047	BCT-4	704	RD-404	
FF	HM212049	BCT-6	706	RD-406	

Table 2, Bearing Centering Tool Interchange

Adapter Plates				
Seal	Adapter Plate	Color		
847	847-T			
855	855-T	Dive		
857	857-T	Blue		
863	863-T			

Table 3, Adapter Plates

Contents

Subject	Subject Number
General Information	050
Service Operations	
Axle Removal and Installation	100
Steering Knuckle Disassembly and Assembly	110
Specifications	400

General Information

General Information

Detroit front axles have a unique steering knuckle design that reduces vibration and wear. Low-friction and high-strength needle bearings roll on a large diameter kingpin, replacing the conventional bushings. They are compatible with all standard industry model brakes, hubs, and wheel bearings.

There are three basic models for Detroit front axles: Model 2, Model 3, and Model 5. The basic model is indicated by the numbers on the axle's identification tag. The following explains a typical model number.

Typical Model Number: AF-12-3.

- AF = front axle
- 12 = Weight Rating (times 1000 lb)
- 3 = Model Number

NOTE: Detroit axles are a proprietary product, though in some applications they may be referred to as "Freightliner" or "Axle Alliance" axles or "MB components."

Axle Removal and Installation

Removal

- 1. Park the vehicle on a level surface, shut down the engine, set the parking brake, and chock the rear tires. Put the transmission in neutral.
- At both ends of the front axle, loosen all the wheel nuts.

WARNING

Never work around or under a vehicle that is supported only by a jack. Always support the vehicle with safety stands. Jacks can slip, causing the vehicle to fall, which could result in serious injury or death.

- Raise the front of the vehicle and support it with safety stands.
- 4. Drain the air system.
- 5. Remove the front wheel and tire assemblies. For instructions, see **Group 40**.
- 6. Remove the brake drums. For instructions, see the applicable section in **Group 42**.
- Remove the front hubs from the axle. For instructions, see Section 33.01.
- 8. Remove the brake shoes. For instructions, see the applicable section in **Group 42**.
- Remove the ABS sensors and wiring from the brake anchor plates and secure them and their wiring out of the way.
- 10. Remove the brake air chambers and the slack adjusters. For instructions, see the applicable section in **Group 42**.
- 11. Remove the brake anchor plates from the axle ends.
- 12. Disconnect the drag link from the axle steering arm.
- If so equipped, disconnect the sway bar from the axle brackets.
- 14. Using a suitable jack, support the front axle.
- 15. Remove the U-bolt nuts or remove the nuts that hold the axle beam to the leaf springs and the air bag brackets, as applicable.
- 16. Remove the U-bolts, if applicable.
- 17. Remove the axle from the vehicle.

18. If you are replacing the steering knuckles, put the axle on a suitable stand and secure it to prevent it from moving.

Installation

- With the axle on a suitable jack, position it under the vehicle.
- For vehicles with front air suspension, raise the axle so that the holes in the axle beam line up with the bolts that hold the air bags to the leaf springs. Install the nuts and washers and tighten the nuts 220 lbf·ft (298 N·m).
 - For vehicles with a leaf-spring front suspension, install the U-bolts and nuts. For instructions on tightening U-bolt nuts, see the applicable section in **Group 32**.
- 3. If so equipped, connect the sway bar to the axle brackets. Tighten the sway bar fasteners 100 lbf·ft (136 N·m).
- Connect the drag link to the steering arm. For instructions, see the applicable section in Group 46.
- Install the brake anchor plates to the axle ends. For instructions, see the applicable section in Group 42.
- 6. Install the brake air chambers and slack adjusters on the axle. For instructions, see the applicable section in **Group 42**.
- 7. Install the ABS sensors.
- 8. Install the brake shoes. For instructions, see the applicable section in **Group 42**.
- 9. Install the hubs and adjust the wheel bearings. For instructions, see **Section 33.01**.
- 10. Install the brake drums.
- 11. Adjust the slack adjusters. For instructions, see the applicable section in **Group 42**.
- 12. Install the tire and wheel assemblies. For instructions, see **Group 40**.
- 13. Raise the vehicle, remove the safety stands, and lower the vehicle.
- 14. Start the engine and build the air pressure.

Axle Removal and Installation

- 15. If equipped with a front air suspension, check that the suspension air bags are inflating correctly.
- 16. Remove the chocks from the rear tires.

33.03

Steering Knuckle Disassembly and Assembly

Disassembly

NOTE: The following procedures can be done with the axle installed on the vehicle or with the axle removed from the vehicle.

 If the axle has been removed, make sure it is securely mounted on a suitable stand. Go to the step for removing the tie rod from the tie-rod arm.

If the axle is on the vehicle, park the vehicle on a level surface, shut down the engine, set the parking brake, and chock the rear tires. Drain the air system.

- 2. If the axle is on the vehicle, do the following substeps to gain access to the steering knuckle:
 - 2.1 Remove the wheel and tire assembly from the applicable side of the vehicle.
 - 2.2 Remove the hub and brake drum. For instructions, see **Section 33.01**.
 - 2.3 Remove the brake shoes. For instructions, see the applicable section in **Group 42**.
 - 2.4 If so equipped, remove the ABS sensor and wiring from the brake anchor plates and secure the sensor and the wiring out of the way.
 - 2.5 Disconnect the air line from the brake air chamber, then remove the air chamber and the slack adjusters. For instructions, see the applicable section in **Group 42**.
 - 2.6 Disconnect the drag link from the steering arm, if present.

NOTE: On the driver's side of the vehicle, the steering arm connects to the steering knuckle. On the passenger's side, no steering arm is present.

- 3. If not already done, disconnect the tie rod from the tie-rod arm.
- 4. Remove the tie-rod arm from the steering knuckle. See Fig. 1.
- 5. If applicable, remove the steering arm. See Fig. 1.
- Remove the steering knuckle and spindle assembly from the axle beam. See Fig. 1.

- 6.1 Remove the upper and lower snap rings that hold the cover plates in place. See Fig. 1.
- 6.2 Remove the upper and lower cover plates from the steering knuckle.
- 6.3 Remove and discard the O-ring from the edges of each cover plate.
- 6.4 Note the orientation of the draw keys and the kingpin, then remove the draw keys and nuts that hold the kingpin in place.
- 6.5 Using a brass drift, remove the kingpin by driving it downward. Make a note of where the needle bearings were installed.
- 6.6 Remove the spacer(s) and shim(s) from the upper surface of the axle beam bore.
- 6.7 Push down on the steering knuckle and spindle assembly to clear the lip on the thrust friction bearing and remove the assembly from the axle beam bore.

NOTE: The steering knuckle on the passenger's side (side without a steering arm) has a thrust roller bearing instead of a thrust friction bearing. Unlike the thrust friction bearing, the thrust roller bearing has no protruding lip at the top. When removing the thrust roller bearing from the axle beam bore, it is not necessary to push down on the steering knuckle.

- 7. Remove the grease seal from the upper steering-knuckle bore.
- 8. Remove the thrust friction bearing (driver's side) or the thrust roller bearing (passenger's side) from the top of the lower steering knuckle bore.

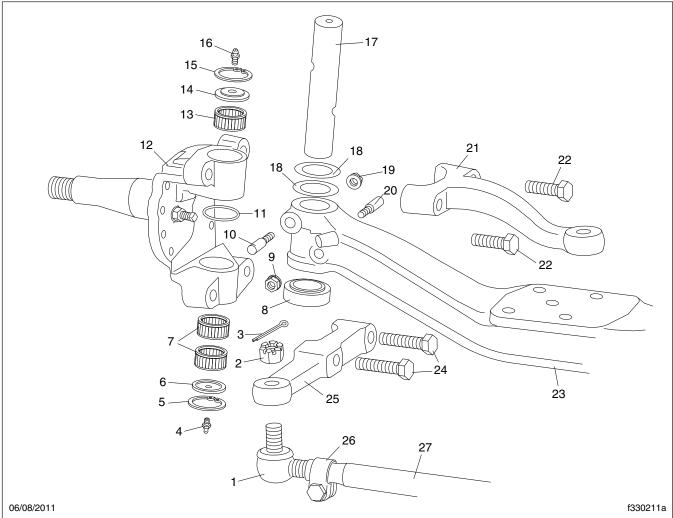
NOTE: If removing the thrust friction bearing (driver's side), note the orientation of the bearing for future reference.

- 9. Using a brass drift, drive out the needle bearings from the steering knuckle bores.
- 10. If needed, repeat the entire procedure for the other side of the axle assembly.

Assembly

IMPORTANT: If replacing the kingpin, use a complete rebuild kit with all new components.

Steering Knuckle Disassembly and Assembly



NOTE: The number of upper and lower needle bearing sets may vary, depending on the axle model.

- 1. Tie-Rod Ball Joint
- 2. Castle Nut
- 3. Cotter Pin
- 4. Lower Grease Fitting
- Lower Snap Ring
- 6. Lower Cover Plate
- 7. Lower Needle Bearings (may be one or two sets)
- Thrust Friction Bearing (thrust roller bearing on the passenger side)
- 9. Lower Draw Key Nut
- 10. Upper Draw Key
- 11. Grease Seal
- 12. Steering Knuckle
- Upper Needle Bearing (may be one or two sets)
- 14. Upper Cover Plate
- 15. Upper Snap Ring
- 16. Upper Grease Fitting
- 17. Kingpin

- 18. Shim
- 19. Upper Draw Key Nut
- 20. Lower Draw Key
- 21. Steering Arm
- 22. Steering Arm Capscrew
- 23. Axle Beam
- 24. Tie-Rod Arm Capscrews
- 25. Tie-Rod Arm
- 26. Tie-Rod Clamp
- 27. Tie-Rod Tube

Fig. 1, Front Axle Components (driver side shown)

 Clean the steering knuckle bores and the axle beam bores. Check for damage such as grooves, scratches, and pitting. If any bores show significant damage, replace the component.

Steering Knuckle Disassembly and Assembly

- Install the grease seal with the grooved side down (toward the road) — into the top of the upper steering knuckle bore. Carefully drive the seal down into the bore until the outer edge of the seal is flush with the bottom edge of the bore. Make sure the seal is not cocked.
- 3. Install new needle bearings into the bores of one of the steering knuckles. Install the same number of bearings as was removed.

NOTE: Install the needle bearings just far enough into the bores so that the cover plates can be installed.

4. Install a new thrust friction bearing (driver's side) or thrust roller bearing (passenger's side) into the top of the lower steering knuckle bore. Install the thrust friction bearing (or thrust roller bearing) with the sealed side up.

NOTE: The thrust friction bearing has a protruding lip at the top. The thrust roller bearing has no such protruding lip.

- Partially install the steering knuckle on the axle beam.
 - 5.1 Making sure the flats on the kingpin are aligned with the draw-key holes in the axle beam, put the new kingpin into the top bore of the steering knuckle. Note that the top of the new kingpin is clearly marked. Push the kingpin through the axle beam bore until the upper end of the kingpin is flush with the upper surface of the axle beam bore.
 - 5.2 Align the steering knuckle with the axle beam, then check the clearance between the axle beam bore and the upper steering knuckle bore. Clearance is to be a maximum of 0.003 inch (0.08 mm).

IMPORTANT: To correctly check the clearance, the thrust friction or thrust roller bearing must be installed correctly, and upward pressure must be applied to the steering knuckle.

5.3 If needed, install sufficient spacers to reduce the clearance to 0.002 to 0.003 inch (0.05 to 0.08 mm).

- Install the kingpin fully into the steering knuckle bores, making sure the flats on the kingpin are still aligned with the draw-key holes in the axle heam
- 7. Install new upper and lower draw keys and nuts. See Fig. 1.
 - 7.1 Install the upper draw key from the back of the axle, and the lower one from the front of the axle.

IMPORTANT: Make sure the new draw keys are the same length as those removed. On some axle models the lower draw key is longer than the upper one.

- 7.2 Tighten the draw-key nuts 30 to 55 lbf-ft (40 to 75 N·m).
- 8. Install new grease fittings and cover plates.
 - 8.1 Install the new upper cover plate (with a new O-ring) and the snap ring. Install the new grease fitting into the cover plate.
 - 8.2 Install the new lower cover plate (with a new O-ring) and the snap ring. Install the new grease fitting into the cover plate.
- Install the steering arm. Apply Loctite® 277 to the threads and tighten the steering arm capscrews: if M20 capscrews are used, tighten them 425 lbf·ft (575 N·m); if M24 capscrews are used, tighten them 664 lbf·ft (900 N·m).
- 10. Attach the tie-rod arm to the steering knuckle. Apply Loctite® 277 to the threads and tighten the tie-rod arm capscrews: if M20 capscrews are used, tighten them 425 lbf-ft (575 N·m); if M24 capscrews are used, tighten them 664 lbf-ft (900 N·m).
- 11. If applicable, repeat the entire procedure for the other side of the axle assembly.
- 12. Attach the tie-rod arm to the tie rod. Tighten the castle nut 120 to 170 lbf-ft (163 to 230 N-m) plus a maximum of one-sixth of a turn to align a slot in the castle nut with the cotter pin hole in the tie rod stud. Insert the cotter pin and bend the tangs to secure it.
- 13. If removed, install the axle.
- 14. If removed, connect the drag link to the steering arm.

Steering Knuckle Disassembly and Assembly

- 15. Install the brake anchor plates on the axle ends. For instructions, see the applicable section in **Group 42**.
- 16. Install the brake air chambers and slack adjusters on the axle. For instructions, see the applicable section in **Group 42**.
- 17. Install the ABS sensor.
- 18. Install the brake shoes. For instructions, see the applicable section in **Group 42**.
- 19. Install the hub and adjust the wheel bearings. For instructions, see **Section 33.01**.
- 20. Install the brake drum.
- 21. Install the tire and wheel assembly. For instructions, see **Group 40**.
- 22. If necessary, repeat the entire procedure for the other side of the vehicle.
- 23. Raise the vehicle, remove the safety stand, then lower the vehicle.
- 24. Remove the chocks from the tires.

Specifications

Torque Values				
Application Size Class Torque: lbf-ft (N-n				
Air Bag-to-Leaf Spring Nuts	_	_	220 (298)	
Draw-Key Nuts	_	_	30–55 (40–75)	
Sway Bar Fasteners	_	_	100 (136)	

Table 1, Torque Values