## Group Index, Alphabetical


| Section | Section Number |
|---|---|
| Wheels and Tires | 40.00 |

## Contents


| Subject | Subject Number |
|---|---|
| General Information | 050 |
| Service Operations | |
| 8-Hole Disc Wheel With Two-Piece Flange Nuts Removal and Installation | 100 |
| 10-Hole Disc Wheel With Two-Piece Flange Nuts Removal and Installation | 110 |
| 10-Hole Disc Wheel With Inner and Outer Nuts; Removal and Installation | 120 |
| Spoke Wheel, Tire and Rim Assembly; Removal and Installation | 130 |
| Tire Demounting and Mounting Service Precautions | 140 |
| Demounting and Mounting Tubeless Tires on One-Piece Drop Center Wheels or Rims | 150 |
| Wheel and Components Inspection | 160 |
| Tire and Components Inspection | 170 |
| Tire Inflation | 180 |
| Troubleshooting | 300 |
| Specifications | 400 |

## General Information

### WHEELS AND TIRES

The tires support the weight of the vehicle, and are integral parts of the drivetrain and braking systems. The wheels serve as load carrying members between the tires and the axle.

There are two types of wheels: spoke and disc.

Spoke wheels consist of a wheel and brake drum assembly installed on the axle **(Fig. 1),** and a tire and rim assembly that mounts on the wheel. Rim clamps and rim nuts hold the tire and rim assembly in place.

Disc wheels consist of a rim and disc. The rim, the portion of the wheel on which the tire is mounted and supported, is welded to the disc **(Fig. 2).** After the tire is mounted on the wheel, the assembly is held in place on the hub with wheel studs and nuts.

Standard ten-hole dual disc wheels are held in place on the hub by self-centering inner and outer wheel nuts. Eight-hole and optional ten-hole (single and dual) disc wheels are centered by pilot pads and are held in place on the hub with cone locknuts.

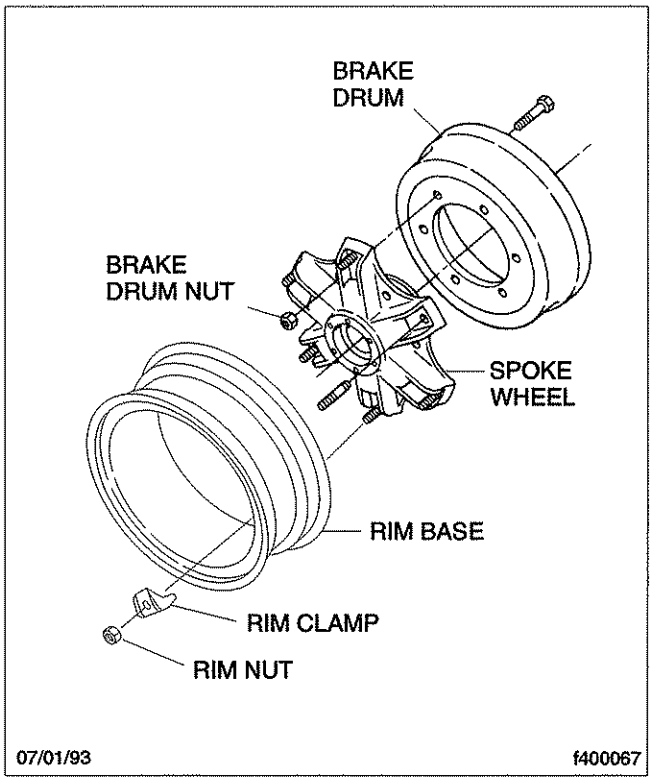



**Fig. 1, Spoke Wheel and Brake Drum Assembly**

Tires are constructed of either radial or bias plies:

Radial tires have ply cords that run from bead to bead, and at a right angle to the belt plies and tire tread **(Fig. 3).** The belt plies constrict the radial ply cords and give rigidity to the tread.

Bias ply tires have body ply cords that run diagonally from bead to bead **(Fig. 4).** The tires may also have narrow plies under the tread, called breakers, with cords that lie in about the same direction as the body ply cords.

Tire body plies, breakers, and belts are made of polyester, rayon, nylon, fiberglass, steel, or aramids (fibrous reinforcements). In radial ply tires, these materials are used in various combinations, including steel body/steel belt, polyester body/fiberglass belt, or nylon body/steel belt.

Wheels and tires operate either with or without tubes. Tube-type tires require a tube and flap for correct assembly on a two-or three-piece rim **(Fig. 1).** Tubeless tires require only the tire, and a one-piece drop-center wheel or rim. **See Fig. 2.**

### TIRE MATCHING AND MIXING

IMPORTANT: Review and follow these requirements for matching and mixing tires, before installing any tire and wheel or rim assembly on a vehicle.

Before changing wheels and tires, consider the effect that the change may have on the Gross Vehicle Weight Rating (GVWR) of the vehicle. At the time of vehicle certification, the GVWR is calculated by adding the vehicle's Gross Axle Weight Ratings (GAWR). The GVWR and each of the GAWRs are shown on a certification label (U.S.-purchased vehicles) or "Statement of Compliance" label (Canadian-purchased vehicles) attached to the left rear door post. **See Fig. 5.**

Tire and rim labels **(Fig. 5 and Fig. 6)** certify the minimum tire and rim combinations that can be installed on the vehicle for the given GAWRs. Each GAWR is determined by considering each component of the axle system, including suspension, axle, wheels, and tires. The lowest component's capacity is the value used for the system. Therefore, the tires and rims installed on the vehicle at the time of vehicle manufacture may have a higher load capacity than that certified by the tire and rim label. Tires and rims

## General Information

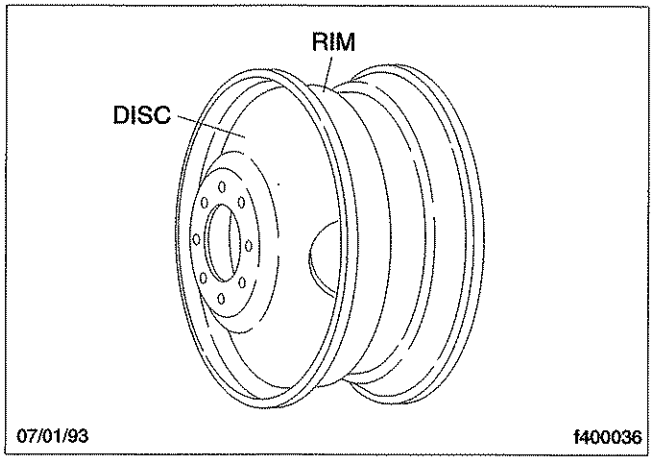



**Fig. 2, Disc Wheel**

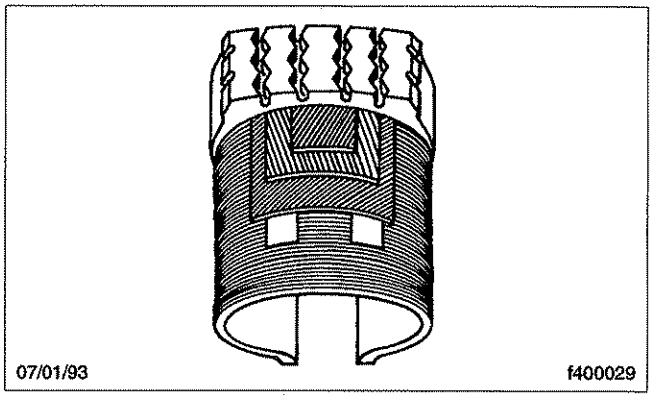



**Fig. 3, Radial Ply Tire Construction**

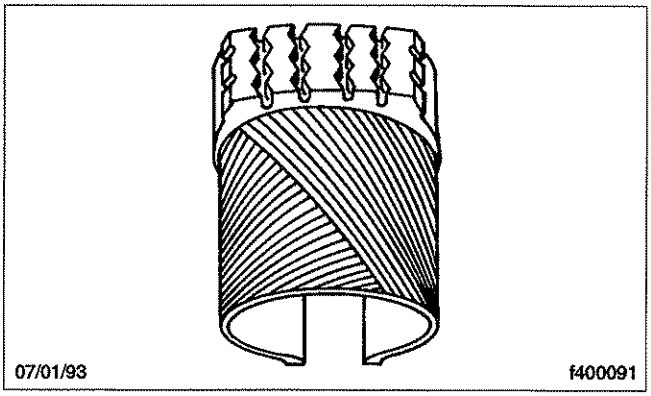



**Fig. 4, Bias Ply Tire Construction**

of the minimum capacity can be installed without changing the load limitations. If tires and rims are installed that have a lower load capacity than that shown on the tire and rim label, then the tires and rims determine the load limitations (the GAWRs and GVWR will be lower).

When pairing tires in a dual assembly, the tire diameters must not differ by more than 1/4 inch (6.4 mm), or the tire circumference by more than 3/4 inch (19 mm).

### ⚠ CAUTION

**CAUTION: Mismatching dual tires overloads the larger diameter tire, causing it to overdeflect and overheat. The smaller diameter tire, lacking proper**

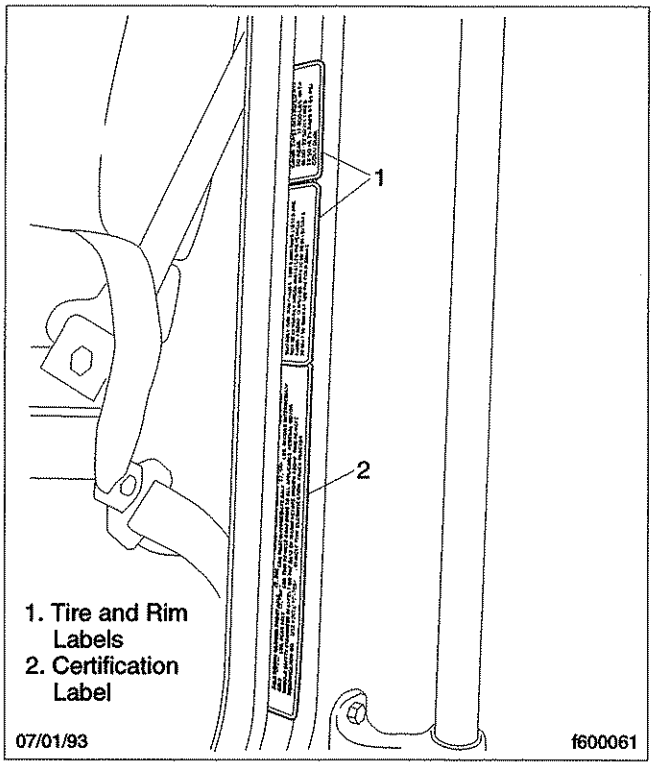



**Fig. 5**

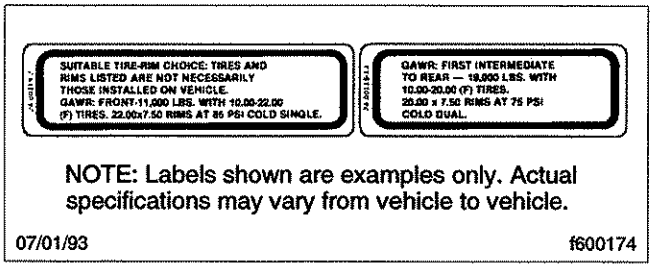



**Fig. 6**

**road contact, wears faster and unevenly. Tread or ply separation, tire body breaks, and blowouts can occur from mismatched duals.**

With an endless pi tape **(Fig. 7)** or square **(Fig. 8),** measure the diameter of the tires 24 hours after inflation. A matching stick **(Fig. 9),** string gauge **(Fig. 10),** or tire straight edge **(Fig. 11)** can also be used to determine the difference in tire radius, which is then doubled to calculate the diameter difference.

When pairing tires of unequal diameters (but within the above limits), mount the larger tire on the outside.

## ⚠ CAUTION

**CAUTION: Driving a vehicle on one tire of a dual assembly dangerously exceeds the carrying capacity of the single tire and wheel. Operating in this manner can cause damage to the wheel and tire.**

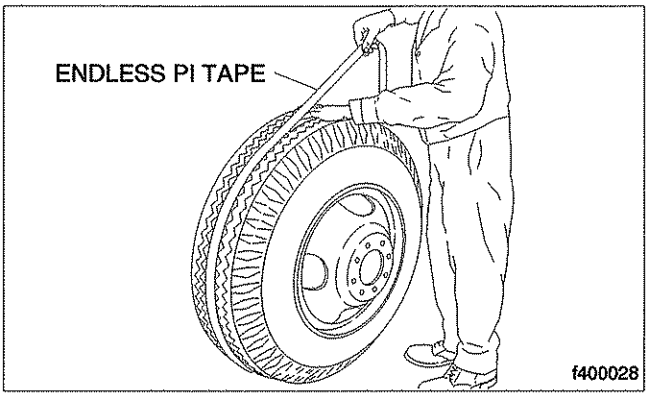



**Fig. 7**

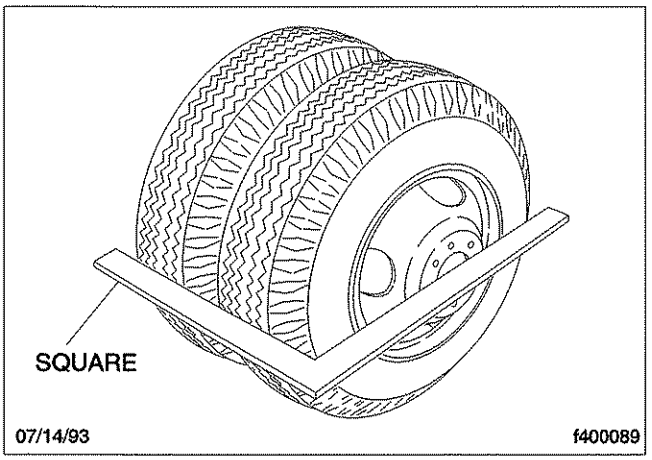



**Fig. 8**

Inflate all tires on an axle to within 35 kPa (5 psi) of one another. For tire inflation specifications, refer to the applicable tables in **"Specifications, 400."**

There must be sufficient space between dual tires for air to flow and cool the tires, and to prevent them from rubbing against one another. Rims and wheels of the same size, but of different makes and types, can have different offsets, which would affect dual spacing. If there is sidewall contact between tires, or between the inside tire and the chassis, refer to the tire manufacturer's catalog to determine the minimum dual spacing. Refer to the rim or wheel manufacturer's catalog to determine the correct offset.

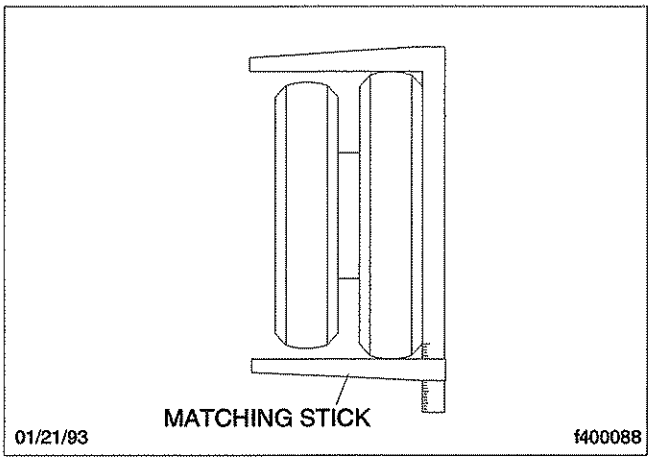



**Fig. 9**

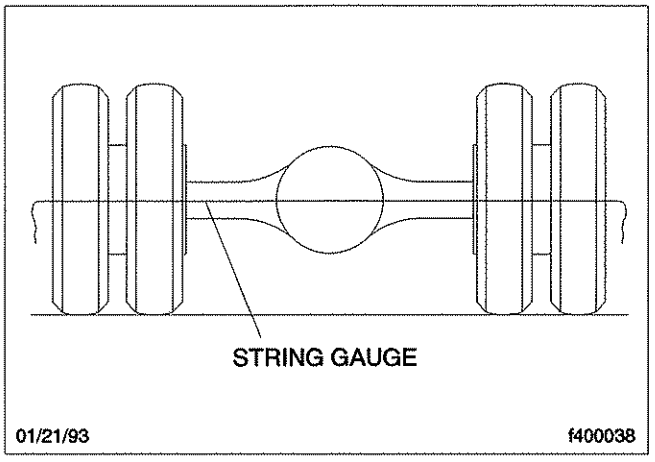



**Fig. 10**

## General Information

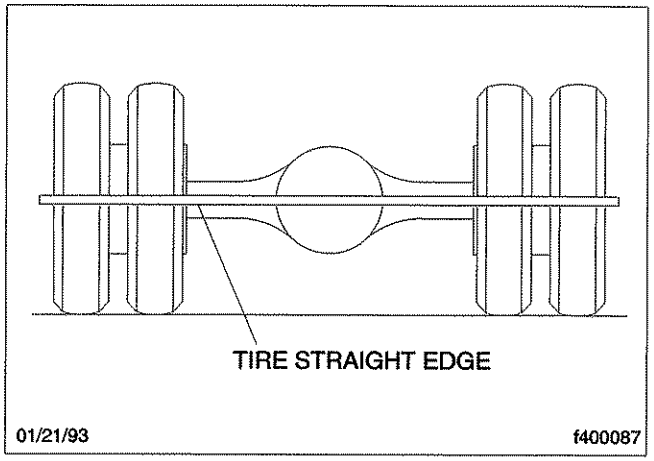



**Fig. 11**

Federal Motor Carrier Safety regulations require the removal of all tires with less than 3-mm (4/32-inch) remaining groove depth on a front axle, and tires with less than 1.5-mm (2/32-inch) remaining groove depth on a rear axle. However, tires with the word "Regroovable" on the sidewall, may be regrooved.

Better tire and vehicle performance is usually obtained by using tires of the same size and construction. Using tires of different construction is permitted if the following rules are observed:

- Do not mix radial and bias ply tires on the same axle.
- If both radial and bias ply tires are used, better handling is usually obtained by using the bias ply tires on the front axle.

### ⚠ CAUTION

**CAUTION: Mixing radial and bias ply tires should be done as an emergency measure only. Some loss of steering control and premature tire wear could occur when driving under such conditions.**

If installing radial tires on a vehicle formerly equipped with bias ply tires, refer to the applicable tables in **"Specifications, 400,"** concerning the inflation needs and load limits of the bias ply tires being removed, and of the radial ply tires being installed. Radial ply tires permit greater loads per tire, but also require higher inflation. They can also cause higher stresses on rims and wheels than bias ply tires. Contact the rim or wheel manufacturer about the compatibility of the rim or wheel with radial ply tires.

# 8-Hole Disc Wheel With Two-Piece Flange Nuts Removal and Installation

## Removal

1. Chock all tires that will not be serviced, to prevent vehicle movement. If removing the wheels and tires from the front axle, apply the parking brake.
2. Raise the end of the vehicle being serviced until the tires clear the floor. Place safety stands under the axle being serviced.
3. If the tire or wheel is damaged (or if there is suspected damage), deflate the tire being serviced by removing the valve core. On rear axles deflate both tires of the dual assembly.
4. Place a jack or wheel-and-tire dolly under the wheel assembly being serviced. Turn the wheel until one hub-pilot pad is in the top-center position.
5. Leaving the top nut until last, remove all eight two-piece flange nuts.

**⚠ CAUTION**

**The wheel center hole and hub pilot have close tolerances. If the wheel is not kept square to the hub, it could bind during removal and damage the stud threads or pilot pads. Keep the wheel square to the hub during removal.**

IMPORTANT: On both sides of the vehicle, the two-piece flange nuts have right-hand threads.

6. Remove the wheel. Do not let it drop on or drag across the stud threads.

## Installation

NOTE: Before installing a wheel and tire assembly, inspect it using the instructions in **Subject 160**. Also, follow the tire matching and mixing requirements in **Subject 050**.

1. Clean the hub and wheel mounting surfaces, and between the rims of dual wheels. Make sure the tire is correctly inflated. For instructions, see **Subject 180**.
2. Apply a few drops of light engine oil to the wheel studs and the area between the body and the flange of each two-piece flange nut. Wipe off any excess oil.

**⚠ CAUTION**

**The wheel center hole and hub pilot have close tolerances. If the wheel is not kept square to the hub, it could bind during installation and damage the stud threads or pilot pads. Keep the wheel square to the hub during installation.**

IMPORTANT: Before installing the wheels, make sure the drum is positioned on the raised step of the pilot pad. One of the hub's pilot pads must be at the top location. To help keep the drum in place, it may be necessary to adjust the brakes before installing the wheels.

3. Locate one hub-pilot pad in the top-center position. Using a jack or wheel-and-tire dolly, position the wheel assembly (inner wheel assembly of rear axles) on the hub. Make sure the wheel is square to the hub and that the threads or pilot pads are not damaged by contact with the wheel during installation. On rear axles, mount the outer wheel against the inner wheel using the same procedure.
4. Make sure the hub-pilot pad is still centered at the top.

IMPORTANT: Install the wheel assembly so that the balance weight(s) on the wheels are 180 degrees opposite the balance weight(s) on the brake drum. If this causes the valve stems on rear wheel assemblies to be in the same wheel hole, mount the outer wheel so that the outer wheel balance weight(s) are on the same side as the brake drum balance weight(s).

5. Install and hand-tighten a two-piece flange nut on the top and bottom studs.

**⚠ CAUTION**

**The two-piece flange nuts have right-hand metric threads. Do not try to install a similar size SAE nut on a stud, or the stud and nut will be damaged.**

6. Install and hand-tighten the remaining two-piece flange nuts. Tighten the two-piece flange nuts 50 to 100 lbf·ft (68 to 135 N·m) following the sequence in **Fig. 1**.
7. Check that the wheel is correctly seated against the hub and on the hub-pilot pads.

## 8-Hole Disc Wheel With Two-Piece Flange Nuts Removal and Installation

8. Following the sequence in **Fig. 1**, tighten the two-piece flange nuts 450 to 500 lbf·ft (610 to 678 N·m).

**⚠ WARNING**

**If the wheel nuts cannot be tightened to minimum torque values, the studs could be turning in the hub flange, having lost their locking ability. In this case, the wheel hub assembly is damaged and must be replaced with a new assembly.**

**Failure to reach minimum torque values could also be caused by stripped threads on the wheel studs or wheel nuts. Again, damaged parts must be replaced with new parts. Failure to replace damaged parts could result in the loss of a wheel or loss of vehicle control, causing property damage or personal injury.**

NOTE: Replace damaged parts following the instructions in the front axle or rear axle group in this manual.

9. Remove the safety stands, lower the vehicle, and remove the chocks.

10. After operating the vehicle for 50 to 100 miles (80 to 160 km), retighten the wheel nuts 450 to 500 lbf·ft (610 to 678 N·m). Follow the sequence in **Fig. 1**.

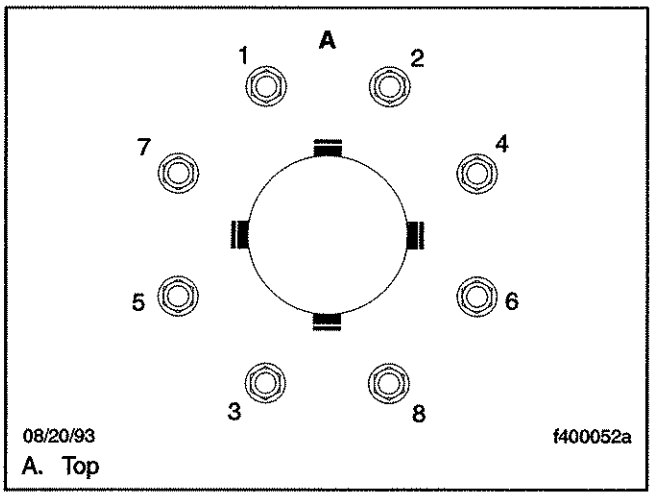



**Fig. 1, 8-Stud Disc Wheel Tightening Sequence**

**⚠ CAUTION**

**Too little wheel nut torque can cause wheel shimmy, wheel damage, stud breakage, and extreme tire tread wear. Too much wheel nut torque can break studs, damage threads, and crack discs in the stud hole area. Use the specified torque values, and follow the tightening sequence in Fig. 1.**

IMPORTANT: The two-piece flange nuts seat during vehicle operation. It is necessary to periodically tighten the wheel nuts to the specified torque. Tighten the two-piece flange nuts to the specified torque 50 to 100 miles (80 to 160 km) after service work, and check the torque every 50,000 miles (80 000 km) thereafter.

# 10-Hole Disc Wheel With Two-Piece Flange Nuts Removal and Installation

## Removal

1. Park the vehicle on a level surface and apply the parking brakes. Shut down the engine. Chock all tires that will not be serviced to prevent vehicle movement.
2. Raise the end of the vehicle being serviced until the tires clear the floor. Place safety stands under the axle being serviced.
3. If the tire or wheel is damaged or if there is suspected damage, deflate the tire (or tires, on a dual assembly) being serviced by removing the valve core.
4. Turn the wheel until one hub-pilot pad is in the top-center position.
5. Leaving the top and bottom nuts until last, remove the other eight two-piece flange nuts.
6. Place a jack or wheel-and-tire dolly under the wheel assembly being serviced. Remove the top and bottom nuts.

**⚠ CAUTION**

**The wheel center hole and hub pilot have close tolerances. If the wheel is not kept square to the hub, it could bind during removal and damage the stud threads or pilot pads. Keep the wheel square to the hub during removal.**

IMPORTANT: On both sides of the vehicle, the two-piece flange nuts have right-hand metric threads.

7. Remove the wheel. Do not let it drop on or drag across the stud threads.

## Installation

NOTE: Before installing a wheel and tire assembly, inspect it using the instructions in **Subject 160.** Also follow the tire matching and mixing requirements in **Subject 050.**

1. Clean the hub and wheel mounting surfaces, and all disc faces of dual wheels. Make sure the tire is correctly inflated. For instructions, see **Subject 180.**
2. Apply a few drops of light engine oil to the wheel studs and the area between the body and the flange of each two-piece flange nut. Wipe off any excess oil.

**⚠ CAUTION**

**The wheel center hole and hub pilot have close tolerances. If the wheel is not kept square to the hub, it could bind during installation and damage the stud threads or pilot pads. Keep the wheel square to the hub during installation.**

IMPORTANT: Before installing the wheels, make sure the drum is positioned on the raised step of the pilot pad. One of the hub's pilot pads must be at the top location. To help keep the drum in place, it may be necessary to adjust the brakes before installing the wheels.

3. Locate one hub-pilot pad in the top-center position. Using a jack or wheel-and-tire dolly, position the wheel assembly (inner wheel assembly of rear axles) on the hub. Make sure the wheel is square to the hub and that the threads are not damaged by contact with the wheel during installation. On rear axles, mount the outer wheel against the inner wheel using the same procedure.
4. Make sure the hub-pilot pad is still centered at the top.

IMPORTANT: Install the wheel assembly so that the balance weight(s) on the wheels are 180 degrees opposite the balance weight(s) on the brake drum. If this causes the valve stems to be in the same wheel hole on the rear wheel assemblies, mount the outer wheel so that the outer wheel balance weight(s) is on the same side as the brake drum balance weight(s).

5. Install and hand-tighten a two-piece flange nut on the top and bottom studs.

**⚠ CAUTION**

**The two-piece flange nuts have right-hand metric threads. Do not try to install a similar size SAE nut on a stud, or the stud and nut will be damaged.**

6. Install and hand-tighten the remaining two-piece flange nuts. Tighten the nuts 50 lbf·ft (68 N·m) following the sequence in **Fig. 1.**
7. Check that the wheel is correctly seated against the hub and on the hub-pilot pads.

## 10-Hole Disc Wheel With Two-Piece Flange Nuts Removal and Installation

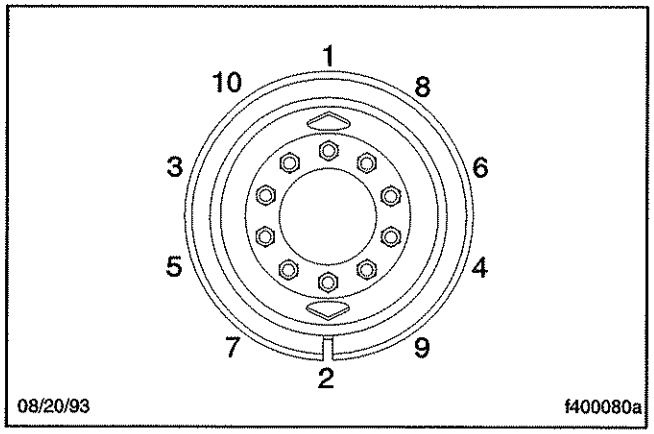



**Fig. 1, 10-Stud Disc Wheel Tightening Sequence**

8. Following the sequence in **Fig. 1**, tighten the two-piece flange nuts 450 to 500 lbf·ft (610 to 678 N·m).

**⚠ WARNING**

**If the wheel nuts cannot be tightened to minimum torque values, the studs could be turning in the hub flange, having lost their locking ability. In this case, the wheel hub assembly is damaged and must be replaced with a new assembly.**

**Failure to reach minimum torque values could also be caused by stripped threads on the wheel studs or wheel nuts. Again, damaged parts must be replaced with new parts. Failure to replace damaged parts could result in the loss of a wheel or loss of vehicle control, causing property damage or personal injury.**

IMPORTANT: Replace damaged parts following the instructions in the front axle or rear axle group in this manual.

9. Remove the safety stands, lower the vehicle, and remove the chocks.

10. After operating the vehicle for 50 to 100 miles (80 to 160 km), retighten the wheel nut 450 to 500 lbf·ft (610 to 678 N·m). Follow the sequence in **Fig. 1**.

**⚠ CAUTION**

**Too little wheel nut torque can cause wheel shimmy, wheel damage, stud breakage, and extreme tire tread wear. Too much wheel nut torque can break studs, damage threads, and crack discs in the stud hole area. Use the specified torque values, and follow the tightening sequence in Fig. 1.**

IMPORTANT: The two-piece flange nuts seat during vehicle operation. It is necessary to periodically tighten the wheel nuts to the specified torque. Tighten the two-piece flange nuts to the specified torque 50 to 100 miles (80 to 160 km) after service work, and check the torque every 10,000 miles (16 000 km) thereafter.

# 10-Hole Disc Wheel With Inner and Outer Nuts; Removal and Installation

## Removal

1. Chock all tires that will not be serviced, to prevent vehicle movement. If removing the wheels and tires from the front axle, apply the parking brake.
2. Raise the end of the vehicle being serviced until the tires clear the floor. Place safety stands under the axle being serviced.
3. If the tire or wheel is damaged (or if there is suspected damage), deflate the tire being serviced by removing the valve core. On rear axles deflate both tires of the dual assembly.
4. Place a jack or wheel-and-tire dolly under the wheel assembly being serviced. Remove the wheel nuts, then raise and remove the wheel assembly. Be careful not to damage the threads of the wheel studs as the wheel is pulled away. On rear wheel assemblies, remove the outer wheel first, being careful not to damage the threads of the inner wheel nuts.

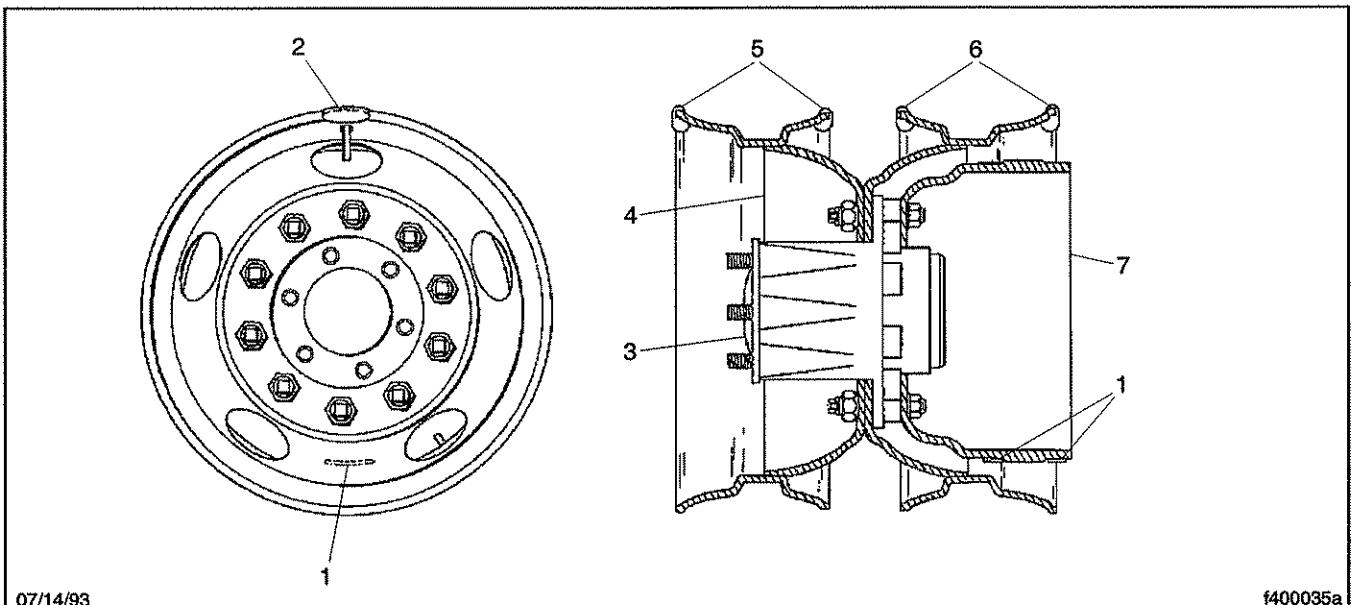
## Installation

NOTE: Before installing a wheel and tire assembly, inspect it using the instructions under **Subject 160.** Also, follow the tire matching and mixing requirements under **Subject 050.**

1. Clean the hub and wheel mounting surfaces, and between the rims of dual wheels. Make sure the tire is inflated using the procedures under **Subject 180.**
2. Use a jack or wheel-and-tire dolly to mount the wheel assembly (inner dual wheel of rear wheel assemblies) on the wheel studs. Be careful not to damage the threads of the wheel studs when installing the wheel assembly.

IMPORTANT: Mount the wheel assembly so that the balance weight(s) on the wheels are 180 degrees opposite the balance weight(s) on the brake drum (**Fig. 1**).

If, on two-handhole wheels, this causes the valve stems of rear wheel assemblies to be in the same wheel hole, mount the outer wheel so that the outer wheel balance weight(s) are on the same side of the




1. Brake Drum Balance Weight(s)
2. Inner and Outer Wheel Balance Weight(s)
3. Hub
4. Disc Wheel
5. Outer Wheel Balance Weight(s)
6. Inner Wheel Balance Weight(s)
7. Brake Drum

**Fig. 1, Recommended Location of Wheel and Brake Drum Balance Weights**

## 10-Hole Disc Wheel With Inner and Outer Nuts; Removal and Installation

assembly as the brake drum balance weight(s). **See Fig. 2.**

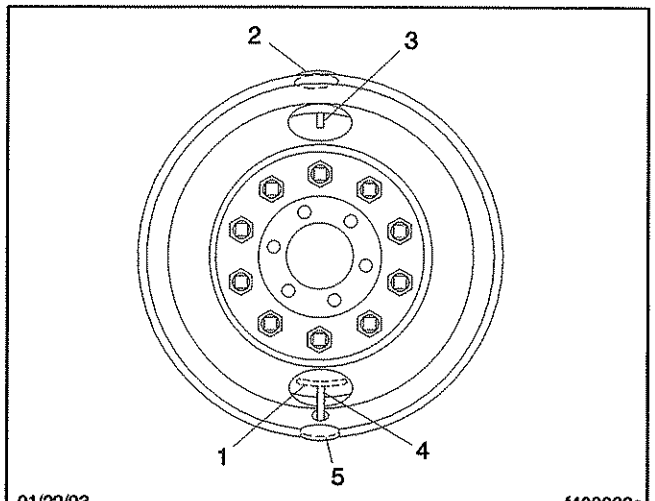
If, on five-handhole or aluminum wheels, the valve stems of rear wheel assemblies are in the same handhole, separate the valve stems by one hole. Install the wheel weights evenly and as close to 180 degrees opposite the brake drum balance weight(s) as possible. **See Fig. 3.**

3. Install a wheel nut (inner wheel nut of rear wheel assemblies) on each wheel stud, and run them up until each nut is flush with the face or the chamfer of the wheel. Rotate the wheel a half turn to seat the parts.
4. Tighten the wheel nuts 68 N·m (50 lbf·ft), following the sequence in **Fig. 4.**
5. Following the same sequence, tighten the wheel nuts again. Refer to the applicable table in **Specifications, 400.**

**⚠ WARNING**

**WARNING: If the wheel nuts cannot be tightened to minimum torque values, the studs could be turning in the hub flange, having lost their locking ability. In this case, the wheel hub assembly is damaged and must be replaced with a new assembly.**

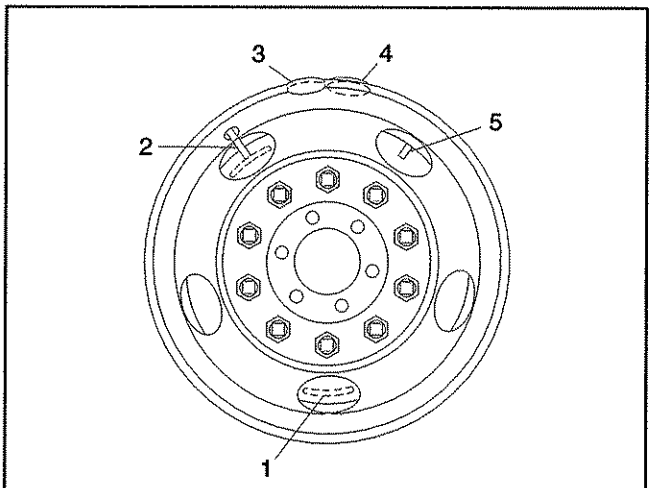
**Failure to reach minimum torque values could also be caused by stripped threads on the wheel studs or wheel nuts. Again, damaged parts must be replaced with new parts, as described in the front axle or rear axle group of this manual. Failure to replace damaged parts could result in the loss of a**




01/22/93 f400092a

1. Brake Drum Balance Weight(s)
2. Inner Wheel Balance Weight(s)
3. Inner Wheel Valve Stem
4. Outer Wheel Valve Stem
5. Outer Wheel Balance Weight(s)

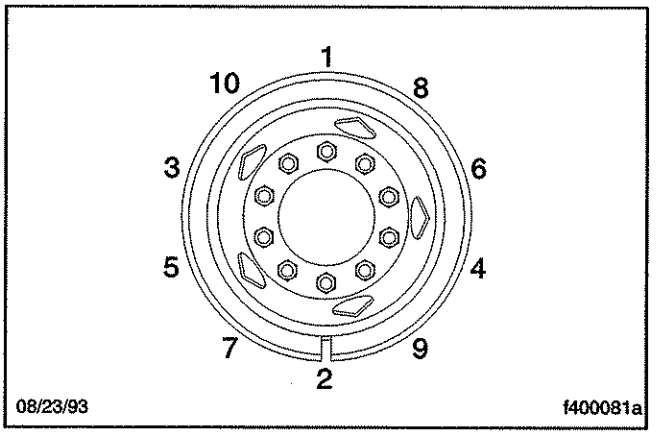
**Fig. 2, Alternate Location of Wheel and Brake Drum Balance Weights, Two-Handhole Wheels**




08/24/93 f400093a

1. Brake Drum Balance Weight(s)
2. Outer Wheel Valve Stem
3. Outer Wheel Balance Weight(s)
4. Inner Wheel Balance Weight(s)
5. Inner Wheel Valve Stem

**Fig. 3, Alternate Location of Wheel and Brake Drum Balance Weights, Five-Handhole or Aluminum Wheels**




08/23/93 f400081a

**Fig. 4, 10-Stud Disc Wheel Tightening Sequence**

**wheel and loss of vehicle control, causing property damage or personal injury.**

6. For front wheel assemblies, go to the next step. For rear wheel assemblies, use a jack or wheel-and-tire dolly to mount the outer dual wheel on the inner wheel nuts. Be careful not to damage the threads of the inner wheel nuts when installing the wheel assembly. Install the outer wheel nuts following the procedures above.
7. Remove the safety stands, lower the vehicle, and remove the chocks.
8. After operating the vehicle for 80 to 160 km (50 to 100 miles), retighten the wheel nuts to the torque in the applicable table in **Specifications, 400**. Follow the sequence in **Fig. 4**.

## ⚠ CAUTION

**CAUTION: Locknuts seat during vehicle operation. It is necessary to periodically tighten the wheel nuts to the specified torque. Too little wheel nut torque can cause wheel shimmy, wheel damage, stud breakage, and extreme tire tread wear. Too much wheel nut torque can break studs, damage threads, and crack discs in the stud hole area. Use the specified torque values, and follow the tightening sequence in Fig. 4.**

NOTE: When retightening the inner wheel nuts, loosen the outer wheel nuts several turns, retighten the inner wheel nuts, then the outer wheel nuts.

# Spoke Wheel, Tire and Rim Assembly; Removal and Installation

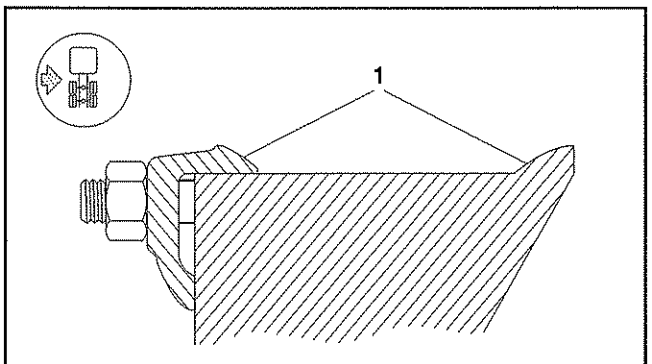
## Removal

1. Chock all tires that will not be serviced, to prevent vehicle movement. If removing tire and rim assemblies from the front axle, apply the parking brake.
2. Raise the end of the vehicle being serviced until the tires clear the floor. Place safety stands under the axle being serviced.
3. Deflate the tire(s) being serviced by removing the valve core(s).
4. Place a jack or wheel-and-tire dolly under the tire and rim assembly being serviced (outer tire and rim assembly on rear axle). Remove the rim nuts and clamps; then, slide the tire and rim (outer tire and rim on rear axle) off the wheel.
5. On rear axles only, remove the rim spacer. Place a jack or wheel-and-tire dolly under the inner tire and rim assembly, and slide it off.

## Installation

NOTE: Before installing a wheel and tire assembly, inspect it using the instructions under **Subject 160.** Also, follow the tire matching and mixing requirements under **Subject 050.**

1. Clean the wheel, rim spacer, and rim mounting surfaces. The mounting surface of the wheel is the 28-degree taper on the inboard side of each spoke. **See Fig. 1.**
2. Make sure the tire and rim assembly is inflated using the procedures under **Subject 180.**




1. 28-Degree Tapered Rim Mounting Surfaces

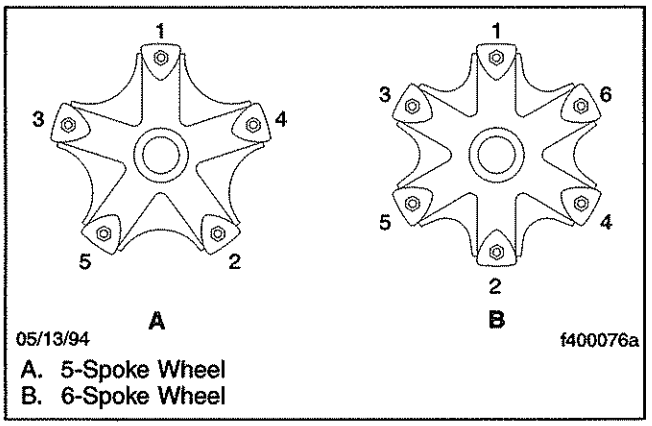
**Fig. 1, Spoke Wheel Tapered Mounting Surface**

3. Slide the assembly over the wheel and push it into place against the tapered mounting surface. It should fit snugly against all the tapers. Be sure that the valve stem faces out and is centered between two spokes.
4. Install the rim clamps and nuts. Run the nuts up until the end of each wheel stud is flush with the face of its nut. Rotate the wheel a half turn to seat the parts.
5. Tighten the rim nuts a quarter turn at a time, following the star pattern **shown in Fig. 2.** Continue until all the rim nuts are tightened to the required torque value. Refer to the applicable torque table in **Specifications, 400.**

**⚠ WARNING**

**WARNING: If the wheel nuts cannot be tightened to minimum torque values, the studs could be turning in the hub flange, having lost their locking ability. In this case, the wheel hub assembly is damaged and must be replaced with a new assembly.**

**Failure to reach minimum torque values could also be caused by stripped threads on the wheel studs or wheel nuts. Again, damaged parts must be replaced with new parts, as described in the front axle or rear axle group in this manual. Failure to replace damaged parts could result in the loss of a wheel and loss of vehicle control, causing property damage or personal injury.**




A. 5-Spoke Wheel
B. 6-Spoke Wheel

**Fig. 2, Spoke Wheel Tightening Sequence**

## Spoke Wheel, Tire and Rim Assembly; Removal and Installation

### ⚠ CAUTION

**CAUTION: Failure to tighten the nuts in the sequence shown, and to the correct torque, could cause misalignment of the tire and chording of the rim (Fig. 3). This would result in excessive vehicle vibration and permanent damage to the rim and wheel.**

IMPORTANT: On rear tire and rim assemblies, the clamps must not bottom out until at least 80 percent of the recommended torque is reached. If the clamps do bottom out, make sure the correct clamps and rim spacers are being used. Make sure the rim edges contact the spacer edges.

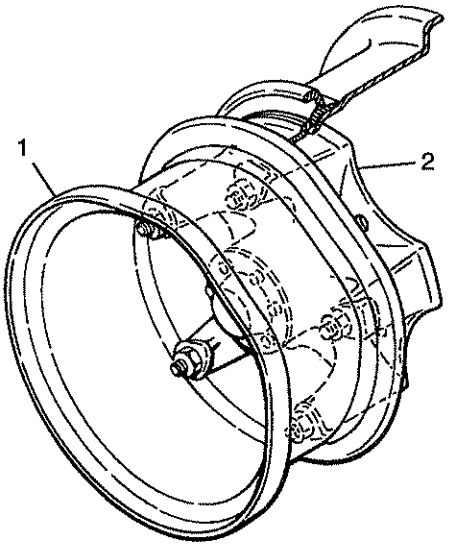
NOTE: When replacing a spoke wheel, contact the wheel manufacturer for the correct torque value for the brake drum nuts attaching the spoke wheel to the brake drum.

6. Check the wheel alignment by placing a block of wood or any other point of reference on the floor next to the tire. Rotate the tire and note any variations in the space between the tire and the block. If the variation exceeds 1.5 mm (1/16 inch) for front rims, or 3 mm (1/8 inch) for rear duals, the rim is not correctly mounted.

   To correct any misalignment, loosen the rim nuts where the largest gap occurs, and tighten the nuts on the opposite side. Recheck and correct until the variation is corrected. Make sure the rim nuts are tightened to the correct. Refer to the applicable torque table in **Specifications, 400.**

7. Remove the safety stands, lower the vehicle, and remove the chocks.

8. After operating the vehicle for 80 to 160 km (50 to 100 miles), retighten the rim nuts to the torque specified in the applicable table in **Specifications, 400.** Follow the sequence **shown in Fig. 2.**




1. Rim
2. Spoke Wheel

**Fig. 3, Out-of-Round Rim (Rim Chording)**

# Tire Demounting and Mounting Service Precautions

## Safety Precautions

IMPORTANT: Don't mount or demount tires without proper training as required in Occupational Safety and Health Administration (OSHA) Rules and Regulations 1910.177, *Servicing Multi-Piece and Single Piece Rim Wheels*. Service information containing mounting and demounting instructions are available through your rim supplier. Charts detailing service procedures are available through OSHA area offices. The address and telephone number of the nearest OSHA area office can be obtained by looking in the local telephone directory under U.S. Government, Labor Department of Occupational Safety and Health Administration.

Use the information from the above sources with the following precautions before and during the demounting and mounting of tires:

- Examine all wheel and tire parts as explained under the headings **Subject 160** and **Subject 170**. Replace damaged, rusted, or worn parts.
- Since wheels and rims are under stress, and are dangerous if improperly assembled, be sure all parts of an assembly match in size, manufacturer, and classification within a manufacturer's line. Before assembling the wheel or rim, check the catalog issued by the wheel or rim manufacturer for the correct part numbers and sizes of approved parts. Never use a part that does not bear clear, legible, and correct numbers and manufacturer's identification, even if that part appears to fit.
- Make sure that tires are stored indoors, or outdoors under cover, to prevent water collecting inside the tire.
- Use special tools, as recommended by tire suppliers, for mounting and demounting tires. These tools must be smooth, and used with care, to avoid gouging the rim.
- Loosening tire beads may be difficult, since considerable force may be needed. The use of a machine designed for loosening tire beads is recommended.
- Handle the wheels and rims on a wooden floor or rubber mat to prevent nicking or gouging the wheel or rim.
- Do not use a duck-bill hammer, or any steel hammer on wheel or rim parts. Use rubber, leather-faced, or plastic mallets to tap parts together, if necessary.
- Lubricate the tire with an approved tire-mounting lubricant. Never use antifreeze, silicones, petroleum-based lubricants, or any flammable material (ether/starting fluid).
- When lubricating a tire prior to mounting, make sure excess lubricant does not run into the tire.
- Michelin Tire Corporation recommends applying lubricant to the valley of the tire, formed by the tire and rim, before using tools to break the bead.
- Michelin also recommends applying a sufficient but sparing amount of lubricant to the entire rim face when mounting a tire on a rim, to ensure correct bead seating and ease of mounting.
- Balance the tire and wheel or rim assembly before installing the assembly on a vehicle.
- Don't reinflate a tire that has been run flat or has been run at 80 percent or less of its recommended operating pressure. Use your spare. Before removing the low tire from the vehicle, make sure it is completely deflated. Later, have the assembly taken apart and all the parts checked for damage, including the side or lockrings.
- The air pressure contained in a tire is dangerous. When servicing a tire, stay out of any potential path or route that a rim wheel component may travel during an explosive separation.

# Demounting and Mounting Tubeless Tires on One-Piece Drop Center Wheels or Rims

## Fifteen Degree Tapered Drop Center

**⚠ WARNING**

**WARNING: Read the information under Subject 140. Failure to follow the precautions, before and during tire demounting and mounting, could cause tire or rim damage while servicing or in use. An incorrectly mounted tire can burst causing equipment damage and personal injury.**

### DEMOUNTING

1. Deflate the tire being serviced by removing the valve core. Check the valve stem by running a piece of wire through the stem to make sure it is not plugged.
2. Loosen both beads from the rim by driving the flat end of the tire tool between the tire bead and the rim flange. Holding the tool upright, hammer on the neck to free the tire bead from the rim **(Fig. 1).** Repeat at 20-cm (8-inch) intervals around the flanges, until both beads are free from the rim.
3. Place the wide side of the rim down. Lubricate the tire bead and the rim. Insert the curved end of two tire tools between the bead and the rim, and just to one side of the tire valve. Step on the side of the tire, opposite from the valve, to force the first bead into the rim well **(Fig. 2).** Hold one of the tools in place with your foot and pry with the second tool, forcing the bead over the rim flange. Continue to work the first bead off of the rim.
4. When the first bead is off the rim, and the second bead is in the rim well, stand the assembly upright with the valve stem near the top. Lubricate the second bead and rim. Insert the straight end of the tool between the tire bead and the back rim flange, hooking the tool over the second flange. Lean the tire assembly toward the tool and use a rocking or bouncing action to pry the rim out of the tire. **See Fig. 3.**
5. Clean and inspect all parts. Refer to **Subject 160** and **Subject 170** for procedures.

### MOUNTING

1. Place the valve stem, with a rubber washer, through the valve hole from the tire side of the rim. Screw on the valve nut from the opposite side. Make sure the rubber bushing and metal collar or nut are centered and fit snugly in the valve hole **(Fig. 4).** Tighten the nut securely.
2. Place the rim on the floor with the wide side down. Using a brush or swab, lubricate both bead seats (flanges) of the rim, and both tire beads, with an approved lubricant. Apply enough lubricant to enable correct bead seating, and to make mounting easier. Don't let excess lubricant run inside the tire.
3. Lay the tire on the rim. If there is a balance mark on the tire, line up this mark with the valve stem.

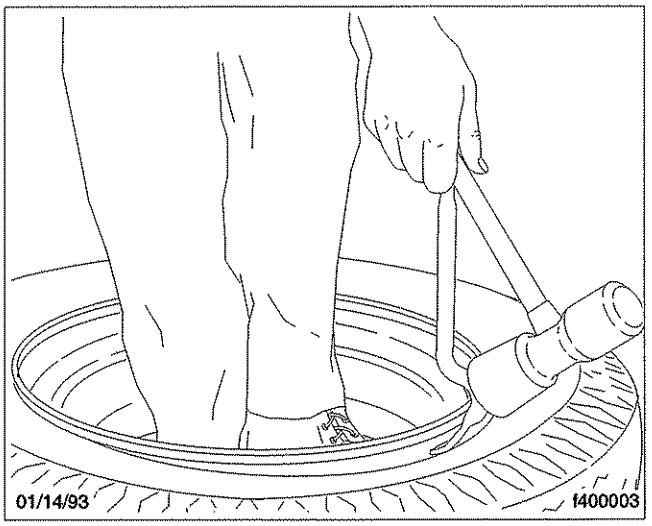



**Fig. 1**

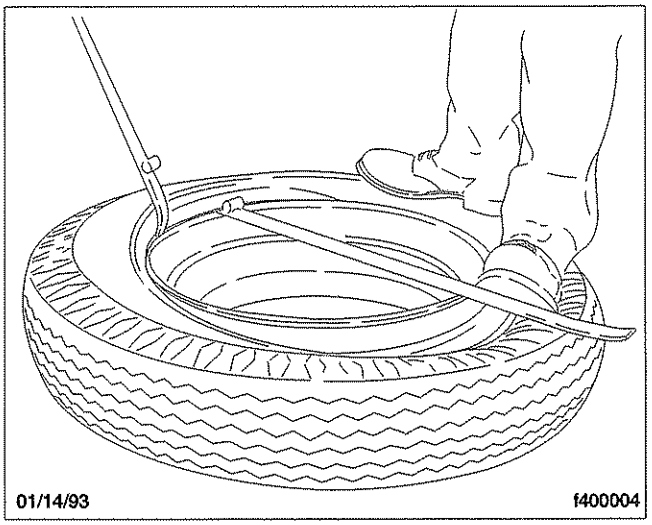



**Fig. 2**

## Demounting and Mounting Tubeless Tires on One-Piece Drop Center Wheels or Rims

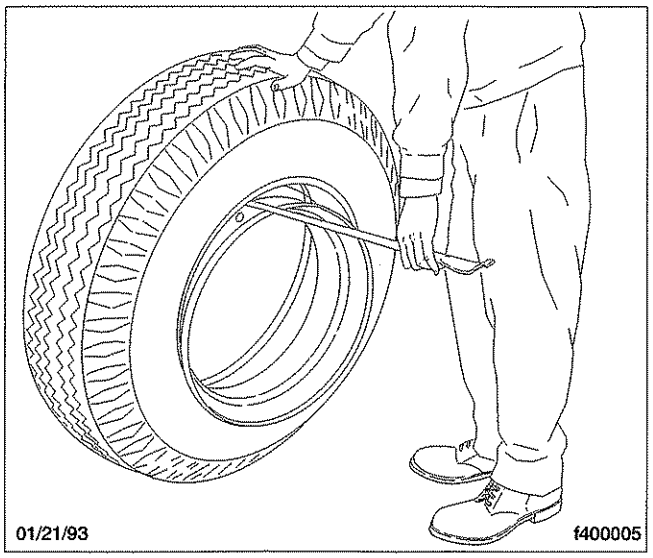



Fig. 3

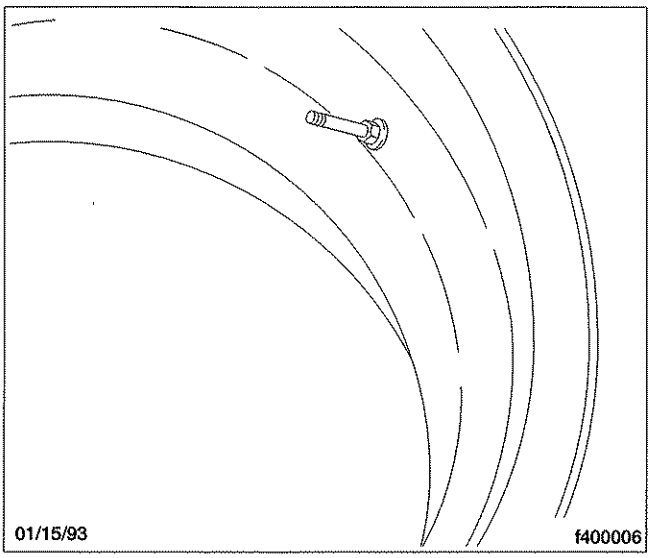



Fig. 4

Push the lower bead over the flange and into the rim well. Using the straight end of the tire tool (with the stop resting on the rim flange), take small bites to work the remaining section of the bead into the rim. **See Fig. 5.**

4. Start the upper bead over the rim flange and into the rim well by standing on the tire. If necessary, push a section of the bead into the rim well, and anchor it by attaching Vise-Grip® pliers to the rim flange (snub side toward the tire). Using the spoon end of the tire iron, with the stop toward the rim, work around the bead **(Fig. 6).** Use small bites until the bead slips over the flange and into the rim well. If necessary, insert a second tire iron and relubricate the last 8 inches (20 cm) of bead.
5. Inflate the tire. Refer to **Subject 180** for procedures.

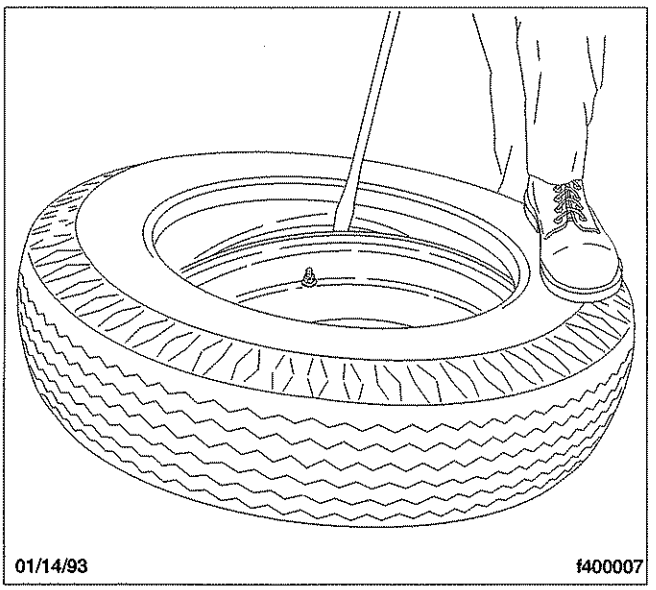



Fig. 5

## Demounting and Mounting Tubeless Tires on One-Piece Drop Center Wheels or Rims

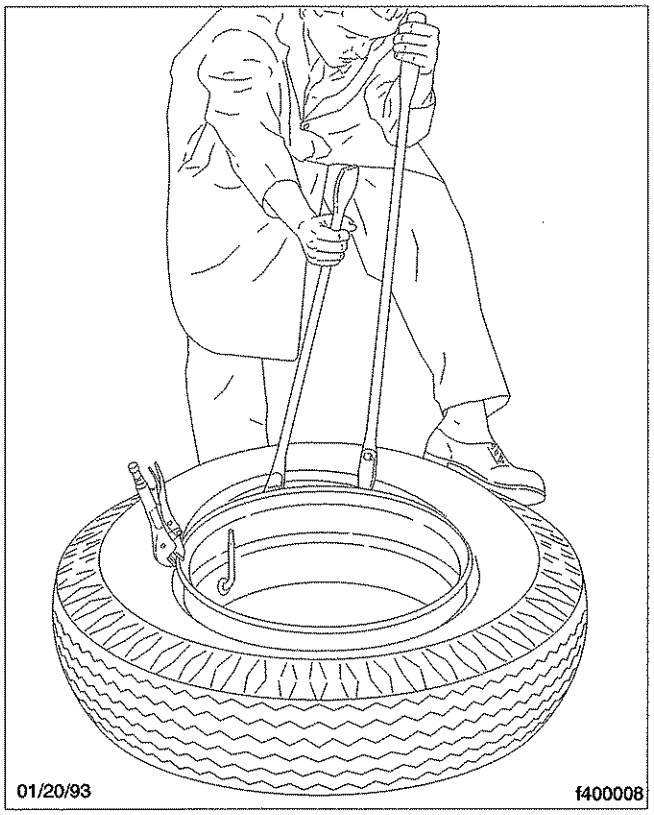



**Fig. 6**

## Inspection

**⚠ WARNING**

**WARNING: Failure to inspect the tires and wheels and correct any problems, could cause tire or rim damage while servicing or while in use. An incorrectly mounted tire can burst causing equipment damage and personal injury.**

Examine the wheel or rim, and all parts. Remove any grease, dirt, or rust. Using a wire brush, remove any rubber from the bead seat. Use special care when cleaning the rim gutter. Rust or other foreign matter can prevent the correct fitting of side rings. Replace corroded parts. Paint the rim to prevent corrosion.

NOTE: Don't paint Alcoa aluminum disc wheels. If the wheels are corroded, contact the manufacturer for instructions.

A cracked brake drum, damaged inner or outer wheel nuts **(Fig. 1),** or an out-of-round wheel or rim makes the replacement of the damaged part necessary. Replace the wheel if it has out-of-round stud holes.

NOTE: Refer to the **front axle group** or the **rear axle group** for inspection and service procedures for the hub, wheel studs, wheel, and brake drum or disc rotor assemblies. When replacing the spoke wheel or the brake drum, contact the wheel manufacturer for the correct torque value for the brake drum nut that attaches the spoke wheel to the brake drum.

Inspect valve cores for cracks, bends, and air retention. Replace damaged or leaky cores.

The most critical area of a spoke wheel is the 28-degree tapered rim mounting surface **(Fig. 2).** Clean the surface and examine it for damage or excessive wear. Replace the wheel if the mounting surface is damaged or worn below the 28-degree taper.

Check the clamps, rim spacer, rim studs, and spoke-wheel nuts for damage or wear. The clamps must not be excessively worn. The end of the wedge portion must be at least 1.5-mm (1/16-inch) thick **(Fig. 3).** The rim spacer must not be bent, distorted, or crushed. Replace all damaged or broken parts.

Do not attempt to rework, weld, heat, or braze any rim or wheel parts that are cracked, broken, or damaged. Use new parts or parts that are not cracked, broken, or otherwise damaged, and that are of the same size and type.

Remove all foreign matter, such as grease and dirt, from the wheel mounting surface. Smooth any projections on the mounting surface to ensure even pressure when tightening the wheel nuts.

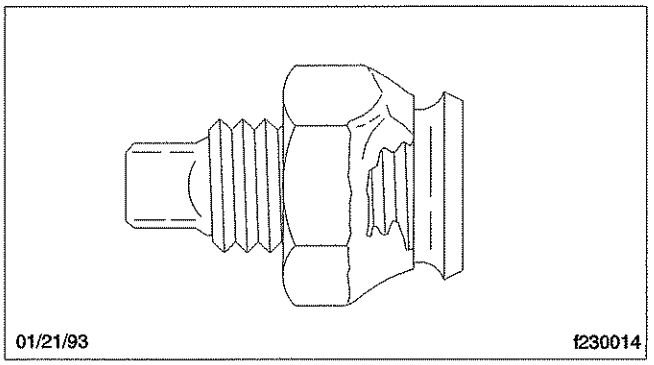



**Fig. 1, Damaged Outer Wheel Nut**

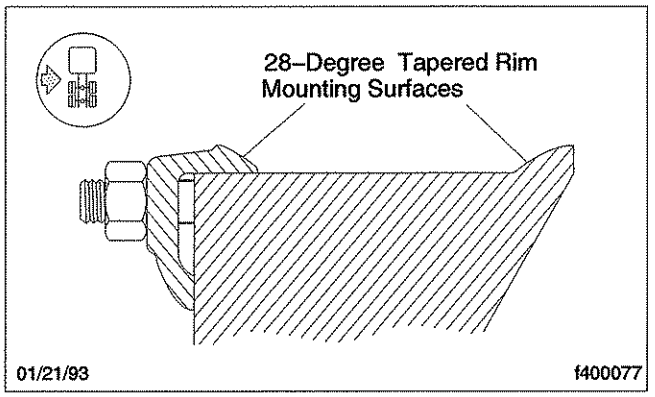



**Fig. 2, Spoke Wheel Tapered Mounting Surface**

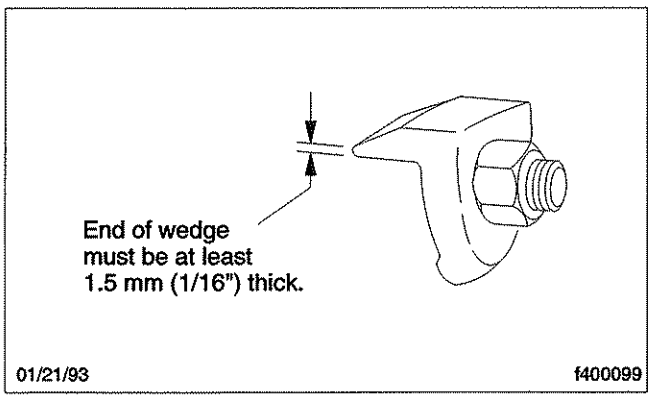



**Fig. 3, Rim Clamp**

## Inspection

**⚠ WARNING**

**WARNING: Failure to inspect the tires and wheels and correct any problems, could cause tire or rim damage while servicing or while in use. An incorrectly mounted tire can burst causing equipment damage and personal injury.**

Inspect the inside and outside of the tire for out-of-roundness, loose cords, cuts, foreign objects, and other damage. Repair as needed. Contact the tire manufacturer for repair procedures.

Do not repair tires with the following problems:

- Cuts in the tread that are wire or breaker fiber deep.
- Tread worn to the wire or breaker fibers.
- Tread that is scalloped or otherwise worn unevenly.
- Visible, broken, deformed, or otherwise damaged bead wires.
- Deteriorated rubber.
- Rubber cracked to the wire or cord.
- Separations in the casing.
- Exposed cord (for example, due to weather checking or sidewall scuffing).

Inspect the tread for abnormal or excessive wear. **Refer to "Troubleshooting, 300"** for possible causes of abnormal wear. If the tires are wearing irregularly, they should be rotated. If the front axle tires become irregularly worn, they should be moved to the drive axle. The front-end alignment should be checked. In a dual assembly, if one tire wears faster than its mate, the position of the two tires should be reversed. Refer to the vehicle maintenance manual for tire rotation procedures.

Government regulations require the removal of any tire with less than 1.5-mm (2/32-inch) tread remaining. Retread the tire (if possible), regroove it (only if marked " Regroovable " on the sidewall), or discard it.

Michelin Tire Corporation recommends using only new valve cores, caps, and O-rings in a new mounting.

## Tire Inflation

**⚠ WARNING**

**WARNING: During initial tire inflation, there is the possibility of an explosion of the assembly. Observe the following safety rules to reduce the possibility of serious physical injury in the event of an explosion.**

NOTE: Inflate tires in a safety cage **(Fig. 1)** or an approved portable restraining device. Always use a clip-on chuck with an inline valve and gauge. Make sure the inflation hose is long enough to permit standing to the side of the tire during inflation. Never sit on or stand in front of an assembly that is being inflated.

1. Check all parts to make sure they are correctly seated prior to inflation.

IMPORTANT: Inflate tires immediately after mounting, before the tire lubricant dries. Once the lubricant dries, bead positioning is not possible, even with increased inflation pressure.

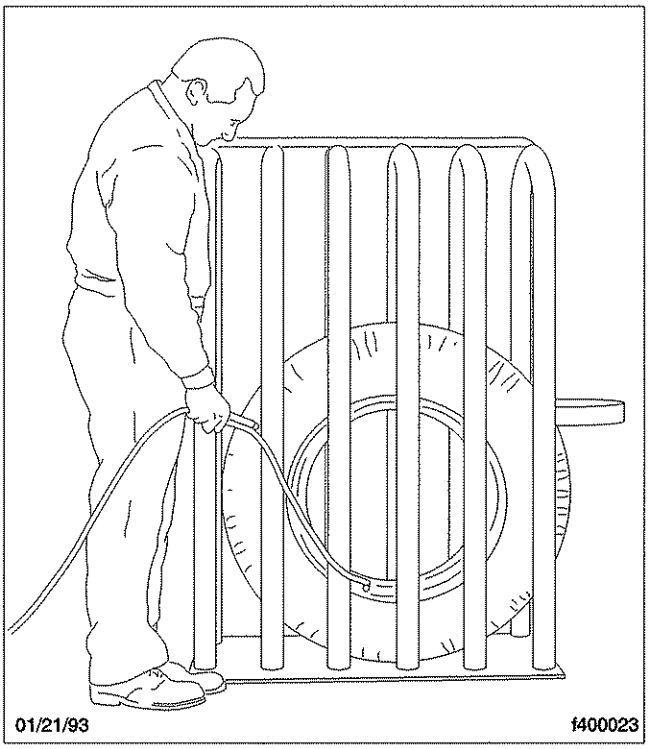



**Fig. 1, Safety Cage**

2. Water in the tire can cause ply separation. During tire inflation, air tank reservoirs and lines must be dry. Use well-maintained air line moisture traps, and service them regularly.

   After placing the tire in a safety cage, or an approved portable restraining device, inflate the tire to 69 kPa (10 psi). Check the parts for correct seating. If the seating is not correct, completely deflate the tire and correct the problem. Never attempt to seat rings or other parts by hammering on an inflated or partially inflated tire.

3. If there are no problems with the assembly at 69 kPa (10 psi), continue to inflate the tire to the recommended pressure. Refer to the applicable tables under **"Specifications, 400"** for correct cold inflation pressures. Michelin Tire Corporation recommends an initial inflation pressure of 620 to 690 kPa (90 to 100 psi) to correctly seat the tire beads.

IMPORTANT: Due to the different flex characteristics of radial sidewalls, it may be necessary to use an inflation aid to help seat tubeless tire beads:

- Metal rings, which use a blast of compressed air to seat the beads.
- Rubber rings, which seal between the tire bead and rim, allowing the bead to move out and seat correctly. A well-lubricated, heavy-duty bicycle tube can be used to help seal between the tire bead and rim.

4. After the initial inflation, completely deflate the tire by removing the valve core. This ensures correct bead seating. Then inflate the tire to the applicable recommended cold inflation pressure listed in tables under **"Specifications, 400."** Install valve caps and tighten them finger-tight.

**⚠ WARNING**

**WARNING: Tire underinflation or overinflation will damage wheels and tires, and could result in a blowout causing possible property damage and personal injury.**

**Use tires of the same size, type, and capacity to carry the load at the recommended cold pressure. Attempting to increase the load capacity of a tire by overinflation will damage the tire assembly.**

## Tire Inflation

NOTE: Inflate the tires to the recommended pressure. Driving on overinflated tires will weaken the cords by reducing their ability to absorb road shocks, and will increase the danger of cuts, snags, and punctures. Overinflation will overstress and damage the rims. Driving on underinflated tires will generate excessive heat. This weakens the tire body, and reduces tire strength.

5. Check the inflation pressure 24 hours after mounting new tires.

NOTE: When testing a vehicle on a dynamometer, severe tire damage can occur. Because the manufacturers differ in their recommendations for preventing tire damage, refer to the manufacturer's instructions for testing a vehicle on a dynamometer.

## Troubleshooting

This subject contains the following troubleshooting tables:

- Abnormal Tire Wear
- Vehicle Vibration
- Excessive On-the-Road Tire Failures

**Problem—Abnormal Tire Wear**

| Possible Cause | Remedy |
|---|---|
| Tires are not inflated to the correct pressure. | Operate the tires at the recommended inflation pressure and use the proper size tires, wheels, and rims for the load to be carried. Refer to the applicable tables in **"Specifications, 400"** for specifications. |
| Inflation pressures in a dual assembly are unequal. | Inflate all tires to a uniform pressure , within 35 kPa (5 psi). Refer to the applicable tables in **"Specifications, 400"** for the proper cold inflation pressures. |
| Dual tires are mismatched. | Examine all tires and match them according to the specifications in this section. |
| Vehicle is vibrating severely. | Follow the recommendations under "Vehicle Vibration" in this chart. |
| Brakes are grabbing. | Examine and adjust the brakes according to the instructions in the **brakes group.** |
| Axles are improperly aligned. | Align the axles. **Refer to the front axle group** and **the rear axle group** for instructions. |
| Wheel bearings are loose or damaged, or bushings are excessively worn. | Examine, and repair or replace according to the instructions in **the front axle group** and **the rear axle group.** |
| Wear is uneven among tire sets. | Rotate the tires according to the instructions in the wheels and tires group of the vehicle maintenance manual. |
| Driver is abusing equipment. | Caution the driver . |

**Problem—Vehicle Vibration**

| Possible Cause | Remedy |
|---|---|
| Axles are improperly aligned. | Align the axles. **Refer to the front axle group** and **the rear axle group** for instructions. |
| Wheels, rims, or tires are out-of-round, bent, or distorted. | Replace damaged components. |
| Tires, wheels, rims, or brake drums are out-of-balance. | Determine the out of balance component and balance. |
| Tire beads are not properly seated. | Demount and mount the tire. Make certain adequate lubrication is used and, if necessary, use an inflation aid to help seat tubeless tire beads. |
| Tire and rim assembly is improperly installed on a spoke wheel. | Remove the tire and rim assembly and inspect it for out-of-round or rim chording. Replace the rim if it is damaged. Follow closely the tightening sequence and torque values listed. |
| Rim spacers are worn or distorted. | Replace the rim spacers. |
| Driveline, suspensions, or steering components are loose or worn. | Determine the location of the vibration, then repair or replace the loose or worn components. |

## Troubleshooting

**Problem—Excessive On-the-Road Tire Failures**

| Possible Cause | Remedy |
|---|---|
| Tires are not inflated to the correct pressure. | Operate the tires at the recommended inflation pressure and use the proper size tires, wheels, and rims for the load to be carried. Refer to the applicable tables in "Specifications, 400" for specifications. |
| Dual tires are mismatched. | Examine all tires and match them according to the specifications in this section. |
| Water or foreign material is inside the casing. | Clean and dry the tires prior to mounting. Make sure excess lubricant does not flow down into the tire. Store unmounted tires indoors, or under cover, to prevent moisture from collecting inside. |
| Tires are contaminated with oil. | Clean the tires and inspect the engine seals, transmission seals, axle-end and drive axle seals, oil filters and oil lines for leakage. Make sure the lubricant used in mounting does not contain a petroleum derivative. |
| Vehicle is vibrating severely. | Follow the recommendations under "Vehicle Vibration" in this chart. |
| Wheel or rim components are mismatched. | Check the catalog issued by the applicable wheel or rim manufacturer for the proper part numbers and sizes of approved components. Make sure that all parts of an assembly match in size, manufacturer, and classifications within a manufacturer's line. Never use a component which does not bear clear, legible, and proper numbers and manufacturer's identification, even if it appears to fit. |
| Parts are corroded, worn, or otherwise damaged. | Clean or replace parts as necessary. |

IMPORTANT: Do not reduce the pressure of a hot tire if it exceeds the specified pressure. In normal driving, tire temperature and inflation pressure increase. Increases of 10 to 15 psi (70 to 105 kPa) are common. Higher pressures may be signs of overloading, underinflation, excessive speed, improper tire size, or any combination of these factors, and must be checked when the tire is cool.

The load and cold inflation pressure must not exceed the rim or wheel manufacturer's recommendations, even though the tire may be approved for a higher load or inflation. Some rims and wheels are stamped with a maximum load and maximum cold inflation rating. Consult the rim or wheel manufacturer if they are not stamped. If the load exceeds the maximum rim or wheel capacity, the load must be adjusted or reduced.

For further data on rims and tires, and for inflation and load limits not given here, see the "Tire and Rim Association Yearbook." Contact the tire manufacturer for further information on their tires.

NOTE: To obtain metric equivalents, use the following conversions:

- kg = lbs x 0.454
- kPa = psi x 6.890

| Tire Load Limits, Goodyear Bias Ply Tubeless Tires, Front Axle (Maximum Speed 60 mph [97 km/h]) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | Load Range | Ply Rating | Maximum Tire Loads (lbs) at Various Cold Inflation Pressures | | | | | | | | | | |
| | | | 50 psi | 55 psi | 60 psi | 65 psi | 70 psi | 75 psi | 80 psi | 85 psi | 90 psi | 95 psi | 100 psi | 105 psi |
| 9-22.5 | E | 10 | 2800 | 3010 | 3190 | 3370 | 3560 | 3730 | 3890 | 4050 | — | — | — | — |
| 10-22.5 | E | 10 | — | 3560 | 3770 | 4000 | 4210 | 4410 | 4610 | — | — | — | — | — |
| 10-22.5 | F | 12 | — | 3560 | 3770 | 4000 | 4210 | 4410 | 4610 | 4790 | 4970 | 5150 | — | — |
| 11-22.5 | F | 12 | — | — | 4290 | 4530 | 4770 | 4990 | 5220 | 5430 | — | — | — | — |
| 11-22.5 | G | 14 | — | — | 4290 | 4530 | 4770 | 4990 | 5220 | 5430 | 5640 | 5840 | 6040 | — |
| 15-22.5 | G | 14 | — | 5680 | 6040 | 6390 | 6720 | 7040 | 7360 | 7660 | — | — | — | — |
| 15-22.5 | H | 16 | — | 5680 | 6040 | 6390 | 6720 | 7040 | 7360 | 7660 | 7950 | 8240 | 8520 | — |

**Table 1, Tire Load Limits, Goodyear Bias Ply Tubeless Tires, Front Axle (Maximum Speed 60 mph [97 km/h])**

| Tire Load Limits, Goodyear Bias Ply Tubeless Tires, Rear Axle (Maximum Speed 60 mph [97 km/h]) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | Load Range | Ply Rating | Maximum Tire Loads (lbs) at Various Cold Inflation Pressures | | | | | | | | | | |
| | | | 40 psi | 45 psi | 50 psi | 55 psi | 60 psi | 65 psi | 70 psi | 75 psi | 80 psi | 85 psi | 90 psi | 95 psi |
| 9-22.5 | E | 10 | 2460 | 2640 | 2800 | 2960 | 3120 | 3270 | 3410 | 3550 | — | — | — | — |
| 10-22.5 | E | 10 | — | 3120 | 3310 | 3510 | 3690 | 3870 | 4040 | — | — | — | — | — |
| 10-22.5 | F | 12 | — | 3120 | 3310 | 3510 | 3690 | 3870 | 4040 | 4200 | 4360 | 4520 | — | — |
| 11-22.5 | F | 12 | — | — | 3760 | 3970 | 4180 | 4380 | 4580 | 4760 | — | — | — | — |
| 11-22.5 | G | 14 | — | — | 3760 | 3970 | 4180 | 4380 | 4580 | 4760 | 4950 | 5120 | 5300 | — |

**Table 2, Tire Load Limits, Goodyear Bias Ply Tubeless Tires, Rear Axle (Maximum Speed 60 mph [97 km/h])**

## Specifications

| Variations in Load and Inflation Limits According to Speed | | | | |
|---|---|---|---|---|
| Speed Range mph (km/h) | Inflation Pressure Increase | | Percent Increase/(Decrease) in Load | |
| | Bias Ply Tires psi (kPa) | Radial Ply Tires psi (kPa) | Regular Width Tires | Wide Base Tires |
| 71–75 (114–120) | 10 (69)* | 10 (69)* | (10) | (10) |
| 61–70 (98–112) | 10 (69)* | 10 (69)* | 0 | 0 |
| 51–60 (82–96) | 0 | 0 | 0 | 0 |
| 41–50 (66–80) | 0 | 0 | 9 | 7 |
| 31–40 (50–64) | 0 | 0 | 16 | 9 |
| 21–30 (34–48) | 0 | 10 (69)* | 24 | 12 |
| 11–20 (18–32) | 0 | 15 (103)* | 32 | 17 |

* Not to exceed the maximum rim or wheel capacity specified by the manufacturer of the rim or wheel.

**Table 3, Variations in Load and Inflation Limits According to Speed**

| Tire Load Limits, Michelin Radial Ply Tubeless Tires, Front Axle | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | Load Range | Ply Rating | Maximum Tire Loads (lbs) at Various Cold Inflation Pressures | | | | | | | | | | | | |
| | | | 55 psi | 60 psi | 65 psi | 70 psi | 75 psi | 80 psi | 85 psi | 90 psi | 95 psi | 100 psi | 105 psi | 110 psi | 115 psi | 120 psi |
| 9R22.5X | F | 12 | 2860 | 3090 | 3317 | 3502 | 3700 | 3912 | 4050 | 4307 | 4500 | — | — | — | — | — |
| 10R22.5X | F | 12 | — | — | — | — | 4255 | 4490 | 4725 | 4963 | 5150 | — | — | — | — | — |
| 10R22.5X | G | 14 | — | — | — | — | 4255 | 4490 | 4725 | 4963 | 5150 | 5430 | 5510 | — | — | — |
| 11R22.5X | G | 14 | — | — | — | — | 4693 | 4950 | 5215 | 5470 | 5755 | 6040 | — | — | — | — |
| 11R22.5X | H | 16 | — | — | — | — | 4693 | 4950 | 5215 | 5470 | 5755 | 6040 | 6245 | 6428 | 6610 | — |
| 11R24.5X | G | 14 | — | — | — | — | 4960 | 5235 | 5513 | 5780 | 6105 | 6430 | — | — | — | — |
| 12R22.5X | H | 16 | — | — | — | — | 4958 | 5235 | 5513 | 5705 | 6055 | 6295 | 6590 | 6835 | 7200 | — |

**Table 4, Tire Load Limits, Michelin Radial Ply Tubeless Tires, Front Axle**

| Tire Load Limits, Michelin Radial Ply Tubeless Tires, Rear Axle | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | Load Range | Ply Rating | Maximum Tire Loads (lbs) at Various Cold Inflation Pressures | | | | | | | | | | | | |
| | | | 55 psi | 60 psi | 65 psi | 70 psi | 75 psi | 80 psi | 85 psi | 90 psi | 95 psi | 100 psi | 105 psi | 110 psi | 115 psi | 120 psi |
| 9R22.5X | F | 12 | 2610 | 2840 | 3113 | 3261 | 3473 | 3671 | 3830 | 4050 | 4220 | — | — | — | — | — |
| 10R22.5X | F | 12 | — | — | — | — | 3914 | 4130 | 4349 | 4566 | 4740 | — | — | — | — | — |
| 10R22.5X | G | 14 | — | — | — | — | 3914 | 4130 | 4349 | 4566 | 4740 | 4995 | 5080 | — | — | — |
| 11R22.5X | G | 14 | — | — | — | — | 4224 | 4550 | 4693 | 4923 | 5180 | 5440 | — | — | — | — |
| 11R22.5X | H | 16 | — | — | — | — | 4224 | 4550 | 4693 | 4923 | 5180 | 5440 | 5620 | 5880 | 5950 | — |
| 11R24.5X | G | 14 | — | — | — | — | 4534 | 4740 | 4976 | 5200 | 5495 | 5790 | — | — | — | — |
| 12R22.5X | H | 16 | — | — | — | — | 4390 | 4635 | 4880 | 5130 | 5361 | 5575 | 6000 | 6055 | 6360 | — |

**Table 5, Tire Load Limits, Michelin Radial Ply Tubeless Tires, Rear Axle**

| Tire Load Limits, Michelin Pilote X Radial Ply Tubeless Tires, Front Axle | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | Load Range | Ply Rating | Maximum Tire Loads (lbs) at Various Cold Inflation Pressures | | | | | | | | | | | | | |
| | | | 55 psi | 60 psi | 65 psi | 70 psi | 75 psi | 80 psi | 85 psi | 90 psi | 95 psi | 100 psi | 105 psi | 110 psi | 115 psi | 120 psi |
| 225/70R19.5 | G | 12 | — | — | — | 3040 | 3220 | 3405 | 3640 | — | — | — | — | — | — | — |
| 235/80R22.5 | G | 14 | — | — | 3593 | 3815 | 4035 | 4278 | 4543 | 4675 | — | — | — | — | — | — |
| 245/70R19.5 | F | 12 | 2640 | 2870 | 3075 | 3270 | 3455 | 3660 | 3870 | 4080 | — | — | — | — | — | — |
| 245/70R19.5 | G | 14 | — | — | — | 3270 | 3455 | 3660 | 3870 | 4080 | 4425 | 4545 | — | — | — | — |
| 255/70R22.5 | H | 16 | — | — | 3385 | 3598 | 3810 | 4020 | 4235 | 4448 | 4652 | 4805 | 4940 | 5273 | 5510 | — |
| 255/80R22.5 | G | 14 | — | — | — | 4000 | 4235 | 4465 | 4710 | 4960 | 5205 | — | — | — | — | — |
| 275/80R22.5 | G | 14 | — | — | — | 4560 | 4825 | 5090 | 5365 | 5625 | 5920 | 6175 | — | — | — | — |
| 275/80R22.5 | H | 16 | — | — | 4155 | 4435 | 4715 | 4990 | 5260 | 5535 | 5805 | 6080 | 6345 | 6615 | 6940 | — |
| 275/80R24.5 | G | 14 | — | — | — | 4560 | 4825 | 5090 | 5365 | 5625 | 5920 | 6175 | — | — | — | — |
| 295/80R22.5 | H | 16 | — | — | — | 4705 | 4990 | 5285 | 5570 | 5870 | 6155 | 6450 | 6740 | 7030 | 7390 | — |
| 315/80R22.5 | J | 18 | — | — | 5400 | 5715 | 6045 | 6405 | 6675 | 6995 | 7310 | 7630 | 7950 | 8270 | — | — |
| 315/80R22.5 | J | 20 | — | — | — | — | — | — | 6675 | 6995 | 7310 | 7630 | 7950 | 8270 | 8485 | 8750 |
| 385/65R22.5 | J | 18 | — | — | — | 6310 | 6640 | 6940 | 7280 | 7580 | 7890 | 8220 | 8530 | 9000 | 9150 | 9370 |

**Table 6, Tire Load Limits, Michelin Pilote X Radial Ply Tubeless Tires, Front Axle**

| Tire Load Limits, Michelin Pilote X Radial Ply Tubeless Tires, Rear Axle | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | Load Range | Ply Rating | Maximum Tire Loads (lbs) at Various Cold Inflation Pressures | | | | | | | | | | | | | |
| | | | 55 psi | 60 psi | 65 psi | 70 psi | 75 psi | 80 psi | 85 psi | 90 psi | 95 psi | 100 psi | 105 psi | 110 psi | 115 psi | 120 psi |
| 225/70R19.5 | G | 12 | — | — | — | 2762 | 2970 | 3185 | 3415 | — | — | — | — | — | — | — |
| 235/80R22.5 | G | 14 | — | — | 3395 | 3594 | 3814 | 4035 | 4278 | 4410 | — | — | — | — | — | — |
| 245/70R19.5 | F | 12 | 2530 | 2722 | 2910 | 3102 | 3290 | 3482 | 3670 | 3860 | — | — | — | — | — | — |
| 245/70R19.5 | G | 14 | — | — | — | 3102 | 3290 | 3482 | 3670 | 3860 | 4062 | 4300 | — | — | — | — |
| 255/70R22.5 | H | 16 | — | — | 3135 | 3329 | 3522 | 3712 | 3905 | 4096 | 4280 | 4420 | 4540 | 4852 | 5070 | — |
| 255/80R22.5 | G | 14 | — | — | — | 3695 | 3910 | 4135 | 4355 | 4575 | 4810 | — | — | — | — | — |
| 275/80R22.5 | G | 14 | — | — | — | 4112 | 4350 | 4588 | 4833 | 5070 | 5335 | 5675 | — | — | — | — |
| 275/80R22.5 | H | 16 | — | — | 3680 | 3920 | 4168 | 4425 | 4675 | 4930 | 5175 | 5415 | 5650 | 5883 | 6175 | — |
| 275/80R24.5 | G | 14 | — | — | — | 4113 | 4350 | 4588 | 4833 | 5070 | 5335 | 5675 | — | — | — | — |
| 295/80R22.5 | H | 16 | — | — | — | 4210 | 4465 | 4740 | 5008 | 5283 | 5548 | 5805 | 6055 | 6305 | 6610 | — |

**Table 7, Tire Load Limits, Michelin Pilote X Radial Ply Tubeless Tires, Rear Axle**

## Specifications

| Tire Load Limits, Bridgestone Standard Profile Radial Ply Tubeless Tires, Front Axle | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | Load Range | Ply Rating | Maximum Tire Loads (lbs) at Various Cold Inflation Pressures | | | | | | | | | | | | |
| | | | 55 psi | 60 psi | 65 psi | 70 psi | 75 psi | 80 psi | 85 psi | 90 psi | 95 psi | 100 psi | 105 psi | 110 psi | 115 psi | 120 psi |
| 9R22.5 | F | 12 | — | 3010 | 3190 | 3370 | 3560 | 3730 | 3890 | 4050 | 4210 | 4350 | 4500 | — | — | — |
| 10R22.5 | F | 12 | — | 3560 | 3770 | 4000 | 4210 | 4410 | 4610 | 4790 | 4970 | 5150 | — | — | — | — |
| 10R22.5 | G | 14 | — | 3560 | 3770 | 4000 | 4210 | 4410 | 4610 | 4790 | 4970 | 5150 | 5320 | 5490 | 5670 | — |
| 11R22.5 | G | 14 | — | — | — | 4530 | 4770 | 4990 | 5220 | 5430 | 5640 | 5840 | 6040 | — | — | — |
| 11R22.5 | H | 16 | — | — | — | 4530 | 4770 | 4990 | 5220 | 5430 | 5640 | 5840 | 6040 | 6240 | 6430 | 6610 |
| 11R24.5 | G | 14 | — | — | — | 4820 | 5070 | 5310 | 5550 | 5780 | 6000 | 6210 | 6430 | — | — | — |
| 12R22.5 | H | 16 | — | — | — | 4940 | 5200 | 5450 | 5690 | 5920 | 6140 | 6370 | 6590 | 6790 | 7010 | 7200 |

**Table 8, Tire Load Limits, Bridgestone Standard Profile Radial Ply Tubeless Tires, Front Axle**

| Tire Load Limits, Bridgestone Standard Profile Radial Ply Tubeless Tires, Rear Axle | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | Load Range | Ply Rating | Maximum Tire Loads (lbs) at Various Cold Inflation Pressures | | | | | | | | | | | | |
| | | | 55 psi | 60 psi | 65 psi | 70 psi | 75 psi | 80 psi | 85 psi | 90 psi | 95 psi | 100 psi | 105 psi | 110 psi | 115 psi | 120 psi |
| 9R22.5 | F | 12 | — | 2960 | 3120 | 3270 | 3410 | 3550 | 3690 | 3820 | 3950 | — | — | — | — | — |
| 10R22.5 | F | 12 | — | 3510 | 3690 | 3870 | 4040 | 4200 | 4360 | 4520 | — | — | — | — | — | — |
| 10R22.5 | G | 14 | — | 3510 | 3690 | 3870 | 4040 | 4200 | 4360 | 4520 | 4670 | 4820 | 4970 | — | — | — |
| 11R22.5 | G | 14 | — | — | — | 4380 | 4580 | 4760 | 4950 | 5120 | 5300 | — | — | — | — | — |
| 11R22.5 | H | 16 | — | — | — | 4380 | 4580 | 4760 | 4950 | 5120 | 5300 | 5470 | 5630 | 5800 | — | — |
| 11R24.5 | G | 14 | — | — | — | 4660 | 4870 | 5070 | 5260 | 5450 | 5640 | 5820 | 6000 | 6170 | — | — |
| 12R22.5 | H | 16 | — | — | — | 4780 | 4990 | 5190 | 5390 | 5590 | 5780 | 5960 | 6150 | 6320 | — | — |

**Table 9, Tire Load Limits, Bridgestone Standard Profile Radial Ply Tubeless Tires, Rear Axle**

| Tire Load Limits, Bridgestone Low Profile Radial Ply Tubeless Tires, Front Axle | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | Load Range | Ply Rating | Maximum Tire Loads (lbs) at Various Cold Inflation Pressures | | | | | | | | | | | | |
| | | | 55 psi | 60 psi | 65 psi | 70 psi | 75 psi | 80 psi | 85 psi | 90 psi | 95 psi | 100 psi | 105 psi | 110 psi | 115 psi | 120 psi |
| 245/70R19.5 | F | 12 | 2640 | 2870 | 3075 | 3270 | 3455 | 3660 | 3870 | 4080 | — | — | — | — | — | — |
| 245/75R22.5 | G | 14 | — | — | — | 3470 | 3645 | 3810 | 3975 | 4140 | 4300 | 4455 | 4610 | 4675 | — | — |
| 255/70R22.5 | H | 16 | — | — | — | — | — | — | 4410 | 4600 | 4780 | 4970 | 5150 | 5330 | 5510 | — |
| 265/75R22.5 | G | 14 | — | — | — | 3875 | 4070 | 4255 | 4440 | 4620 | 4800 | 4975 | 5150 | 5205 | — | — |
| 285/75R24.5 | G | 14 | — | — | — | 4545 | 4770 | 4990 | 5210 | 5420 | 5675 | 5835 | 6040 | 6175 | — | — |
| 295/75R22.5 | G | 14 | — | — | — | 4500 | 4725 | 4945 | 5155 | 5370 | 5575 | 5780 | 5980 | 6175 | — | — |
| 315/80R22.5 | J | 18 | — | — | 5400 | 5715 | 6045 | 6405 | 6675 | 6995 | 7310 | 7630 | 7950 | 8270 | — | — |
| 385/65R22.5 | J | 18 | — | — | — | 6380 | 6710 | 7040 | 7350 | 7650 | 7950 | 8230 | 8510 | 8790 | 9050 | 9370 |

**Table 10, Tire Load Limits, Bridgestone Low Profile Radial Ply Tubeless Tires, Front Axle**

| Tire Load Limits, Bridgestone Low Profile Radial Ply Tubeless Tires, Rear Axle | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | Load Range | Ply Rating | Maximum Tire Loads (lbs) at Various Cold Inflation Pressures | | | | | | | | | | | | |
| | | | 55 psi | 60 psi | 65 psi | 70 psi | 75 psi | 80 psi | 85 psi | 90 psi | 95 psi | 100 psi | 105 psi | 110 psi | 115 psi | 120 psi |
| 245/70R19.5 | F | 12 | 2530 | 2722 | 2910 | 3102 | 3290 | 3482 | 3670 | 3860 | — | — | — | — | — | — |
| 245/75R22.5 | G | 14 | — | — | — | 3465 | 3615 | 3765 | 3915 | 4055 | 4195 | 4300 | — | — | — | — |
| 255/70R22.5 | H | 16 | — | — | — | — | — | — | 4050 | 4230 | 4400 | 4570 | 4740 | 4910 | 5070 | — |
| 265/75R22.5 | G | 14 | — | — | — | 3875 | 4040 | 4205 | 4370 | 4525 | 4685 | 4805 | — | — | — | — |
| 285/75R24.5 | G | 14 | — | — | — | 4540 | 4740 | 4930 | 5205 | 5310 | 5495 | 5675 | — | — | — | — |
| 295/75R22.5 | G | 14 | — | — | — | 4500 | 4725 | 4945 | 5155 | 5370 | 5510 | 5780 | 5980 | 6175 | — | — |

**Table 11, Tire Load Limits, Bridgestone Low Profile Radial Ply Tubeless Tires, Rear Axle**

| Disc-Type Wheel Fastener Torques for Accuride Wheels | | |
|---|---|---|
| Description | Nut Size | Torque (dry threads) lbf·ft (N·m) |
| *8-Hole Disc Wheel With Two-Piece Flange Nuts* | | |
| Front and Rear Wheel Nut | M22 x 1.5 | 450–500 (610–678)* |
| *10-Hole Disc Wheel With Two-Piece Flange Nuts* | | |
| Front and Rear Wheel Nut | M22 x 1.5 | 450–500 (610–678)* |
| *10-Hole Disc Wheel With Inner and Outer Nuts* | | |
| Front Wheel Nut | 1-1/8–16 | 400–500 (540–678)†<br>450–500 (610 –678)‡<br>450–500 (610–678) |
| | 3/4–16 | 450–500 (610–678)* |
| Rear Wheel Inner Nut | 3/4–16 | 400–500 (540–678)†<br>450–500 (610–680) |
| Rear Wheel Outer Nut | 1-1/8–16 | 400–500 (540–678)†<br>450–500 (610–680) |
| Wheel Stud Retainer Nut | 3/4–16 | 175–200 (235–270) |

* Torque values are given for lubricated threads.

† Lubricated threads should be tightened 405 to 510 N·m (300 to 375 lbf·ft). Lubricate threads with a mixture of 25 percent colloidal graphite in cup grease or equivalent. Do not apply thread lubricant to ball seats of the nuts and wheels. Wipe it off if it is applied accidentally.

‡ On 1-1/8–16 size wheel studs with a head (**Fig.1**), tighten the wheel nuts 650 to 750 lbf·ft (880 to 1020 N·m).

**Table 12, Disc-Type Wheel Fastener Torques for Accuride Wheels**

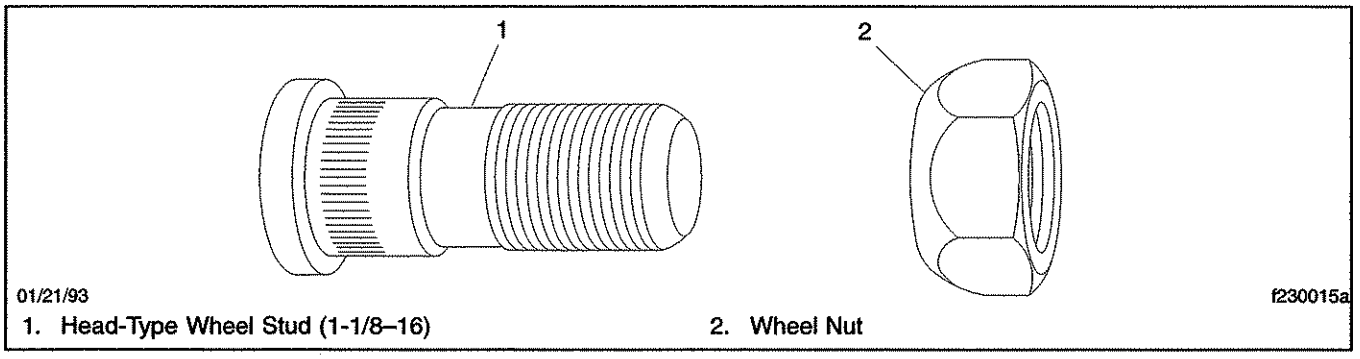
## Specifications

| Spoke-Type Wheel Mounting Torques for Gunite | | |
|---|---|---|
| **Description** | **Nut Size** | **Torque (dry threads) lbf·ft (N·m)** |
| Front Wheel Nut, 5- and 6-Spoke | 5/8–11 | 160–175 (215–235)<br>150–175 (205–235) |
| | 3/4–10 | 240–260 (325–355)<br>200–225 (270–305)*<br>200–250 (270–340) |
| Rear Wheel Nut, 5- and 6-Spoke | 5/8–11 | 160–175 (215–235)<br>150–175 (205–235) |
| | 3/4–10 | 190–210 (260–285)†<br>200–225 (270–305)<br>200–250 (270–340) |

* On front axles with over 12,000 lb (5448 kg) capacity, tighten nuts 240 to 265 lbf·ft (325 to 360 N·m). Gunite part number W-854 nut, with a phosphate and oil coating, must be used.

† 190 to 210 lbf·ft (260 to 285 N·m) recommended when using channel spacers (**Fig. 2**). 240 to 260 lbf·ft (325 to 355 N·m) permitted when using corrugated or corrugated-channel spacers. See **Fig. 3**.

**Table 13, Spoke-Type Wheel Mounting Torques for Gunite**




1. Head-Type Wheel Stud (1-1/8–16)
2. Wheel Nut

**Fig. 1, Head-Type Wheel Nut**

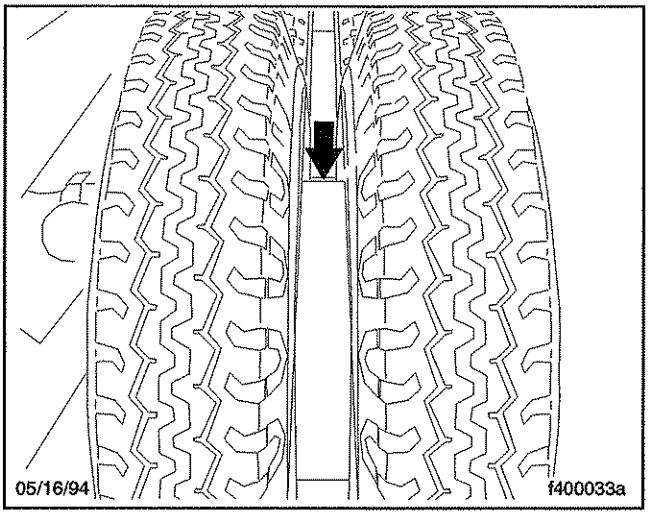



**Fig. 2, Channel Spacer**

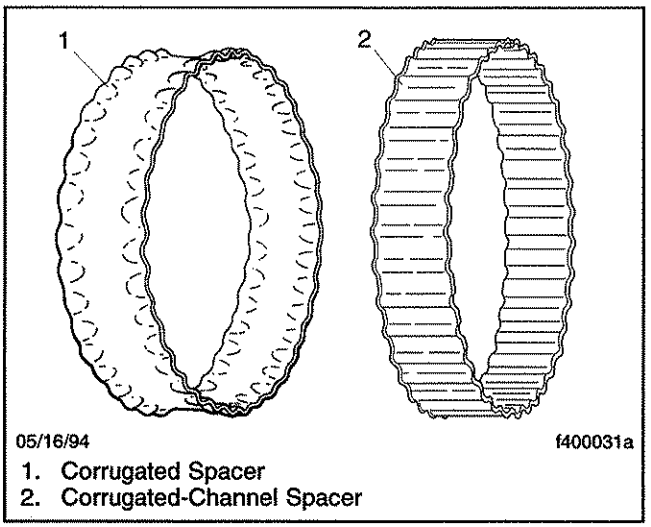



**Fig. 3, Corrugated Spacers**