

- **SUSPENSION—VIBRATION/SHAKE FELT IN STEERING WHEEL OR SEAT 72-120 KM/H (45-75 MPH)**
- **VIBRATION—VIBRATION/SHAKE FELT IN STEERING WHEEL OR SEAT 72-120 KM/H (45-75 MPH)**

**Article No.
00-21-9**

FORD: 1999-2001 F-53 MOTORHOME

ISSUE

Some 1999-2001 F-53 Motorhome Chassis vehicles may exhibit tire and wheel-induced vibration concerns under the following conditions:

- Occurs on smooth roads at highway speeds 72-120 km/h (45-75 mph) and is normally sensitive in a specific smaller speed range.
- Felt in the steering wheel or seat/floor.
- Falls in a frequency range of 10-24 Hz when measured on an Electronic Vibration Analyzer (EVA).

ACTION

Balance all wheel/tire assemblies using the Haweka Flange Plate Adapter Kit (Haweka Part No. 280-400-048) and reinstall wheel/tire assemblies on vehicle using centering pilots provided in the Haweka Kit. Contact Haweka directly for tool ordering information (phone 1-800-242-6687 or 1-704-896-7535).

SERVICE PROCEDURE

This shake issue should not be confused with:

- A vibration that is affected by engine rpm or that is eliminated by placing the transmission in Neutral.
- Harsh ride complaints that are felt only on rough road surfaces or while driving over tar strips/cracks in pavement.
- Driveline-induced vibrations that have a higher frequency range (40-120 Hz).
- Steering wheel shimmy or nibble (rotational motion of the steering wheel) typically induced by lateral runout of the wheel/tire assembly.
- Column shake induced by rough road surfaces.

Contributing Factors to Wheel/Tire Shake:

- Variation in the construction of the tire that is noticeable when the tire rotates against the pavement. This condition can be present on perfectly round tires because of variations in the inner tire construction. This condition can occur once per wheel rotation frequency or twice rotation frequency.
- Wheel radial runout in excess of 1.22mm (0.048”).
- Wheel and tire assembly imbalance.
- Clearance between the wheel center hole and front hub pilot has the affect of increasing the assembly radial runout that can contribute to the shake/vibration.

NOTE

THE HAWEKA FLANGE PLATE ADAPTER KIT MUST BE USED TO ENSURE PROPER RUNOUT MEASUREMENT AND BALANCE OF THE WHEEL AND TIRE ASSEMBLY. THIS ADAPTER KIT IS CAPABLE OF PROVIDING A MORE ACCURATE AND REPEATABLE RUNOUT AND BALANCE MEASUREMENT THAN A CONVENTIONAL CONE-STYLE ADAPTER DUE TO THE RELATIVELY LARGE SIZE AND WEIGHT OF THIS WHEEL/TIRE ASSEMBLY. IN ADDITION, A HUNTER GSP 9700 WITH ROAD FORCE MEASUREMENT CAPABILITY SHOULD BE USED WHEN AVAILABLE.

NOTE

IF IT IS NECESSARY TO REPLACE A TIRE, CONTACTING THE “AROUND THE WHEEL” PROGRAM AT 1-888-353-3251 WILL ENSURE THAT THE TIRES YOU RECEIVE WILL HAVE THE LOWEST AMOUNT OF RUNOUT/FORCE VARIATION.

NOTE

VEHICLES BUILT BETWEEN JANUARY 5, 1998 AND JANUARY 10, 2000 USE GOODYEAR G159

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TIRES. VEHICLES BUILT AFTER JANUARY 10, 2000 USE GOODYEAR G670 TIRES.

VEHICLE TEST DRIVE

Test drive the vehicle to verify that the issue is wheel/tire-induced shake. It is best to conduct this evaluation on a smooth road at highway speeds. If you are uncertain as to the origin of the vibration, you may want to use an EVA (Electronic Vibration Analyzer) to ensure this is a wheel and tire-induced issue. Refer to TSB 99-11-1 or Section 100-04 of the appropriate year F-Super Duty/Excursion/F-53 Motorhome Workshop Manual for a description on using an EVA. Subjectively rate the severity of the shake for comparison after conducting the repair procedure.

WHEEL AND TIRE DIAGNOSIS AND BALANCE PROCEDURE

1. Remove wheel and tire assemblies from the vehicle.
2. Check the condition of wheels and tire for damage or debris.
3. Clamp the tire on a wheel balance machine using the Haweka Adapter Kit according to the instructions provided by Haweka. Ensure that the side of the centering disk with the closest fit to wheel center hole is utilized.
4. Verify wheel radial runout does not exceed 1.22mm (0.048").

NOTE

DO NOT CONDUCT THE FOLLOWING RUNOUT MEASUREMENTS WITH THE ASSEMBLY MOUNTED ON THE VEHICLE.

5. Runout measurements:
 - a. If you have a balancer with road force variation capability, measure and mark the high point location of assembly radial force variation as (1). If force variation is 27 kg (60 lbs.) or greater, perform the indexing procedure in Steps 6-10. If force variation is less than 27 kg (60 lbs.), proceed to Step 12.
 - b. If you have a conventional balancer without road force variation capability, check tire radial runout at the center tread. Mark the high point location as (1). If radial runout exceeds 1.27mm (0.050"), the assembly must be match-mounted as described in Steps 6-10. If radial runout is below 1.27mm (0.050"), proceed to Step 12.
6. Refer to Figure 1 (View A) and place the following marks on the wheel/tire assembly from the first measurement taken in Step 5.
 - Mark the TIRE with a (1) in the 1st high point location measured.
 - Mark the WHEEL with a (1) in the 1st high point location measured.
 - Mark the valve stem location on the tire as (V).
7. Break the assembly down and rotate the tire so the valve reference mark (V) is opposite the valve stem (Figure 1, View B).
8. Re-inflate the tire and measure the force variation or assembly runout depending on the capability of your equipment. Record your reading and mark the second high point location on the tire as (2). If the force variation or runout is reduced below the acceptable guidelines indicated in Step 5, proceed to Step 12. If not, proceed to Steps 9-11.
9. If (2) on the tire is within 15.2 cm (6") of (1) on the tire and is still outside the guidelines, replace the tire (Figure 1, View C).
10. If (2) on the tire is within 15.2 cm (6") of (1) on the wheel, replace the wheel (Figure 1, View D).
11. If (2) is not within 15.2 cm (6") of either (1) on the tire or wheel, then draw an arrow from (2) toward (1) (in the shortest direction, see Figure 1, View E). Rotate tire on the rim 90 degrees (1/4 turn) in this direction using (V) on the tire as your reference point. This will normally reduce runout to an acceptable level. If force variation or runout is not reduced to an acceptable level, then the tire should be replaced.
12. Dynamically balance the wheel and tire assembly. If the indicated imbalance (either static, dynamic left, or dynamic right) is greater than 170 g. (6.0 oz), the assembly should be installed on the drive axle.

**WHEEL AND TIRE INSTALLATION ON VEHICLE
(FRONT AXLE)**

1. The wheel/tire assemblies installed on the front axle and/or tag axle (if equipped) should be:
 - Lowest force variation or tire runout of the six (6) assemblies.
 - Lowest indicated imbalance of the six (6) assemblies (as measured without any weights prior to balancing the assembly).
2. Choose four (4) centering pilots (included with the Haweka Flange Adapter Kit) that best fit the wheel lug holes prior to installing the wheel/tire assembly on the hub. Mark the lug holes that will be used for centering as shown (Figure 2).
3. Install the wheel/tire assembly on the hub and install four (4) lug nuts finger tight.
4. Thread the centering pilots onto the lugs and through the wheel holes previously marked as shown (Figure 3). Rotate the wheel as you thread in the pilots to make the installation easier.

NOTE
TO PREVENT DAMAGE TO THE CENTERING PILOTS, DO NOT USE AN IMPACT GUN TO INSTALL OR REMOVE THE CENTERING PILOTS.

NOTE
DO NOT INSTALL THE CENTERING PILOTS PRIOR TO INSTALLING THE WHEEL ONTO THE HUB. THE PILOTS ARE NOT INTENDED TO SUPPORT THE WHEEL/TIRE ASSEMBLY WEIGHT DURING INSTALLATION.

5. The centering pilots will help to roughly center the wheel on the hub pilot. Use a feeler gage to check the gap around the wheel pilot to ensure that it is centered. If necessary, rotate the wheel and tap it with a rubber mallet to improve the centering.
6. Snug the four (4) lug nuts to retain the wheels in place.
7. Remove the centering pilots, install the remaining lug nuts and torque all eight (8) to 190 N•m (140 lb-ft) as specified in the F-Super Duty/Excursion/F-53 Motorhome Workshop Manual, Section 204-04.

**WHEEL AND TIRE INSTALLATION ON VEHICLE
(REAR DRIVE)**

1. Choose four (4) centering pilots that best fit the wheel lug holes prior to installing the wheel/tire assembly on the hub. Mark the lug holes that will be used for centering. On the rear axle, the same size centering pilots may not be appropriate for both the inner and outer dual wheels. If this is the case, identify three (3) pilots for the wheel with the smallest lug holes (to be mounted on the inner position) and three (3) pilots for the wheel with the largest lug holes (to be mounted on the outer position). This will allow centering both dual wheels in the steps that follow (Figure 4).
2. Install the inner and outer duals on the hub and install two (2) lug nuts finger tight.
3. Thread the centering pilots onto the lugs and through the wheel holes previously marked. On the rear duals, install the three (3) centering pilots for the outer wheel first and then the centering pilots for the inner wheel. Rotate the wheel as you thread in the pilots to make the installation easier (Figure 4).

NOTE
TO PREVENT DAMAGE TO THE CENTERING PILOTS, DO NOT USE AN IMPACT GUN TO INSTALL OR REMOVE THE CENTERING PILOTS.

NOTE
DO NOT INSTALL THE CENTERING PILOTS PRIOR TO INSTALLING THE WHEEL ONTO THE HUB. THE PILOTS ARE NOT INTENDED TO SUPPORT THE WHEEL/TIRE ASSEMBLY WEIGHT DURING INSTALLATION.

4. The centering pilots will help to roughly center the wheel on the hub pilot. Use a feeler gage to check the gap around the wheel pilot to ensure that it is centered. If necessary, rotate the wheel and tap it with a rubber mallet to improve the centering.
5. Snug two (2) lug nuts to retain the wheels in place.
6. Remove the centering pilots, install the remaining lug nuts and torque all eight (8) to 190 N•m (140 lb-ft) as specified in the F-Super Duty/Excursion/F-53 Motorhome Workshop Manual, Section 204-04.
7. Test drive to verify repair.

Article No. 00-21-9 Cont'd.

OTHER APPLICABLE ARTICLES: 99-11-1

WARRANTY STATUS: Eligible Under The
Provisions Of Bumper To
Bumper Warranty Coverage

OPERATION	DESCRIPTION	TIME
002109A	Balance All Tire & Wheel Assemblies As Outlined In TSB Procedure (Includes Time To Replace Tire And/Or Wheel Assemblies As Required)	5.4 Hrs.

DEALER CODING

BASIC PART NO.
1015

OASIS CODES: 304000, 306000, 702100, 702200,
703000, 703300

**CONDITION
CODE**
42

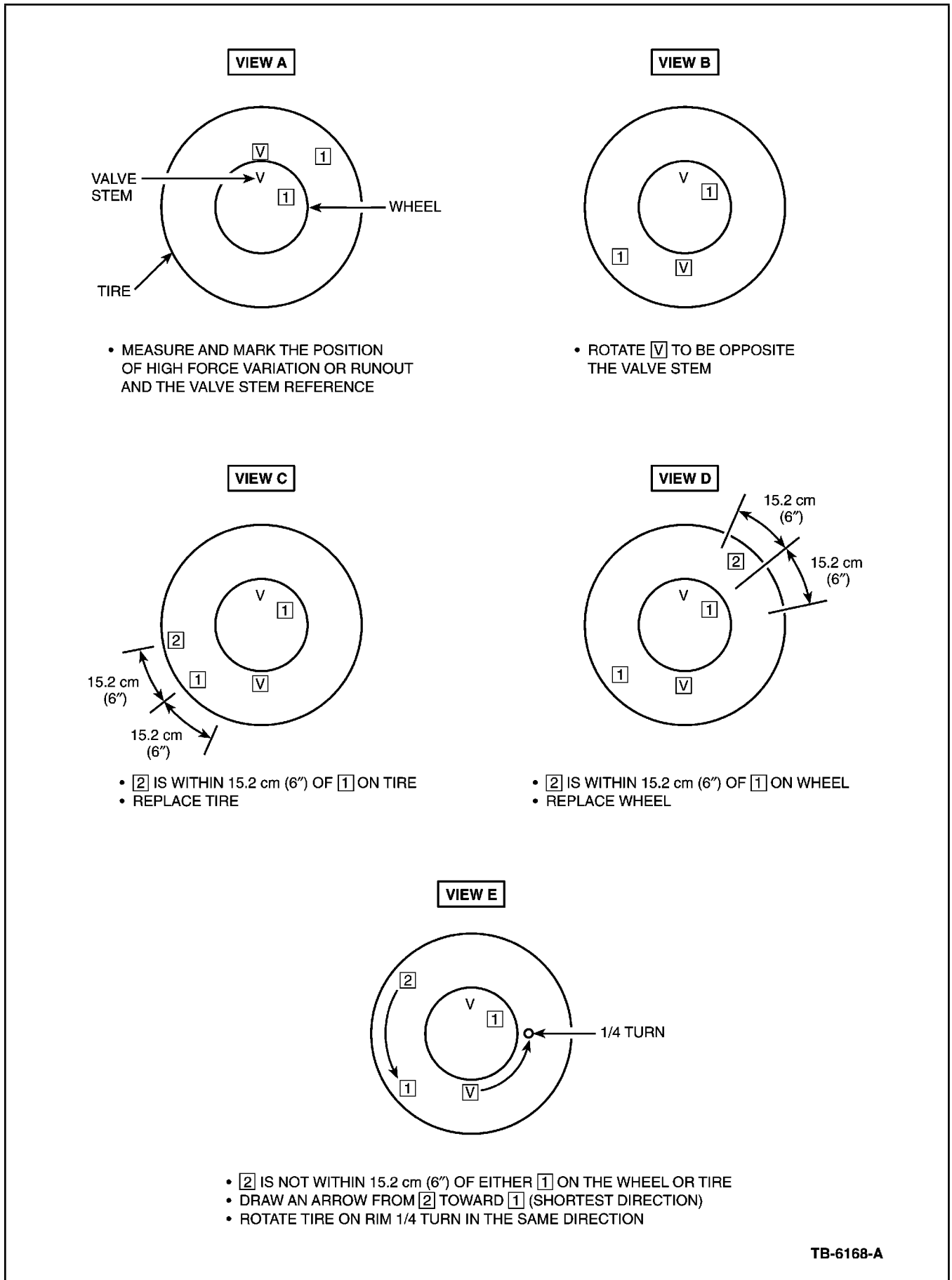


Figure 1 - Article 00-21-9

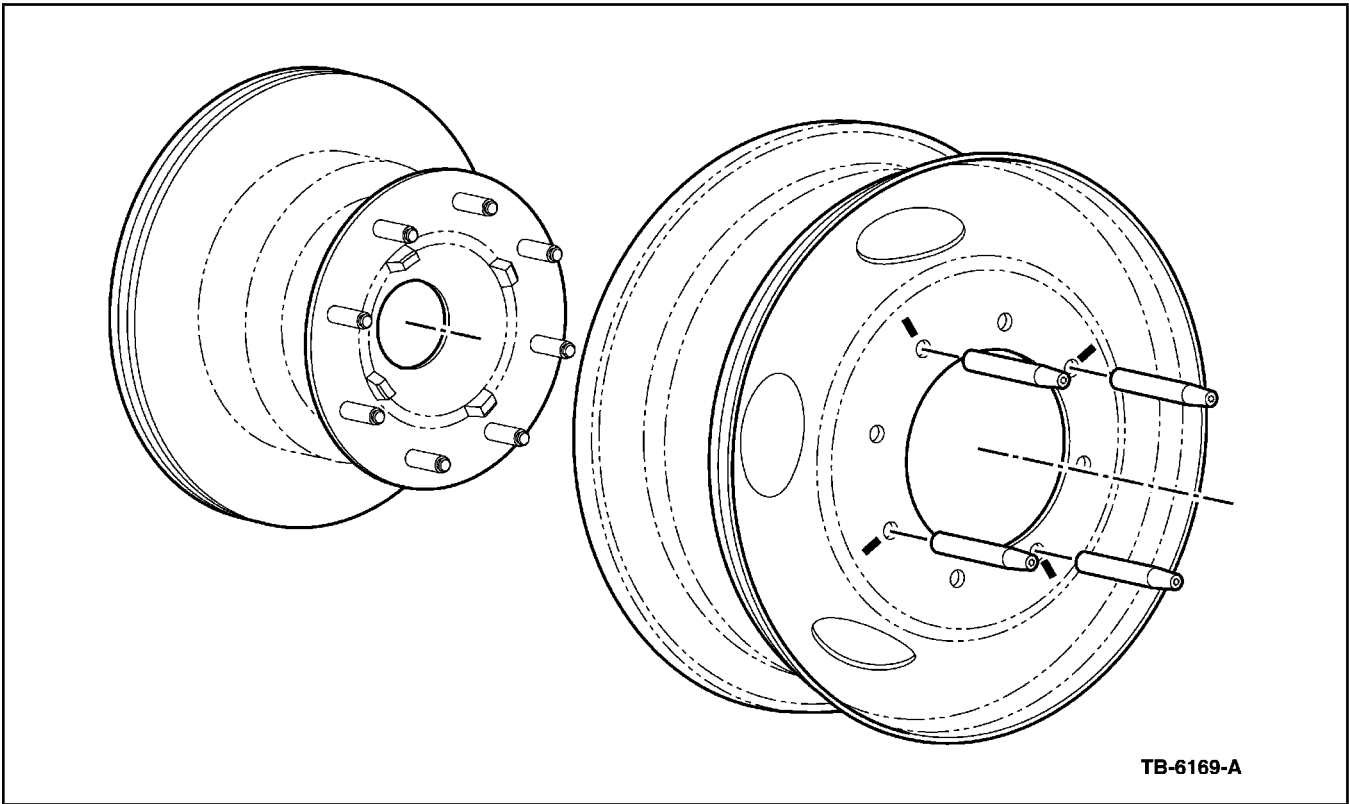


Figure 2 - Article 00-21-9

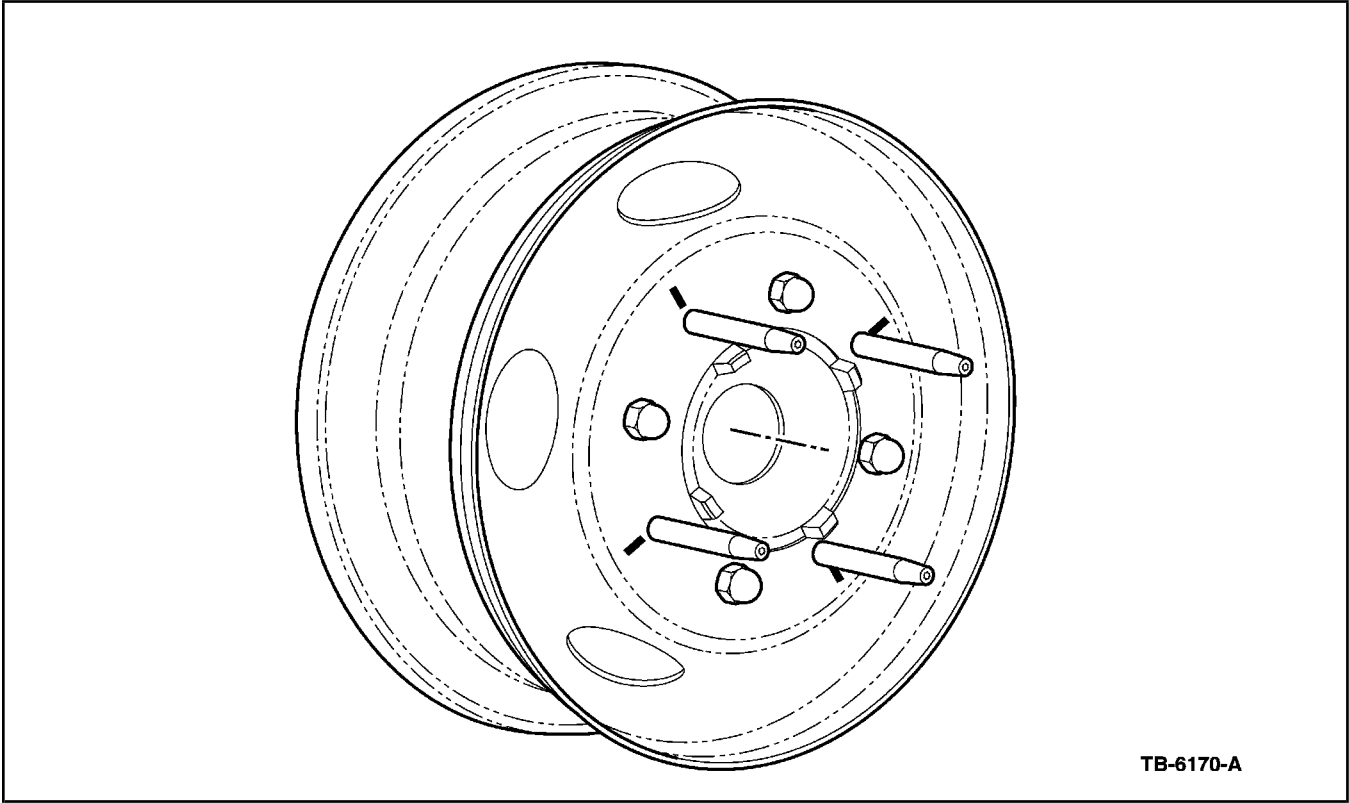


Figure 3 - Article 00-21-9

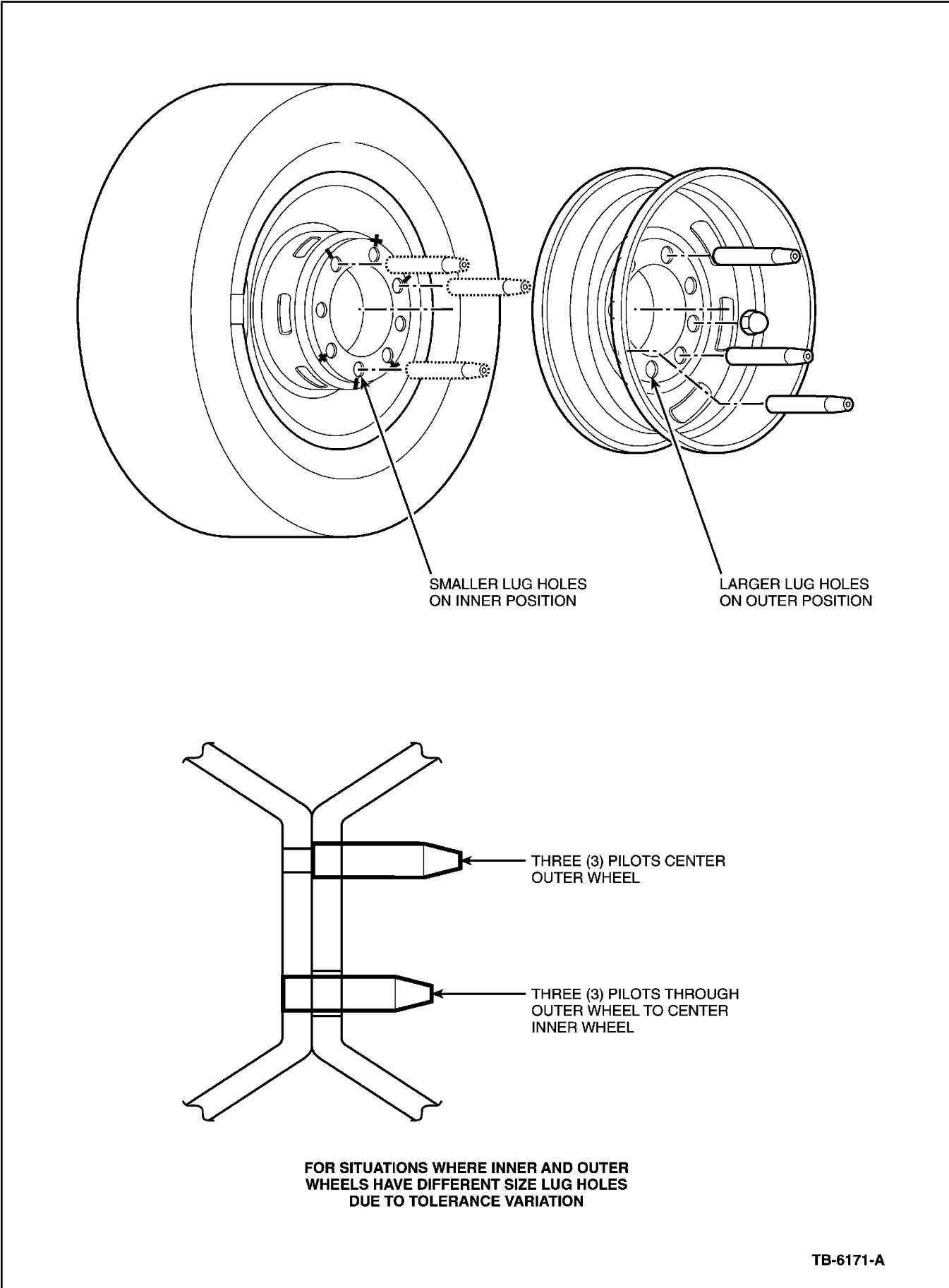


Figure 4 - Article 00-21-9