

# WHEELS AND TIRES

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## TIRES

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### GENERAL INFORMATION

Tires are designed for each specific vehicle. They provide the best overall performance for normal operation. The ride and handling characteristics match the vehicle's requirements. With proper care they will give excellent reliability, traction, skid resistance, and tread life. These tires have specific load carrying capacities. When correctly inflated, they will operate properly.

Tires used in cool climates, and with light loads will have a longer life than tires used in hot climates with heavy loads. Abrasive road surfaces will accelerate tire wear.

Driving habits have more effect on tire life than any other factor. Careful drivers will obtain much greater mileage than careless drivers.

Driving habits that shorten the life of any tire;

- Rapid acceleration and deceleration
- Severe application of brakes
- High-speed driving
- Taking turns at excessive speeds
- Striking curbs and other obstacles

It is very important to follow the tire rotation interval

### IDENTIFICATION

Tire type, size, aspect ratio and speed rating are encoded in the letters and numbers imprinted on the side wall of the tire. Refer to the chart to decipher the tire identification code (Fig. 1).

Performance tires will have a speed rating letter after the aspect ratio number. The speed rating is not always printed on the tire sidewall. The letter **S** indicates that the tire is speed rated up to 112 mph.

- **Q** up to 100 mph
- **T** up to 118 mph
- **U** up to 124 mph
- **H** up to 130 mph
- **V** up to 149 mph
- **Z** more than 149 mph (consult the tire manufacturer for the specific speed rating)

An All Season type tire will have either **M + S**, **M & S** or **M—S** (indicating mud and snow traction) imprinted on the side wall.

### RADIAL-PLY TIRES

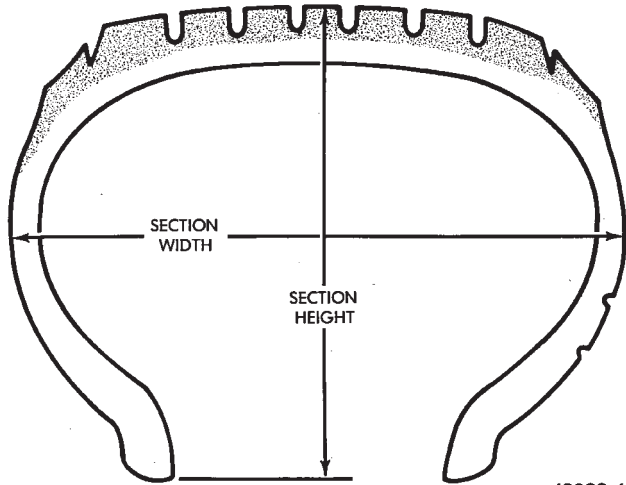
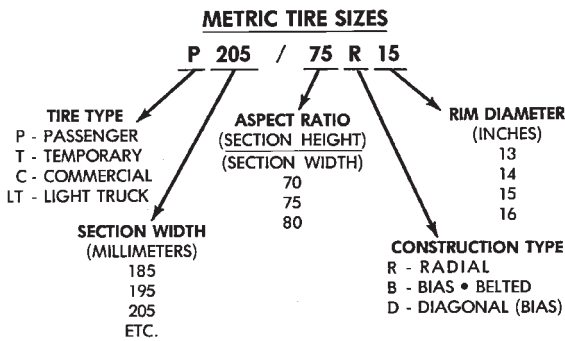
Radial-ply tires improve handling, tread life, ride quality and decrease rolling resistance.

Radial-ply tires must always be used in sets of four. Under no circumstances should they be used on the front only. They may be mixed with temporary spare tires when necessary, but reduced speeds are recommended.

Radial-ply tires have the same load-carrying capacity as other types of tires of the same size. They use the same recommended inflation pressures.

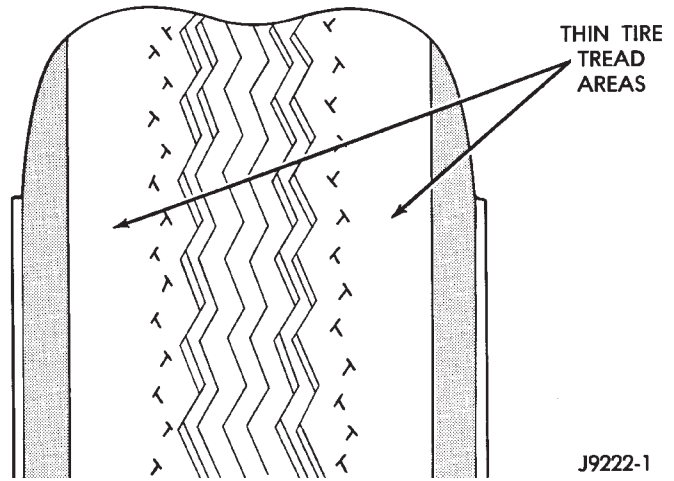
### SPARE TIRE (TEMPORARY)

The compact spare tire is designed for emergency use only. The original tire should be repaired and re-installed at the first opportunity. Refer to Owner's Manual for complete details.



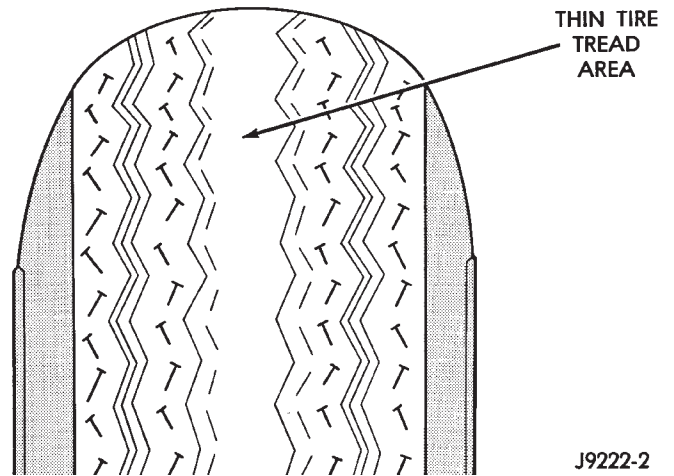
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**Fig. 1 Tire Size Identification**



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**Fig. 2 Under Inflation Wear**



J9222-2

**Fig. 3 Over Inflation Wear**

**TIRE CHAINS**

Tire snow chains may be used on certain models. Refer to Owner's Manual for more information.

**CLEANING OF TIRES**

Steam cleaning may be used for cleaning. DO NOT use gasoline or wire brush for cleaning. DO NOT use mineral oil or an oil-based solvent.

**PRESSURE GAUGES**

High-quality, dial-type, air-pressure gauges are recommended. After checking with the gauge, replace valve cap and finger tight.

**TIRE INFLATION PRESSURES**

Under inflation (Fig. 2) causes rapid shoulder wear and tire flexing.

Over inflation (Fig. 3) causes rapid center wear and loss of the tire's ability to cushion shocks.

Improper inflation can cause;

- Uneven wear patterns
- Reduced tread life
- Reduced fuel economy
- Unsatisfactory ride
- Cause the vehicle to drift

Refer to the Owner's Manual for information regarding proper tire inflation pressure.

This pressure has been carefully selected to provide for safe vehicle operation. Tire pressure should be

checked **cold** once per month. Tire pressure decreases when the outside temperature drops.

Inflation pressures specified on the placards are always **cold inflation pressure**. Cold inflation pressure is obtained after the vehicle has not been operated for at least 3 hours. Tire inflation pressures may increase from 2 to 6 pounds per square inch (psi) during operation. **Do not** reduce this normal pressure build-up.

Vehicles loaded to the maximum capacity should not be driven at continuous speeds above 75 mph (120 km/h).

**WARNING: OVER OR UNDER INFLATED TIRES CAN AFFECT VEHICLE HANDLING AND CAN FAIL SUDDENLY, RESULTING IN LOSS OF VEHICLE CONTROL.**

**REPLACEMENT TIRES**

OEM tires provide a proper balance of many features such as;

- Ride

- Noise
- Handling
- Durability
- Tread life
- Traction
- Rolling resistance
- Speed capability

Original equipment tires should be used when replacement is needed.

**Refer to the placard on the vehicle or the Owner's Manual for the correct replacement tire.**

Failure to use original or equivalent replacement tires may adversely affect the handling of the vehicle.

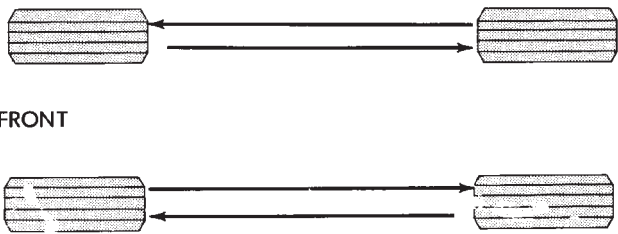
The use of oversize tires is **not recommended**. They may cause interference with vehicle suspension and steering travel. This can cause tire damage or failure.

**WARNING: FAILURE TO EQUIP THE VEHICLE WITH TIRES HAVING ADEQUATE LOAD CAPABILITY CAN RESULT IN SUDDEN TIRE FAILURE.**

**ROTATION**

Tires on the front and rear axles operate at different loads and perform different steering, driving, and braking functions. For these reasons, the tires wear at unequal rates. They may also develop irregular wear patterns. These effects can be reduced by rotating the tires according to the maintenance schedule in the Owners Manual. This will improve tread life, traction and maintain a smooth quiet ride.

The suggested method of tire rotation is the **same side front to rear** pattern (Fig. 4). Other rotation methods can be used, but may not provide the same tire longevity benefits.



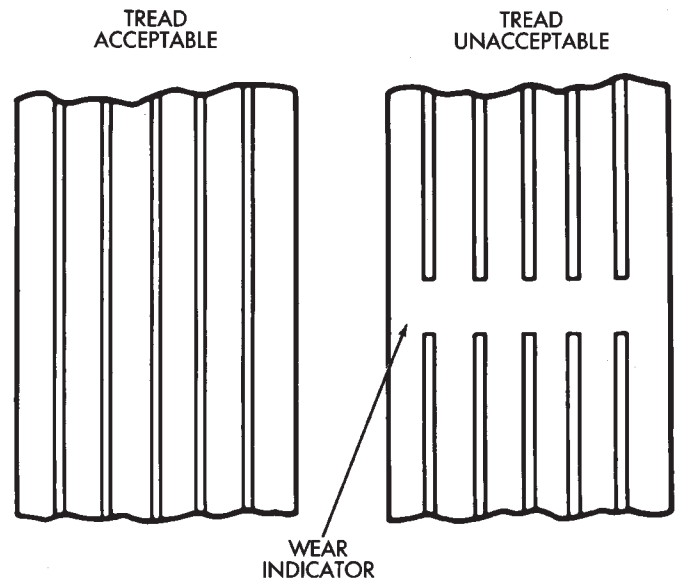
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**Fig. 4 Tire Rotation Pattern**

**TREAD WEAR INDICATORS**

Tread wear indicators are molded into the bottom of the tread grooves. When tread is 1.6 mm (1/16 in.), the tread wear indicators will appear as a 13 mm (1/2 in.) band across the tread width.

Tire replacement is necessary when indicators appear in two or more grooves Fig. 5).

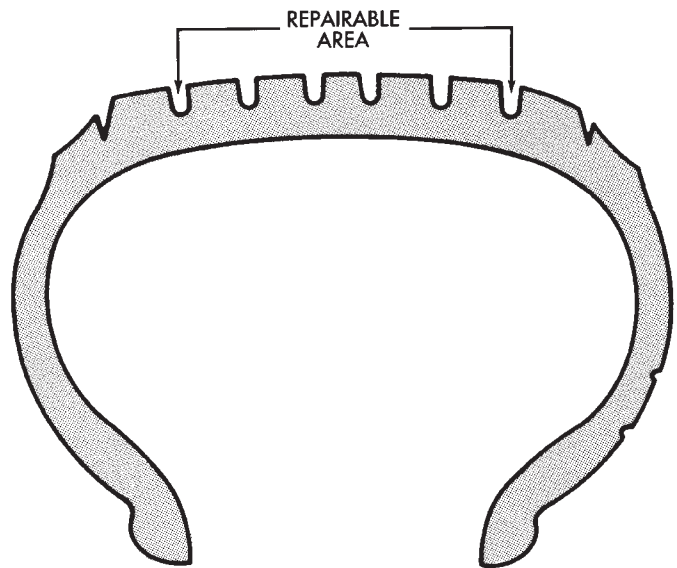


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**Fig. 5 Tread Wear Indicators**

**REPAIRING LEAKS**

For proper repairing, a radial tire it must be removed from the wheel. Repairs should only be made if the puncture is in the **tread area** (Fig. 6). If outside the tread area the tire should be replaced.



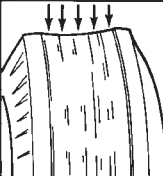
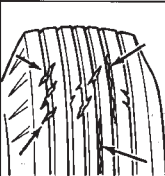
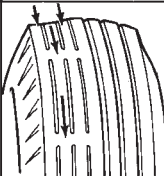
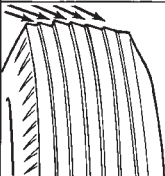
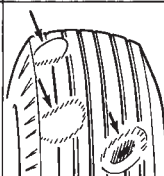
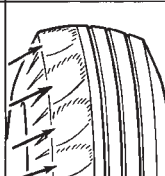
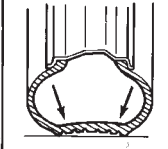
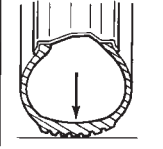
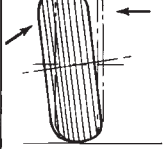
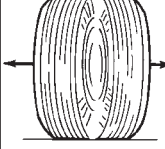
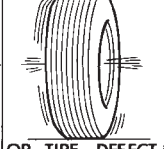


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**Fig. 6 Tire Repair Area**

Deflate tire completely before dismounting tire from the wheel. Use lubrication such as a mild soap solution when dismounting or mounting tire. Use tools free of burrs or sharp edges.

Before mounting tire on wheel, make sure all rust scale is removed from the rim. Repaint or seal if necessary.

CONDITION	RAPID WEAR AT SHOULDERS	RAPID WEAR AT CENTER	CRACKED TREADS	WEAR ON ONE SIDE	FEATHERED EDGE	BALD SPOTS	SCALLOPED WEAR
EFFECT	 						
CAUSE	UNDER-INFLATION OR LACK OF ROTATION 	OVER-INFLATION OR LACK OF ROTATION 	UNDER-INFLATION OR EXCESSIVE SPEED*	EXCESSIVE CAMBER 	INCORRECT TOE 	UNBALANCED WHEEL OR TIRE DEFECT* 	LACK OF ROTATION OF TIRES OR WORN OR OUT-OF-ALIGNMENT SUSPENSION.
CORRECTION	ADJUST PRESSURE TO SPECIFICATIONS WHEN TIRES ARE COOL ROTATE TIRES			ADJUST CAMBER TO SPECIFICATIONS	ADJUST TOE-IN TO SPECIFICATIONS	DYNAMIC OR STATIC BALANCE WHEELS	ROTATE TIRES AND INSPECT SUSPENSION SEE GROUP 2

\*HAVE TIRE INSPECTED FOR FURTHER USE.

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**Fig. 7 Abnormal Tire Tread Wear Patterns**

**TIRE NOISE OR VIBRATION**

The radial-ply tire on your vehicle is more sensitive to improper mounting, or imbalance.

To determine if tires are the cause of vibration, drive the vehicle over a smooth road at different speeds. Note the effect of acceleration and deceleration on noise level. Differential and exhaust noise will change in intensity as speed varies. Tire noise will usually remain constant.

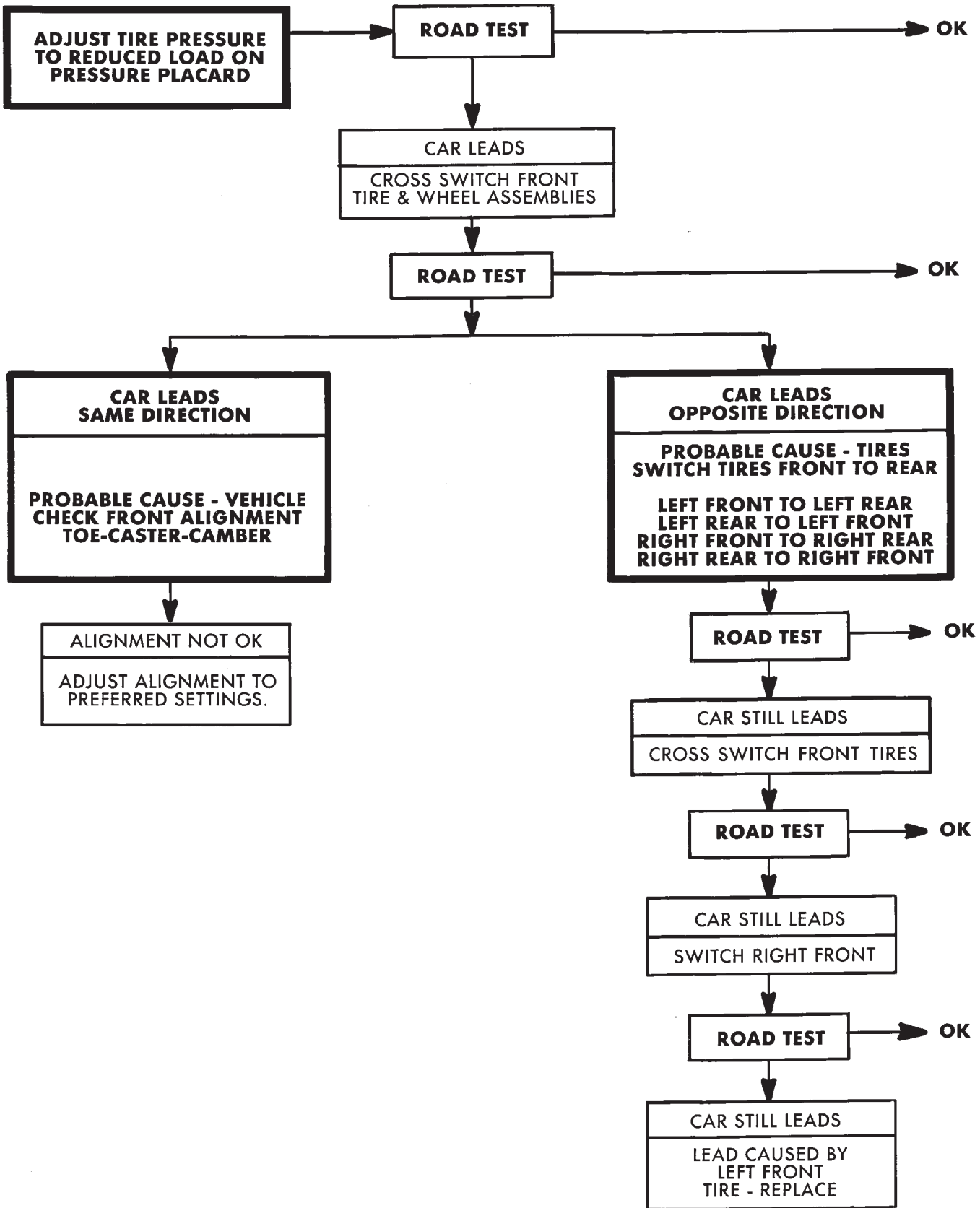
**TIRE WEAR PATTERNS**

Under inflation will increase wear on the shoulders of the tire. Over inflation will increase wear at the center of the tread.

Excessive camber causes the tire to run at an angle to the road. One side of tread is worn more than the other.

Excessive toe-in or toe-out causes wear on the tread edges. There is a feathered effect across the tread (Fig. 7).

LEAD CORRECTION CHART



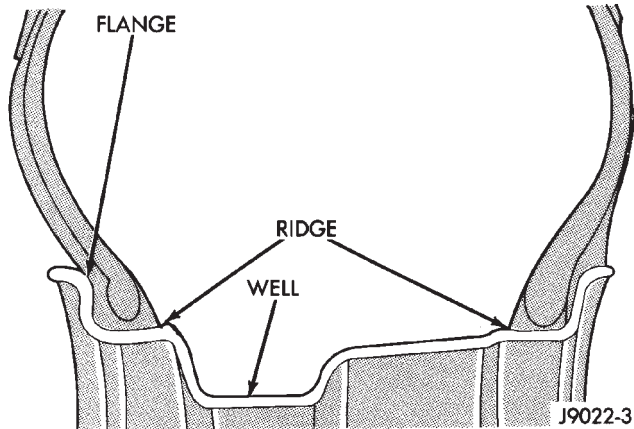


## WHEELS

## GENERAL INFORMATION

Original equipment wheels are designed for the specified Maximum Vehicle Capacity.

All models use steel or cast aluminum drop center wheels. The safety rim wheel (Fig. 1) has raised sections between the rim flanges and the rim well.



**Fig. 1 Wheel Safety Rim**

Initial inflation of the tire forces the bead over these raised sections. In case of tire failure, the raised sections hold the tire in position on the wheel until the vehicle can be brought to a safe stop.

Cast aluminum wheels require special balance weights and alignment equipment.

## WHEEL INSTALLATION

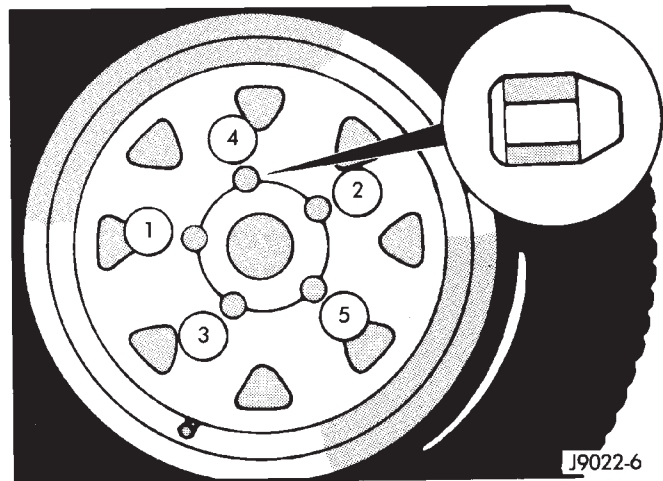
The wheel studs and nuts are designed for specific applications. They must be replaced with equivalent parts. Do not use replacement parts of lesser quality or a substitute design. All aluminum and some steel wheels have wheel stud nuts which feature an enlarged nose. This enlarged nose is necessary to ensure proper retention of the aluminum wheels.

Before installing the wheel, be sure to remove any build up of corrosion on the wheel mounting surfaces. Ensure wheels are installed with good metal-to-metal contact. Improper installation could cause loosening of wheel nuts. This could affect the safety and handling of your vehicle.

To install the wheel, first position it properly on the mounting surface. All wheel nuts should then be tightened just snug. Gradually tighten them in sequence to 129 N·m (95 ft. lbs.) torque (Fig. 2). **Never use oil or grease on studs or nuts.**

## WHEEL REPLACEMENT

Wheels must be replaced if they have:



**Fig. 2 Lug Nut Tightening Pattern**

- Excessive runout
- Bent or dented
- Leak air through welds
- Have damaged bolt holes

Wheel repairs employing hammering, heating, or welding are not allowed.

Original equipment wheels are available through your dealer. Replacement wheels from any other source should be equivalent in:

- Load carrying capacity
- Diameter
- Width
- Offset
- Mounting configuration

Failure to use equivalent replacement wheels may affect the safety and handling of your vehicle. Replacement with **used** wheels is not recommended. Their service history may have included severe treatment.

**Refer to the Specifications Chart for information regarding above requirements.**

## WHEEL ORNAMENTATION

**WARNING: HANDLE ALL WHEEL ORNAMENTATION WITH EXTREME CARE DURING REMOVAL AND INSTALLATION. SHARP EDGES ON THE COVERS OR CAPS CAN CAUSE PERSONAL INJURY.**

## TIRE AND WHEEL BALANCE

It is recommended that a two plane dynamic balancer be used when a wheel and tire assembly require balancing. Static should be used only when a two plane balancer is not available.

For static imbalance, find location of heavy spot causing imbalance. Counter balance wheel directly

opposite the heavy spot. Determine weight required to counterbalance the area of imbalance. Place half of this weight on the **inner** rim flange and the other half on the **outer** rim flange (Fig. 3, Fig. 4). Off-vehicle balancing is necessary.

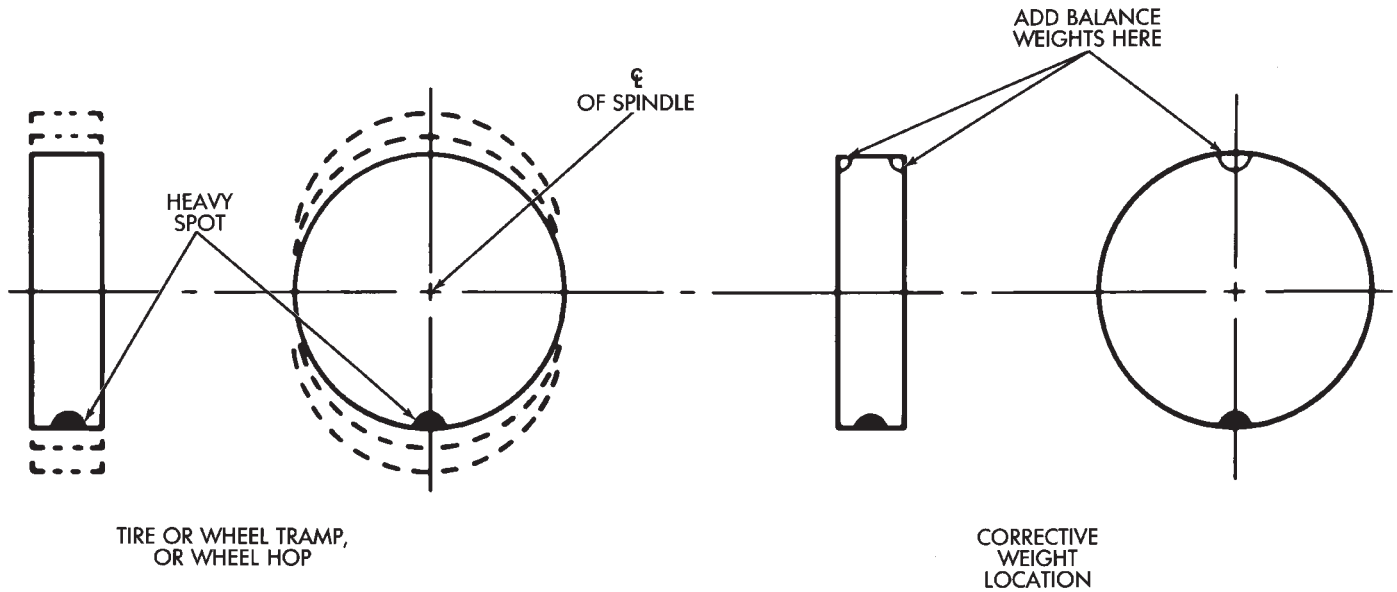
Wheel balancing can be accomplished with either on or off vehicle equipment. When using on-vehicle balancing equipment, follow these precautions:

- Limited-slip rear axle differential, remove the opposite wheel/tire
- Before balancing the wheels/tires on a vehicle equipped with a transfer case, disconnect the drive shafts

### MATCH MOUNTING

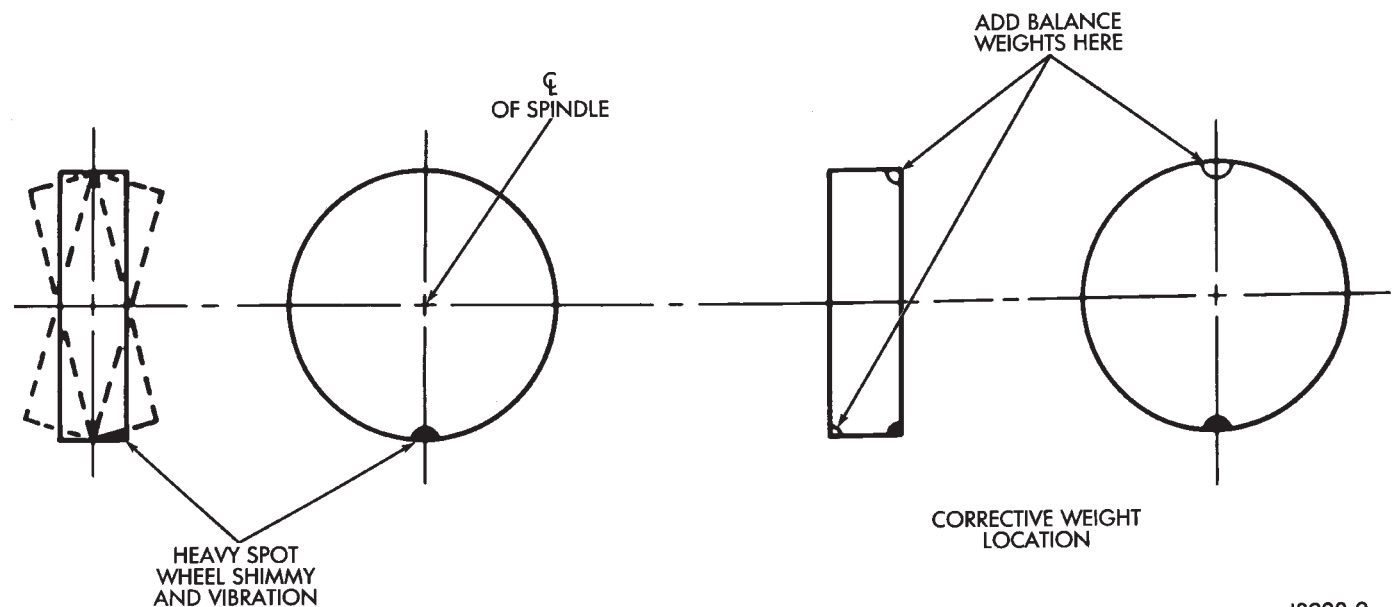
Wheels and tires are match mounted at the factory. This means that the high spot of the tire is matched to the low spot on the wheel rim. This technique is used to reduce run-out in the wheel/tire assembly. The high spot on the tire is marked with a paint mark or a bright colored adhesive label on the out-board sidewall. The low spot on the rim is at the valve stem location on the wheel rim.

Before dismounting a tire from its wheel, a reference mark should be placed on the tire at the valve



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Fig. 3 Static Unbalance & Balance

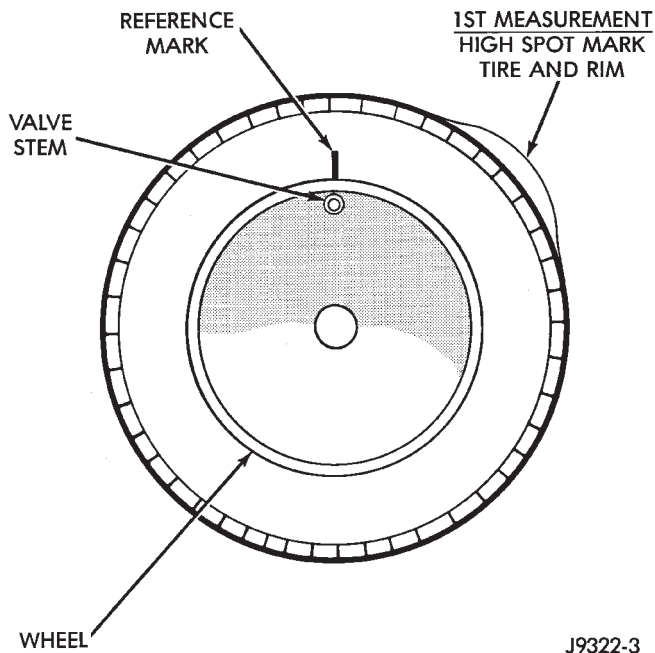


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Fig. 4 Dynamic Unbalance & Balance

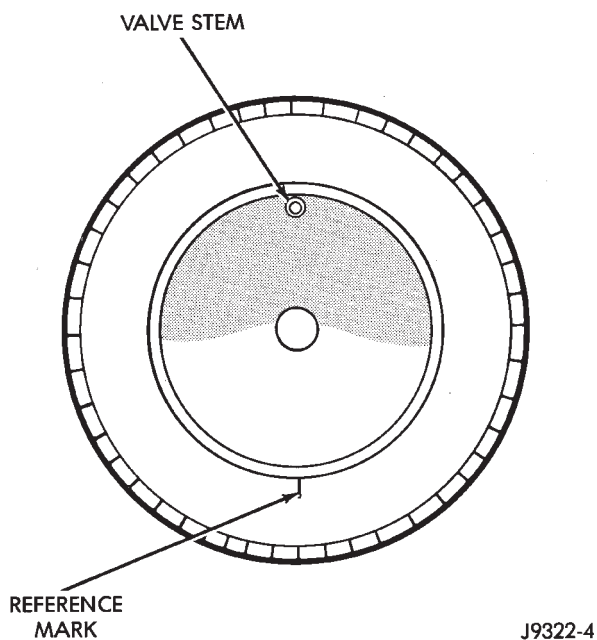
stem location. This reference will ensure that it is re-mounted in the original position on the wheel.

(1) Measure the total indicator runout on the center of the tire tread rib. Record the indicator reading. Mark the tire to indicate the high spot. Place a mark on the tire at the valve stem location (Fig. 5).



**Fig. 5 First Measurement On Tire**

(2) Break down the tire and remount it 180 degrees on the rim (Fig. 6).

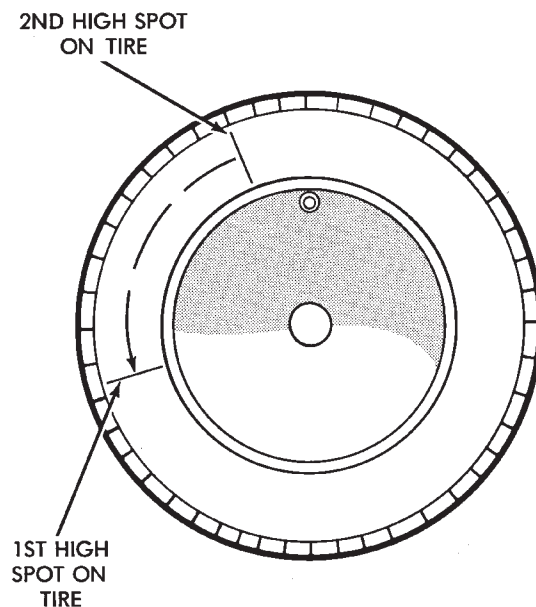


**Fig. 6 Remount Tire 180 Degrees**

(3) Measure the total indicator runout again. Mark the tire to indicate the high spot.

(4) If runout is still excessive, the following procedures must be done.

- If the high spot is within 101.6 mm (4.0 in.) of the first spot and is still excessive, replace the tire.
- If the high spot is within 101.6 mm (4.0 in.) of the first spot on the wheel, the wheel may be out of specifications. Refer to Wheel and Tire Runout.
- If the high spot is NOT within 101.6 mm (4.0 in.) of either high spot, draw an arrow on the tread from second high spot to first. Break down the tire and remount it 90 degrees on the rim in that direction (Fig. 7). This procedure will normally reduce the runout to an acceptable amount.



**Fig. 7 Remount Tire 90 Degrees In Direction of Arrow**

### TIRE AND WHEEL RUNOUT

Radial runout is the difference between the high and low points on the tire or wheel (Fig. 8).

Lateral runout is the **wobble** of the tire or wheel.

Radial runout of more than 1.5 mm (.060 inch) measured at the center line of the tread may cause the vehicle to shake.

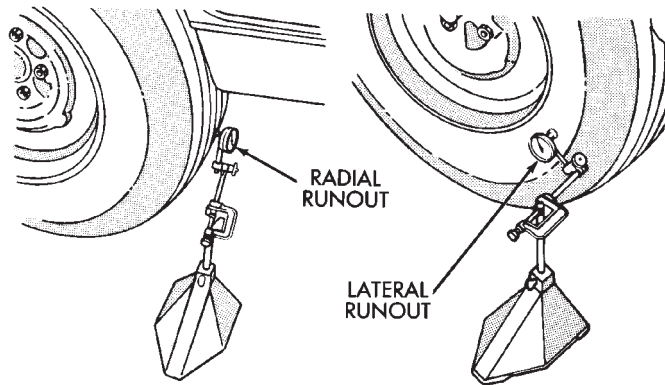
Lateral runout of more than 2.0 mm (.080 inch) measured near the shoulder of the tire may cause the vehicle to shake.

Sometimes radial runout can be reduced. Relocate the wheel and tire assembly on the mounting studs (See Method 1). If this does not reduce runout to an acceptable level, the tire can be rotated on the wheel. (See Method 2).

#### METHOD 1 (RELOCATE WHEEL ON HUB)

Check accuracy of the wheel mounting surface; adjust wheel bearings.





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**Fig. 8 Checking Tire Runout**

Drive vehicle a short distance to eliminate tire flat spotting from a parked position.

Make sure all wheel nuts are properly torqued.

Relocate wheel on the mounting, two studs over from the original position.

Re-tighten wheel nuts until all are properly torqued, to eliminate brake distortion.

Check radial runout. If still excessive, mark tire sidewall, wheel, and stud at point of maximum runout and proceed to Method 2.

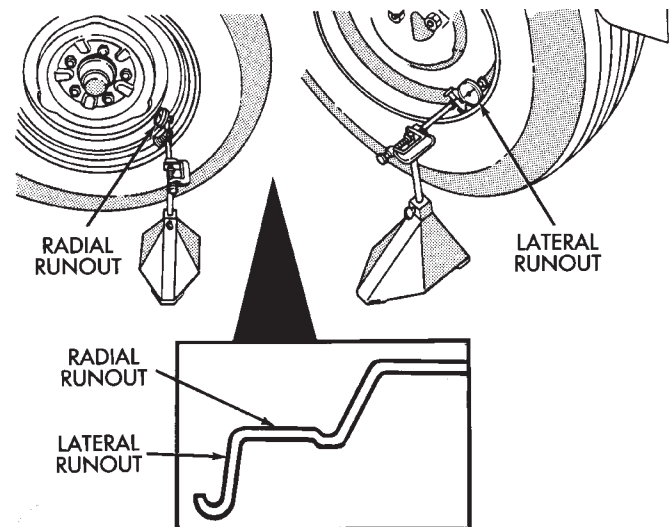
**METHOD 2 (RELOCATE TIRE ON WHEEL)**

Rotating tire on wheel is particularly effective when there is runout in both tire and wheel.

Remove tire from wheel and re-mount wheel on hub in former position.

Check wheel radial runout (Fig. 9).

- STEEL WHEELS: Radial runout 0.040 in., Lateral runout 0.045 in.
- ALUMINUM WHEELS: Radial runout 0.030 in., Lateral runout 0.035 in.



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**Fig. 9 Checking Wheel Runout**

If point of greatest runout is near original chalk mark, remount tire 180 degrees. Recheck runout.

## VEHICLE VIBRATION

Vehicle vibration can be caused by:

- Tire/wheel unbalance or excessive runout
- Defective tires with extreme tread wear
- Nylon overlay flat spots (performance tires only)
- Incorrect wheel bearing adjustment (if applicable)
- Loose or worn suspension/steering components
- Certain tire tread patterns
- Incorrect drive shaft angles or excessive drive shaft/yoke runout
- Defective or worn U-joints
- Excessive brake rotor or drum runout
- Loose engine or transmission supports/mounts
- And by engine operated accessories

**Refer to the appropriate Groups in this manual for additional information.**

### VIBRATION TYPES

There are two types of vehicle vibration:

- Mechanical
- Audible.

Mechanical vehicle vibration can be felt through the seats, floor pan and/or steering wheel.

Audible vehicle vibration is heard above normal background noise. The sound can be a droning or drumming noise.

Vibrations are sensitive to change in engine torque, vehicle speed or engine speed.

#### ENGINE TORQUE SENSITIVE VIBRATION

This vibration can be increased or decreased by:

- Accelerating
- Decelerating
- Coasting
- Maintaining a constant vehicle speed

#### VEHICLE SPEED SENSITIVE VIBRATION

This vibration condition always occurs at the same vehicle speed regardless of the engine torque or engine speed.

#### ENGINE SPEED (RPM) SENSITIVE VIBRATION

This vibration occurs at varying engine speeds. It can be isolated by increasing or decreasing the engine speed with the transmission in NEUTRAL position.

### VIBRATION DIAGNOSIS

A vibration diagnosis should always begin with a 10 mile (16 km) trip (to warm the vehicle and tires). Then a road test to identify the vibration. Corrective action should not be attempted until the vibration type has been identified via a road test.

During the road test, drive the vehicle on a smooth surface. If vibration exists, note and record the following information:

- Identify the vehicle speed range when the vibration occurs
- Identify the type of vibration
- Identify the vibration sensitivity
- Determine if the vibration is affected by changes in vehicle speed, engine speed and engine torque.

When the vibration has been identified, refer to the Vibration Diagnosis chart for causes. Consider correcting only those causes coded in the chart that are related to the vibration condition.

Refer to the following cause codes and descriptions for explanations when referring to the chart.

**TRR—Tire and Wheel Radial Runout:** Vehicle speed sensitive, mechanical vibration. The runout will not cause vibration below 20 mph (32 km/h).

**WH—Wheel Hop:** Vehicle speed sensitive, mechanical vibration. The wheel hop generates rapid up-down movement in the steering wheel. The vibration is most noticeable in the 20 - 40 mph (32 - 64 km/h) range. The wheel hop will not cause vibration below 20 mph (32 km/h). Wheel hop is caused by a tire/wheel that has a radial runout of more than 0.045 of-an-inch (1.14 mm). If wheel runout is acceptable and combined runout cannot be reduced by re-positioning the tire on wheel, replace tire.

**TB—Tire/Wheel Balance:** Vehicle speed sensitive, mechanical vibration. Static tire/wheel unbalance will not cause vibration below 30 mph (46 km/h). Dynamic tire/wheel unbalance will not cause vibration below 40 mph (64 km/h).

**TLR—Tire/Wheel Lateral runout:** Vehicle speed sensitive, mechanical vibration. The runout will not cause vibration below 50 - 55 mph (80 - 88 km/h). Excessive lateral runout will also cause front-end shimmy.

**TW—Tire Wear:** Vehicle speed sensitive, audible vibration. Abnormal tire wear causes small vibration in the 30 - 55 mph (88 km/h) range. This will produce a whine noise at high speed. The whine will change to a growl noise when the speed is reduced.

**W—Tire Waddle:** Vehicle speed sensitive, mechanical vibration. Irregular tire uniformity can cause side-to-side motion during speeds up to 15 mph (24 km/h). If the motion is excessive, identify the defective tire and replace it.

**UAJ—Universal Joint (Drive Shaft) Angles:** Torque/vehicle speed sensitive, mechanical/audible vibration. Incorrect drive shaft angles cause mechanical vibration below 20 mph (32 km/h) and in the 70 mph (112 km/h) range. The incorrect angles can also produce an audible vibration in the 20 - 50 mph (32 - 80 km/h) range. Caster adjustment could be required to correct the angles.

**UJ—Universal Joints:** Engine torque/vehicle speed sensitive, mechanical/audible vibration. If the

VIBRATION DIAGNOSIS

Vibration Sensitivity	Correction Codes For Mechanical Vibrations Within Specific MPH (km/h) Ranges									
	10 (16 km)	20 (32 km)	30 (48 km)	40 (64 km)	50 (80 km)	60 (96 km)	70 (112 km)	80 (128 km)	90 (144 km)	
Vehicle Speed Sensitive		← W →				← TRR and SSC →		← TB →		
				← WH →			← DSY →	← TLR →		
			← UJ and AN →							
					← WB →					
Torque Sensitive	← UJA →			← UJ and AN →					← UJA →	
Engine Speed Sensitive		← EA →			← ES →					
		← DEM →								

Vibration Sensitivity	Correction Codes For Audible Vibrations Within Specific MPH (km/h) Ranges									
	10 (16 km)	20 (32 km)	30 (48 km)	40 (64 km)	50 (80 km)	60 (96 km)	70 (112 km)	80 (128 km)	90 (144 km)	
Vehicle Speed Sensitive			← UJA →			← DSY →				
				← JU and WH →			← TW →			
				← WB →						
Torque Sensitive				← AN →						
				← UJ and TED →						
Engine Speed Sensitive					← EA and ES →					
		← DEM →		← ADB →						

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U-joint is worn it will cause vibration with almost any vehicle speed/engine torque condition.

**DSY—Drive Shaft and Yokes:** Vehicle speed sensitive, mechanical/audible vibration. The condition will not cause vibration below 35 mph (56 km/h). Excessive runout, unbalance or dents and bends in the shaft will cause the vibration. Identify the actual cause and repair/replace as necessary.

**WB—Wheel Bearings:** Vehicle speed sensitive, mechanical/audible vibration. Loose wheel bearings cause shimmy-like vibration at 35 mph (56 km/h) and above. Worn bearings will also produce a growl noise at low vehicle speed and a whine noise at high vehicle speed. The wheel bearings must be adjusted or replaced, as applicable.

**AN—Axle Noise:** Engine torque/vehicle speed sensitive, mechanical/audible vibration. The axle will not cause mechanical vibration unless the axle shaft is bent. Worn or damaged axle pinion shaft or differential gears and bearings will cause noise. Replace the defective component(s) as necessary.

**SSC—Suspension and Steering Components:** Vehicle speed sensitive, mechanical vibration. Worn suspension/steering components can cause mechanical vibration at speeds above 20 mph (32 km/h). Identify and repair or replace the defective component(s).

**EA—Engine Driven Accessories:** Engine speed sensitive, mechanical/audible vibration. Vibration can be caused by loose or broken A/C compressor, PS pump, water pump, generator or brackets, etc. Usually more noticeable when the transmission is shifted into the NEUTRAL position and the engine speed (rpm) increased. Inspect the engine driven accessories in the engine compartment. Repair/replace as necessary.

**ADB—Accessory Drive Belts:** Engine speed sensitive, audible vibration. Worn drive belts can cause a vibration that produces either a droning, fluttering or rumbling noise. Inspect the drive belt(s) and tighten/replace as necessary.

**DEM—Damaged Engine or Transmission Support Mounts:** Engine speed sensitive, mechanical/audible vibration. If a support mount is worn, noise or vibration will occur. Inspect the support mounts and repair/replace as necessary.

**ES—Exhaust System:** Engine speed sensitive, mechanical/audible vibration. If loose exhaust components contact the vehicle body they will cause noise and vibration. Inspect the exhaust system for loose, broken and mis-aligned components and repair/replace as necessary.

SPECIFICATIONS

WHEEL LUG NUT

DESCRIPTION	TORQUE
1/2 x 20 with 60° Cone .....	109 to 150 N·m (80 to 110 ft. lbs.)

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