

# TIRES/WHEELS

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## TIRES/WHEELS

### DIAGNOSIS AND TESTING - TIRES AND WHEEL RUNOUT

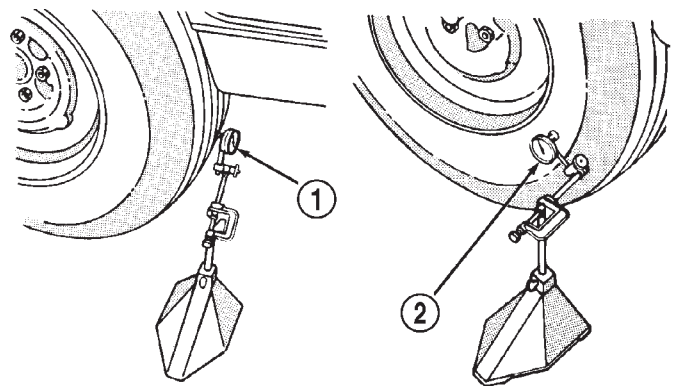
Radial runout is the difference between the high and low points on the tire or wheel (Fig. 1).

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).



J9022-4

**Fig. 1 Checking Tire/Wheel/Hub Runout**

- 1 - RADIAL RUNOUT
- 2 - LATERAL RUNOUT

## TIRES/WHEELS (Continued)

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

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

(2) Check wheel bearings and adjust if adjustable or replace if necessary.

(3) Check the wheel mounting surface.

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

(5) Tighten wheel nuts until all are properly torqued, to eliminate brake distortion.

(6) 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)**

**NOTE:** Rotating the tire on wheel is particularly effective when there is runout in both tire and wheel.

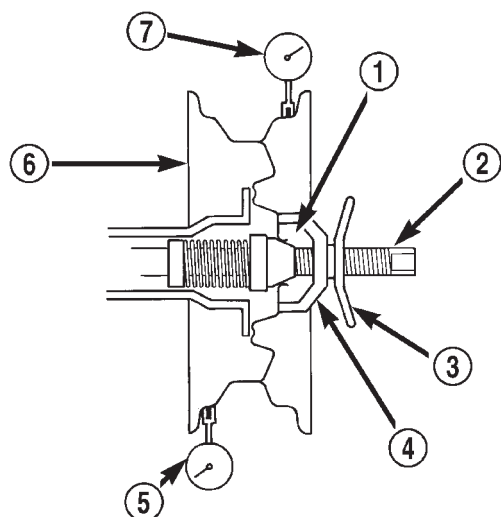
(1) Remove tire from wheel and mount wheel on service dynamic balance machine.

(2) Check wheel radial runout (Fig. 2) and lateral runout (Fig. 3).

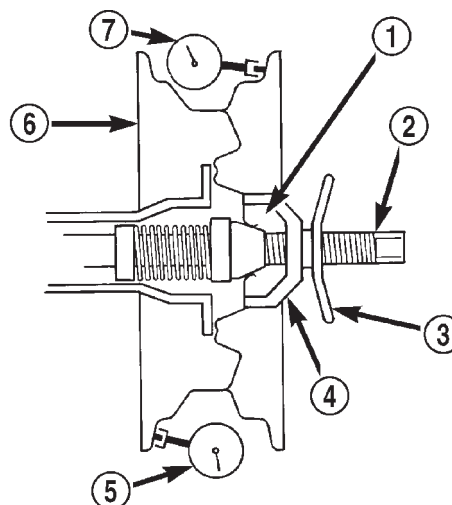
- **STEEL WHEELS:** Radial runout 0.024 in., Lateral runout 0.030 in. (average)

- **ALUMINUM WHEELS:** Radial runout 0.014 in., Lateral runout 0.020 in. (average)

(3) If point of greatest wheel lateral runout is near original chalk mark, remount tire 180 degrees. Recheck runout, (Refer to 22 - TIRES/WHEELS - STANDARD PROCEDURE).

**Fig. 2 Radial Runout**

- 1 - MOUNTING CONE
- 2 - SPINDLE SHAFT
- 3 - WING NUT
- 4 - PLASTIC CUP
- 5 - DIAL INDICATOR
- 6 - WHEEL
- 7 - DIAL INDICATOR



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**Fig. 3 Lateral Runout**

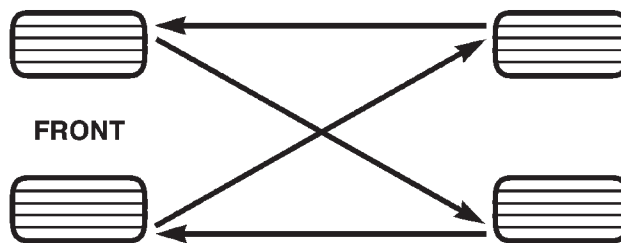
- 1 - MOUNTING CONE
- 2 - SPINDLE SHAFT
- 3 - WING NUT
- 4 - PLASTIC CUP
- 5 - DIAL INDICATOR
- 6 - WHEEL
- 7 - DIAL INDICATOR

**STANDARD PROCEDURE****STANDARD PROCEDURE - TIRE ROTATION**

Tires on the front and rear operate at different loads and perform different steering, driving, and braking functions. For these reasons they wear at unequal rates and tend to develop irregular wear patterns. These effects can be reduced by rotating the tires at regular intervals. The benefits of tire rotation are:

- Increase tread life
- Maintain traction levels
- A smooth, quiet ride

The suggested method of tire rotation is (Fig. 4). Other rotation methods can be used, but they will not provide all the tire longevity benefits.



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**Fig. 4 Tire Rotation Pattern**

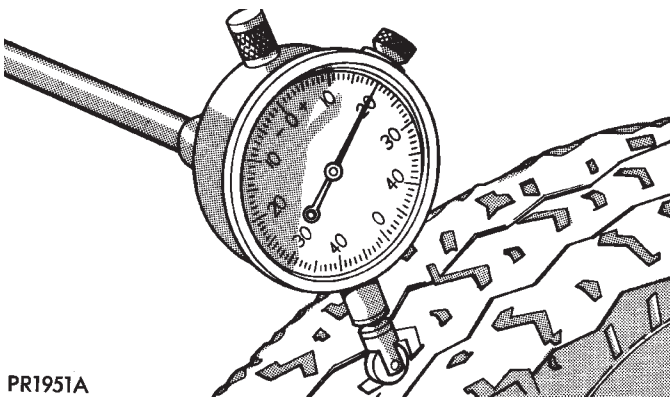
## TIRES/WHEELS (Continued)

**STANDARD PROCEDURE - MATCH MOUNTING**

Tires and wheels are currently match mounted at the factory. Match mounting is a technique used to reduce runout in the wheel/tire assembly. This means that the high spot of the tire is aligned with the low spot on the wheel rim. The high spot on the tire is marked with a paint mark or a bright colored adhesive label on the outboard sidewall. The low spot on the rim is identified with a label on the outside of the rim and a dot on the inside of the rim. If the outside label has been removed the tire will have to be removed to locate the dot on the inside of the rim.

Before dismounting a tire from its wheel, a reference mark should be placed on the tire at the valve stem location. This reference will ensure that it is remounted in the original position on the wheel.

(1) Use a dial indicator to locate the high spot of the tire on the center tread rib (Fig. 5). Record the indicator reading and mark the high spot on the tire. Place a mark on the tire at the valve stem location (Fig. 6).



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**Fig. 5 Dial Indicator**

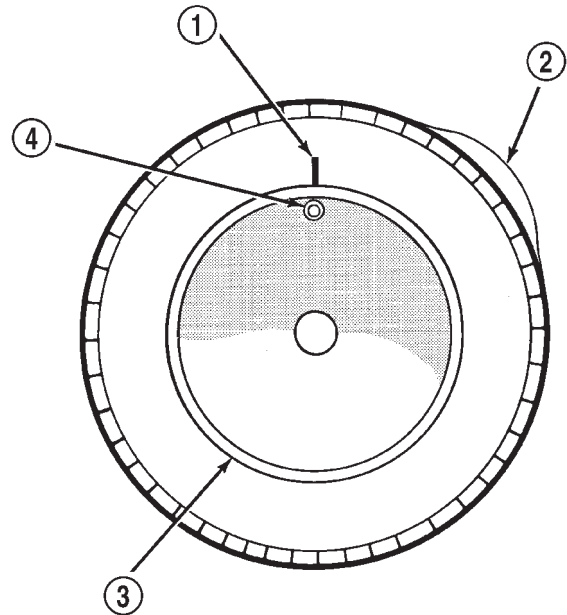
(2) Break down the tire and remount it 180 degrees on the rim (Fig. 7).

(3) Measure the total runout again and mark the tire to indicate the high spot.

(4) If runout is still excessive use the following procedures.

(a) If the high spot is within 101.6 mm (4.0 in.) of the first spot and is still excessive, replace the tire.

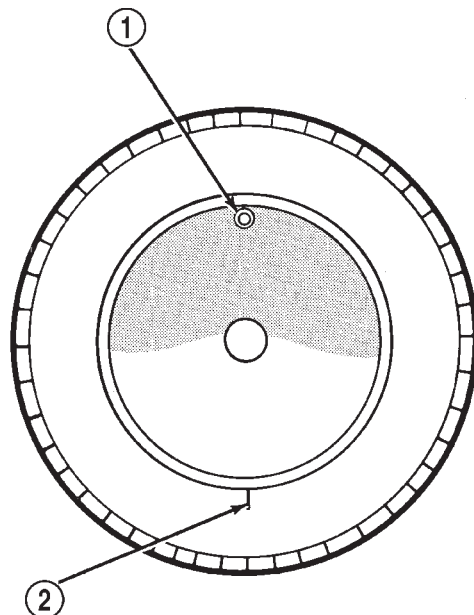
(b) If the high spot is within 101.6 mm (4.0 in.) of the first spot on the wheel, the wheel may be out of specifications, (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING).



J9322-3

**Fig. 6 First Measurement On Tire**

- 1 - REFERENCE MARK
- 2 - 1ST MEASUREMENT HIGH SPOT MARK TIRE AND RIM
- 3 - WHEEL
- 4 - VALVE STEM



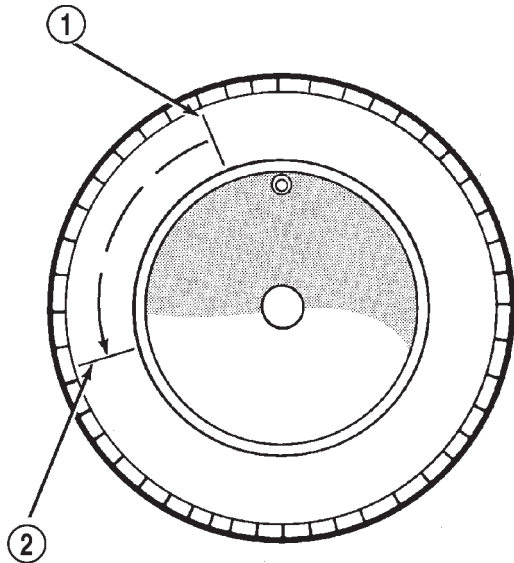
J9322-4

**Fig. 7 Remount Tire 180 Degrees**

- 1 - VALVE STEM
- 2 - REFERENCE MARK

## TIRES/WHEELS (Continued)

(c) 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 rim in that direction (Fig. 8). This procedure will normally reduce the runout to an acceptable amount.



J9322-5

**Fig. 8 Remount Tire 90 Degrees In Direction of Arrow**

- 1 - 2ND HIGH SPOT ON TIRE  
2 - 1ST HIGH SPOT ON TIRE

**STANDARD PROCEDURE - WHEEL BALANCING**

It is recommended that a two plane service dynamic balancer be used when a tire and wheel assembly require balancing. Refer to balancer operation instructions for proper cone mounting procedures. Typically use front cone mounting method for steel wheels. For aluminum wheel use back cone mounting method without cone spring.

**NOTE:** Static should be used only when a two plane balancer is not available.

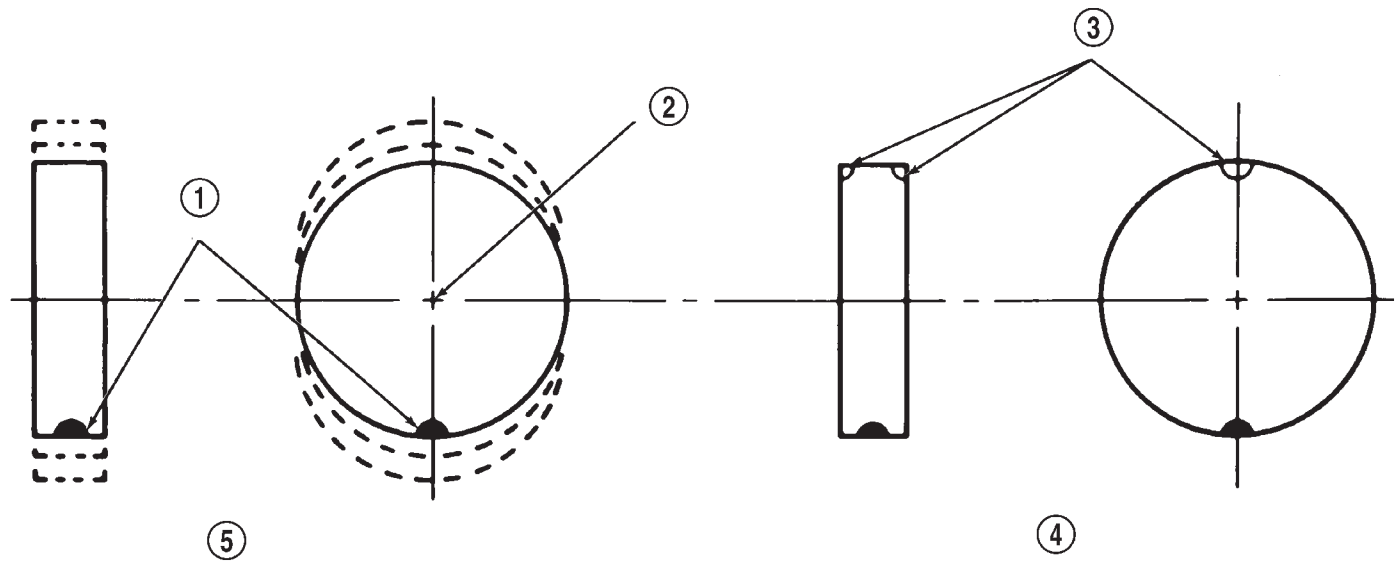
**NOTE:** Cast aluminum and forged aluminum wheels require coated balance weights and special alignment equipment.

Wheel balancing can be accomplished with either on or off vehicle equipment. When using on-vehicle balancing equipment, remove the opposite wheel/tire. Off-vehicle balancing is recommended.

For static balancing, find location of heavy spot causing the imbalance. Counter balance wheel directly opposite the heavy spot. Determine weight required to counter balance the area of imbalance. Place half of this weight on the **inner** rim flange and the other half on the **outer** rim flange (Fig. 9).

For dynamic balancing, the balancing equipment is designed to locate the amount of weight to be applied to both the inner and outer rim flange (Fig. 10).

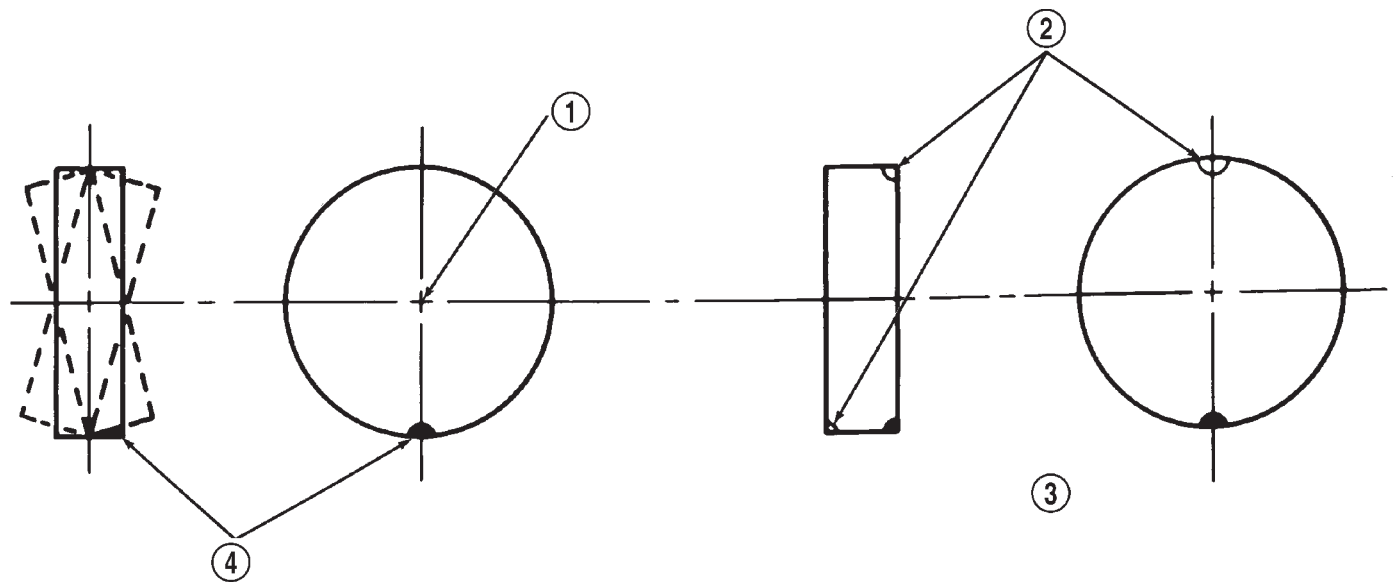
TIRES/WHEELS (Continued)



J8922-8

**Fig. 9 Static Unbalance & Balance**

- |                              |                                       |
|------------------------------|---------------------------------------|
| 1 - HEAVY SPOT               | 4 - CORRECTIVE WEIGHT LOCATION        |
| 2 - CENTER LINE OF SPINDLE   | 5 - TIRE OR WHEEL TRAMP, OR WHEEL HOP |
| 3 - ADD BALANCE WEIGHTS HERE |                                       |



J8922-9

**Fig. 10 Dynamic Unbalance & Balance**

- |                              |                                           |
|------------------------------|-------------------------------------------|
| 1 - CENTER LINE OF SPINDLE   | 3 - CORRECTIVE WEIGHT LOCATION            |
| 2 - ADD BALANCE WEIGHTS HERE | 4 - HEAVY SPOT WHEEL SHIMMY AND VIBRATION |

## TIRES

### DESCRIPTION

#### DESCRIPTION - TIRES

Tires are designed and engineered 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.

Driving habits have more effect on tire life than any other factor. Careful drivers will obtain in most cases, much greater mileage than severe use or careless drivers. A few of the driving habits which will shorten the life of any tire are:

- Rapid acceleration
- Severe brake applications
- High speed driving
- Excessive speeds on turns
- Striking curbs and other obstacles

Radial-ply tires are more prone to irregular tread wear. It is important to follow the tire rotation interval, (Refer to 22 - TIRES/WHEELS - STANDARD PROCEDURE). This will help to achieve a greater tread life.

#### TIRE 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. 11).

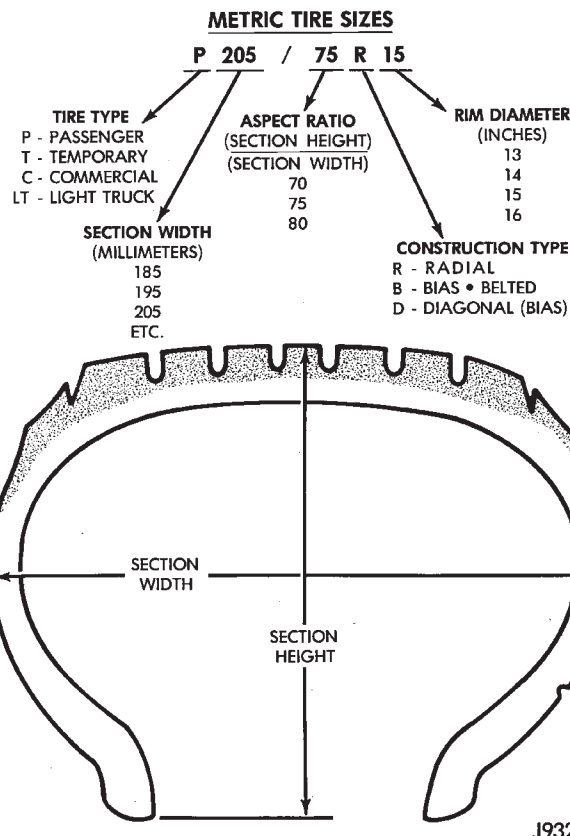
Performance tires have a speed rating letter after the aspect ratio number.

| LETTER | SPEED RATING       |
|--------|--------------------|
| S      | 180 km/h (112 mph) |
| T      | 190 km/h (118 mph) |
| U      | 200 km/h (124 mph) |
| H      | 210 km/h (130 mph) |
| V      | 240 km/h (149 mph) |
| W      | 270 km/h (168 mph) |
| Y      | 300 km/h (186 mph) |

The speed rating is not always printed on the tire sidewall.

#### TIRE CHAINS

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



**Fig. 11 Tire Identification**

#### DESCRIPTION - RADIAL-PLY TIRES

Radial-ply tires improve handling, tread life and 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. A maximum speed of 50 MPH is recommended while a temporary spare is in use.

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

The use of oversized tires, either in the front or rear of the vehicle, can cause vehicle drive train failure. This could also cause inaccurate wheel speed signals when the vehicle is equipped with Anti-Lock Brakes.

The use of tires from different manufactures on the same vehicle is NOT recommended. The proper tire pressure should be maintained on all four tires.

#### DESCRIPTION - SPARE TIRE & TEMPORARY

The temporary spare tire is designed for emergency use only. The original tire should be repaired or replaced at the first opportunity, then reinstalled. Do not exceed speeds of 50 M.P.H. when using the temporary spare tire. Refer to Owner's Manual for complete details.

## TIRES (Continued)

**DESCRIPTION - REPLACEMENT TIRES**

The original equipment tires provide a proper balance of many characteristics such as:

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

It is recommended that tires equivalent to the original equipment tires be used when replacement is needed.

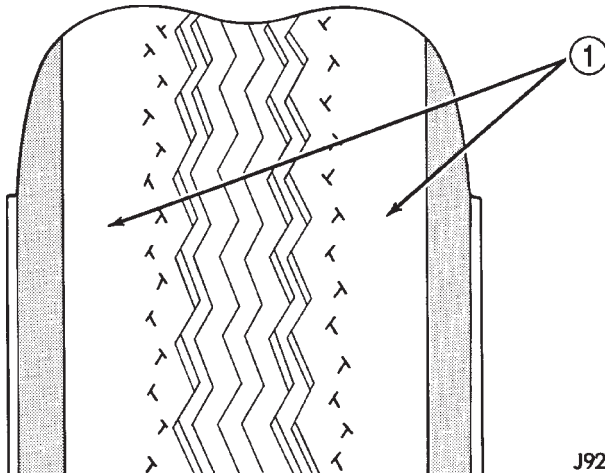
Failure to use equivalent replacement tires may adversely affect the safety and handling of the vehicle.

The use of oversize tires may cause interference with vehicle components. Under extremes of suspension and steering travel, interference with vehicle components may cause tire damage.

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

**DIAGNOSIS AND TESTING****DIAGNOSIS AND TESTING - TIRE INFLATION**

Under inflation will cause rapid shoulder wear, tire flexing, and possible tire failure (Fig. 12).



J9222-1

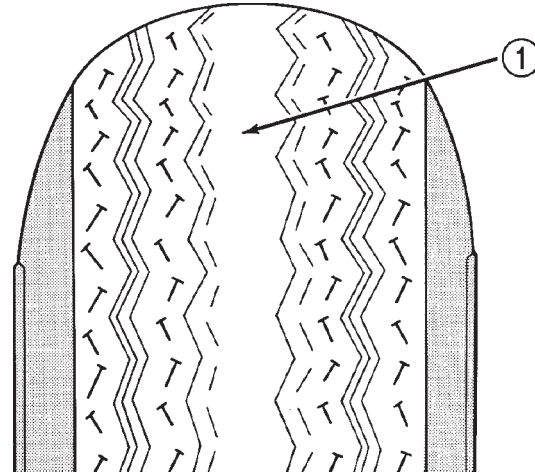
**Fig. 12 Under Inflation**

1 - THIN TIRE THREAD AREAS

Over inflation will cause rapid center wear and loss of the tire's ability to cushion shocks (Fig. 13).

Improper inflation can cause:

- Uneven wear patterns



J9222-2

**Fig. 13 Over Inflation Wear**

1 - THIN TIRE THREAD AREA

- Reduced tread life
- Reduced fuel economy
- Unsatisfactory ride
- Vehicle drift

For proper tire pressure specification refer to the Tire Inflation Pressure Chart provided with the vehicle.

Tire pressures have been chosen to provide safe operation, vehicle stability, and a smooth ride. Tire pressure should be checked cold once a month. The spare tire pressure should be checked at least twice annually. Tire pressure decreases as the ambient temperature drops. Check tire pressure frequently when ambient temperature varies widely.

Inflation pressures specified on the placards are cold inflation pressure. The vehicle must sit for at least 3 hours to obtain the correct cold inflation pressure reading. Or driven less than one mile after sitting for 3 hours. Tire inflation pressures may increase from 2 to 6 pounds per square inch (psi) during operation, due to increased tire temperature.

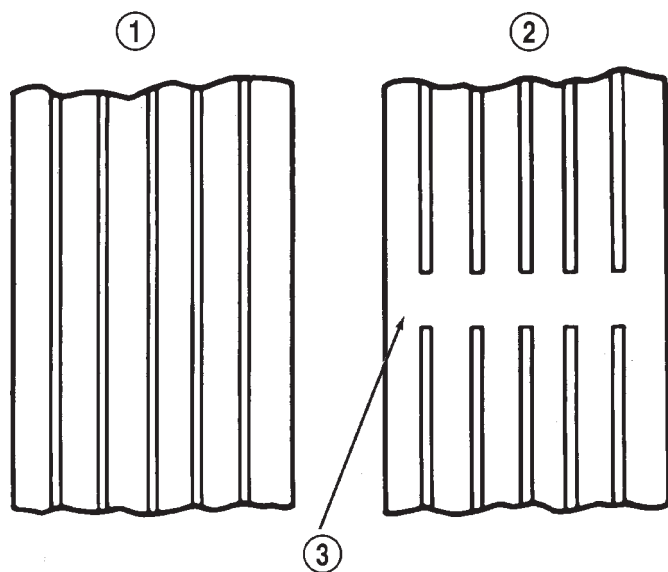
**WARNING: OVER OR UNDER INFLATED TIRES CAN AFFECT VEHICLE HANDLING AND TREAD WEAR. THIS MAY CAUSE THE TIRE TO FAIL SUDDENLY, RESULTING IN LOSS OF VEHICLE CONTROL.**

## TIRES (Continued)

**DIAGNOSIS AND TESTING - TREAD WEAR INDICATORS**

Tread wear indicators are molded into the bottom of the tread grooves. When tread depth is 1.6 mm (1/16 in.), the tread wear indicators will appear as a 13 mm (1/2 in.) band (Fig. 14).

Tire replacement is necessary when indicators appear in two or more grooves or if localized balding occurs.



J8922-5

**Fig. 14 Tread Wear Indicators**

- 1 - TREAD ACCEPTABLE
- 2 - TREAD UNACCEPTABLE
- 3 - WEAR INDICATOR

**DIAGNOSIS AND TESTING - TIRE WEAR PATTERNS**

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

Excessive camber causes the tire to run at an angle to the road. One side of tread is then worn more than the other (Fig. 15).

Excessive toe-in or toe-out causes wear on the tread edges and a feathered effect across the tread (Fig. 15).

**DIAGNOSIS AND TESTING - TIRE NOISE OR VIBRATION**

Radial-ply tires are sensitive to force impulses caused by improper mounting, vibration, wheel defects, or possibly tire imbalance.

To find out if tires are causing the noise or vibration, drive the vehicle over a smooth road at varying

speeds. Note the noise level during acceleration, deceleration and slight left and right steering inputs.

**STANDARD PROCEDURE - REPAIRING LEAKS**

For proper repairing, a radial tire must be removed from the wheel. Repairs should only be made if the defect, or puncture, is in the tread area (Fig. 16). The tire should be replaced if the puncture is located in the sidewall.

Deflate tire completely before removing the 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 which could damage the tire or wheel rim.

Before mounting tire on wheel, make sure all rust is removed from the rim bead and repaint if necessary.

Install wheel on vehicle, and tighten to proper torque specification.

**CLEANING**

Remove the protective coating on the tires before delivery of a vehicle. This coating may cause deterioration of the tires.

To remove the protective coating, apply warm water and let it soak for a few minutes. Afterwards, scrub the coating away with a soft bristle brush. Steam cleaning may also be used to remove the coating.

**NOTE: DO NOT use gasoline, mineral oil, oil-based solvent or a wire brush for cleaning.**

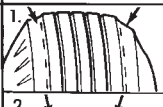
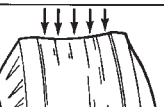
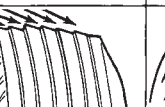
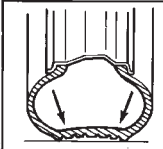
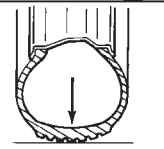
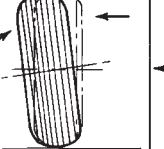
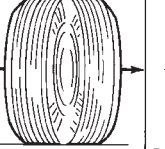
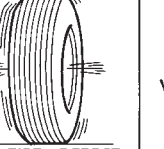
**SPECIFICATIONS***SPECIFICATIONS*

| DESCRIPTION | SPECIFICATION                          |
|-------------|----------------------------------------|
| Tire        | P215/75R16                             |
| Tire        | P235/70R16                             |
| Spare Tire  | P215/75D16<br>POLYSPARE ONLY ON<br>16" |

**SPARE TIRE****REMOVAL**

- (1) Raise the license plate.
- (2) Remove the two bolts securing the wheel cover to the wheel.
- (3) Remove the two lug nuts and the one wheel lock (if equipped) securing the tire/wheel to the spare tire carrier.
- (4) Remove the spare tire.

# SPARE TIRE (Continued)

| 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<br> | OVER-INFLATION OR LACK OF ROTATION<br> | UNDER-INFLATION OR EXCESSIVE SPEED*                                               | EXCESSIVE CAMBER<br> | INCORRECT TOE<br> | UNBALANCED WHEEL OR TIRE DEFECT*<br> | 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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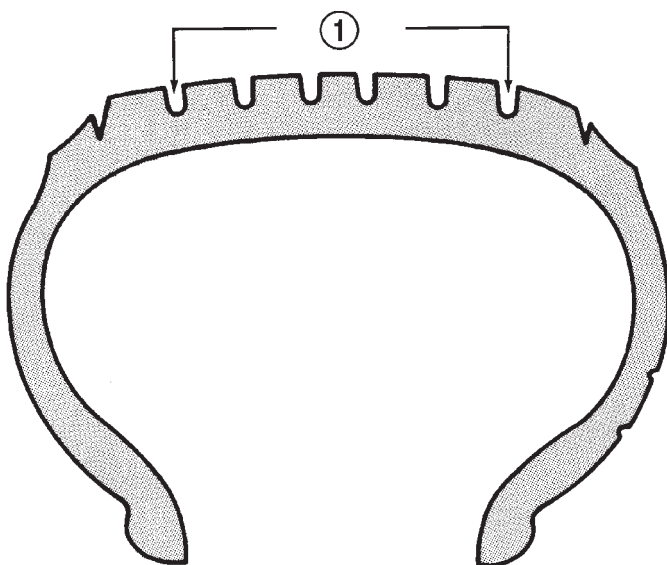
Fig. 15 Tire Wear Patterns

## WHEELS

### DESCRIPTION

The rim size is on the vehicle safety certification label located on the drivers door shut face. The size of the rim is determined by the drivetrain package. Original equipment wheels/rim s are designed for operation up to the specified maximum vehicle capacity.

All models use stamped steel, cast aluminum or forged aluminum wheels. Every wheel has raised sections between the rim flanges and rim drop well called safety humps (Fig. 17).



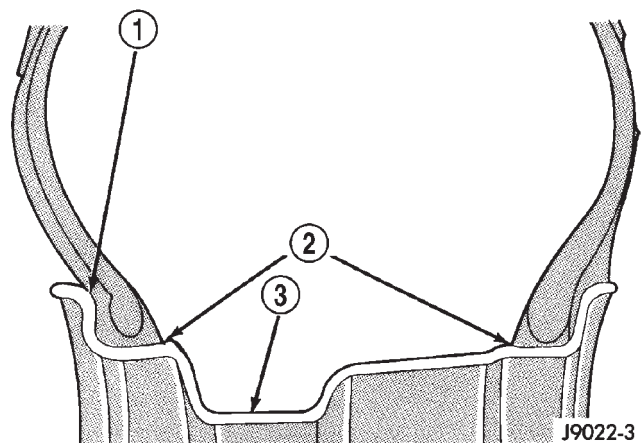
J8922-6

Fig. 16 Tire Repair Area

1 - REPAIRABLE AREA

### INSTALLATION

- (1) Install the spare tire onto the studs on the carrier.
- (2) Install the two lug nuts and one wheel lock (if equipped). Tighten the nuts to 115 N·m (85 ft.lbs.)
- (3) Close the plastic wheel cover and install the two mounting bolts. Tighten the nuts to 115 N·m (85 ft.lbs.)
- (4) Close the license plate to cover the bolts and latch.



J9022-3

Fig. 17 Safety Rim

- 1 - FLANGE
- 2 - RIDGE
- 3 - WELL

## WHEELS (Continued)

Initial inflation of the tire forces the bead over these raised sections. In case of rapid loss of air pressure, the raised sections help hold the tire on the wheel.

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

**DIAGNOSIS AND TESTING - WHEELS**

Inspect wheels for:

- Excessive run out
- Dents or cracks
- Damaged wheel lug nut holes
- Air Leaks from any area or surface of the rim

**NOTE: Do not attempt to repair a wheel by hammering, heating or welding.**

If a wheel is damaged an original equipment replacement wheel should be used. When obtaining replacement wheels, they should be equivalent in load carrying capacity. The diameter, width, offset, pilot hole and bolt circle of the wheel should be the same as the original wheel.

**WARNING: FAILURE TO USE EQUIVALENT REPLACEMENT WHEELS MAY ADVERSELY AFFECT THE SAFETY AND HANDLING OF THE VEHICLE. USED WHEELS ARE NOT RECOMMENDED. THE SERVICE HISTORY OF THE WHEEL MAY HAVE INCLUDED SEVERE TREATMENT OR VERY HIGH MILEAGE. THE RIM COULD FAIL WITHOUT WARNING.**

**STANDARD PROCEDURE****STANDARD PROCEDURE - WHEEL REPLACEMENT**

Wheels must be replaced if they have:

- 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.

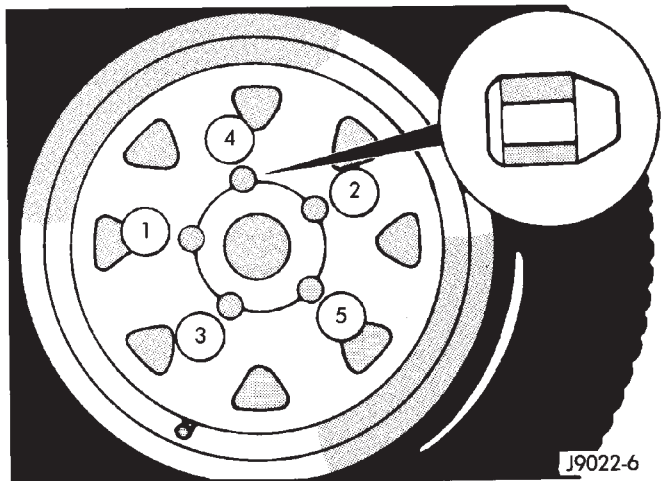
**STANDARD PROCEDURE - WHEEL MOUNTING**

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.

**NOTE: Do not use chrome plated lug nuts with chrome plated 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 the proper torque specification (Fig. 18). **Never use oil or grease on studs or nuts.**



**Fig. 18 Lug Nut Tightening Pattern**

## WHEELS (Continued)

## SPECIFICATIONS

## SPECIFICATION

## TORQUE SPECIFICATIONS

| DESCRIPTION                    | N·m     | Ft. Lbs. | In. Lbs. |
|--------------------------------|---------|----------|----------|
| Lug Nut 1/2 X 20 with 60° Cone | 115-155 | 85-115   | —        |

## STUDS

## REMOVAL

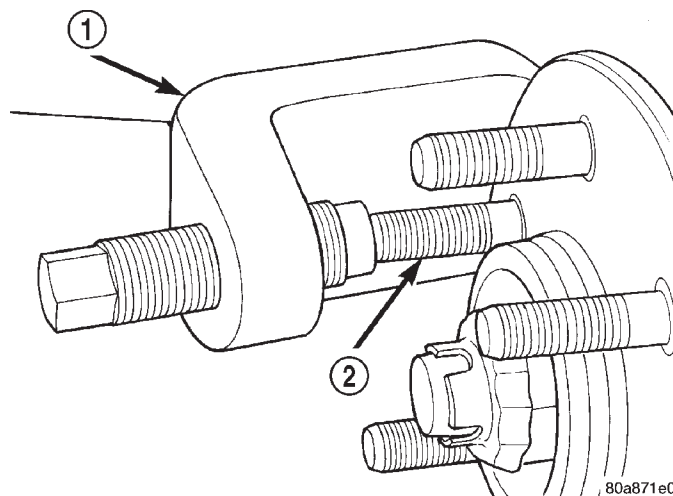
**CAUTION:** Do not use a hammer to remove wheel studs.

- (1) Raise and support vehicle.
- (2) Remove wheel and tire assembly.
- (3) Remove brake caliper, caliper adapter and rotor, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
- (4) Remove stud from hub with Remover C-4150A (Fig. 19).

## INSTALLATION

**CAUTION:** Do not use a hammer to remove wheel studs.

- (1) Install new stud into hub flange.
- (2) Install three washers onto stud, then install lug nut with the flat side of the nut against the washers.
- (3) Tighten lug nut until the stud is pulled into the hub flange. Verify that the stud is properly seated into the flange.
- (4) Remove lug nut and washers.
- (5) Install the brake rotor, caliper adapter, and caliper, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).



**Fig. 19 Wheel Stud Removal**

- 1 - REMOVER
- 2 - WHEEL STUD

- (6) Install wheel and tire assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE), use new lug nut on stud or studs that were replaced.
- (7) Remove support and lower vehicle.