

Suspension

Tires and Wheels - CTS Sedan

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Wheel Nuts	140 N.m	103 lb ft

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material	GM Part Number	Canadian Part Number
Aluminum Wheel	Adhesive/Sealant	12378478	88900041
Aluminum Wheel	3M® General Purpose Cleaner	08984	-
Wheel	Mounting Lubricant	12345884	88863415
Wheel to Hub	Lubricant	1051344	993037

DIAGNOSTIC INFORMATION AND PROCEDURES

TIRE DIAGNOSIS - IRREGULAR OR PREMATURE WEAR

Tire Wear

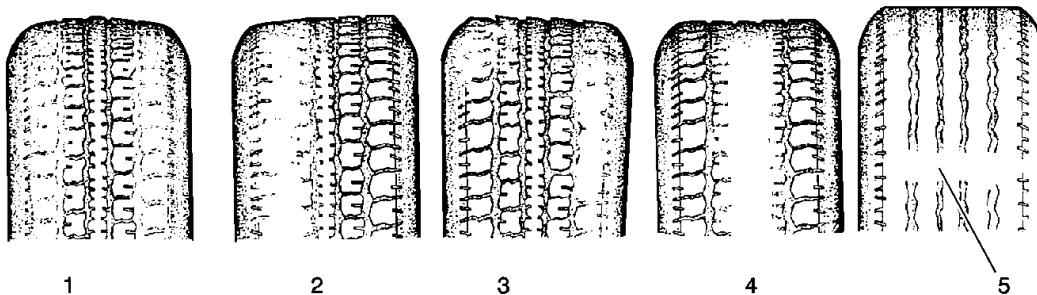


Fig. 1: Identifying Types Of Tire Wear

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Under-Inflation, Hard Cornering, Lack of Regular Rotation
2	Incorrect Wheel Alignment, Hard Cornering, Lack of Regular Rotation
3	Incorrect Wheel Alignment
4	Over-Inflation, Heavy Acceleration, Lack of Regular Rotation
5	Normal Wear to the Wear Indicator

Inspection Procedure

1. Inspect the front tire wear.
2. Inspect the rear tire wear.
3. Rotate the tires if any of the following conditions exist:
 - The amount of time or mileage since the last tire rotation matches the maintenance schedule.
 - The outer tread blocks are worn more than the middle tread blocks (1).
 - The outer tread blocks are worn more than the inner tread blocks (2).
 - The middle tread blocks are worn more than the outer tread blocks (4).
4. Measure the wheel alignment if any of the following conditions exist:
 - The tread blocks have feathered edges (3).
 - The outer tread blocks are worn more than the inner tread blocks (2).
 - The inner tread blocks are worn more than the outer tread blocks (2).
5. Inspect the struts or the shock absorbers if the tire tread exhibits a cupped appearance (3).

TIRE DIAGNOSIS - WADDLE COMPLAINT

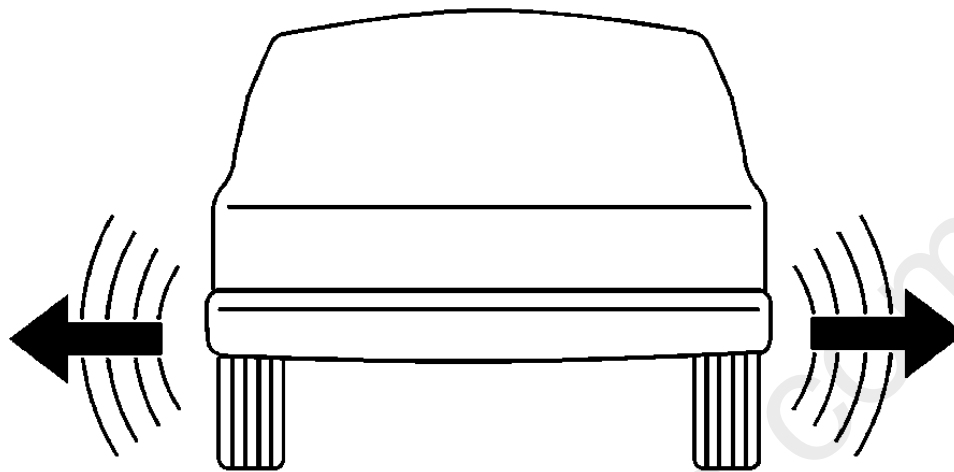


Fig. 2: Identifying Tire Wobble/Waddle
Courtesy of GENERAL MOTORS COMPANY

Tire waddle is a side to side movement at the front of the vehicle and/or the rear of the vehicle. Tire waddle can be caused by the following conditions:

- A steel belt not being straight within the tire
- Excessive lateral runout of the tire
- Excessive lateral runout of the wheel

The tire waddle is most noticeable at a low speed of about 8-48 km/h (5-30 mph). Tire waddle may appear as ride roughness at 80-113 km/h (50-70 mph). Tire waddle may appear as a vibration at 80-113 km/h (50-70 mph).

Inspection Procedure

1. Raise and support the vehicle with safety stands. Refer to **Lifting and Jacking the Vehicle** .

WARNING: Wear gloves when inspecting the tires in order to prevent personal injury from steel belts sticking through the tire.

2. Perform the following preliminary inspection:
 1. Mark the tire with a crayon in order to note the start and the stop position.
 2. Rotate each tire and wheel by hand.
 3. Inspect the tire for bulges or bent wheels. Replace as necessary.
3. Use tire substitution in order to identify the faulty tire. Perform the following steps for a tire substitution check:
 1. Use a comparable tire in order to replace each tire, one at a time.
 2. Test drive the vehicle.
 3. If the problem is tire or wheel related, you will eliminate the problem when you remove the faulty tire from the vehicle.

WHEEL MOUNTING SURFACE CHECK

Replace any wheels that are bent or dented, or have excessive lateral or radial runout. Wheels with runout greater than specified may cause objectionable vibrations.

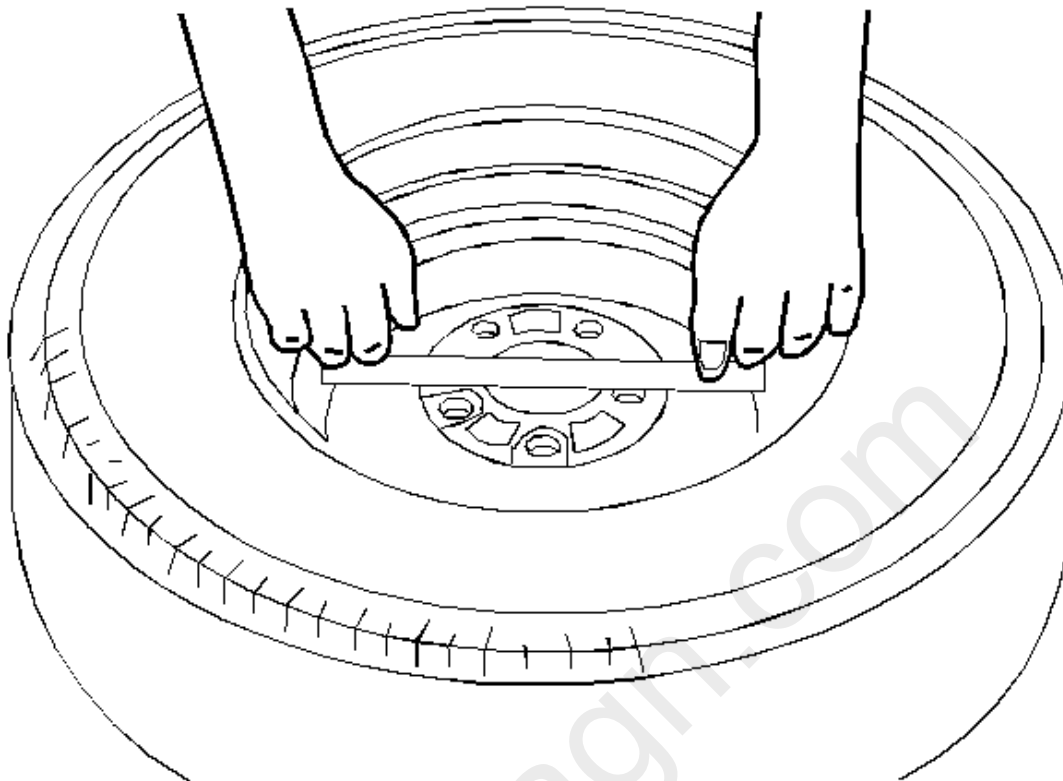


Fig. 3: Checking Wheel Mounting Surface
Courtesy of GENERAL MOTORS COMPANY

1. Thoroughly clean the wheel mounting surface with a clean shop towel and denatured alcohol, or equivalent.
2. Use a straight edge 203-229 mm (8-9 in) long. Place the straight edge on the wheel inboard mounting surface. Try to rock the straight edge up and down within the mounting surface.
3. For aluminum flat-mount wheels, repeat the procedure in step 2 on at least 3-4 different positions on the inboard mounting surface.

If you can rock the straight edge, the mounting surface is bent and you must replace the wheel.

4. Inspect the mounting wheel/nut holes for damage caused from over-torquing the wheel/nuts. Inspect for collapsed wheel/nut bosses. Inspect for cracked wheel bosses.

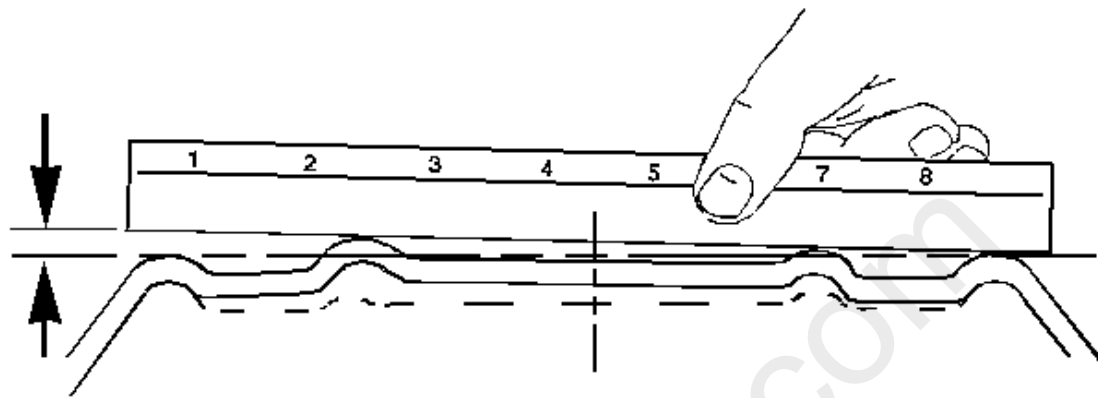


Fig. 4: Inspecting Wheel Inboard Mounting Surface
Courtesy of GENERAL MOTORS COMPANY

5. For steel wheels, repeat the procedure in step 2 on at least 3-4 different positions on the inboard mounting surface.
 - The outer mounting ring is designed to be raised slightly above the inner mounting ring.
 - If you can rock the straight edge, the mounting surface is bent and you must replace the wheel.

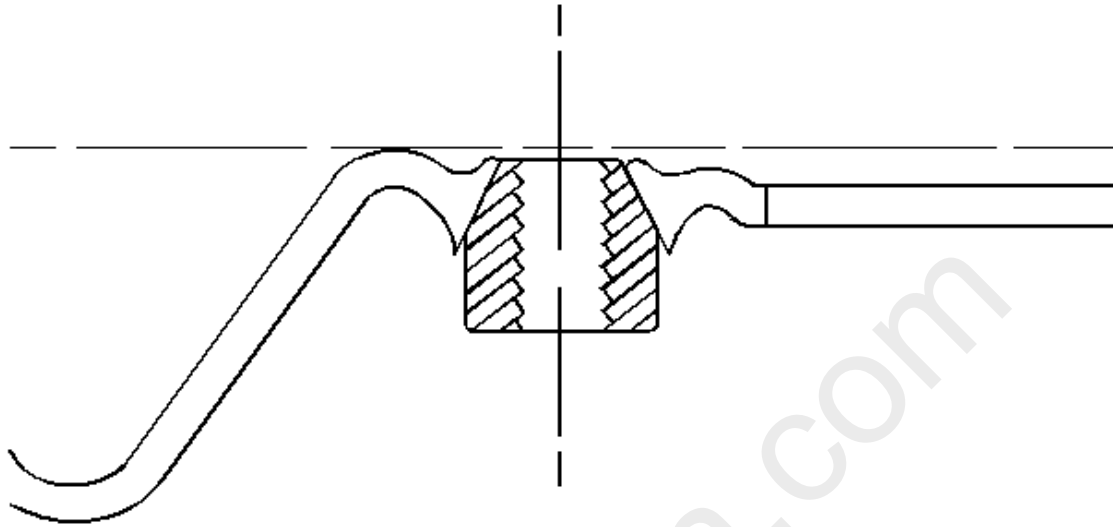


Fig. 5: Inspecting Mounting Wheel/Nut Holes For Damage Caused From Over-Torquing The Wheel/Nuts

Courtesy of GENERAL MOTORS COMPANY

6. Inspect the mounting wheel/nut holes for damage caused from over-torquing the wheel/nuts. Inspect for collapsed wheel/nut bosses. Inspect for cracked wheel bosses.

CAUTION: The use of non-GM original equipment wheels may cause:

- Damage to the wheel bearing, the wheel fasteners and the wheel
- Tire damage caused by the modified clearance to the adjacent vehicle components
- Adverse vehicle steering stability caused by the modified scrub radius
- Damage to the vehicle caused by the modified ground clearance

- **Speedometer and odometer inaccuracy**

NOTE:

- **Replacement wheels must be equivalent to the original equipment wheels in the following ways:**
 - **The load capacity**
 - **The wheel diameter**
 - **The rim width**
 - **The wheel offset**
 - **The mounting configuration**
- **A wheel of the incorrect size or type may affect the following conditions:**
 - **Wheel and hub-bearing life**
 - **Brake cooling**
 - **Speedometer/odometer calibration**
 - **Vehicle ground clearance**
 - **Tire clearance to the body and the chassis**

7. Replace the wheel if the wheel is bent.

8. Replace the wheel if the wheel/nut boss area is cracked.

Identify steel wheels with a 2 or 3-letter code stamped into the rim near the valve stem. Aluminum wheels have the code, the part number, and the manufacturer identification cast into the back side of the wheel.

RADIAL TIRE LEAD/PULL CORRECTION

Radial Tire Lead/Pull Correction

Step	Action	Yes	No
DEFINITION: The deviation of the vehicle from a straight path on a level road with no pressure on the steering wheel.			
1	Did you perform the Vehicle Leads/Pull diagnostic table in Suspension General Diagnosis?	Go to Step 2	Go to <u>Vehicle Leads/Pulls</u>
2	Road test the vehicle to verify the complaint. Select a smooth level surface to perform the test. Does the condition exist?	Go to Step 3	System OK
3	1. Cross-switch the front tire/wheel assemblies. Refer to <u>Tire and Wheel Removal and Installation</u> . 2. Road test the vehicle on a smooth level surface. Does the vehicle still lead/pull?	Go to Step 4	System OK

4	Does the vehicle lead/pull in the opposite direction?	Go to Step 5	Go to <u>Wheel Alignment Measurement</u>
5	1. Cross-switch the left front tire/wheel assembly with the left rear tire/wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u>. 2. Road test the vehicle on a smooth level surface. Does the vehicle still lead/pull?	Go to Step 6	Go to Step 7
6	1. Cross-switch the right front tire/wheel assembly with the right rear tire/wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u>. 2. Road test the vehicle on a smooth level surface. Does the vehicle still lead/pull?	Go to <u>Wheel Alignment Measurement</u>	Go to Step 8
7	Replace the left rear tire. Refer to <u>Tire Dismounting and Mounting</u>. Is the repair complete?	Go to Step 9	-
8	Replace the right rear tire. Refer to <u>Tire Dismounting and Mounting</u>. Is the repair complete?	Go to Step 9	-
9	Verify proper vehicle operation. Does the original condition still exist?	Go to Step 1	System OK

REPAIR INSTRUCTIONS

ALUMINUM WHEEL POROSITY REPAIR

1. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation**.
2. Inflate the tire to the manufactures specified pressure as stated on the tire.
3. Submerge the tire/wheel into a water bath in order to locate the leak.
4. Inscribe a mark on the wheel in order to indicate the leak areas.
5. Inscribe a mark on the tire at the valve stem in order to indicate the orientation of the tire to the wheel.
6. Remove the tire from the wheel. Refer to **Tire Dismounting and Mounting**.

IMPORTANT: Do not damage the exterior surface of the wheel.

7. Use number 80 grit sandpaper to scuff the inside of the rim surface at the leak area.
8. Use general purpose cleaner such as 3M®, P/N 08984 or equivalent, to clean the leak area.

9. Apply 3 mm (0.12 in) thick layer of adhesive/sealant, GM US P/N 12378478 (Canada P/N 88900041) or equivalent, to the leak area.
10. Allow for the adhesive/sealant to dry.
11. Align the inscribed mark on the tire with the valve stem on the wheel.
12. Install the tire to the wheel. Refer to **Tire Dismounting and Mounting**.
13. Pressurize the tire to 276 kPa (40 psi).
14. Submerge the tire/wheel into a water bath in order ensure the leak is sealed.
15. Inflate the tire to the specified pressure as stated on the tire placard.
16. Balance the tire and wheel. Refer to **Tire and Wheel Assembly Balancing - On-Vehicle**.
17. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation**.

ALUMINUM WHEEL REFINISHING

Finish Damage Evaluation Procedure

NOTE:

- If the wheels are chrome-plated, do not re-plate or refinish the wheels.
- If the wheels are polished aluminum, do not refinish the wheels in the dealer environment. Utilize a refinisher that meets manufacturer guidelines.

1. Inspect the wheels for damage from uncoated wheel balance weights or from automatic car wash facilities.
2. Inspect the wheels for the following conditions:
 - Corrosion
 - Scrapes
 - Gouges
3. Verify the damage is not deeper than what sanding can remove.
4. Inspect the wheels for cracks. If a wheel has cracks, discard the wheel.
5. Inspect the wheels for bent rim flanges. If a rim flange is bent, discard the wheel.

Refinishing Procedure

WARNING: To avoid serious personal injury when applying any two part component paint system, follow the specific precautions provided by the paint manufacturer. Failure to follow these precautions may cause lung irritation and allergic respiratory reaction.

1. Remove the tire and wheel assembly from the vehicle. Refer to **Tire and Wheel Removal and Installation**.
2. Remove the balance weights from the wheel.
3. Remove the tire from the wheel. Refer to **Tire Dismounting and Mounting**.

4. Use a suitable cleaner in order to remove the following contaminants from the wheel:

- Lubricants
- Wax
- Dirt

NOTE:

- **Do not re-machine the wheel.**
- **Do not use chemicals in order to strip the paint from the wheel.**

5. Use plastic media blasting in order to remove the paint from the wheel.

6. If the wheel had a machined aluminum finish, spin the wheel and use sand paper in order to restore the circular machined appearance.

NOTE:

The wheel mounting surface and the wheel nut contact surface must remain free of paint.

7. Mask the wheel mounting surface and the wheel nut contact surface.

8. Follow the paint manufacturer's instructions for painting the wheel.

9. Unmask the wheel.

10. Install a new valve stem.

NOTE:

Use new coated balance weights in order to balance the wheel.

11. Install the tire to the wheel. Refer to **Tire Dismounting and Mounting**.

12. Use a suitable cleaner in order to remove the following contaminants from the wheel mounting surface:

- Corrosion
- Overspray
- Dirt

13. Install the tire and wheel assembly to the vehicle. Refer to **Tire and Wheel Removal and Installation**.

TIRE AND WHEEL REMOVAL AND INSTALLATION

Special Tools

- **CH-41013** Rotor Resurfacing Kit
- **CH-42450-A** Wheel Hub Resurfacing Kit

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle**.
2. Remove the wheel cover, if equipped.

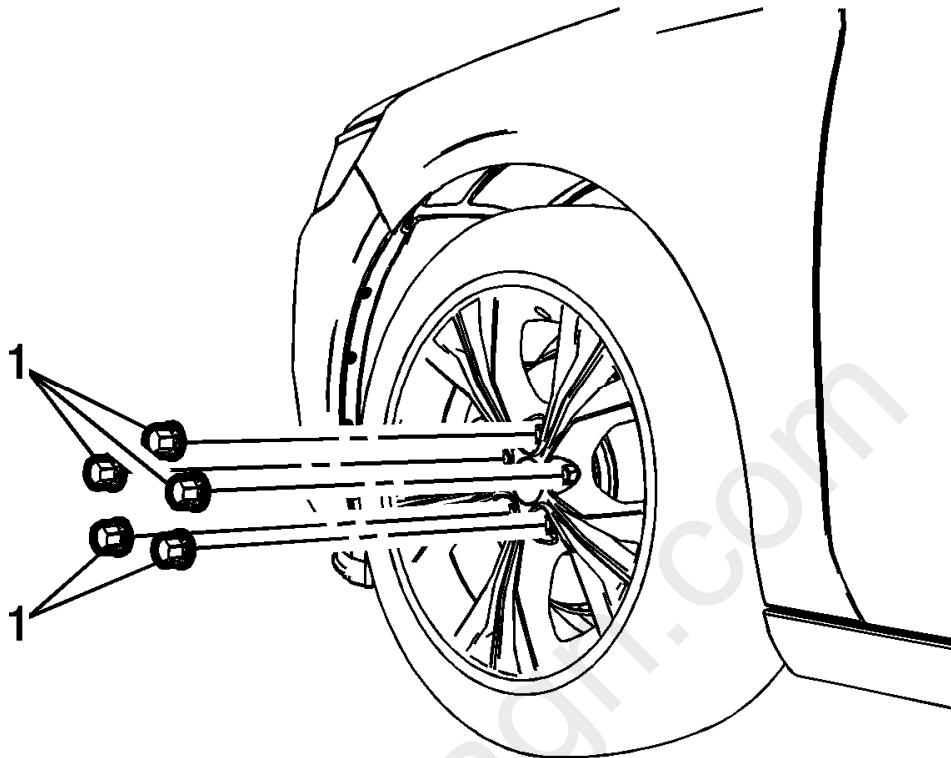


Fig. 6: Wheel Nut Caps

Courtesy of GENERAL MOTORS COMPANY

3. Remove the wheel nut caps (1), if equipped.

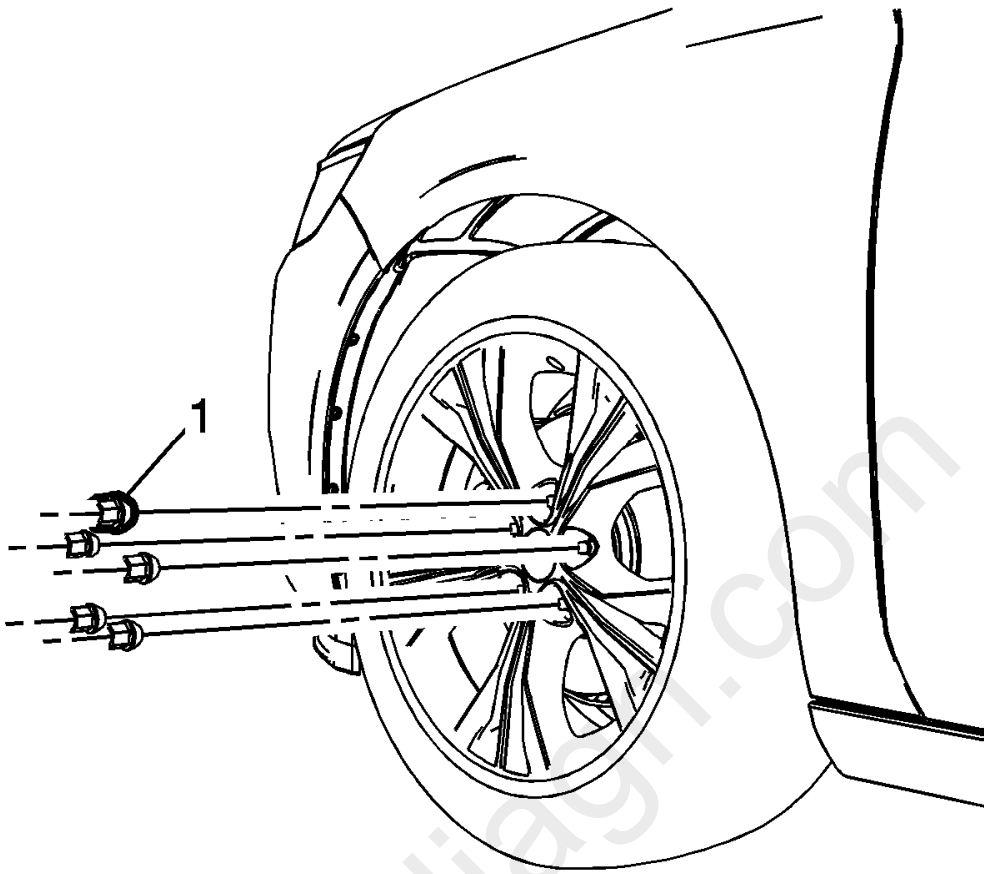


Fig. 7: Wheel Nuts

Courtesy of GENERAL MOTORS COMPANY

4. Remove the wheel nuts (1).

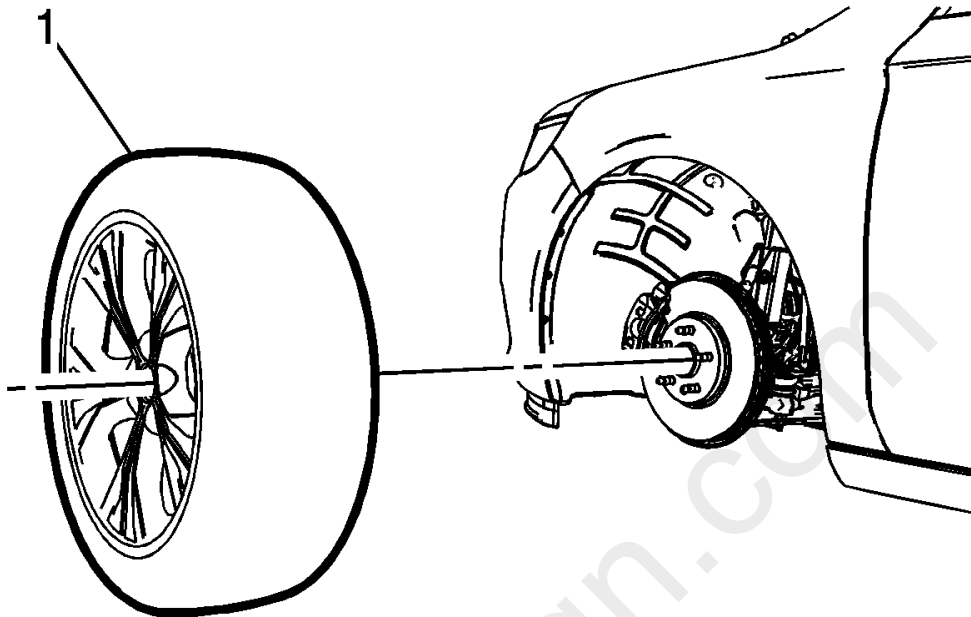


Fig. 8: Tire And Wheel Assembly
Courtesy of GENERAL MOTORS COMPANY

5. Remove the tire and wheel assembly (1).

WARNING: If penetrating oil gets on the vertical surfaces between the wheel and the rotor or drum it could cause the wheel to work loose as the vehicle is driven, resulting in loss of control and an injury accident.

CAUTION: Removing the wheel may be difficult because of foreign materials or a tight fit between the wheel and the hub/rotor. Slightly tap the tire side wall with a rubber mallet in order to remove the wheel. Failure to follow these instructions may result in damage to the wheel.

CAUTION: Never use heat to loosen a tight wheel bolt or nut. This can shorten the life of wheel and damage wheel bearings.

6. If the tire and wheel assembly is difficult to remove or cannot be removed, perform the following steps:

- Hand install the wheel nuts.
 - Loosen the wheel nuts 2 complete turns.
 - Lower the vehicle.
 - Rock the vehicle from side to side.
 - Repeat the procedure if necessary.
7. When the tire and wheel assembly loosens, raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle**.
 8. Remove the wheel nuts.
 9. Remove the tire and wheel assembly.
 10. If necessary and equipped, remove the center cap.

Installation Procedure

WARNING: Before installing the wheels, remove any buildup of corrosion on the wheel mounting surface and brake drum or disc mounting surface. Installing wheels with poor metal-to-metal contact at the mounting surfaces can cause wheel nuts to loosen. This can cause a wheel to come off when the vehicle is moving, causing loss of control and possibly personal injury.

NOTE: Do not use power grinding tools to clean the brake rotor or drum to wheel mating surfaces.

1. Using a wire brush or wire wheel, clean the wheel to brake rotor or drum mating surface.
2. Using the **CH-41013** Rotor Resurfacing Kit, clean the rotor or drum to wheel contact area.
3. Using the **CH-42450-A** Wheel Hub Resurfacing Kit, clean the surfaces around the wheel studs.
4. Clean the threads of the wheel studs.
5. If the threads of the wheel stud are damaged, replace the wheel stud. Refer to **Wheel Stud Replacement**, or **Wheel Stud Replacement**.
6. After cleaning all of the wheel and brake rotor or drum contact areas, use brake cleaner or denatured alcohol to remove any dirt and debris from the wheel nuts and the brake rotor or drum.
7. Inspect and clean the contact areas of the wheel. Refer to **Wheel Mounting Surface Check**.

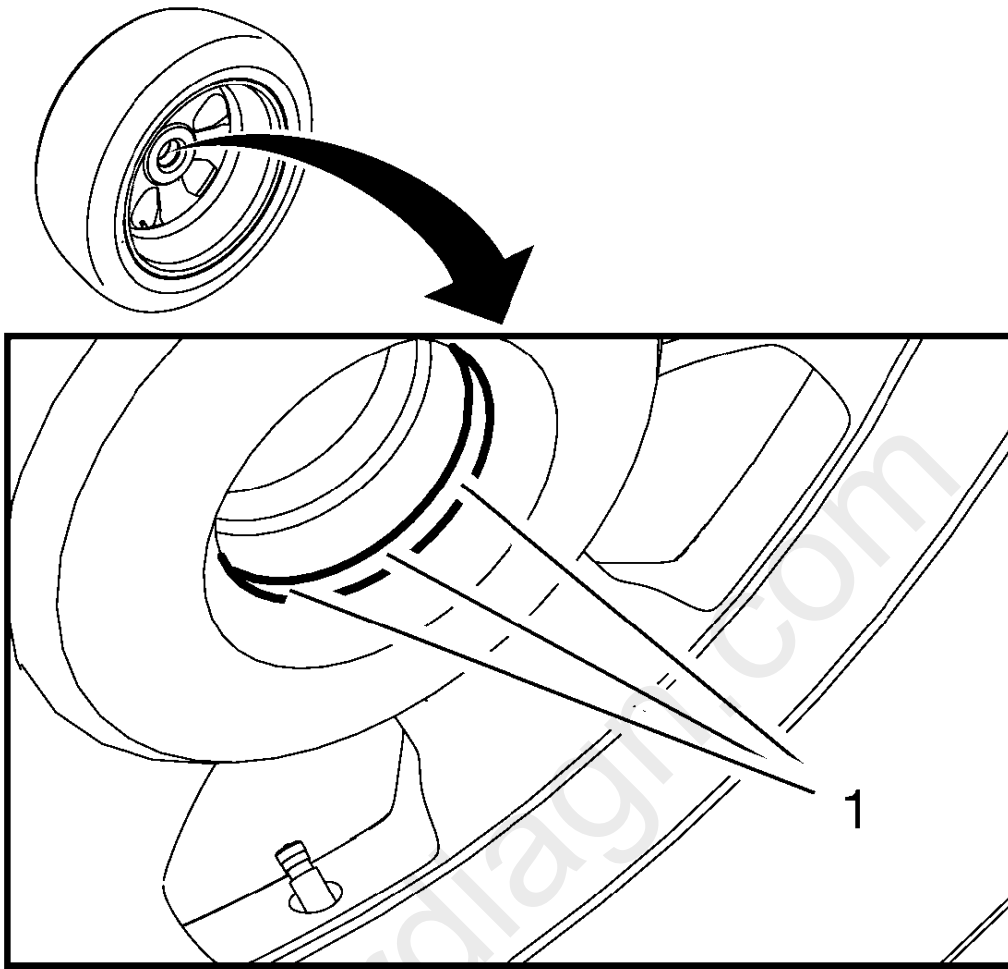


Fig. 9: Rim Inner Center Seat

Courtesy of GENERAL MOTORS COMPANY

8. Apply a small amount of lubricant to the inner diameter of the wheel hub pilot hole (1) where it contacts the wheel hub flange. Refer to **Adhesives, Fluids, Lubricants, and Sealers**.

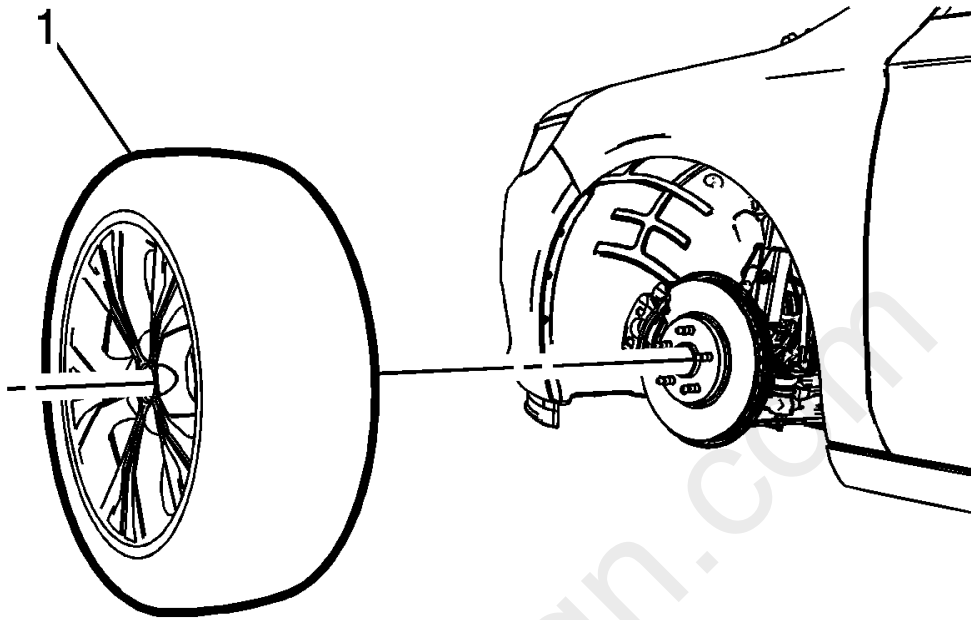


Fig. 10: Tire And Wheel Assembly
Courtesy of GENERAL MOTORS COMPANY

9. Install the tire and wheel assembly (1).

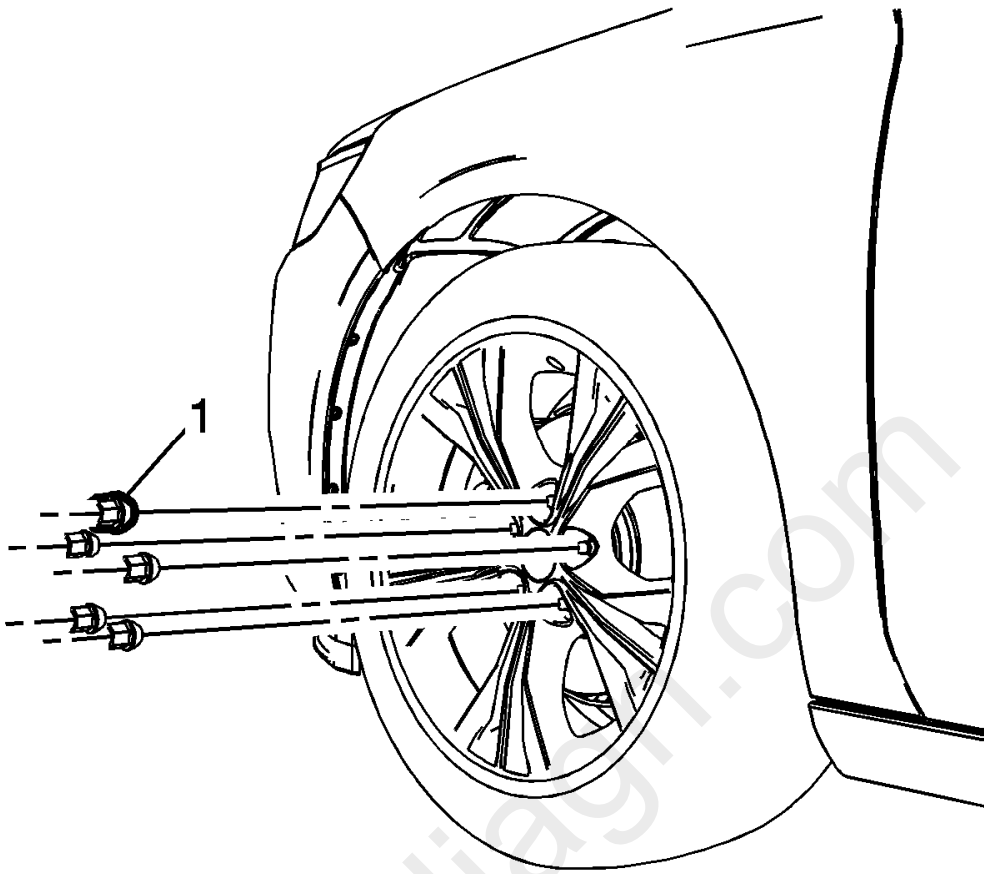


Fig. 11: Wheel Nuts

Courtesy of GENERAL MOTORS COMPANY

WARNING: Never grease or lubricate wheel nuts, studs and mounting surfaces. Wheel nuts, studs, and mounting surfaces must be clean and dry. Tightening the lubricated parts can cause damage to the wheel studs. This can cause a wheel to come off when the vehicle is moving, causing loss of control and possibly personal injury.

10. Hand install the wheel nuts (1).

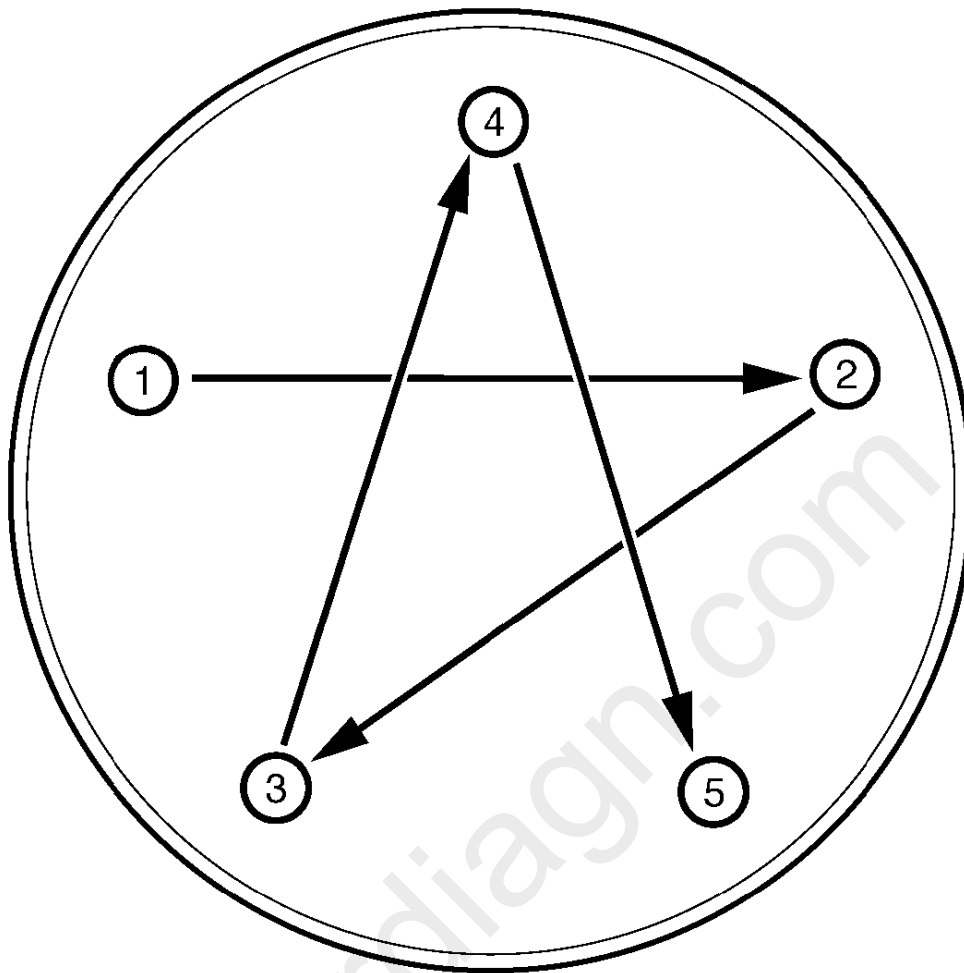


Fig. 12: Wheel Nut Tightening Sequence
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Improperly tightened wheel bolts or nuts can lead to brake pulsation and rotor damage. In order to avoid expensive brake repairs, evenly tighten the wheel bolts or nuts to the proper torque specification.

CAUTION: Refer to Fastener Caution .

11. Using a torque wrench and the appropriate socket, alternately and evenly tighten the wheel nuts to 140 (103 lb ft) in the sequence illustrated.

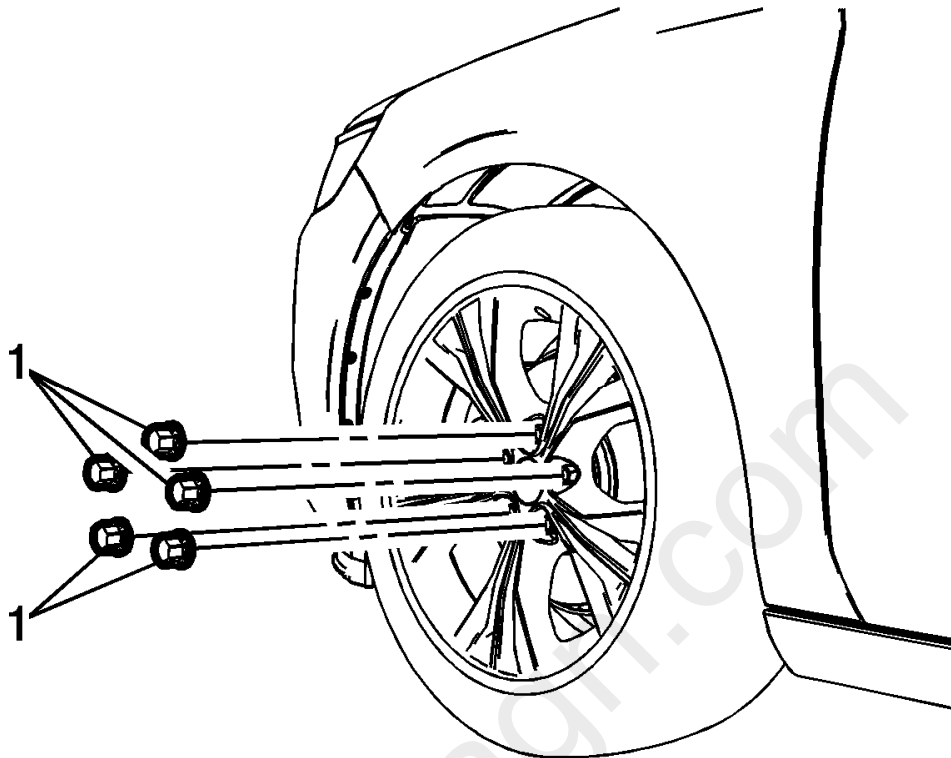


Fig. 13: Wheel Nut Caps
Courtesy of GENERAL MOTORS COMPANY

12. Install the wheel nut caps (1), if equipped.
13. Install the wheel center cap or wheel cover, if equipped.

TIRE REPAIR

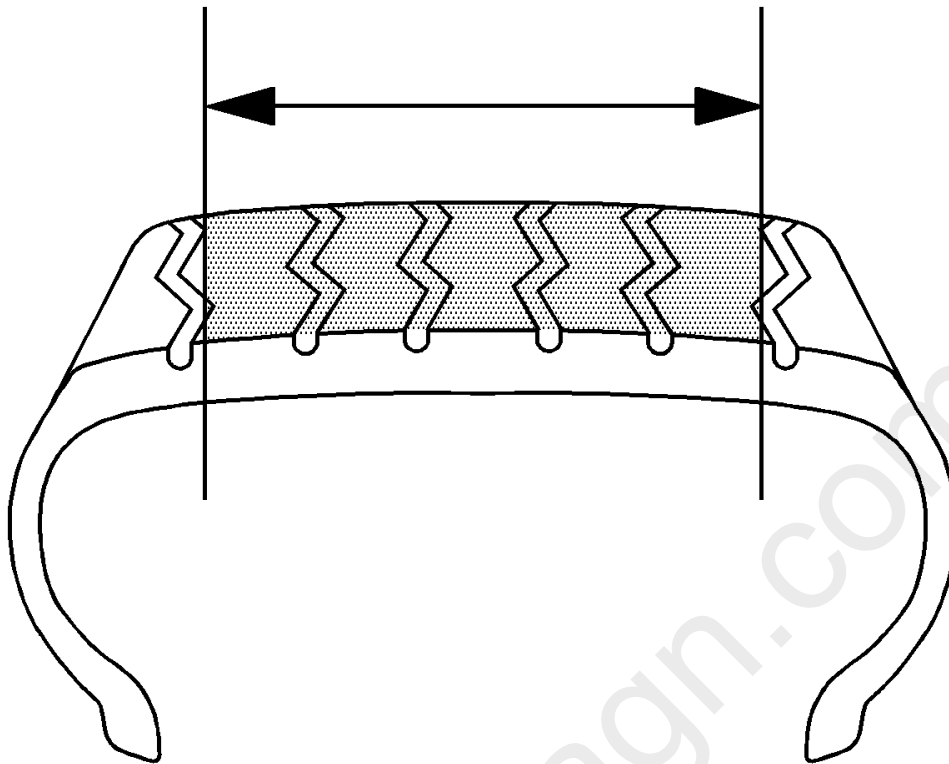


Fig. 14: Identifying Repairable Area On A Radial Tire
Courtesy of GENERAL MOTORS COMPANY

WARNING:

- Tire changing can be dangerous and should be done by trained professionals using proper tools and procedures. Always read and understand any manufacturer's warnings contained in their customers literature or molded into the tire sidewall.
- Serious eye and ear injury may result from not wearing adequate eye and ear protection while repairing tires.
- NEVER inflate beyond 275 kPa (40 pounds) pressure to seat beads.
- NEVER stand, lean or reach over the assembly during inflation.

NOTE:

Repairable area on a radial tire.

- NEVER repair tires worn to the tread indicators 1.59 mm (2/32 in) remaining depth.
- NEVER repair tires with a tread puncture larger than 6.35 mm (1/4 in).

- **NEVER** substitute an inner tube for a permissible or non-permissible repair.
- **NEVER** perform an outside-in tire repair (plug only, on the wheel).
- Every tire must be removed from the wheel for proper inspection and repair.
- **Regardless of the type of repair used, the repair must seal the inner liner and fill the injury.**
- **Consult with repair material supplier/manufacture for repair unit application procedures and repair tools/repair material recommendations.**

Three basic steps for tire puncture repair:

1. Remove the tire from the wheel for inspection and repair.
2. Fill the injury (puncture) to keep moisture out.
3. Seal the inner liner with a repair unit to prevent air loss.

External Inspection

1. Prior to demounting, inspect the tire surface, the valve and the wheel for the source of the leak by using a water and soap solution. Mark the injured area and totally deflate the tire by removing the valve core.
2. Demount the tire from the wheel and place the tire on a well-lighted spreader.

Internal Inspection

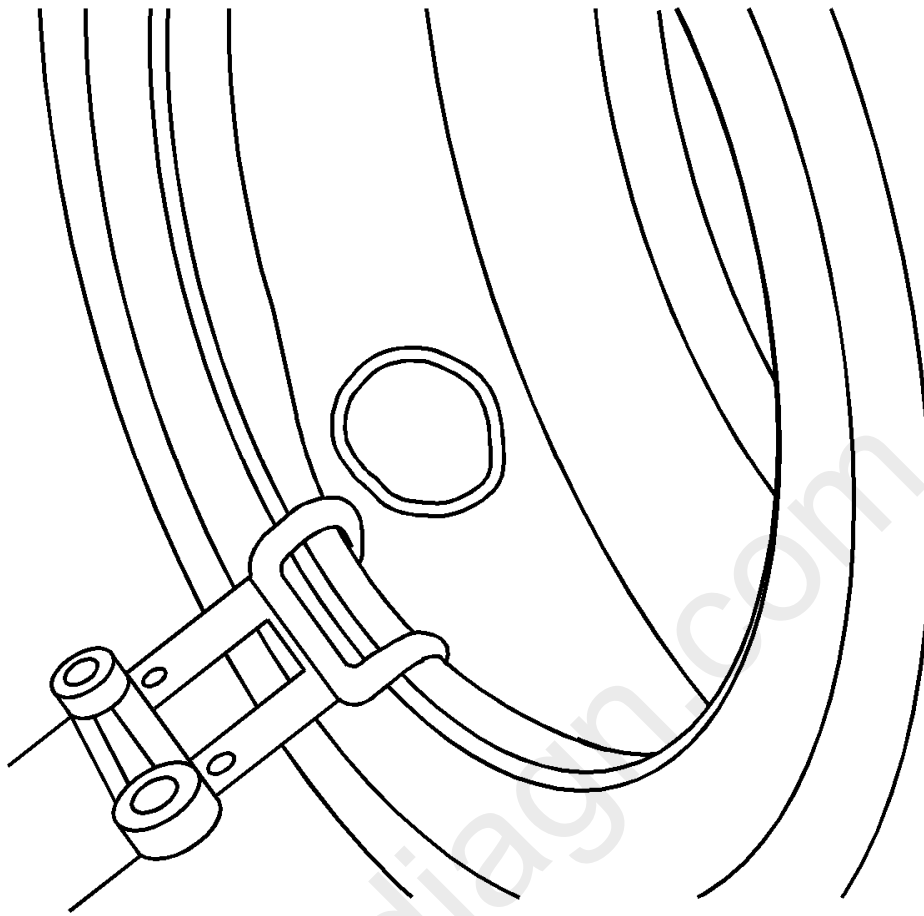


Fig. 15: Marking Tire Puncture Location
Courtesy of GENERAL MOTORS COMPANY

1. Spread the beads and mark the puncture with a tire crayon.
2. Inspect the inner tire for any signs of internal damage.
3. Remove the puncturing object, noting the direction of the penetration.
4. Probe the injury with a blunt awl in order to determine the extent and direction of the injury.
5. Remove any loose foreign material from the injury.
6. Punctures exceeding 6.35 mm (1/4 in) should not be repaired.

Cleaning

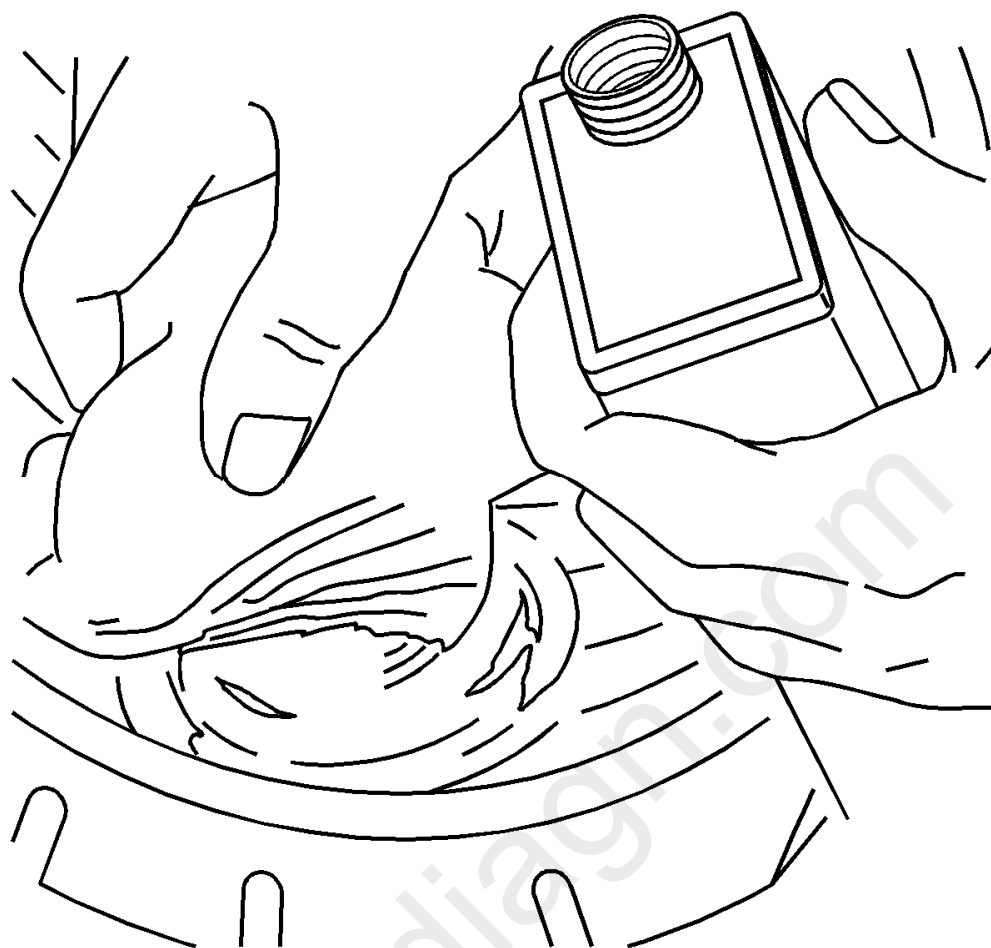


Fig. 16: Cleaning Repair Area
Courtesy of GENERAL MOTORS COMPANY

1. Clean the area around the puncture thoroughly with a proper liner cleaner, clean cloth and a scraper. This step serves to remove dirt and mold lubricants to insure proper adhesion and non-contamination of the buffing tool.
2. Refer to information on the product or manufacturer's Material Safety Data Sheet and follow guidelines for handling and disposal.

Clean the Injury Channel

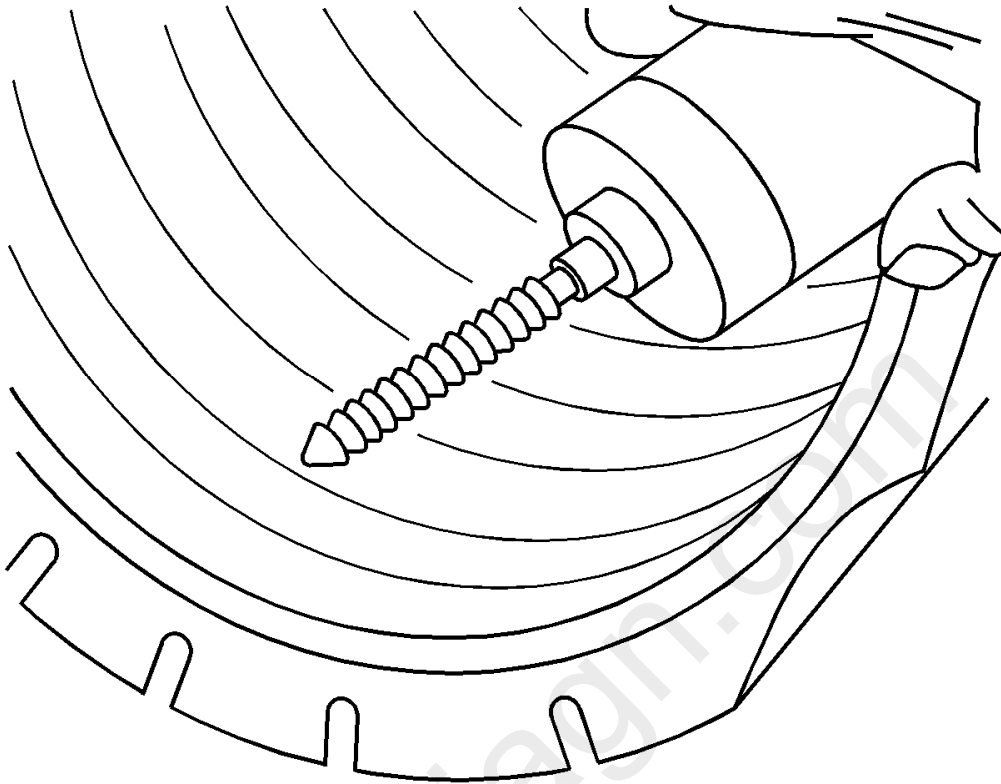


Fig. 17: Reaming Puncture Channel
Courtesy of GENERAL MOTORS COMPANY

1. Use a proper hand reamer, carbide cutter or drill bit to ream the puncture channel from the inside of the tire in order to clean the injury.
2. Remove steel wires protruding above the liner surface to prevent damage to the repair unit.
3. Consult your repair material supplier for recommended reaming tool(s).

Fill the Injury

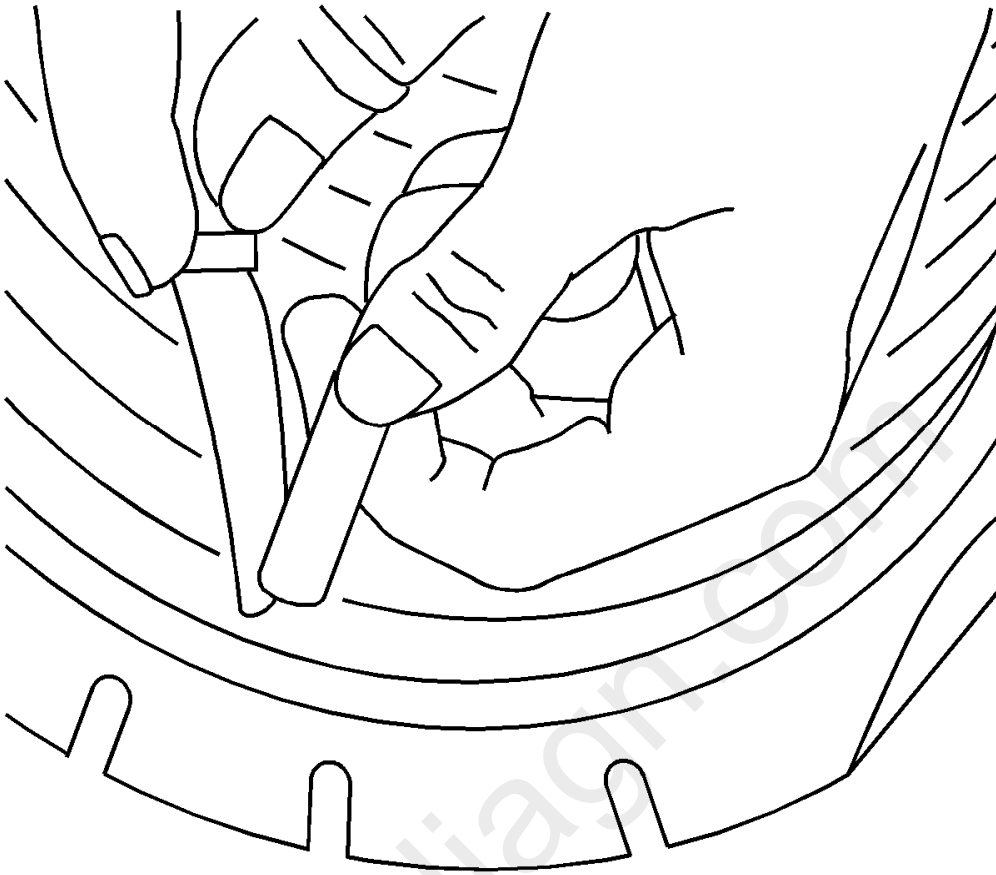


Fig. 18: Filling Injury Location

Courtesy of GENERAL MOTORS COMPANY

1. It is necessary to fill the injury channel to provide back up for the repair unit and to prevent moisture from entering the tire fabric and steel wires.
2. For combination repair/plug units skip this step. Cement the injured channel and fill the injury from the inside of the tire with the repair plug per repair material manufacturer's recommendations. Without stretching the plug, cut the plug off just above the inside tire surface.
3. Consult your repair material supplier for proper repair material selection.

Repair Unit Selection

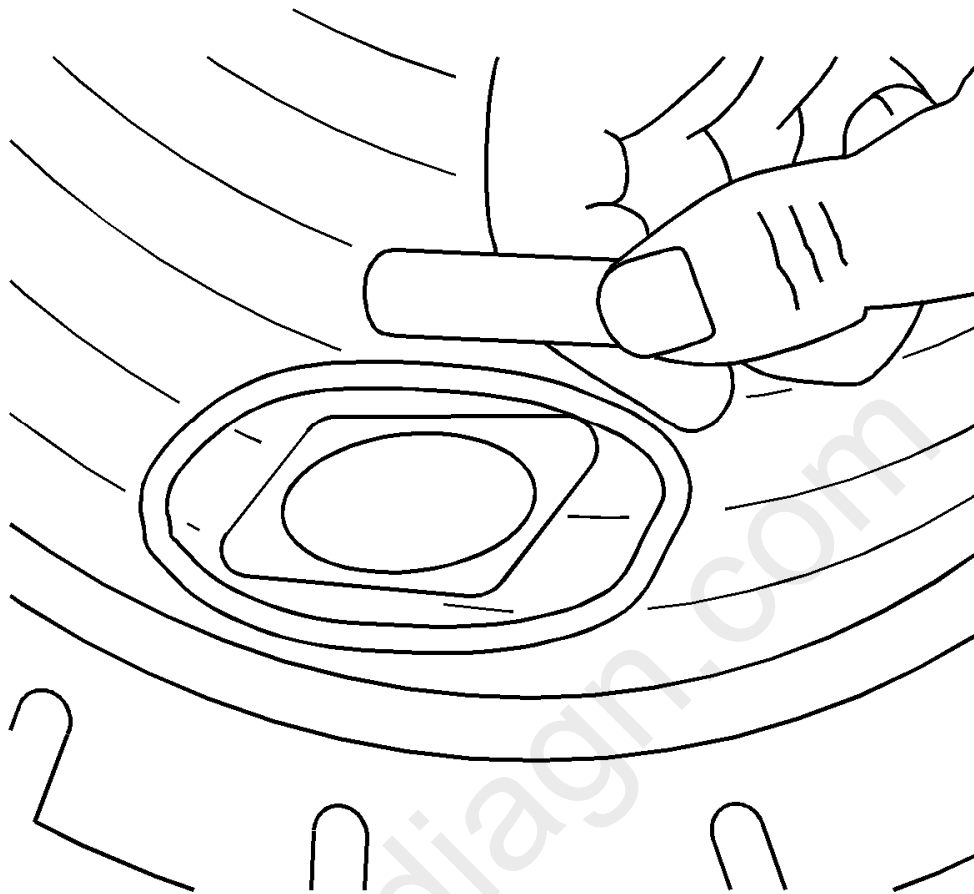


Fig. 19: Outlining Tire Injury Area
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Do not install the repair unit in this step.**

1. Center the repair unit over the injury as a reference and outline an area larger than the unit so that buffing will not remove the crayon marks.
2. Remove the repair unit.
3. DO NOT overlap previous or multiple repair units.
4. Consult your repair material supplier for proper repair unit selection.

Buffing

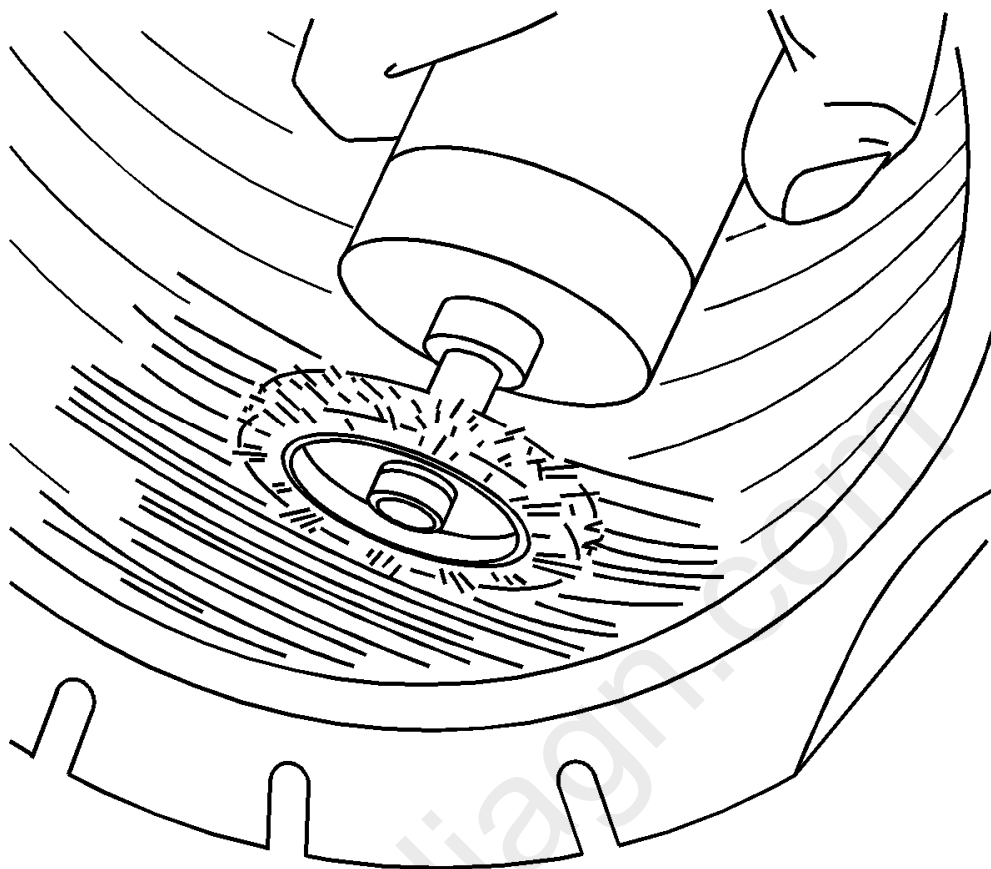


Fig. 20: Buffing Within Marked Area
Courtesy of GENERAL MOTORS COMPANY

1. To prevent contamination and preserve the outline, buff within the marked area thoroughly and evenly with a low speed buffing tool using a fine wire brush or gritted rasp.
2. Buff to a smooth velvet surface (RMA #1 or #2 buffed texture).
3. Use caution not to gouge the inner liner or expose casing fabric.
4. Remove any buffing dust with a vacuum cleaner.
5. Consult your repair material supplier for a proper buffing tool.

Cementing

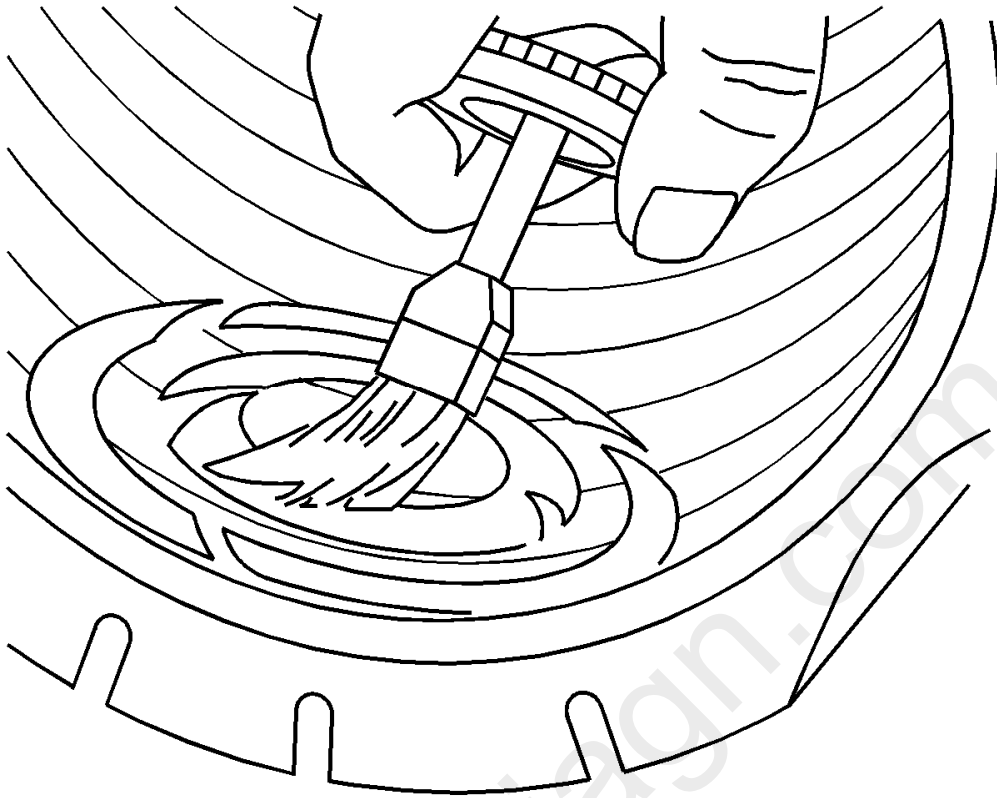


Fig. 21: Applying Chemical Cement
Courtesy of GENERAL MOTORS COMPANY

Apply chemical cement according to the repair material manufacturer's procedures.

Repair Unit Application

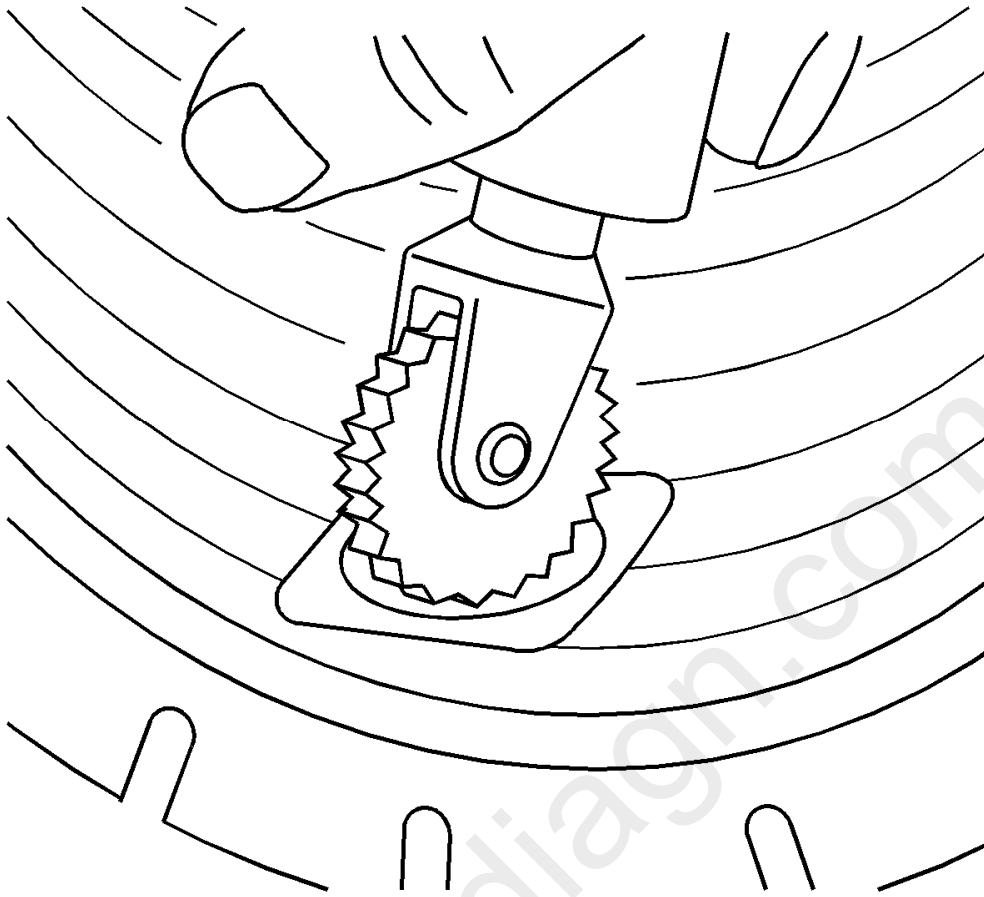


Fig. 22: Installing Repair Unit
Courtesy of GENERAL MOTORS COMPANY

The tire must be in the relaxed position when the repair unit is installed. Do not spread the beads excessively.

Two-Piece Plug and Repair Units

1. If applicable, install the repair unit so that the alignment is correct.
2. Center the repair unit over the injury and stitch down thoroughly with the stitching tool, working from the center out.

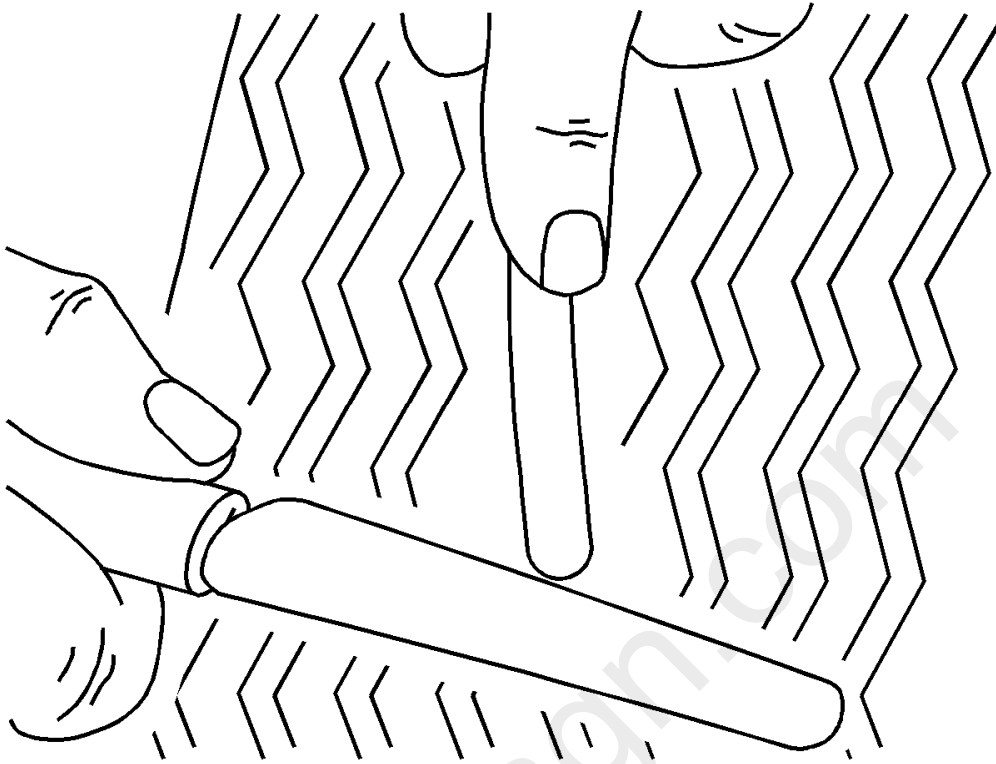


Fig. 23: Cutting Plug Material
Courtesy of GENERAL MOTORS COMPANY

3. Being careful not to stretch the plug material, cut the plug flush with the outer tread.

Combination Repair/Plug Units

1. Pull the plug through the injury until the repair just reaches the liner. Stitch down thoroughly.
2. Follow the repair material manufacturer's recommendations for further installation instructions.

Consult your repair material supplier for the proper stitching tool.

Safety Cage

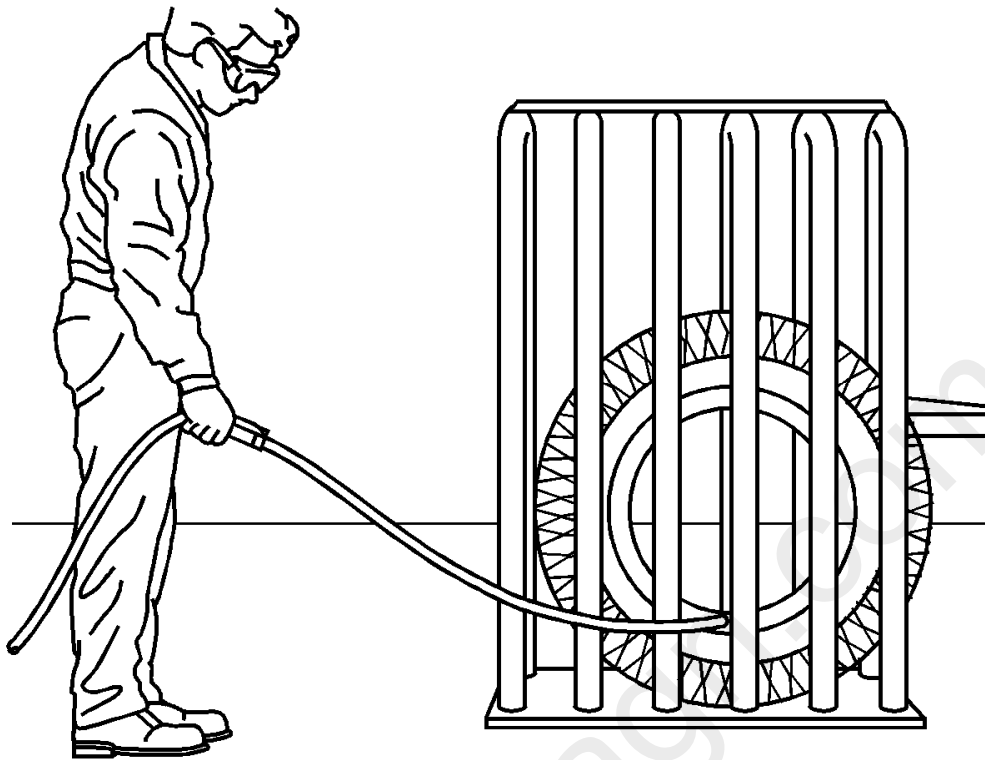


Fig. 24: Identifying Safety Cage
Courtesy of GENERAL MOTORS COMPANY

Some run flat tires may require more than 275 kPa (40 psi) to seat the bead. In such a case, a tire safety cage must be used. Consult the tire manufacturer for its individual repair policy.

Final Inspection

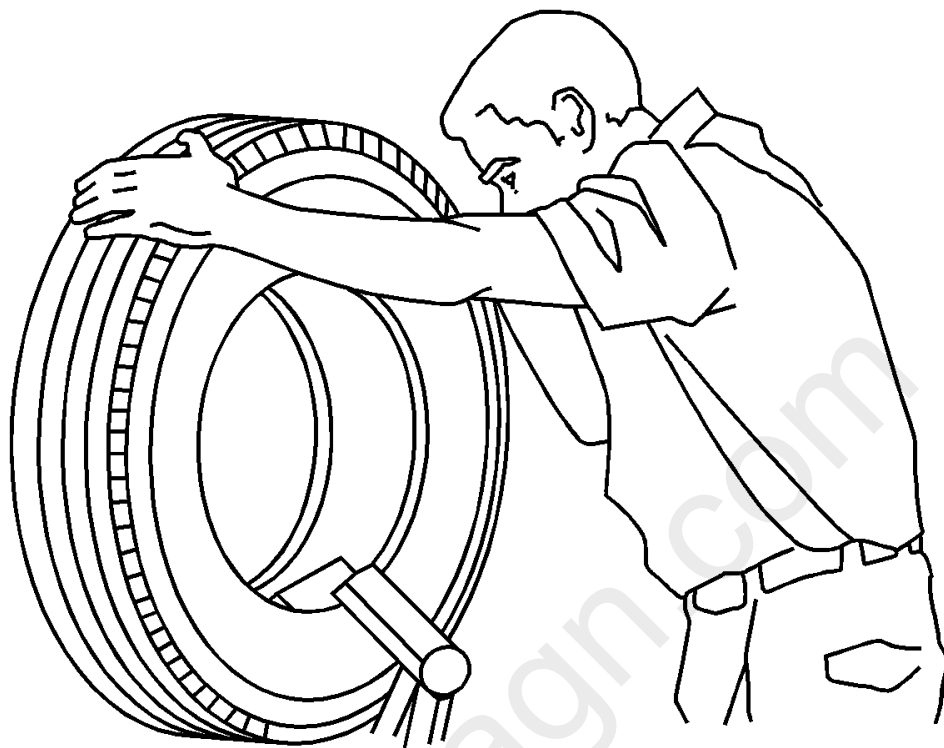


Fig. 25: Performing Final Inspection
Courtesy of GENERAL MOTORS COMPANY

1. After remounting and inflating the tire, check both beads, the repair and the valve with a water and soap solution in order to detect leaks.
2. If the tire continues to lose air, the tire must be demounted and reinspected.
3. Balance the tire and wheel assembly. Refer to **Tire and Wheel Assembly Balancing - Off Vehicle** .

For additional tire puncture repair information, contact:

Rubber Manufacturers Association (RMA)

1400 K Street, N.W., Suite 900

Washington

DC

20005-2403

Telephone: 202-682-4800

E-mail: info@rma.org

Website: www.rma.org

TIRE DISMOUNTING AND MOUNTING

CAUTION: Use a tire changing machine in order to dismount tires. Do not use hand tools or tire irons alone in order to remove the tire from the wheel. Damage to the tire beads or the wheel rim could result.

CAUTION: Do not scratch or damage the clear coating on aluminum wheels with the tire changing equipment. Scratching the clear coating could cause the aluminum wheel to corrode and the clear coating to peel from the wheel.

CAUTION: Damage to either the tire bead or the wheel mounting holes can result from the use of improper wheel attachment or tire mounting procedures. It takes up to 70 seconds for all of the air to completely exhaust from a large tire. Failure to follow the proper procedures could cause the tire changer to put enough force on the tire to bend the wheel at the mounting surface. Such damage may result in vibration and/or shimmy, and under severe usage lead to wheel cracking.

1. Remove the valve core from the valve stem.
2. Deflate the tire completely.

NOTE: Rim-clamp European-type tire changers are recommended.

3. Use the tire changer in order to remove the tire from the wheel. Follow steps 4-7 to remove the tire from the wheel.

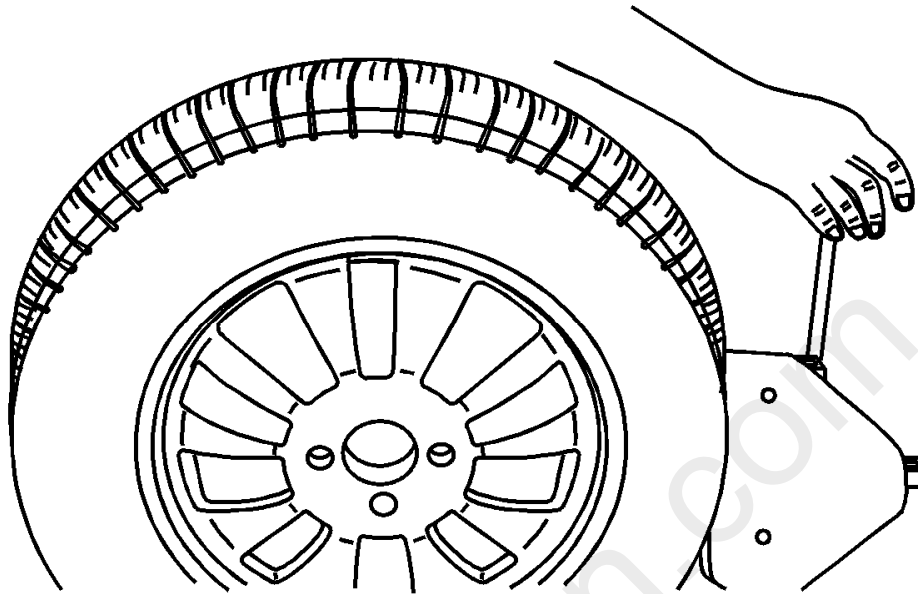


Fig. 26: Using Tire Changer to Remove Tire
Courtesy of GENERAL MOTORS COMPANY

4. When separating the tire bead from the wheel, position the bead breaking fixture 90, 180 and 270 degrees from the valve stem.

CAUTION: Failure to position valve stem in proper position while dismounting and mounting the tire may result in the TPM sensor to become damaged.

5. Position the wheel and tire so the valve stem is at the 7 o'clock position relative to the head. Apply tire bead lubricant to the pry bar to prevent damage to the tire bead. The tire iron or pry bar can be inserted when prying the outer tire bead up and over the mounting/dismounting head.

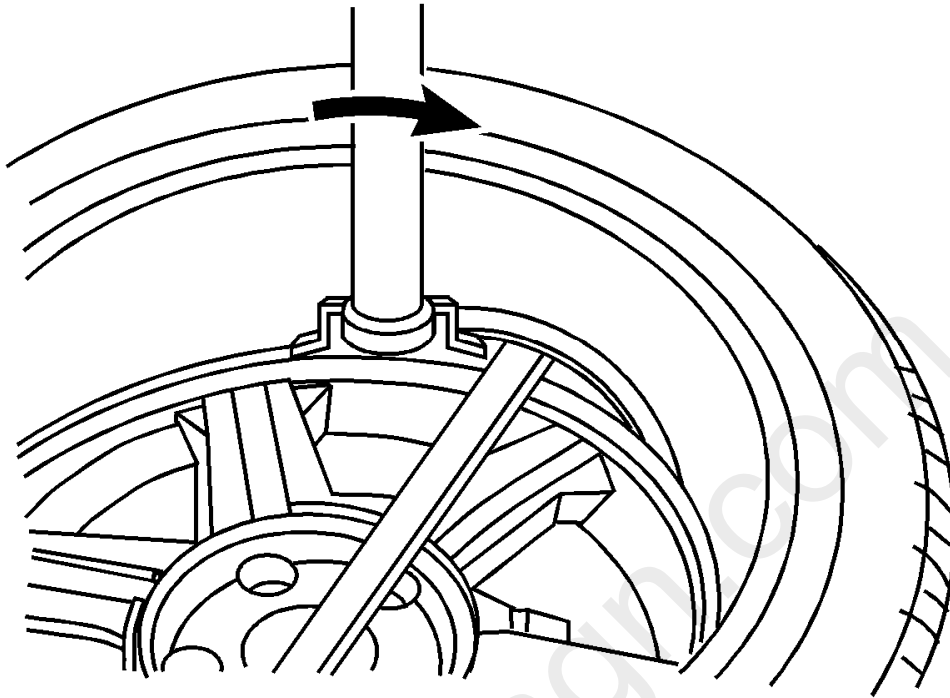


Fig. 27: Separating Tire Bead from Wheel
Courtesy of GENERAL MOTORS COMPANY

6. Position the wheel and tire so the valve stem is again at the 7 o'clock position relative to the head. The tire iron or pry bar can be inserted when prying the inner tire bead up and over the mounting/dismounting head.
7. Remove all residual liquid sealant from the inside of the tire and wheel surfaces. If any tire sealant is noted upon tire dismounting on vehicles equipped with TPM, replace the tire pressure sensor. Refer to **Tire Pressure Indicator Sensor Replacement (Snap In Style)** , **Tire Pressure Indicator Sensor Replacement (Clamp In Style)** .
8. Use medium coarseness steel wool in order to remove any rubber, light rust or corrosion from the wheel bead seats.

CAUTION: When mounting the tires, use an approved tire mounting lubricant. **DO NOT** use silicon or corrosive base compounds to lubricate the tire bead and the wheel rim. A silicon base compound can cause the tire to slip on the rim. A corrosive type compound can cause tire or rim deterioration.

9. Apply mounting lubricant to the tire bead and the wheel rim. Refer to **Adhesives, Fluids, Lubricants, and Sealers**.

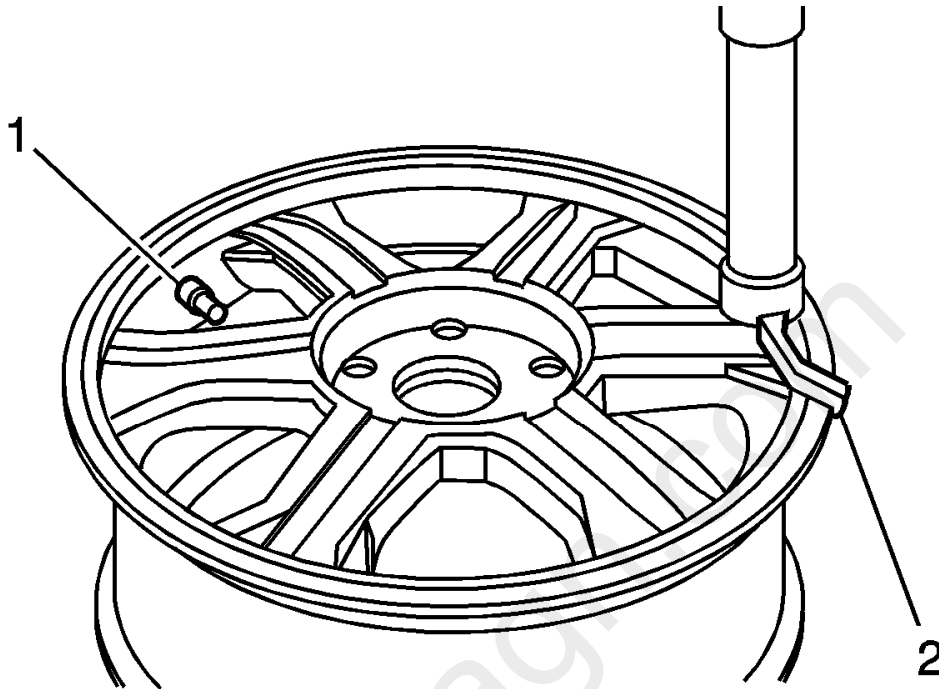


Fig. 28: Position Rim So Valve Stem Is At 7 O'clock Position Relative To Head
Courtesy of GENERAL MOTORS COMPANY

10. Position the rim so the valve stem (1) is at the 7 o'clock position relative to the head (2). This will protect the sensor when the bottom bead seats.

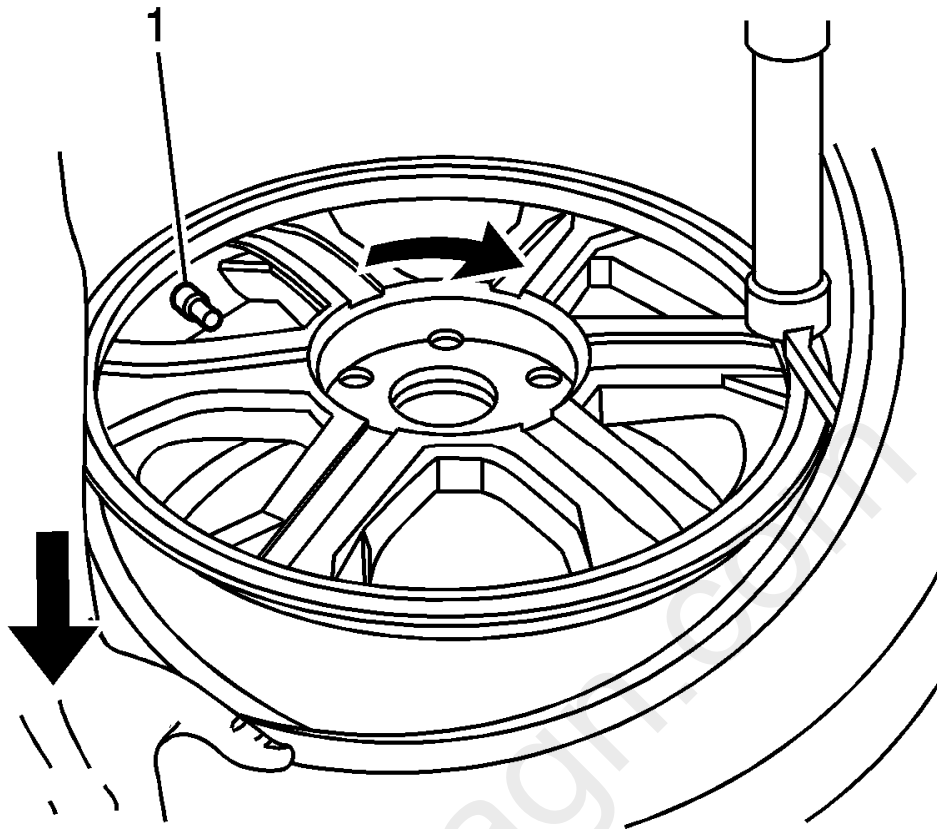


Fig. 29: Ensure Valve Stem Is At 7 O'clock Position
Courtesy of GENERAL MOTORS COMPANY

11. Using the tire machine, rotate the tire/wheel assembly clockwise when transferring the tire bead to the inside of the wheel rim. Ensure that the valve stem (1) is at the 7 o'clock position.

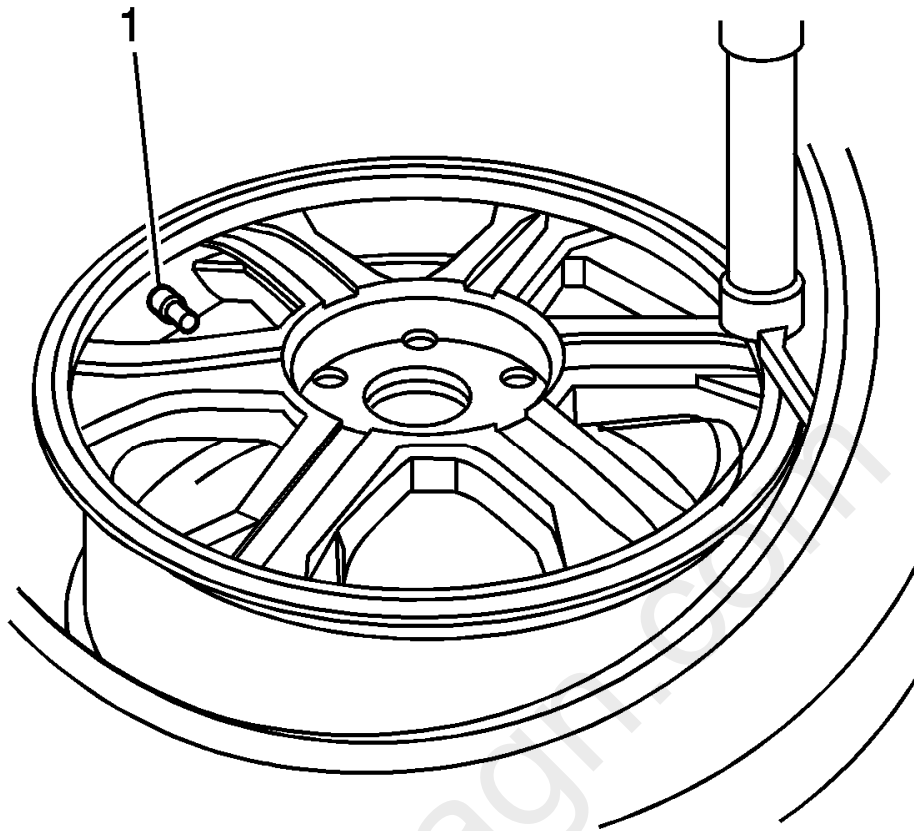


Fig. 30: Reposition Wheel And Tire So Valve Stem Is At 7 O'clock Position Relative To Head
Courtesy of GENERAL MOTORS COMPANY

12. After the bottom bead is on the wheel, reposition the wheel and tire so that the valve stem (1) is at the 7 o'clock position relative to the head. This will protect the sensor while mounting the tire bead to the outside of the wheel.

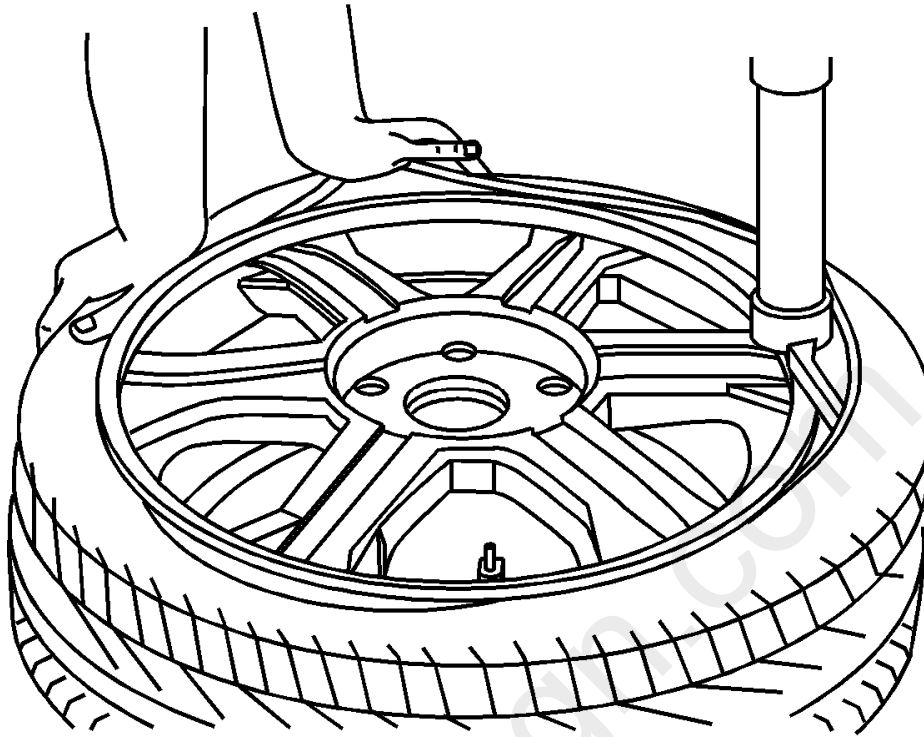


Fig. 31: Transferring Tire Bead
Courtesy of GENERAL MOTORS COMPANY

13. Use the tire changer in order to install the tire to the wheel.

WARNING: To avoid serious personal injury, do not stand over tire when inflating. The bead may break when the bead snaps over the safety hump. Do not exceed 275 kPa (40 psi) pressure when inflating any tire if beads are not seated. If 275 kPa (40 psi) pressure will not seat the beads, deflate, relubricate the beads and reinflate. Overinflation may cause the bead to break and cause serious personal injury.

14. Inflate the tire until it passes the bead humps. Be sure that the valve core is not installed at this time.
15. Install the valve core to the valve core stem.
16. Inflate the tire to the proper air pressure.
17. Ensure that the locating rings are visible on both sides of the tire in order to verify that the tire bead is fully seated on the wheel.

TIRE ROTATION (NON-DIRECTIONAL)

Rotate the tires and wheels at frequent intervals to equalize wear. Refer to the Owners Manual for the proper maintenance schedule. In addition to scheduled rotation, rotate the tire and wheel whenever uneven tire wear is noticed.

Radial tires tend to wear faster in the shoulder area, particularly in front positions. Radial tires in non-drive locations may develop an irregular wear pattern that may increase tire noise. This makes regular rotation especially necessary. Refer to **Tire and Wheel Removal and Installation**.

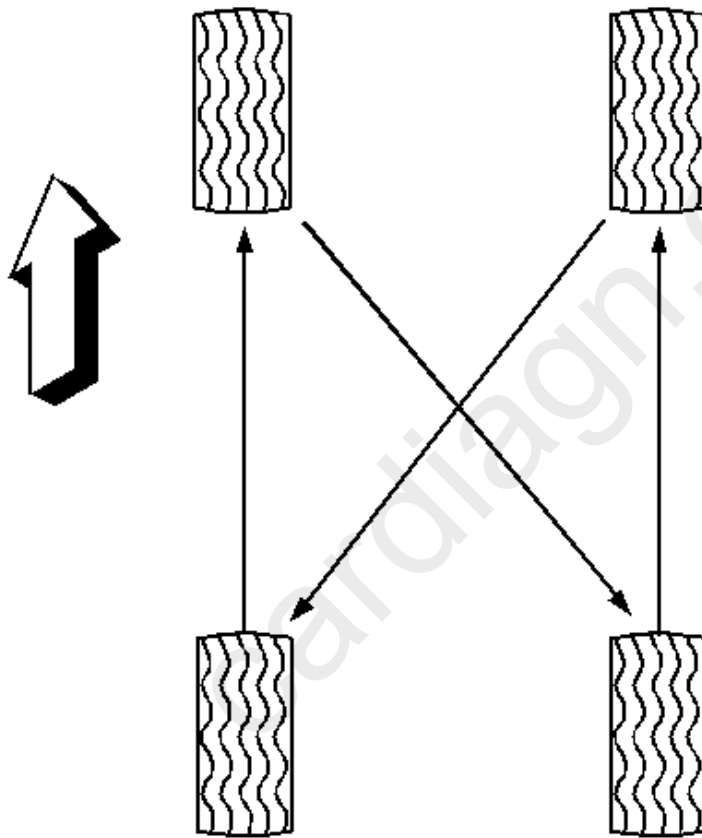


Fig. 32: Rotating Tires (4 Tires)

Courtesy of GENERAL MOTORS COMPANY

Always use a 4-wheel rotation. After rotation, check the wheel nuts for specified torque. Refer to **Fastener Tightening Specifications**. Then, set the tire pressure. Refer to **Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label**.

After performing tire rotation and setting the tire pressure it is necessary to relearn the tire pressure sensors. Refer to **Tire Pressure Indicator Sensor Learn**

TIRE ROTATION (DIRECTIONAL)

Rotate the tires and wheels at frequent intervals to equalize wear. Refer to the Owners Manual for the proper maintenance schedule. In addition to scheduled rotation, rotate the tire and wheel whenever uneven tire wear is noticed.

Radial tires tend to wear faster in the shoulder area, particularly in front positions. Radial tires in non-drive locations may develop an irregular wear pattern that may increase tire noise. This makes regular rotation especially necessary. Refer to **Tire and Wheel Removal and Installation**.

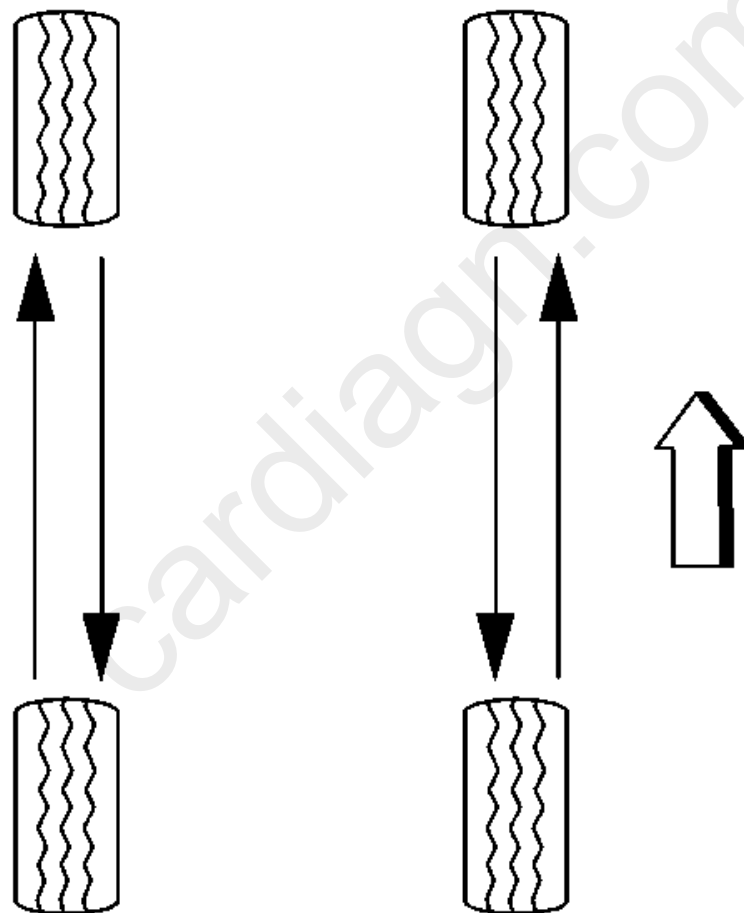


Fig. 33: Tire Rotation (Directional)

Courtesy of GENERAL MOTORS COMPANY

Always use a 4-wheel rotation. After rotation, check the wheel nuts for specified torque. Refer to **Fastener Tightening Specifications**. Then, set the tire pressure. Refer to **Vehicle Certification, Tire Placard, Anti-**

Theft, and Service Parts ID Label .

After performing tire rotation and setting pressure, it is necessary to relearn the tire pressure sensors. Refer to Tire Pressure Indicator Sensor Learn .

DESCRIPTION AND OPERATION

ALL SEASONS TIRES DESCRIPTION

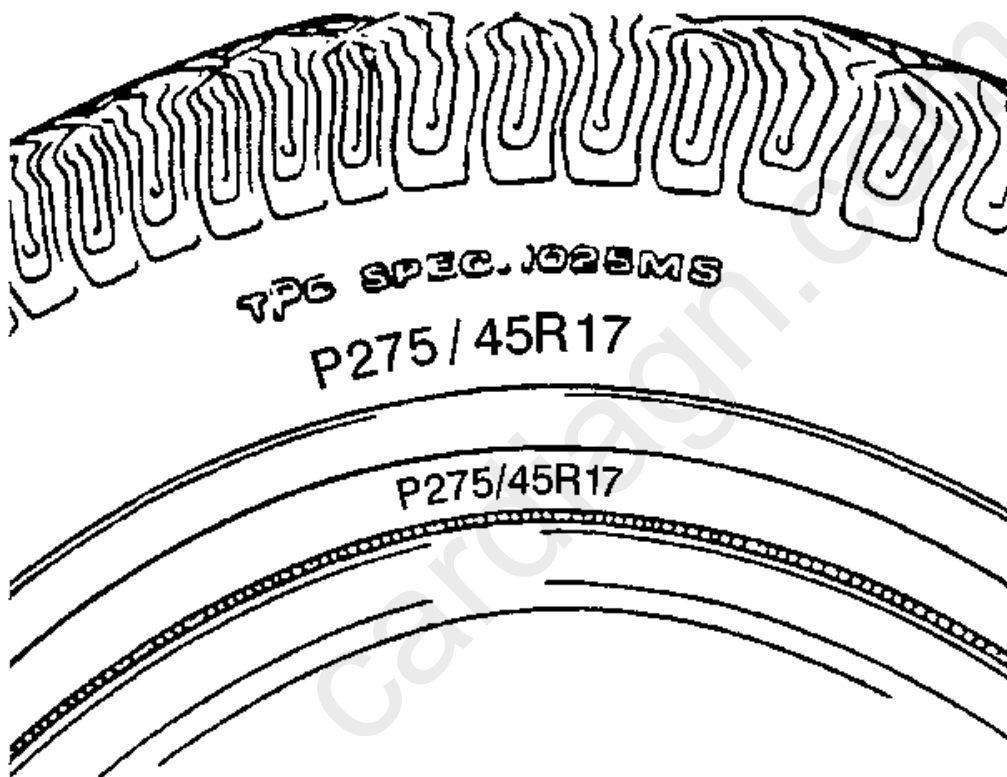


Fig. 34: Identifying All Seasons Tire Marking
Courtesy of GENERAL MOTORS COMPANY

Most GM vehicles are equipped with steel belted all-season radial tires as standard equipment. These tires qualify as snow tires, with a higher than average rating for snow traction than the non-all season radial tires previously used. Other performance areas, such as wet traction, rolling resistance, tread life, and air retention, are also improved. This is done by improvements in both tread design and tread compounds. These tires are identified by an M + S molded in the tire side wall after the tire size. The suffix MS is also molded in the tire side wall after the TPC specification number.

The optional handling tires used on some vehicles now also have the MS marking after the tire size and the TPC specification number.

GENERAL DESCRIPTION

The factory installed tires are designed to operate satisfactorily with loads up to and including the full rated load capacity when these tires are inflated to the recommended pressures.

The following factors have an important influence on tire life:

- Correct tire pressures
- Correct wheel alignment
- Proper driving techniques
- Tire rotation

The following factors increase tire wear:

- Heavy cornering
- Excessively rapid acceleration
- Heavy braking

METRIC WHEEL NUTS AND BOLTS DESCRIPTION

Metric wheel/nuts and bolts are identified in the following way:

- The wheel/nut has the word Metric stamped on the face.
- The letter M is stamped on the end of the wheel bolt.

The thread sizes of metric wheel/nuts and the bolts are indicated by the following example: M12 x 1.5.

- M = Metric
- 12 = Diameter in millimeters
- 1.5 = Millimeters gap per thread

P-METRIC SIZED TIRES DESCRIPTION

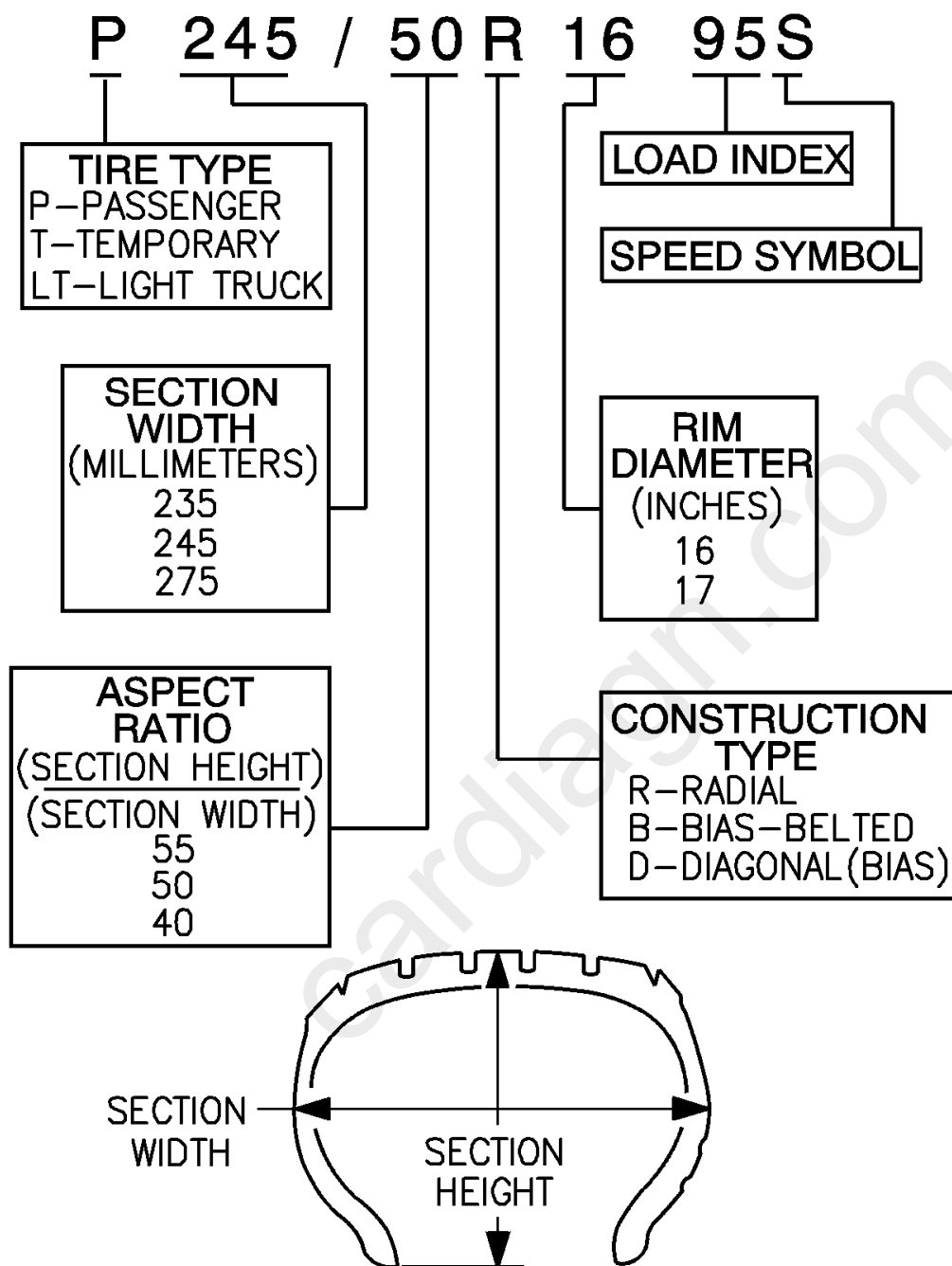


Fig. 35: Identifying P-Metric Sized Tire Marking
 Courtesy of GENERAL MOTORS COMPANY

Replacement tires should be of the same tire performance criteria (TPC) specification number. This will ensure

the same size, the same load range, and the same construction as those originally installed on the vehicle.

REPLACEMENT WHEELS DESCRIPTION

WARNING: Do Not use flat mount wheels on dual ring type wheel applications. The use of flat mount wheels on a dual ring application may cause the wheel to loosen and could cause loss of vehicle control resulting in personal injury.

Replace the wheel if any of the following conditions exist:

- The wheel exhibits excessive runout.
- The wheel is bent.
- The wheel is cracked.
- The wheel is severely corroded.

NOTE: Air leaks caused by porosity on aluminum wheels are repairable.

WARNING: If you are replacing the wheel(s), the wheel stud(s), the wheel nut(s) or the wheel bolt(s), install only new GM original equipment parts. Installation of used parts or non-GM original equipment parts may cause the wheel to loosen, loss of tire air pressure, poor vehicle handling and loss of vehicle control resulting in personal injury.

- The wheel leaks air.

CAUTION: The use of non-GM original equipment wheels may cause:

- Damage to the wheel bearing, the wheel fasteners and the wheel
- Tire damage caused by the modified clearance to the adjacent vehicle components
- Adverse vehicle steering stability caused by the modified scrub radius
- Damage to the vehicle caused by the modified ground clearance
- Speedometer and odometer inaccuracy

Replace the wheel, the wheel studs and the wheel/nuts, or the wheel bolts if applicable, if any of the following conditions exist:

- The wheel has elongated bolt holes.
- The wheel/nuts, or bolts if applicable, loosen repeatedly.

Aluminum wheel identification is cast into the inboard side of the wheel.

TIRE INFLATION DESCRIPTION

This vehicle has been engineered to operate up to the stated load capacity with wheel and tire assemblies of the type, size, construction, and configuration as originally installed. Maintenance of the tire inflation pressures is critical to the continued satisfactory performance, handling, and operating economy of the vehicle. Operation with incorrectly or improperly inflated tires can adversely affect vehicle performance and may contribute to the following:

- Reduced fuel economy
- Tire overloading
- Shortened tire life
- Excessive tire wear
- Uneven tire wear
- Vehicle handling concerns

Inspect the tire pressures when the vehicle has not been driven for at least 3 hours or not more than 1.6 km (1 mi) and when the tires are cool to the touch.

Tire inflation pressures should be inspected monthly and before an extended trip and adjusted to meet the specifications listed for the particular vehicle. Replace any missing or damaged tire valve stem extensions and/or caps to prevent the intrusion of water and contaminants.

One pound per square inch (psi) equals 6.9 kilopascals (kPa). The following table illustrates the conversion of kilopascals to pounds per square inch:

Inflation Pressure Conversion (Kilopascals to PSI)

kPa	psi	kPa	psi
140	20	215	31
145	21	220	32
155	22	230	33
160	23	235	34
165	24	240	35
170	25	250	36
180	26	275	40
185	27	310	45
190	28	345	50
200	29	380	55
205	30	415	60
Conversion: 6.9 kPa = 1 psi			

For the correct inflation pressures refer to the vehicle's tire placard.

Tires inflated to a higher than recommended pressure can contribute to the following conditions:

- A hard ride
- Tire bruising
- Rapid tread wear at the center of the tire

Tires inflated to a lower than recommended pressure can contribute to the following conditions:

- Tire squeal on turns
- Hard steering
- Rapid and/or uneven wear on the outer edges of the tread
- Tire rim bruises and tire rim rupture
- Tire cord breakage
- High tire temperatures
- Sluggish vehicle handling
- Higher fuel consumption

Unequal pressure on the same axle can cause the following conditions:

- Uneven braking action
- Steering lead
- Imprecise vehicle handling

TREAD WEAR INDICATORS DESCRIPTION

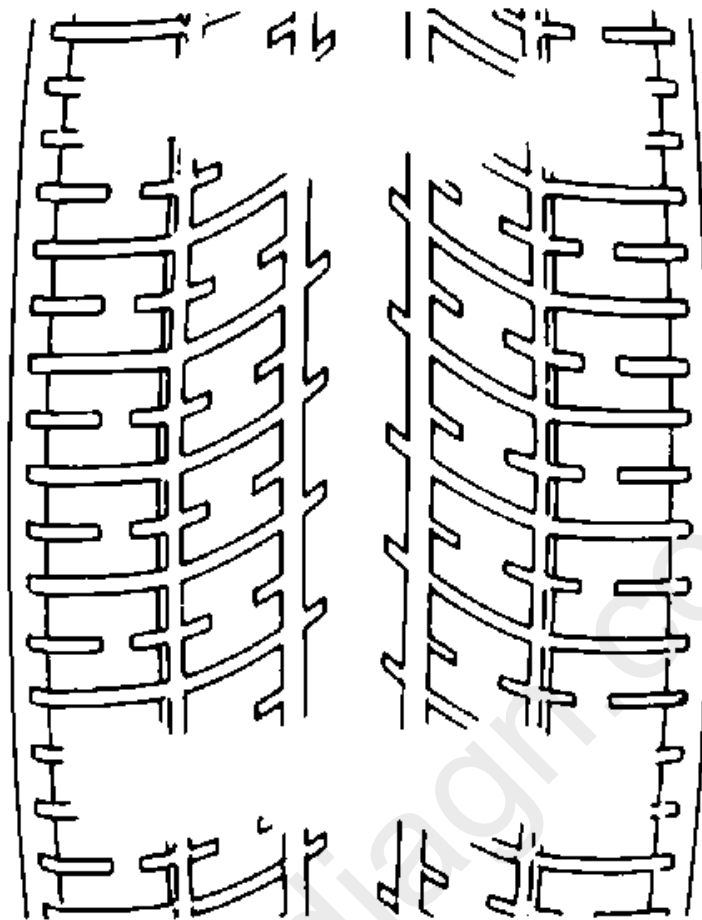


Fig. 36: View Of Tread Wear Indicators
Courtesy of GENERAL MOTORS COMPANY

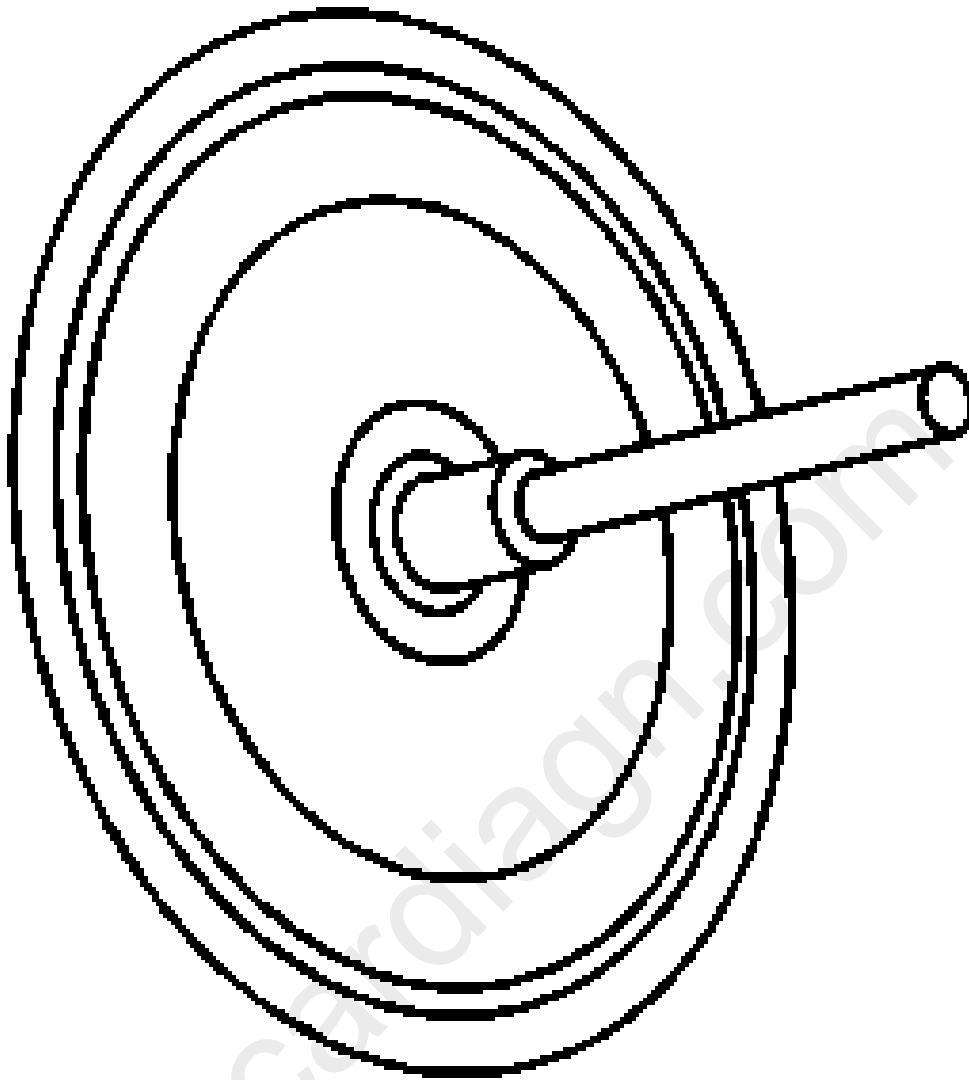
The original equipment tires have tread wear indicators that show when you should replace the tires.

The location of these indicators are at 60 degree intervals around the outer diameter of the tire. The indicators appear as a 6 mm (0.25 in) wide band when the tire tread depth becomes 1.6 mm (2/32 in).

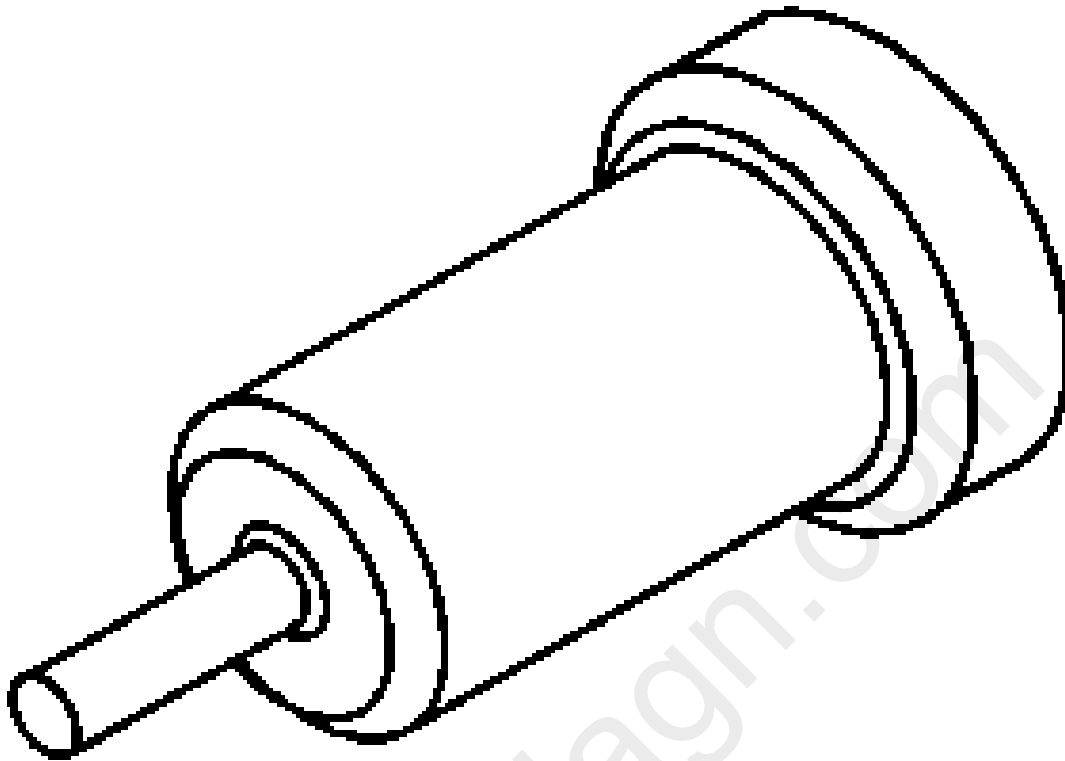
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description



CH 41013
J 41013
Rotor
Resurfacing
kit



CH 42450-
A
J 42450-A
Wheel Hub
Resurfacing
Kit