

2017 SUSPENSION
Tires and Wheels - Impala

SPECIFICATIONS

FASTENER SPECIFICATIONS

Reusable Threaded Fastener Tightening Specifications

NOTE: <i>All fasteners listed in this table can be reused after removal.</i>	
Application	Specification
	Metric (English)
Wheel Nut	150 N.m (111 lb ft)

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number	Canadian Part Number
Wheels	Mounting Lubricant	12345884	88863415
Wheels, Wheel Bearing/Hub	Lubricant	1051344	993037

DIAGNOSTIC INFORMATION AND PROCEDURES

TIRE DIAGNOSIS - IRREGULAR OR PREMATURE WEAR

Tire Wear

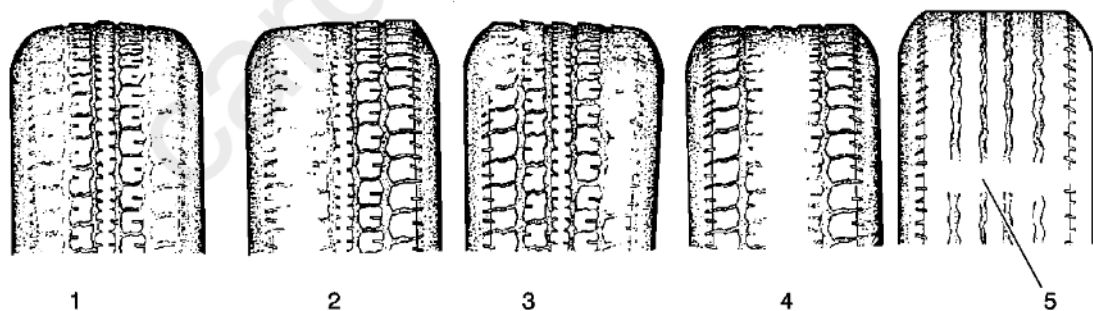


Fig. 1: Identifying Types Of Tire Wear

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

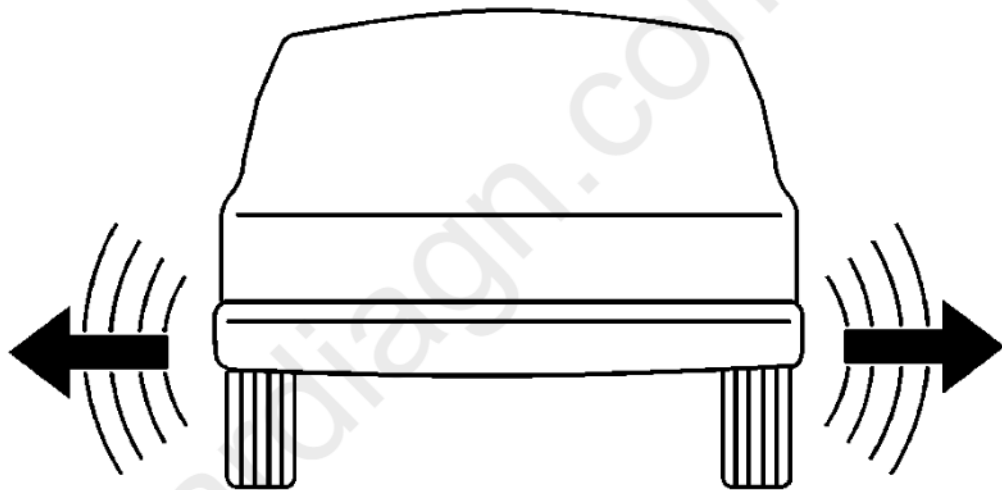


Fig. 2: Identifying Tire Wobble/Waddle

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.

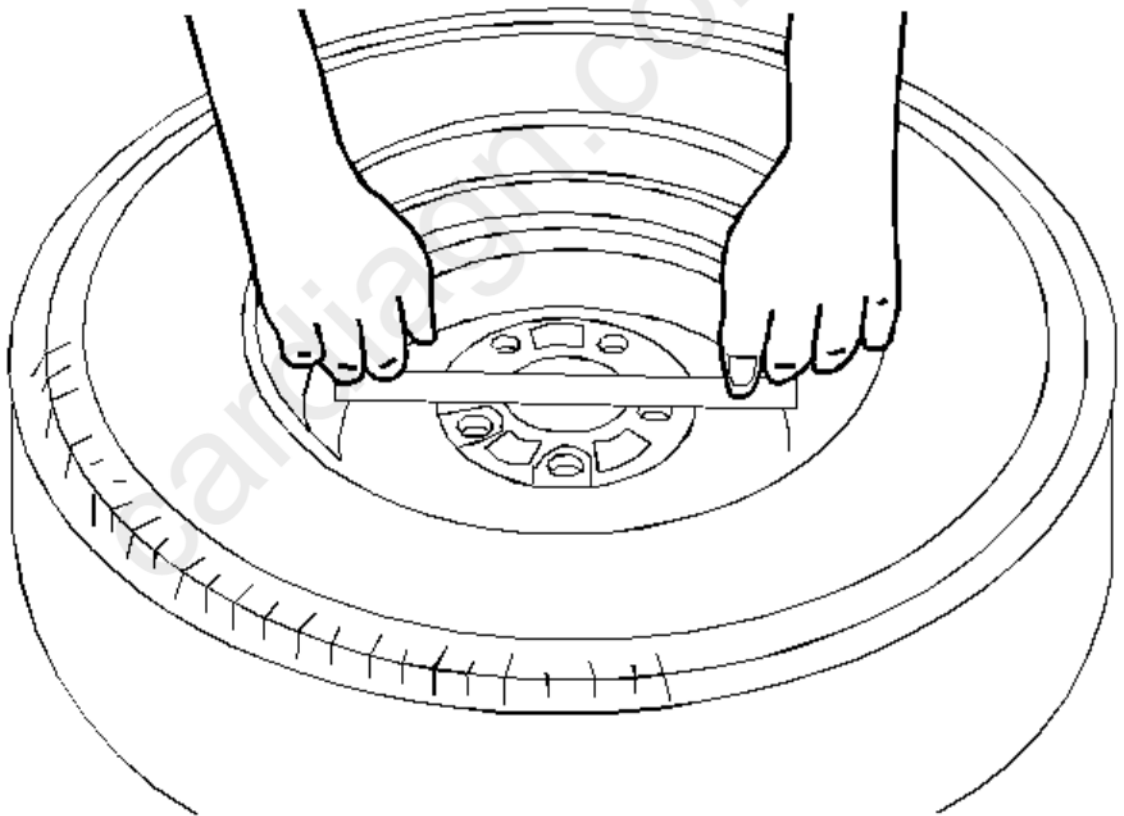


Fig. 3: Checking Wheel Mounting Surface
Courtesy of GENERAL MOTORS COMPANY

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.

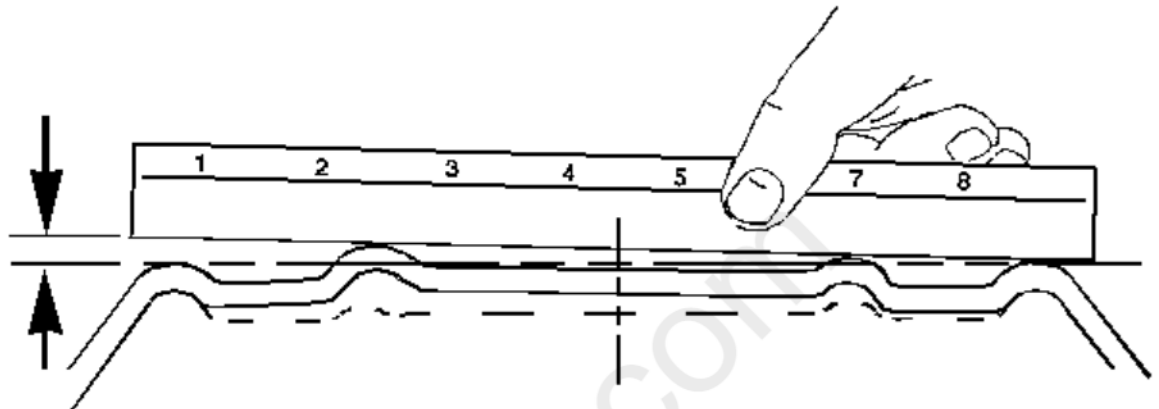


Fig. 4: Inspecting Wheel Inboard Mounting Surface

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.

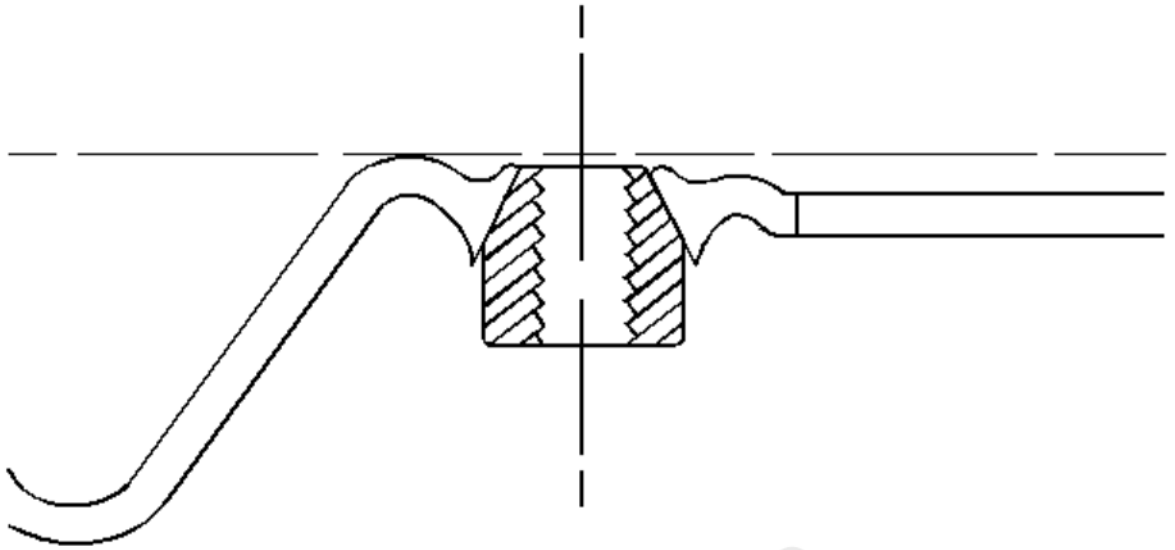


Fig. 5: Inspecting Mounting Wheel/Nut Holes For Damage Caused From Over-Torquing Wheel/Nuts
Courtesy of GENERAL MOTORS COMPANY

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

Step	Action	Yes	No
DEFINITION: Lead/pull is 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?	Go to Step 2	Go to Vehicle Leads/Pulls
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 Tire and Wheel Removal and Installation . 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 Wheel Alignment Measurement
5	1. Cross-switch the left front tire/wheel assembly with the left rear tire/wheel assembly. Refer to Tire and Wheel Removal and Installation . 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 Tire and Wheel Removal and Installation . 2. Road test the vehicle on a smooth level surface. Does the vehicle still lead/pull?	Go to Wheel Alignment Measurement	Go to Step 8
7	Replace the left rear tire. Is the repair complete?	Go to Step 9	-
8	Replace the right rear tire. 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 tire prep to clean the leak area.
9. Apply 3 mm (0.12 in) thick layer of adhesive/sealant to the leak area. Refer to [Adhesives, Fluids, Lubricants, and Sealers](#).
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. Inflate the tire to the manufactures specified pressure as stated on the tire.
14. Submerge the tire/wheel into a water bath in order ensure the leak is sealed.
15. Balance the tire and wheel. Refer to [Tire and Wheel Assembly Balancing - On-Vehicle](#).
16. Install the tire and wheel. Refer to [Tire and Wheel Removal and Installation](#).
17. Lower the vehicle.

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 center cap, if equipped.

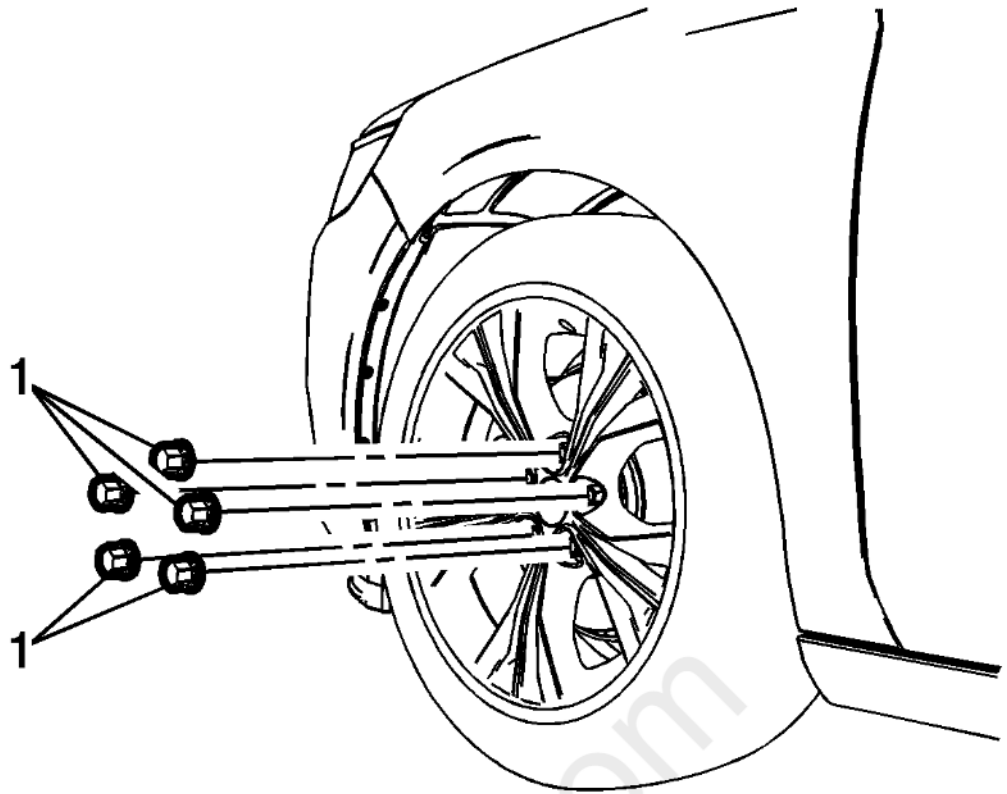


Fig. 6: Wheel Nut Caps

Courtesy of GENERAL MOTORS COMPANY

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

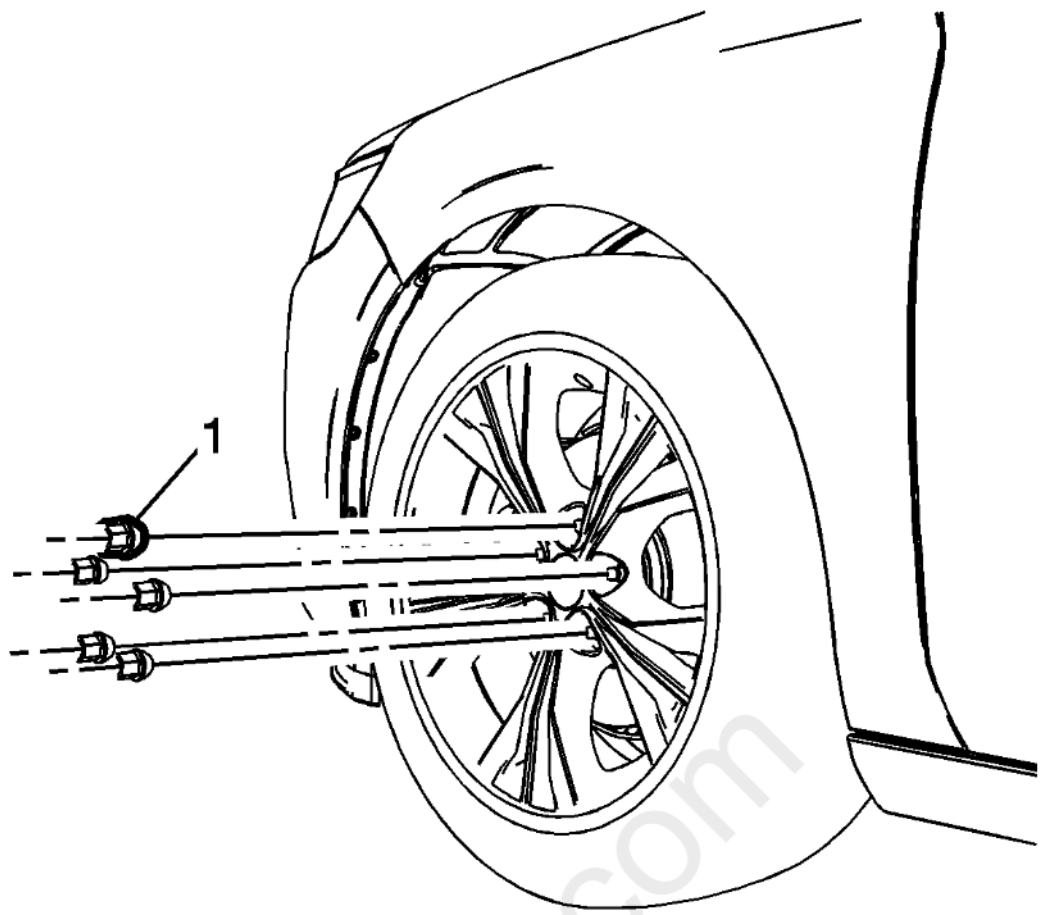


Fig. 7: Wheel Nuts

Courtesy of GENERAL MOTORS COMPANY

4. Remove the wheel nuts (1).

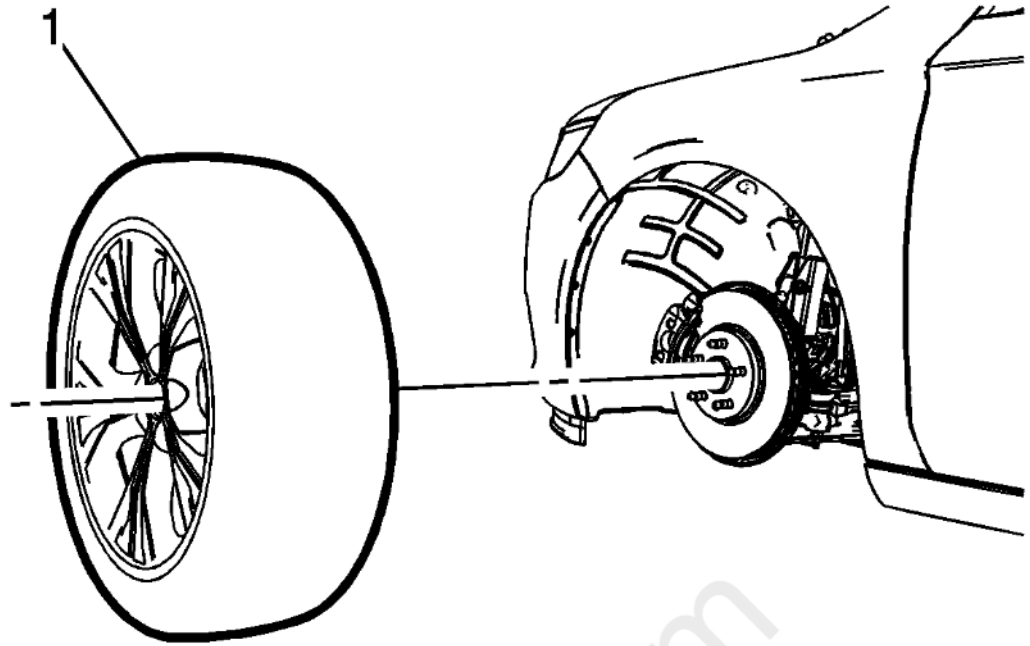


Fig. 8: Tire And Wheel Assembly

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.

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](#).

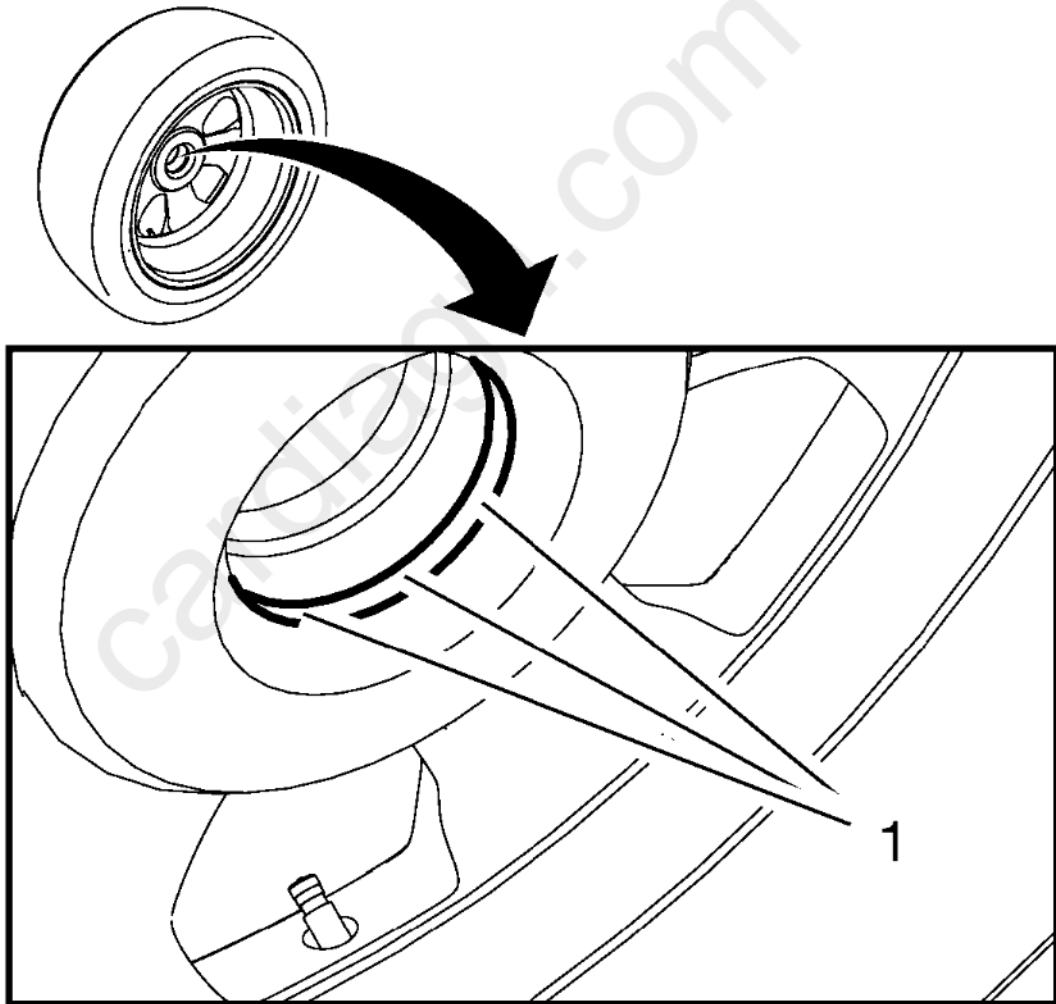


Fig. 9: Wheel Hub Pilot Hole

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](#).

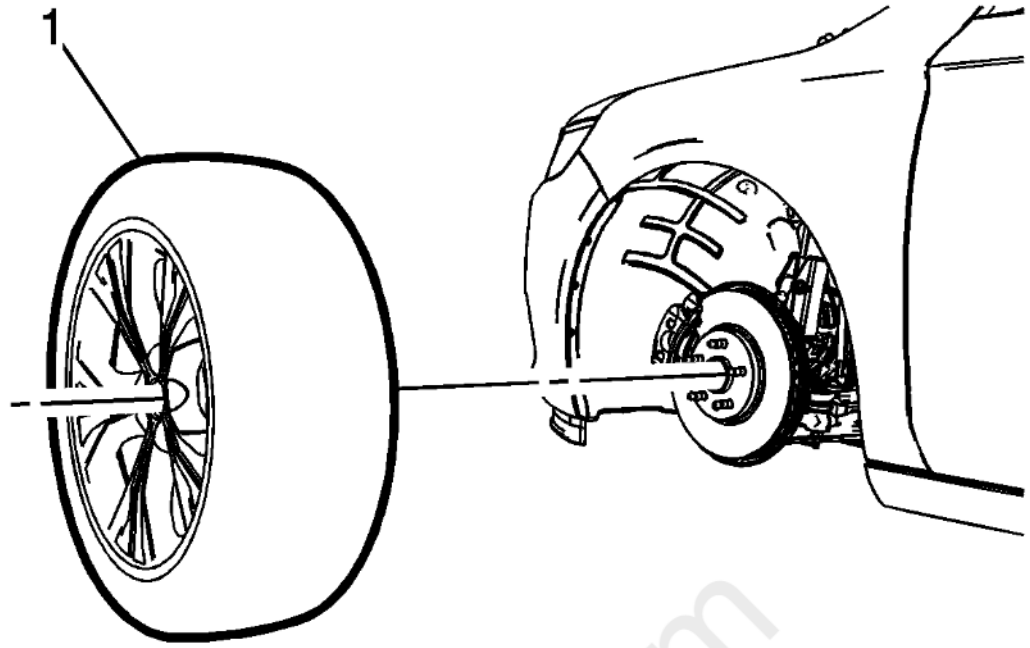


Fig. 10: Tire And Wheel Assembly

Courtesy of GENERAL MOTORS COMPANY

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

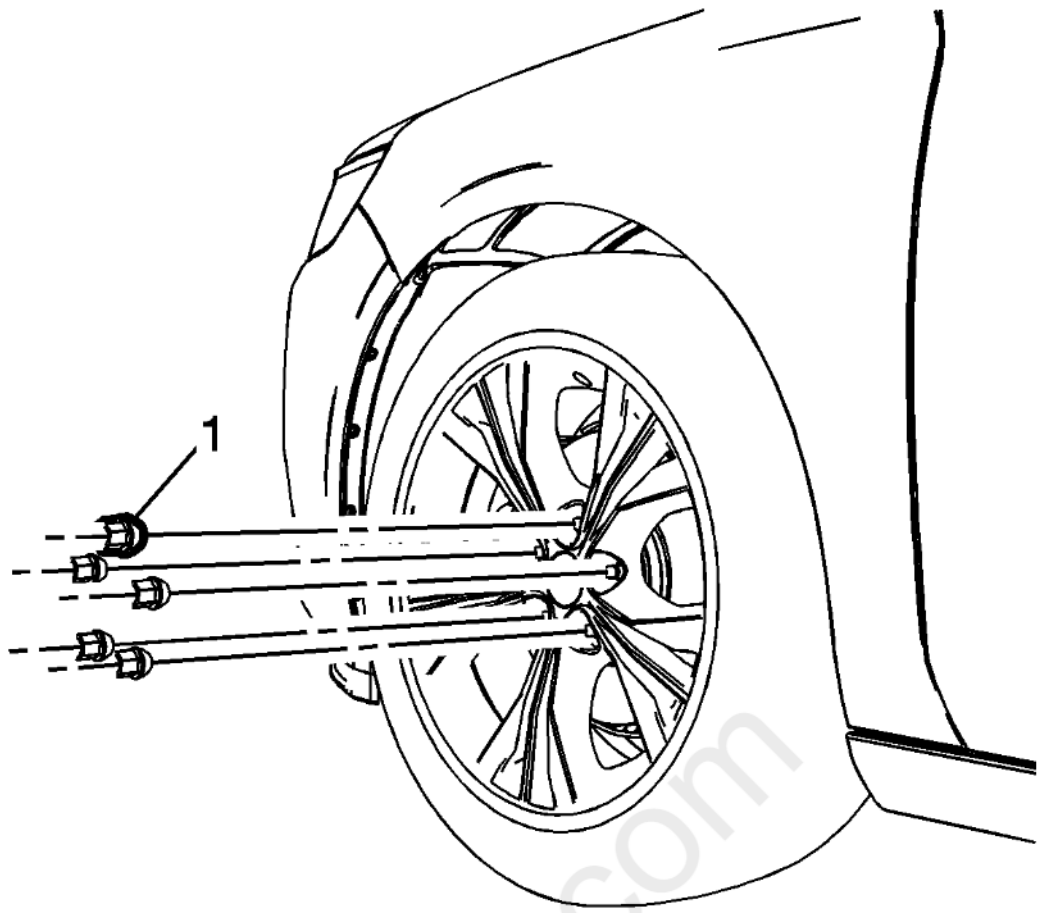


Fig. 11: Wheel Nuts

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).

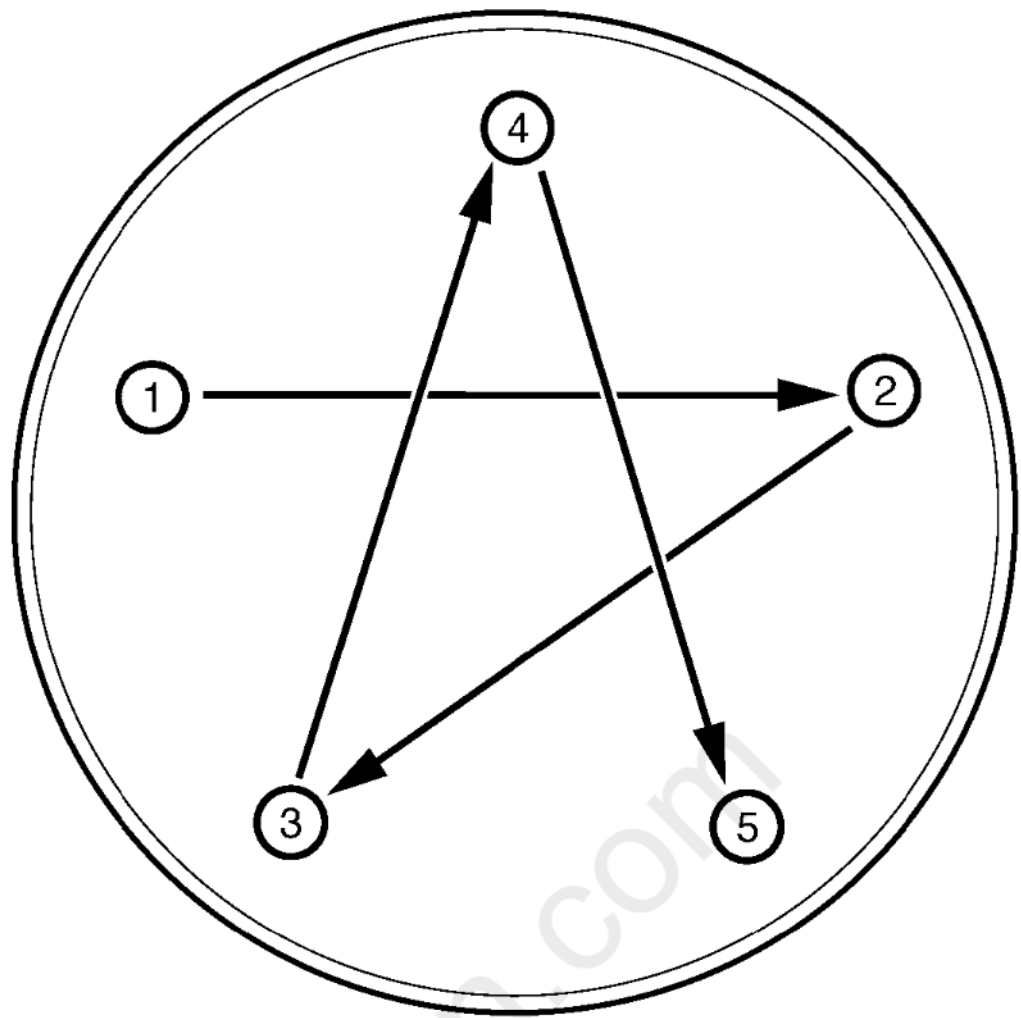


Fig. 12: Wheel Nut Tightening Sequence

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 150 N.m (111 lb ft) in the sequence illustrated.

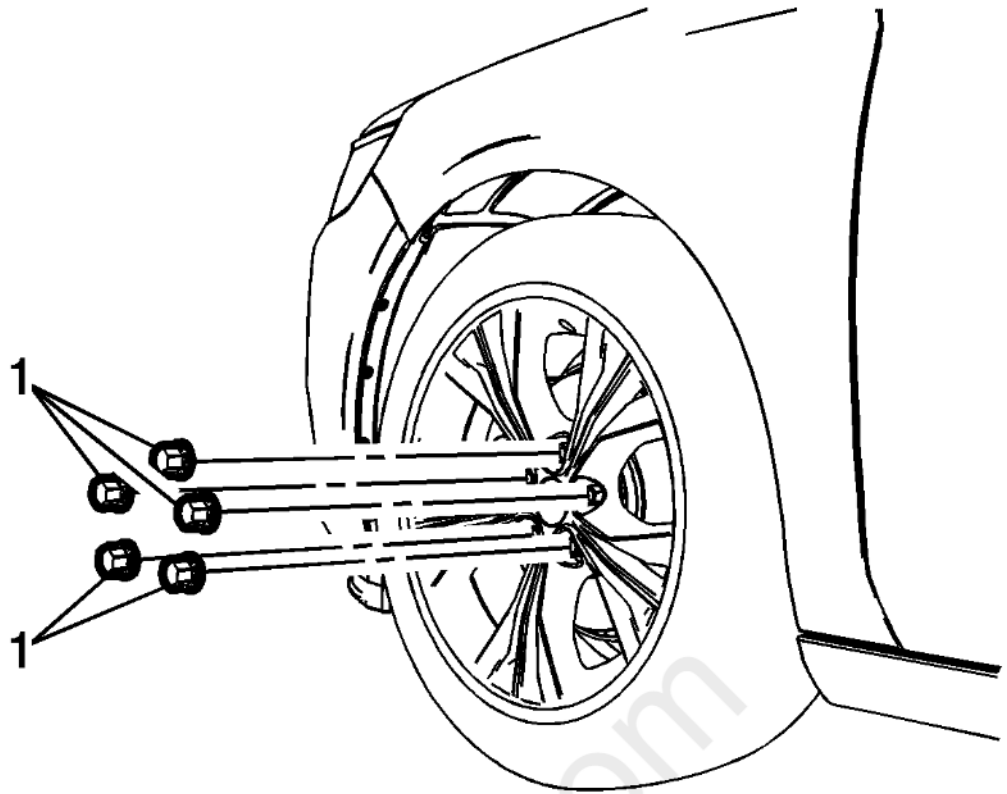


Fig. 13: Wheel Nut Caps

Courtesy of GENERAL MOTORS COMPANY

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

TIRE REPAIR

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.

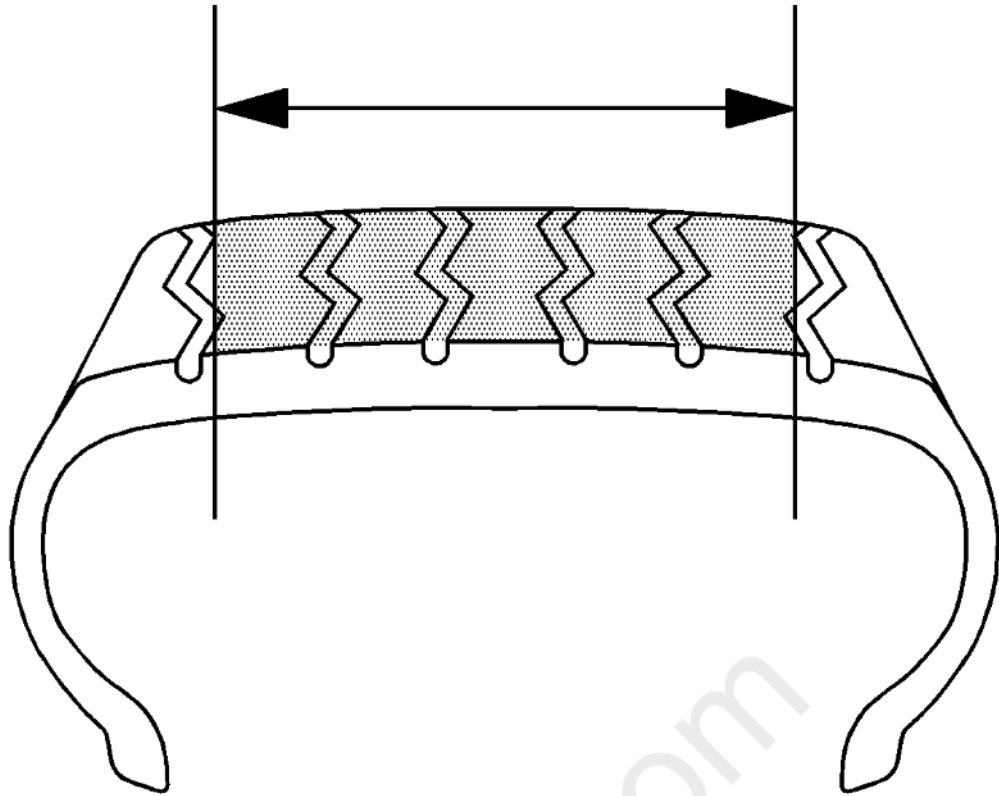


Fig. 14: Identifying Repairable Area On Radial Tire
Courtesy of GENERAL MOTORS COMPANY

Repairable area on a radial tire.

NOTE:

- **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/manufacturer 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

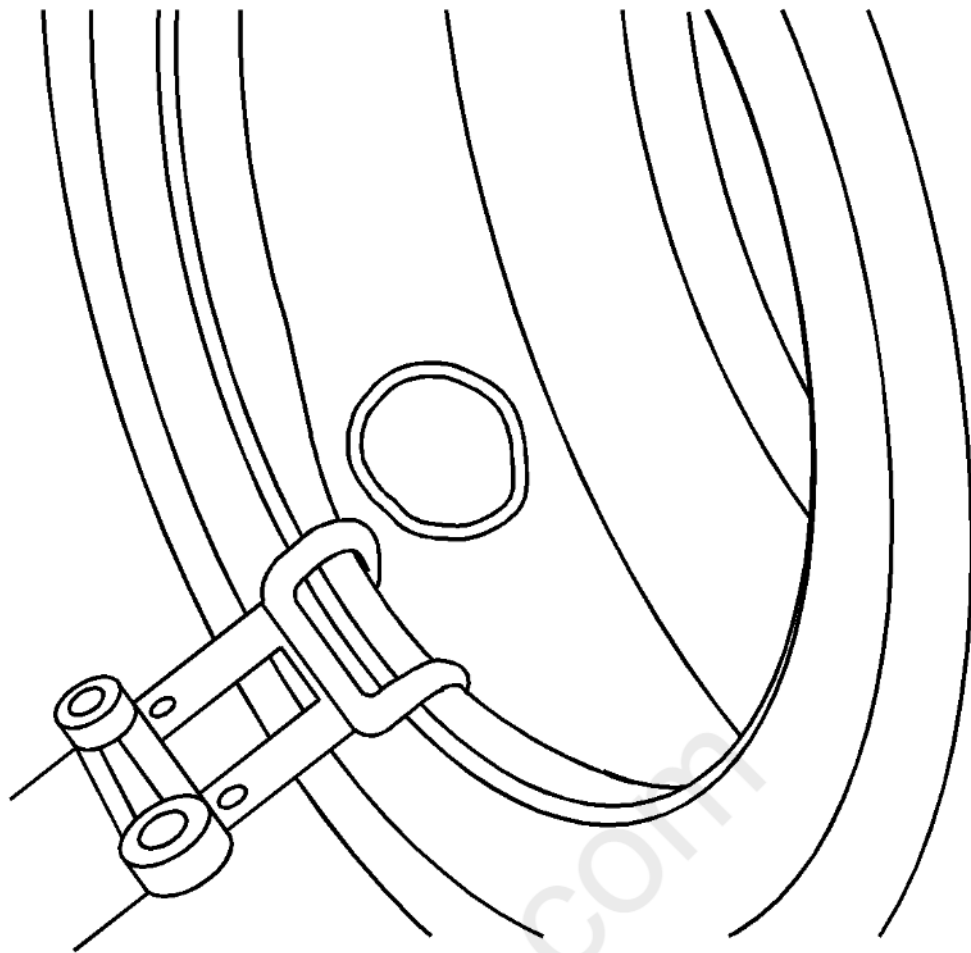


Fig. 15: Marking Tire Puncture Location

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

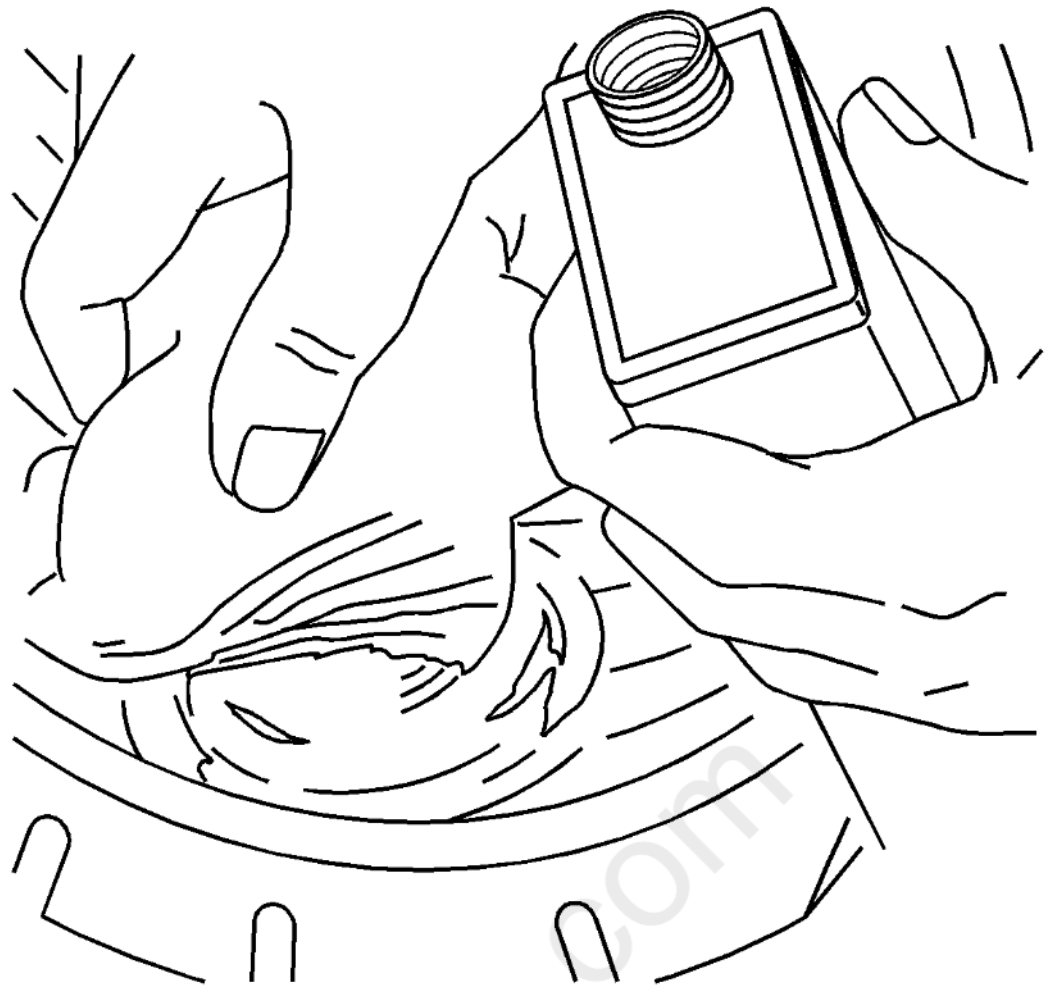


Fig. 16: Cleaning Repair Area

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

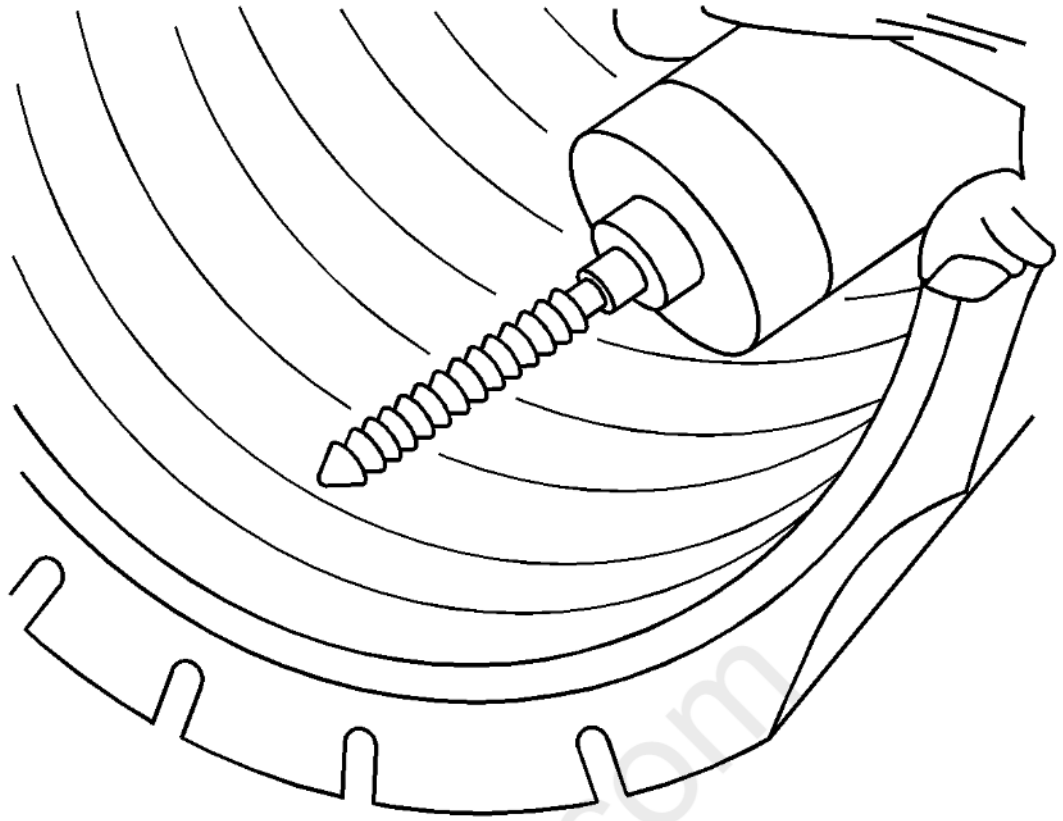


Fig. 17: Reaming Puncture Channel

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

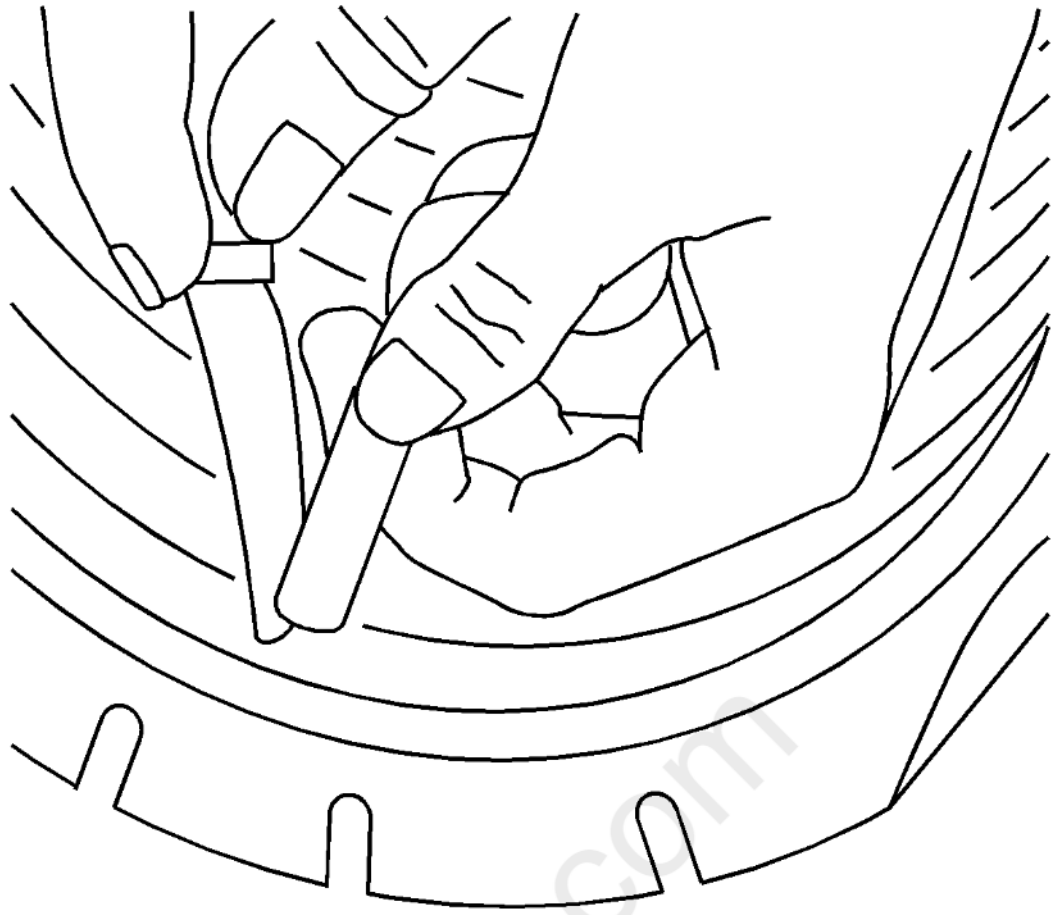


Fig. 18: Filling Injury Channel

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

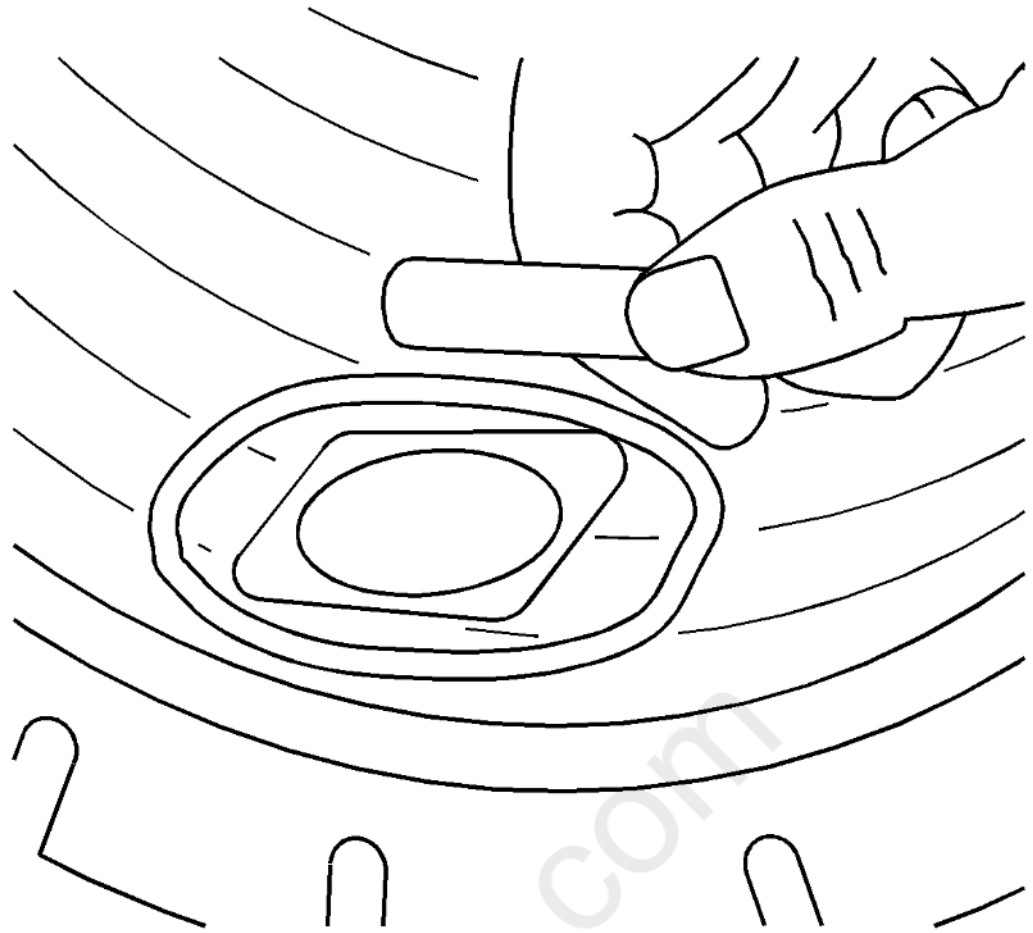


Fig. 19: Centering Repair Unit

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

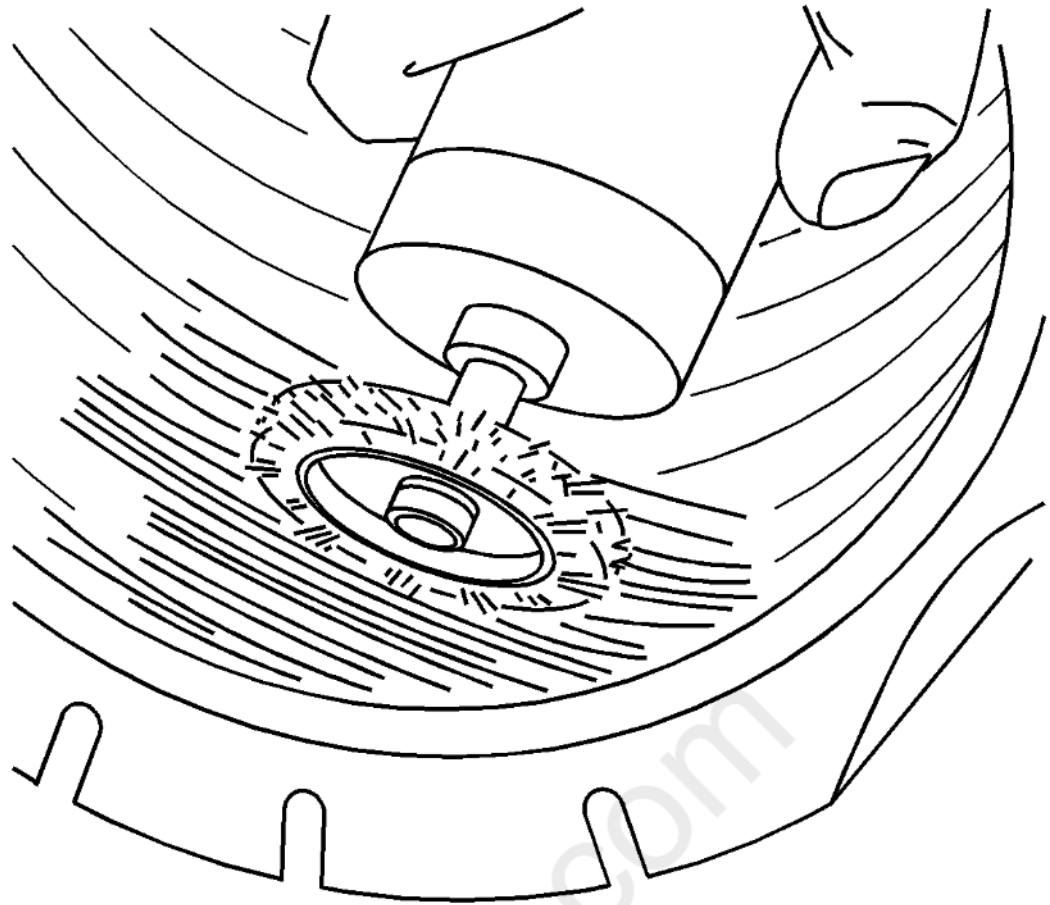


Fig. 20: Buffing Within Marked Area

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

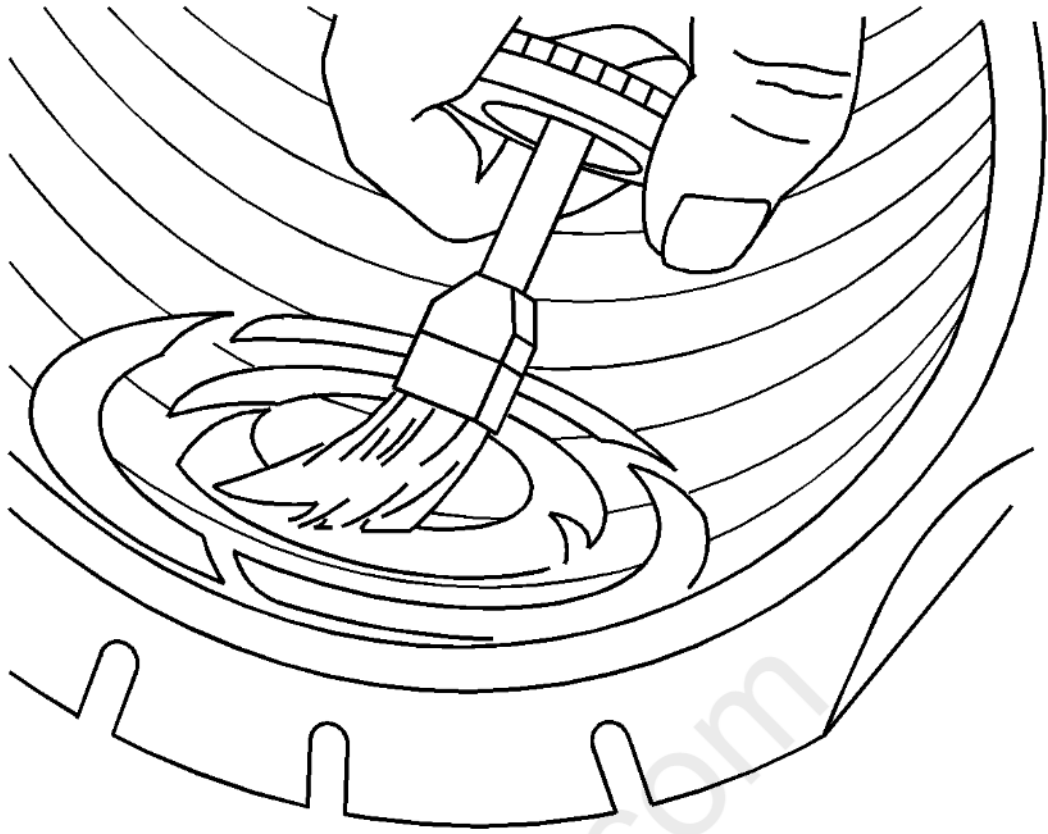


Fig. 21: Applying Chemical Cement

Courtesy of GENERAL MOTORS COMPANY

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

Repair Unit Application

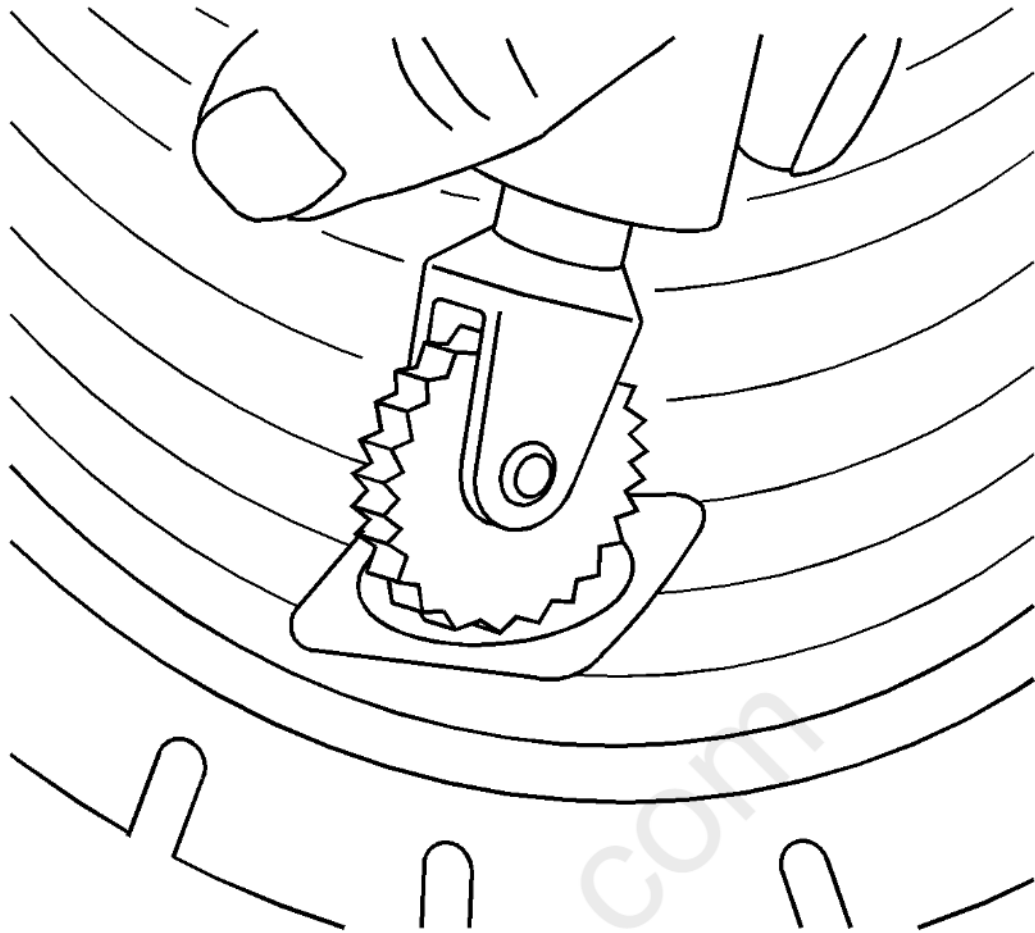


Fig. 22: Stitching Repair Unit

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.

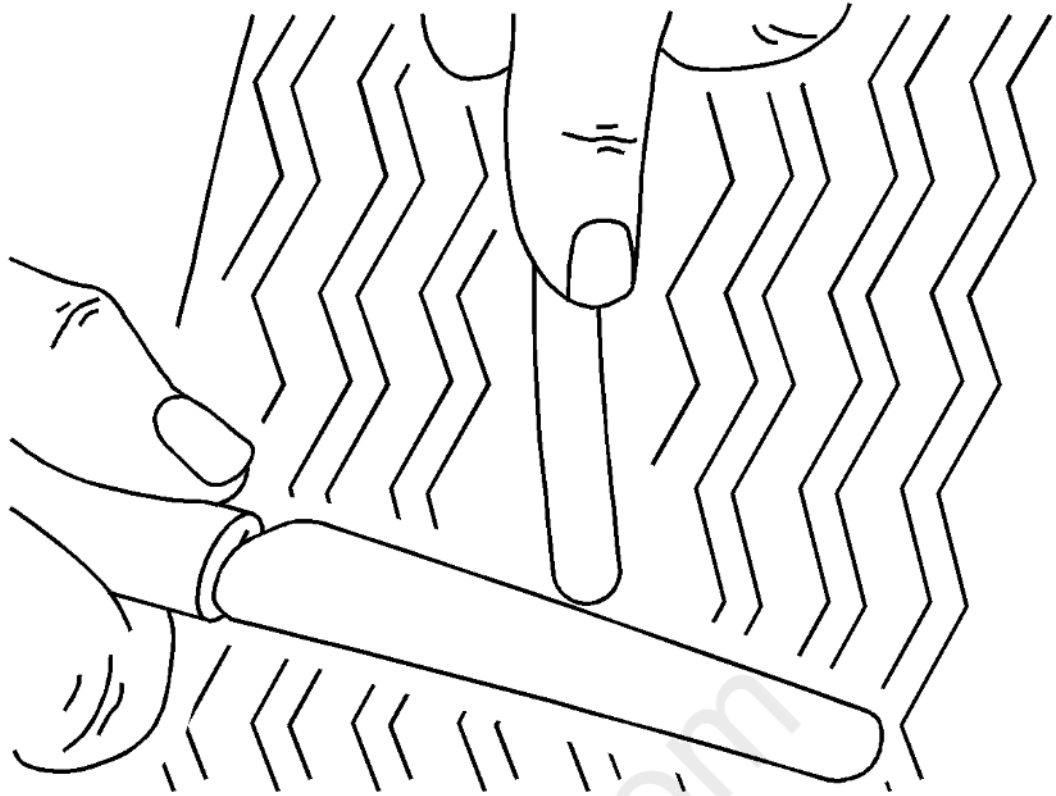


Fig. 23: Cutting Plug Material

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

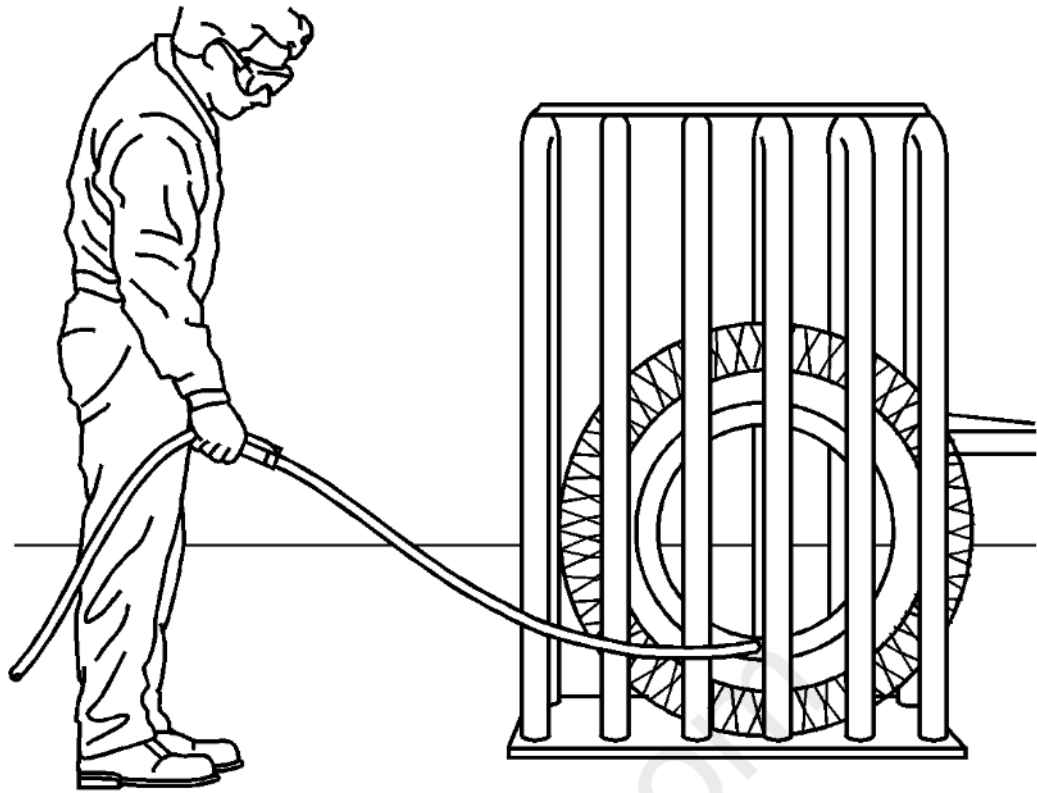


Fig. 24: Tire Safety Cage

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

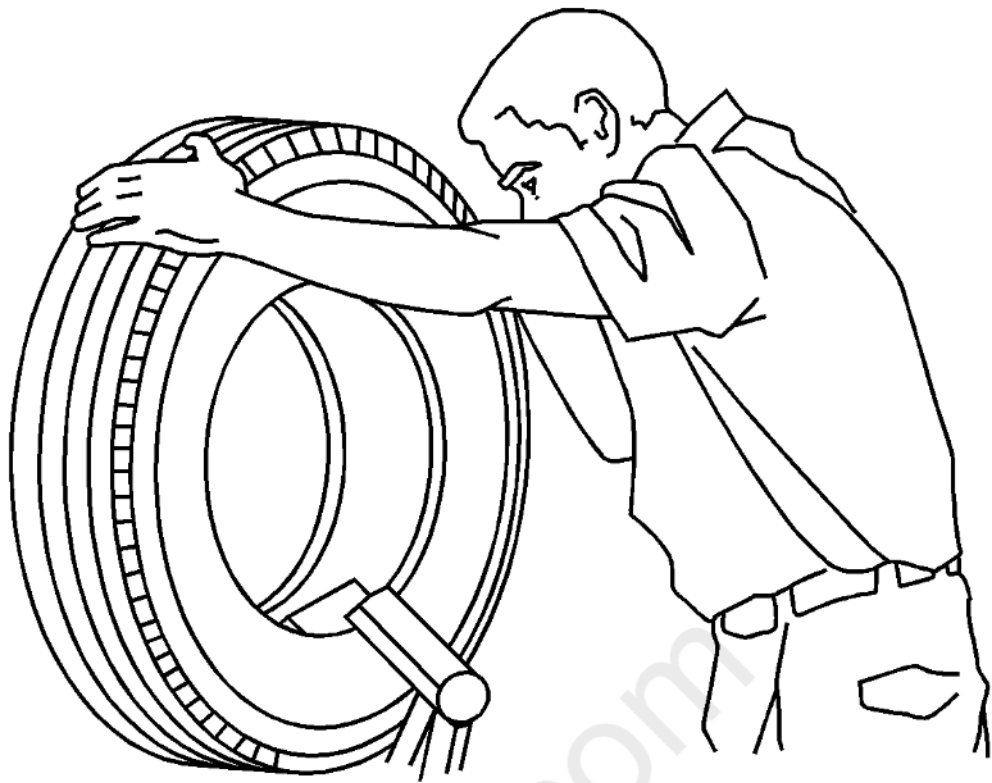


Fig. 25: Performing Final Inspection

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.

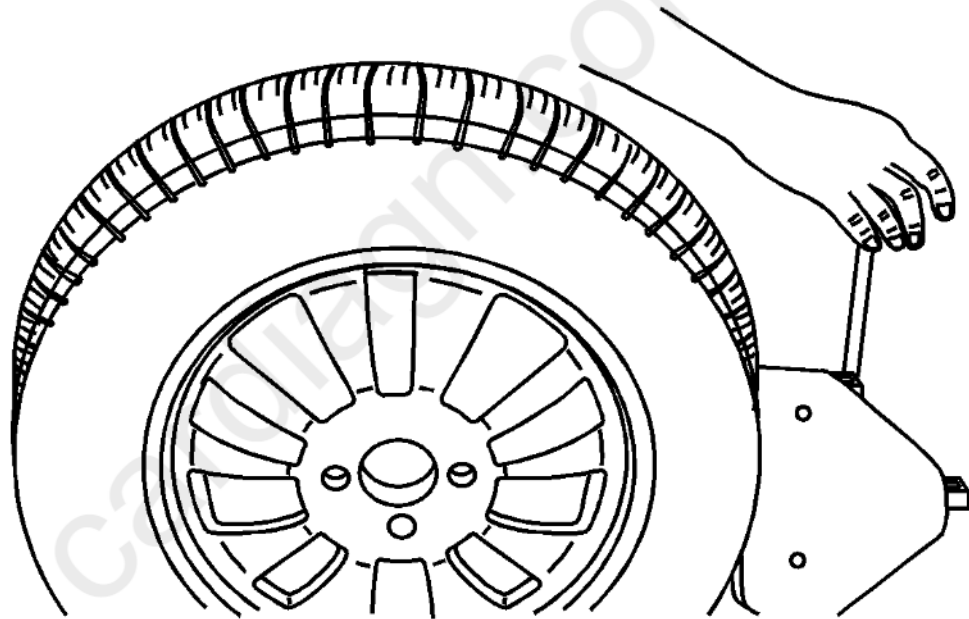


Fig. 26: Using Bead Breaking Fixture

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.

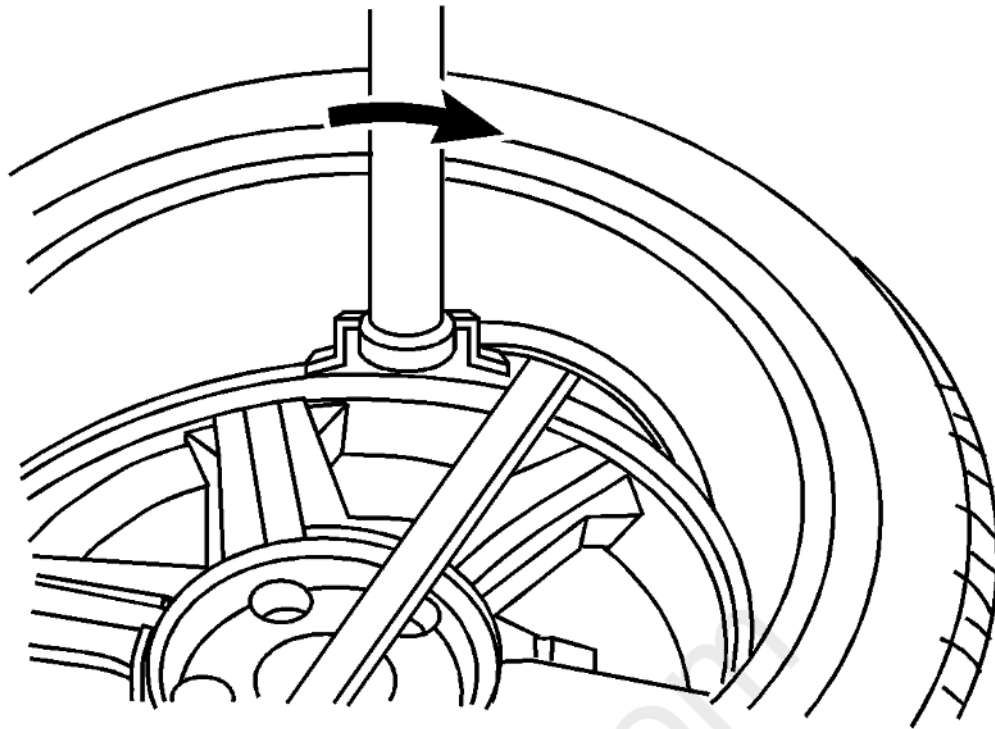


Fig. 27: Separating Tire Bead From Wheel
Courtesy of GENERAL MOTORS COMPANY

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](#).
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](#).

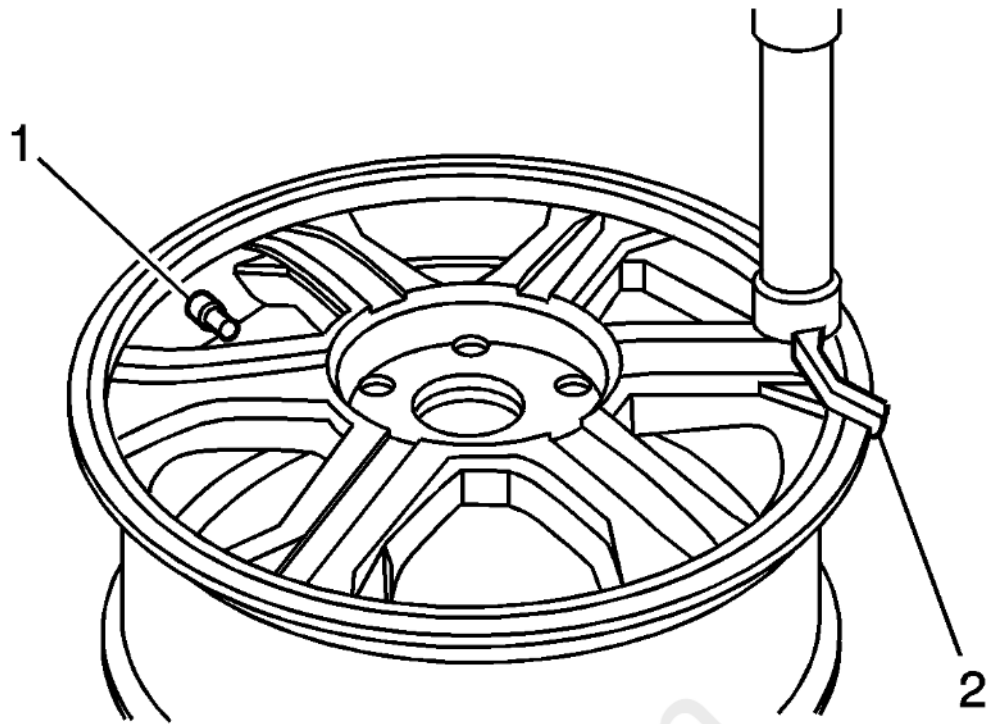


Fig. 28: Position Rim So Valve Stem Is At 7 O'clock Position Relative To Head
Courtesy of GENERAL MOTORS COMPANY

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.

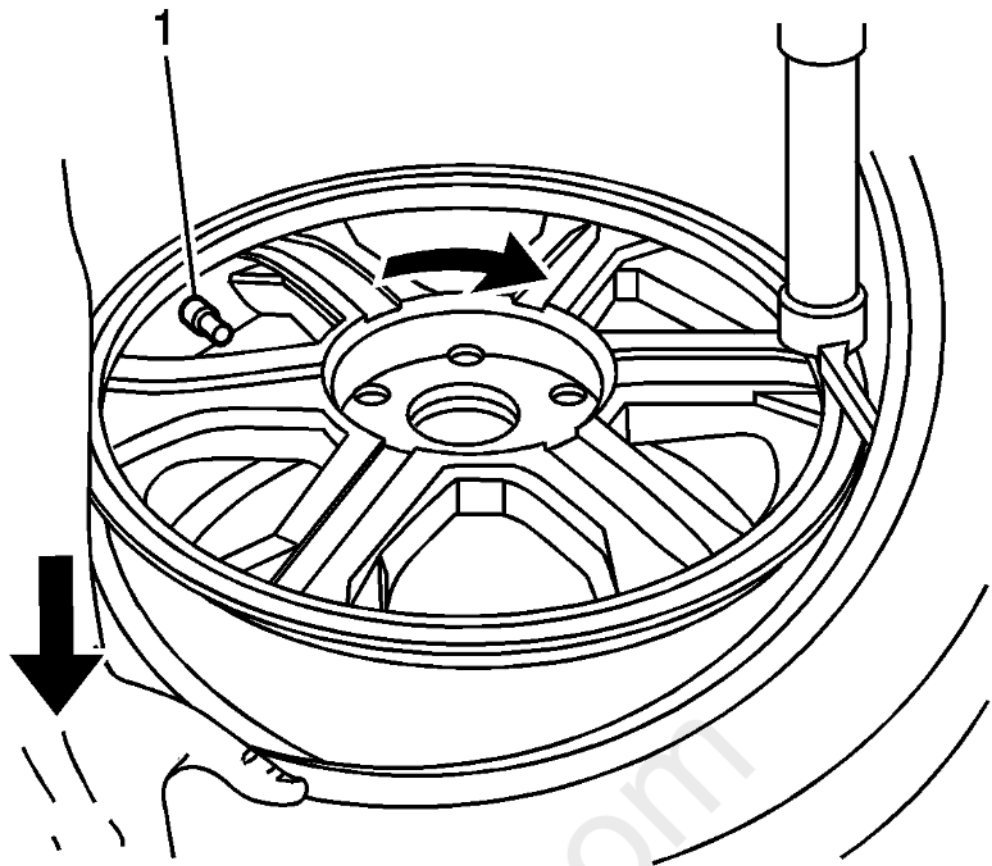


Fig. 29: Ensure Valve Stem Is At 7 O'clock Position

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.

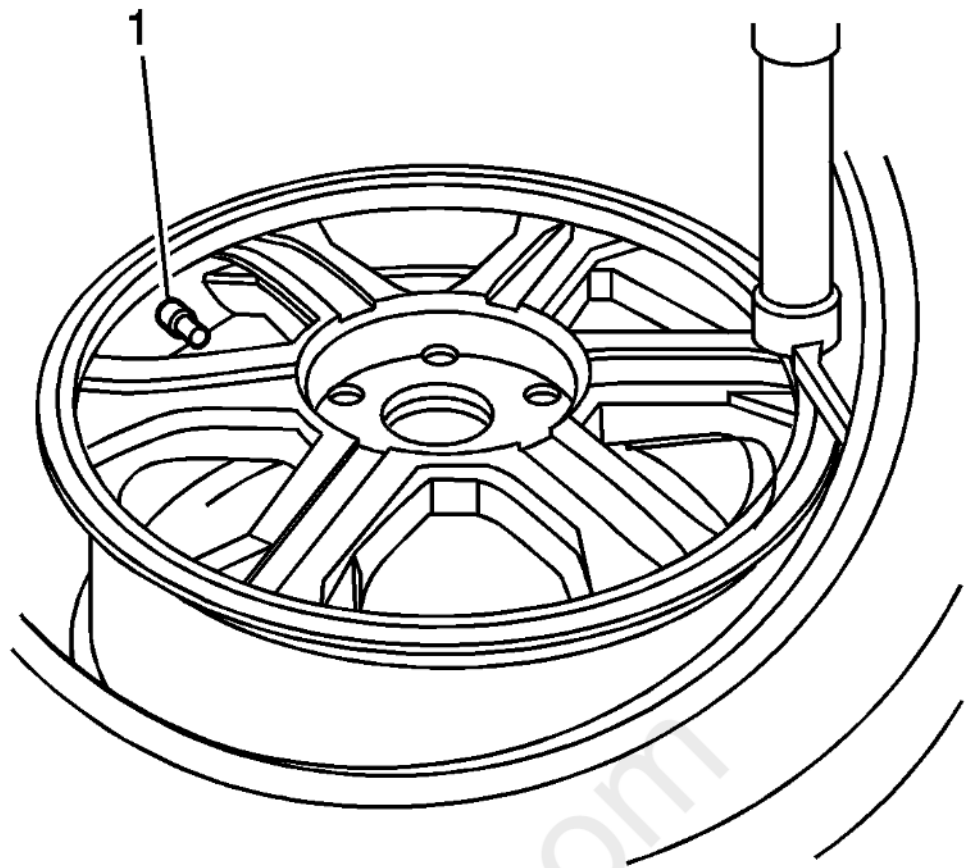


Fig. 30: Reposition Wheel And Tire So Valve Stem Is At 7 O'clock Position Relative To Head
Courtesy of GENERAL MOTORS COMPANY

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.

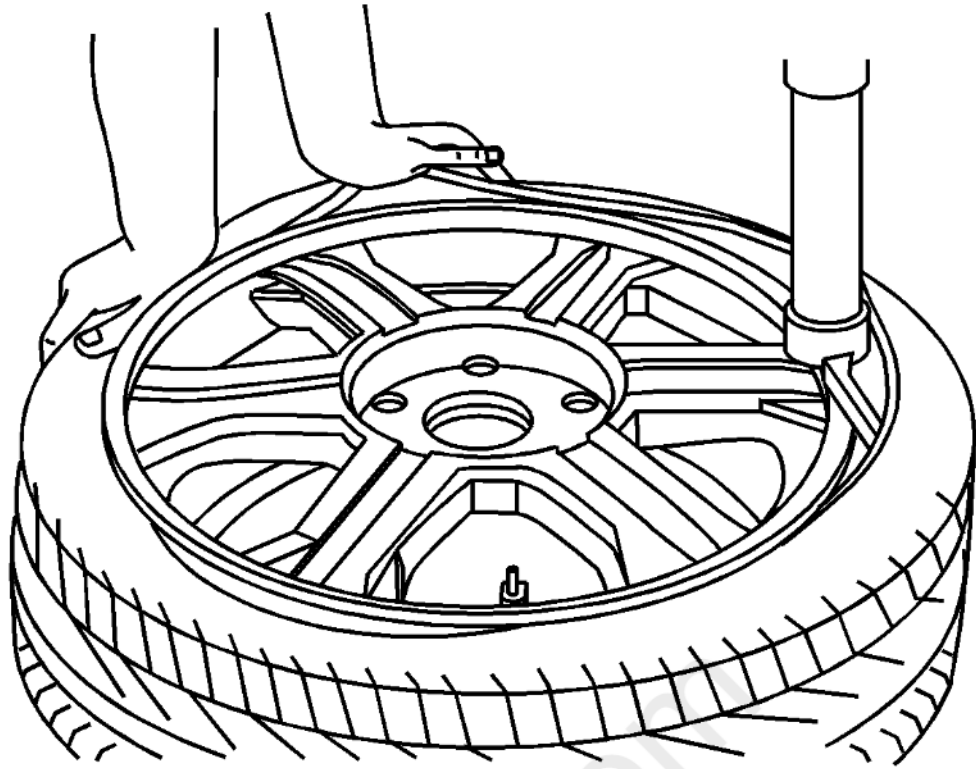


Fig. 31: Using Tire Changer

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

Rotate the tires and wheels at frequent intervals to equalize wear. Refer to tire rotation in Maintenance and Lubrication. 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](#) for tire removal.

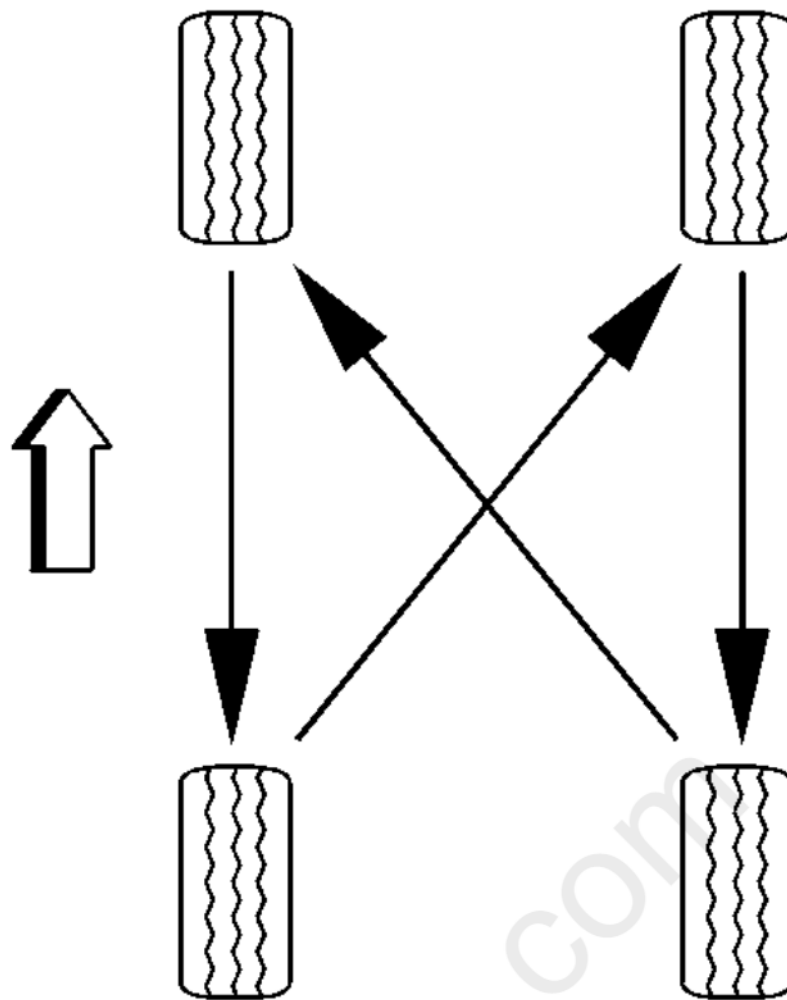


Fig. 32: Identifying Tire Rotation Pattern

Courtesy of GENERAL MOTORS COMPANY

Always use a 4-wheel rotation. After rotation, check the wheel nuts for specified torque. Then, set the tire pressure.

TIRE AND WHEEL BALANCING

WARNING: Failure to adhere to the following precautions before tire balancing can result in personal injury or damage to components:

- Clean away any dirt or deposits from the inside of the wheels.
- Remove any stones from the tread.
- Wear eye protection.
- Use coated weights on aluminum wheels.

Tire and Wheel Assembly Balancer Calibration

Tire and wheel balancers can drift out of calibration over time, or can become inaccurate as a result of heavy use. There will likely not be any visual evidence that a calibration problem exists. If a balancer is not calibrated within specifications, and a tire and wheel assembly is balanced on that machine, the assembly may actually be imbalanced.

Tire and wheel assembly balancer calibration should be checked approximately every 2 weeks, if the machine is used frequently, and/or whenever the balance readings are questionable.

Tire and Wheel Assembly Balancer Calibration Test

NOTE: If the balancer fails any of the steps in this calibration test, the balancer should be calibrated according to the manufacturer's instructions. If the balancer cannot be calibrated, contact the manufacturer for assistance.

Inspect the calibration of the tire and wheel assembly balancer according to the manufacturer's recommendations, or perform the following test.

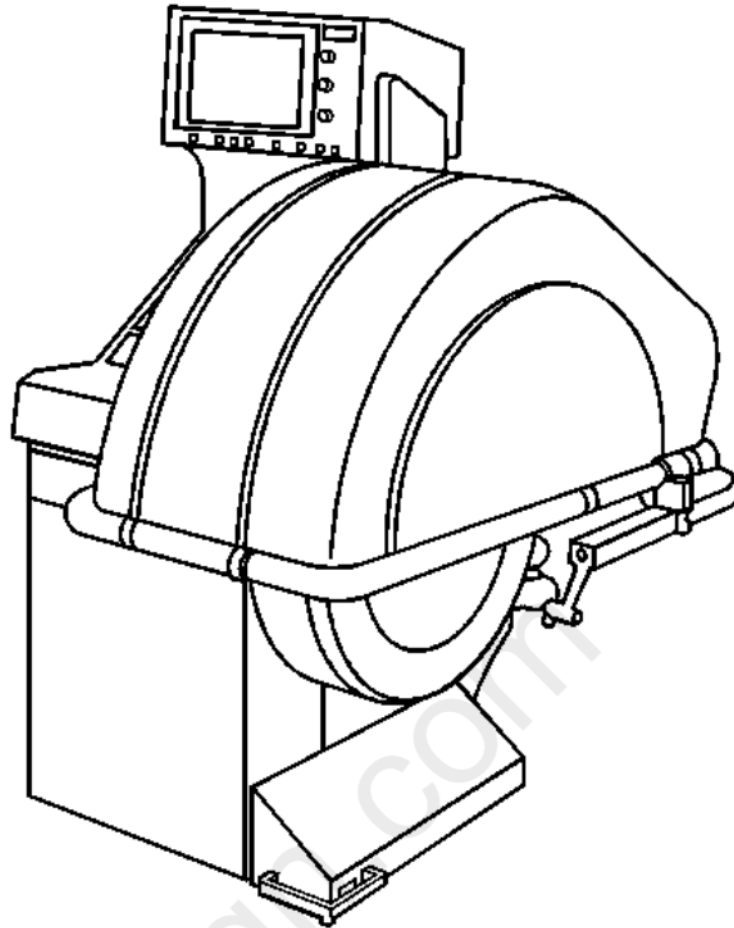


Fig. 33: Tire And Wheel Assembly Balancer
Courtesy of GENERAL MOTORS COMPANY

1. Spin the balancer without a wheel or any of the adapters on the shaft.
2. Inspect the balancer readings.

Specification

Zero within 7 g (1/4 oz)

3. If the balancer is within the specification range, balance a tire and wheel assembly - that is within radial and lateral runout tolerances - to ZERO, using the same balancer.
4. After the tire and wheel assembly has been balanced, add an 85 g (3 oz) test weight to the wheel at any location.
5. Spin the tire and wheel assembly again. Note the readings.
 - In the static and dynamic modes, the balancer should call for 85 g (3 oz) of weight, 180 degrees opposite the test weight.
 - In the dynamic mode, the weight should be called for on the flange of the wheel opposite the test weight.
6. With the assembly imbalanced to 85 g (3 oz), cycle the balancer 5 times.
7. Inspect the balancer readings:

Specification

Maximum variation: 7 g (1/4 oz)

8. Index the tire and wheel assembly on the balancer shaft, 90 degrees from the previous location.
9. Cycle the balancer with the assembly at the new location.

10. Inspect the balancer readings:

Specification

Maximum variation: 7 g (1/4 oz)

11. Repeat steps 8 through 10 until the tire and wheel assembly has been cycled and checked at each of the 4 locations on the balancer shaft.

Tire and Wheel Assembly Balancing Guidelines

NOTE: Tire and wheel assemblies which exhibit excessive runout can produce vibrations even if the assemblies are balanced.

It is strongly recommended that the tire and wheel assembly runout be measured and corrected if necessary **BEFORE** the assemblies are balanced.

If the runout of the tire and wheel assemblies has not yet been measured, refer to [Tire and Wheel Assembly Runout Measurement - Off Vehicle](#) before proceeding.

There are 2 types of tire and wheel balance:

Static Balance

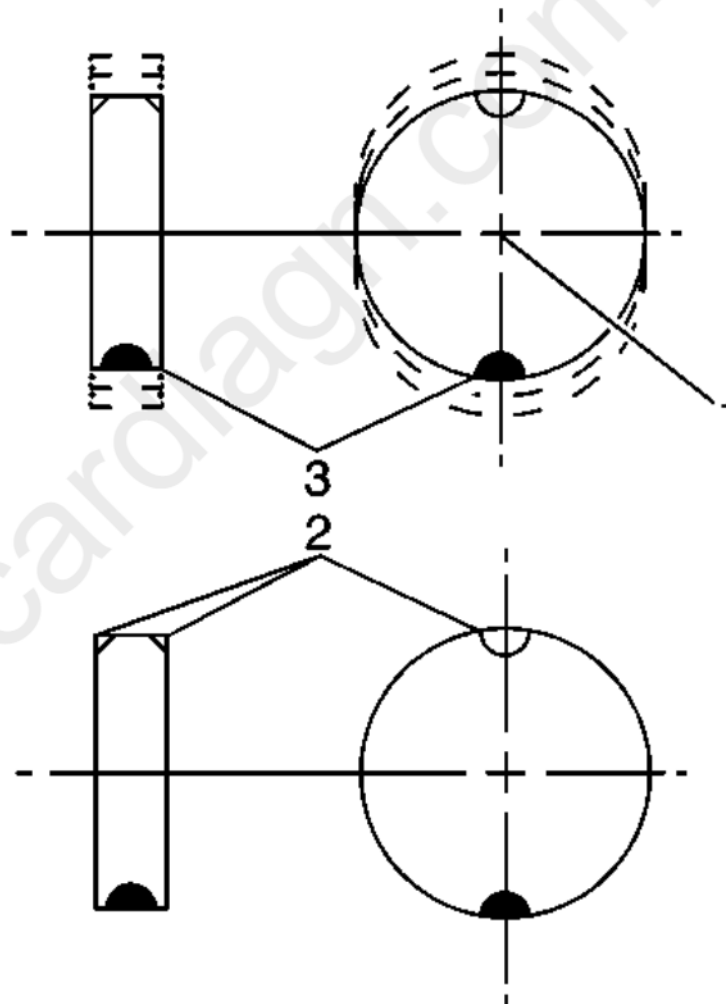


Fig. 34: Identifying Static Balance

Courtesy of GENERAL MOTORS COMPANY

Static balance is the equal distribution of weight around the wheel circumference. The wheel balance weights (2) are positioned on the wheel in order to offset the effects of a heavy spot (3). Wheels that have static imbalance can produce a bouncing action called tramp.

Dynamic Balance

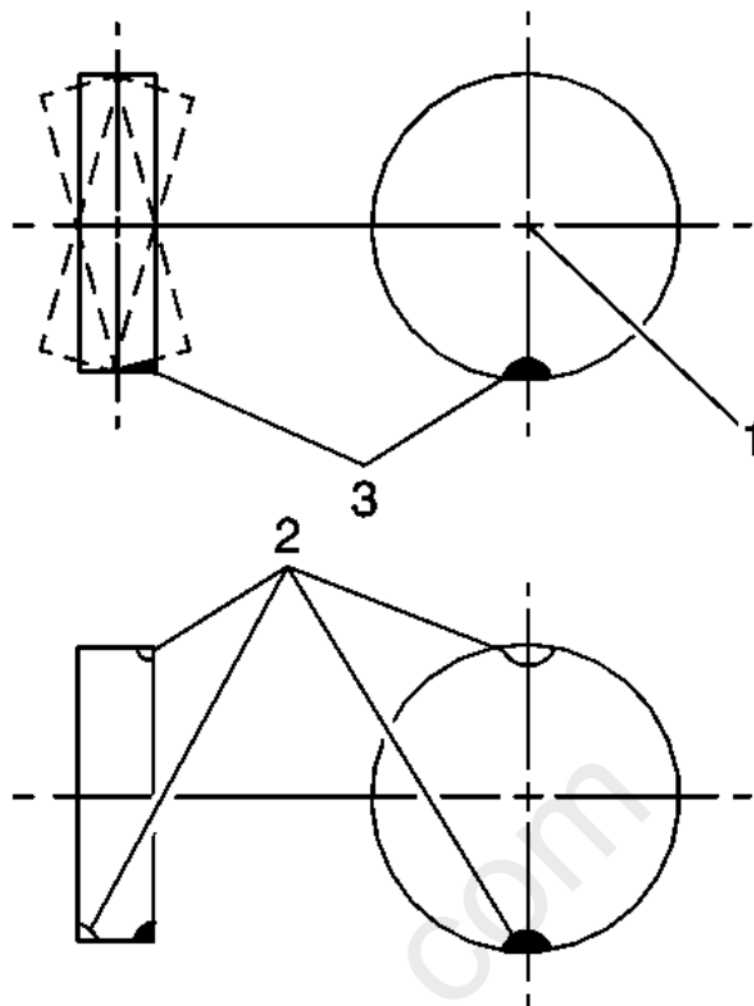


Fig. 35: Identifying Dynamic Balance

Courtesy of GENERAL MOTORS COMPANY

Dynamic balance is the equal distribution of weight on each side of the tire and wheel assembly centerline. The wheel balance weights (2) are positioned on the wheel in order to offset the effects of a heavy spot (3). Wheels that have dynamic imbalance have a tendency to move from side to side and can cause an action called shimmy.

Most off-vehicle balancers are capable of checking both types of balance simultaneously.

As a general rule, most vehicles are more sensitive to static imbalance than to dynamic imbalance; however, vehicles equipped with low profile, wide tread path, high performance tires and wheels are susceptible to small amounts of dynamic imbalance. As little as 14 - 21 g (1/2 - 3/4 oz) imbalance is capable of inducing a vibration in some vehicle models.

Balancing Procedure

NOTE: When balancing tire and wheel assemblies, use a known good, recently calibrated, off-vehicle, two-plane dynamic balancer set to the finest balance mode available.

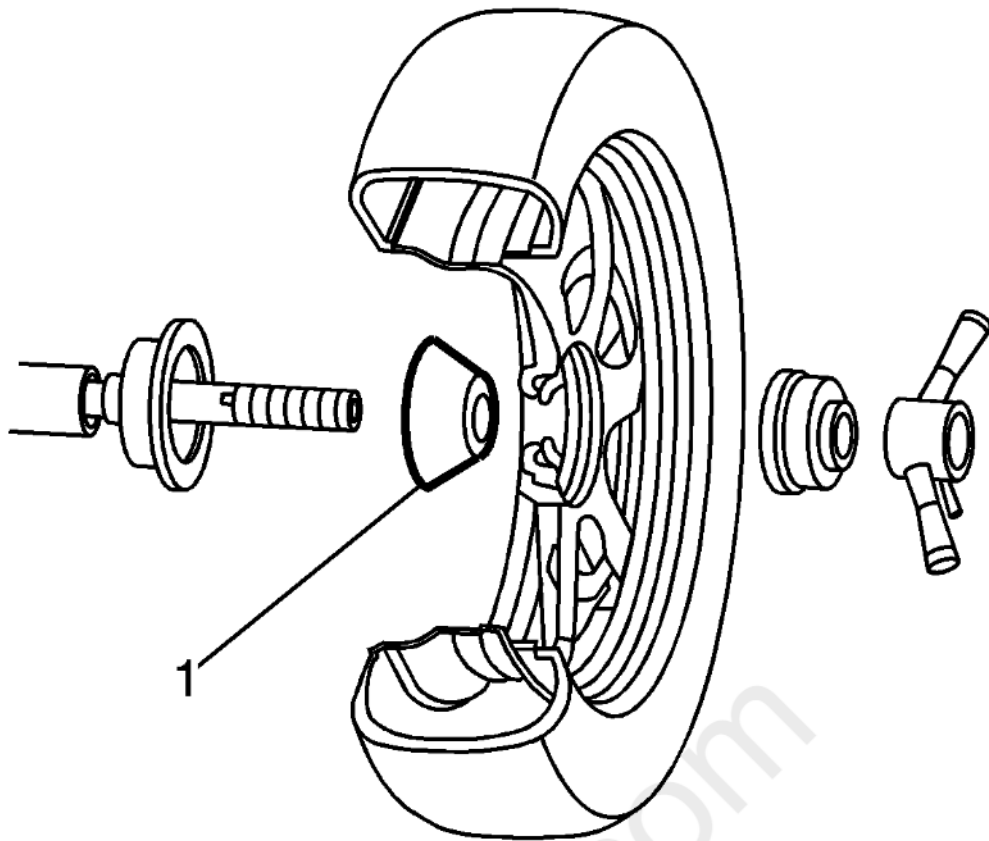


Fig. 36: Wheel Balancer Center Cone

Courtesy of GENERAL MOTORS COMPANY

NOTE: Carefully follow the wheel balancer manufacturers's instructions for proper mounting of the center cone (1).

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#)
2. Mark the location of the wheels to the wheel studs and mark the specific vehicle position on each tire and wheel - LF, LR, RF, RR.
3. Remove the tire and wheel assemblies one at a time and mount on a spin-type wheel balancer. Refer to [Tire and Wheel Removal and Installation](#)
4. Carefully follow the wheel balancer manufacturer's instructions for proper mounting techniques to be used on different types of wheels.

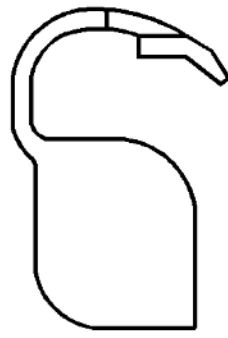
Regard aftermarket wheels, especially those incorporating universal lug patterns, as potential sources of runout and mounting concerns.

5. Be sure to use the correct type of wheel balance weights for the type of wheel rim being balanced. Be sure to use the correct type of coated wheel balance weights on aluminum wheels. Refer to Wheel Weight Usage.
6. Balance all four tire and wheel assemblies as close to zero as possible.
7. Using the matchmarks made prior to removal, install the tire and wheel assemblies to the vehicle. Refer to [Tire and Wheel Removal and Installation](#)
8. Lower the vehicle.

Wheel Weight Usage

Tire and wheel assemblies can be balanced using either the static or dynamic method.

Clip-on Weights



1



4



2



3

Fig. 37: Identifying Clip-On Wheel Weight Types
Courtesy of GENERAL MOTORS COMPANY

NOTE: When balancing factory aluminum wheels with clip-on wheel balance weights, be sure to use special polyester-coated weights. These coated weights reduce the potential for corrosion and damage to aluminum wheels.

These coated weights reduce the potential for corrosion and damage to aluminum wheels.

- MC (1) and AW (2) series weights are approved for use on aluminum wheels.
- P (3) series weights are approved for use on steel wheels only.
- T (4) series coated weights are approved for use on both steel and aluminum wheels.

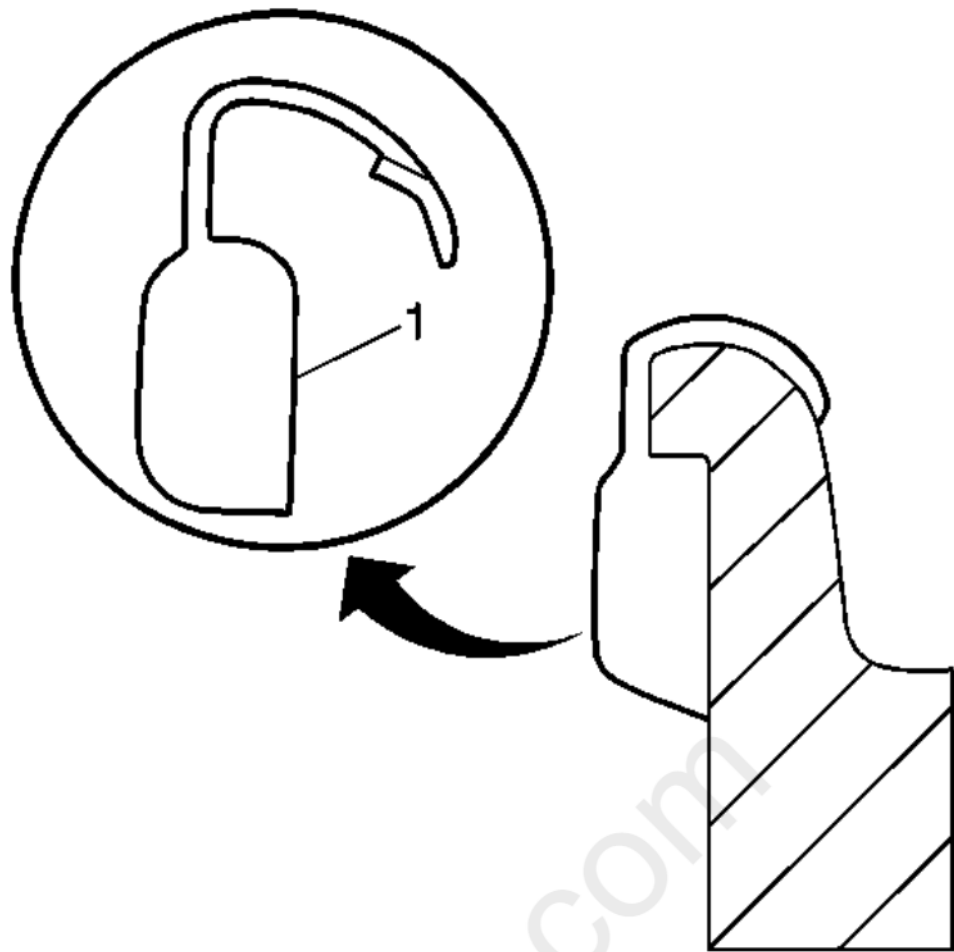


Fig. 38: Attaching Clip-On Wheel Weight

Courtesy of GENERAL MOTORS COMPANY

NOTE: Use a nylon or plastic-tipped hammer when installing coated clip-on wheel balance weights to minimize the possibility of damage to the polyester coating.

The contour and style of the wheel rim flange will determine which type of clip-on wheel weight (1) should be used. The weight should follow the contour of the rim flange. The weight clip should firmly grip the rim flange.

Wheel Weight Placement - Clip-on Weights

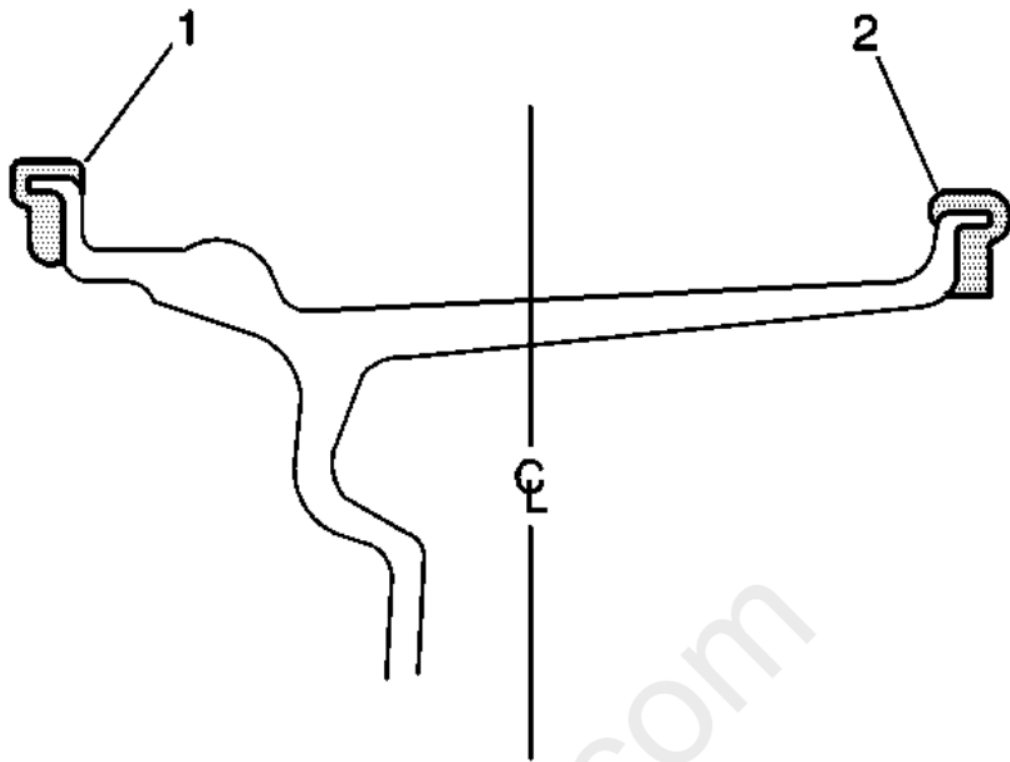


Fig. 39: Clip-On Weight Placement

Courtesy of GENERAL MOTORS COMPANY

When static balancing, locate the wheel balance weights on the inboard flange (2) if only 28 g (1 oz) or less is called for. If more than 28 g (1 oz) is called for, split the weights as equally as possible between the inboard (2) and outboard (1) flanges.

When dynamic balancing, locate the wheel balance weights on the inboard (2) and outboard (1) rim flanges at the positions specified by the wheel balancer.

Adhesive Weights

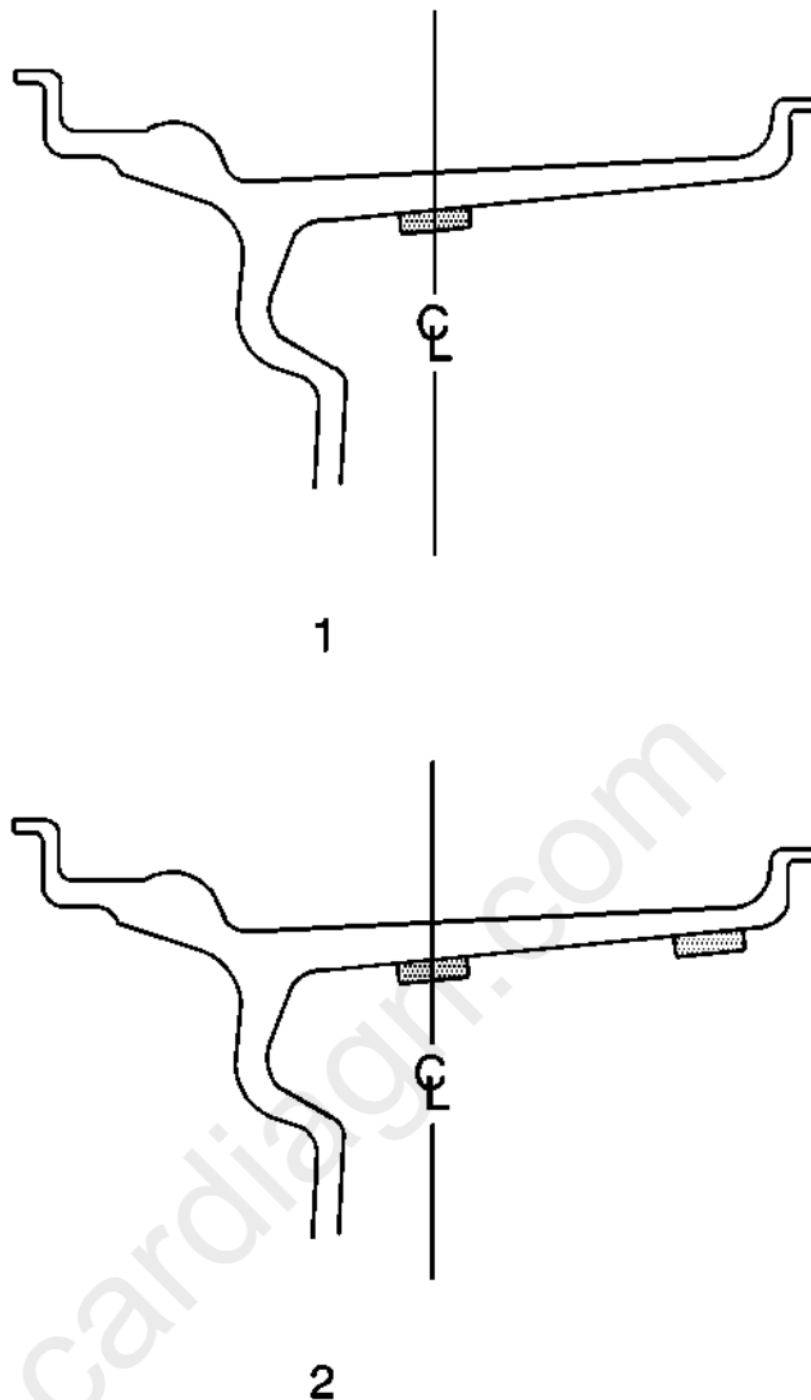


Fig. 40: Adhesive Wheel Weight Placement
Courtesy of GENERAL MOTORS COMPANY

NOTE: When installing adhesive balance weights on flangeless wheels, do NOT install the weight on the outboard surface of the rim.

Adhesive wheel balance weights may be used on factory aluminum wheels. Perform the following procedure to install adhesive wheel balance weights.

1. Determine the correct areas for placement of the wheel weights on the wheel.
 - When static balancing, locate the wheel balance weights along the wheel centerline (1) on the inner wheel surface if only 28 g (1 oz) or less is called for. If more than 28 g (1 oz) is called for, split the weights as equally as possible between the wheel centerline and the inboard edge of the inner wheel surface (2).
 - When dynamic balancing, locate the wheel balance weights along the wheel centerline and the inboard edge of the inner wheel surface (2) at the positions specified by the wheel balancer.
2. Ensure that there is sufficient clearance between the wheel weights and brake system components.

NOTE: Do not use abrasives to clean any surface of the wheel.

3. Using a clean cloth or paper towel with a general purpose cleaner, thoroughly clean the designated balance weight attachment areas of any corrosion, overspray, dirt or any other foreign material.
4. To ensure there is no remaining residue, wipe the balance weight attachment areas again, using a clean cloth or paper towel with a mixture of half isopropyl alcohol and half water.
5. Dry the attachment areas with hot air until the wheel surface is warm to the touch.
6. Warm the adhesive backing on the wheel balance weights to room temperature.
7. Remove the protective covering from the adhesive backing on the back of the balance weights. DO NOT touch the adhesive surface.
8. Apply the wheel balance weights to the wheel, press into place with hand pressure.
9. Secure the wheel balance weights to the wheel with a 90 N (21 lb) force applied with a roller.

DESCRIPTION AND OPERATION

ALL SEASONS TIRES DESCRIPTION

Steel belted all-season radial 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.

GENERAL 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

kPa	psi	kPa	psi
205	30	415	60
Conversion: 6.9 kPa = 1 psi			

For the correct inflation pressures refer to the vehicle 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

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

Tire Designation

The dimensions of a P-metric sized tire are described in its designation as per the following table.

Example: 205/65 R 15 94V

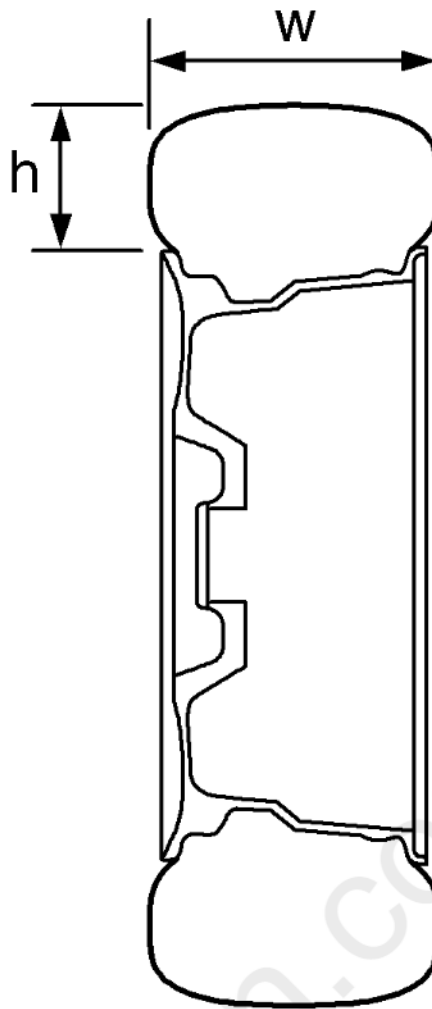


Fig. 41: Tire Width And Height

Courtesy of GENERAL MOTORS COMPANY

Designation	Explanation
205	Tire width in mm
65	Aspect ratio height (h)/width (w) %
R	Construction type, see table below
16	Rim diameter in inches
94	Load index, see table below
V	Speed rating, see table below

Construction Type

Designation	Explanation
R	Radial
B	Bias-belted
D	Diagonal (Bias)

Load Index

Code	Max Load kg	Max Load lb
91	615	1353
93	650	1430
94	670	1474
95	690	1518

Speed Rating

Code	Max Speed km/h	Max Speed mph
Q	160	99

Code	Max Speed km/h	Max Speed mph
S	180	112
T	190	118
H	210	130
V	240	149
W	270	168
Y	300	186

The marking of the tire in the example means:

- 205 - Tire width is 205 mm
- 65 - Aspect Ratio is 65% (height is 65% of width)
- 205 - Tire width is 205 mm
- 16 - The tire is for 16 inch rim
- 94 - Max load is 670 kg (1,474 lb)
- V - Max speed is 240 km/h (149 mph)

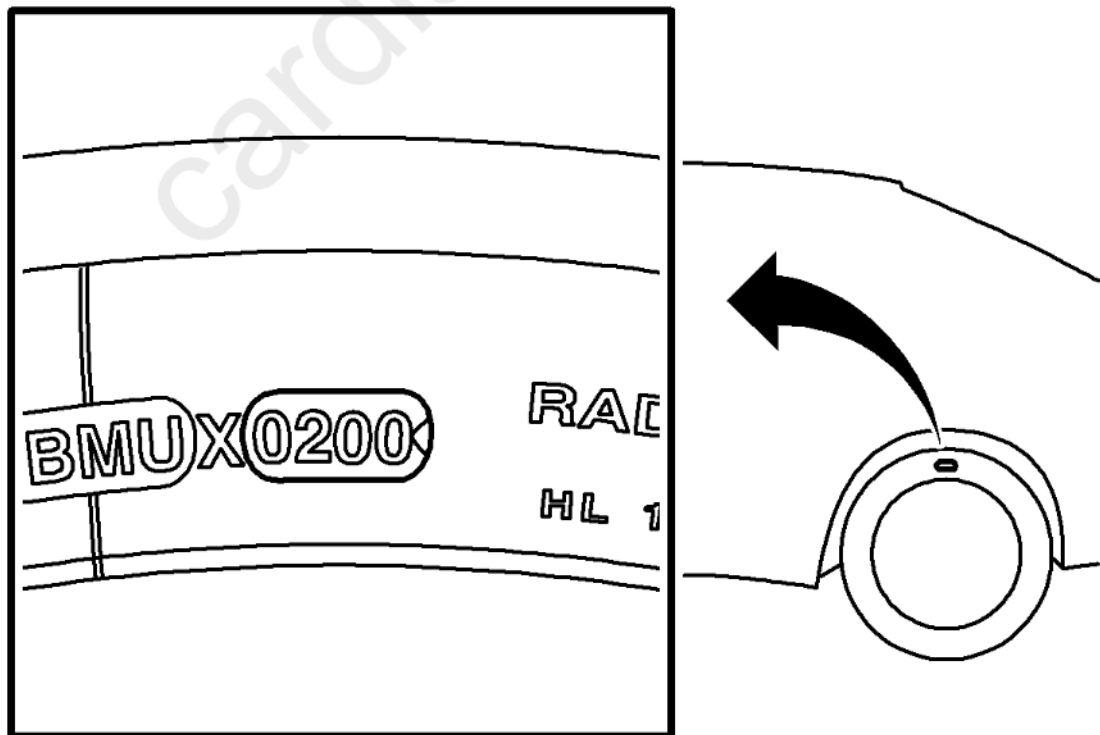
There may sometimes be an added marking showing that the tire can handle more load:

- RF - Reinforced
- XL - Extra Load

Winter tires have an extra marking M+S.

Week of Manufacture

The week and year of manufacture is indicated on the tire.



The 2 first digits states the production week and the 2 last digits states the year. The symbol "<" points to the year. The code 0200< means that the tire is manufactured week 02 year 2000.

Replacing Tires

When replacing wheels/tires/rims using other dimensions always use the diagnostic tool to program the new values to avoid inaccuracy for e.g. speedometer, odometer and TPMS.

Most P-metric tire sizes do not have exact corresponding alphanumeric tire sizes. Replacement tires should be of the same tire performance criteria TPC specification number including the same size, the same load range, and the same construction as those originally installed on the vehicle.

REPLACEMENT WHEELS DESCRIPTION

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.
- The wheel leaks air.

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.

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.

When replacing wheels/tires/rims using other dimensions always use the diagnostic tool to program the new values to avoid inaccuracy for e.g. speedometer, odometer and TPMS.

TIRE INFLATION 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

TREAD WEAR INDICATORS DESCRIPTION

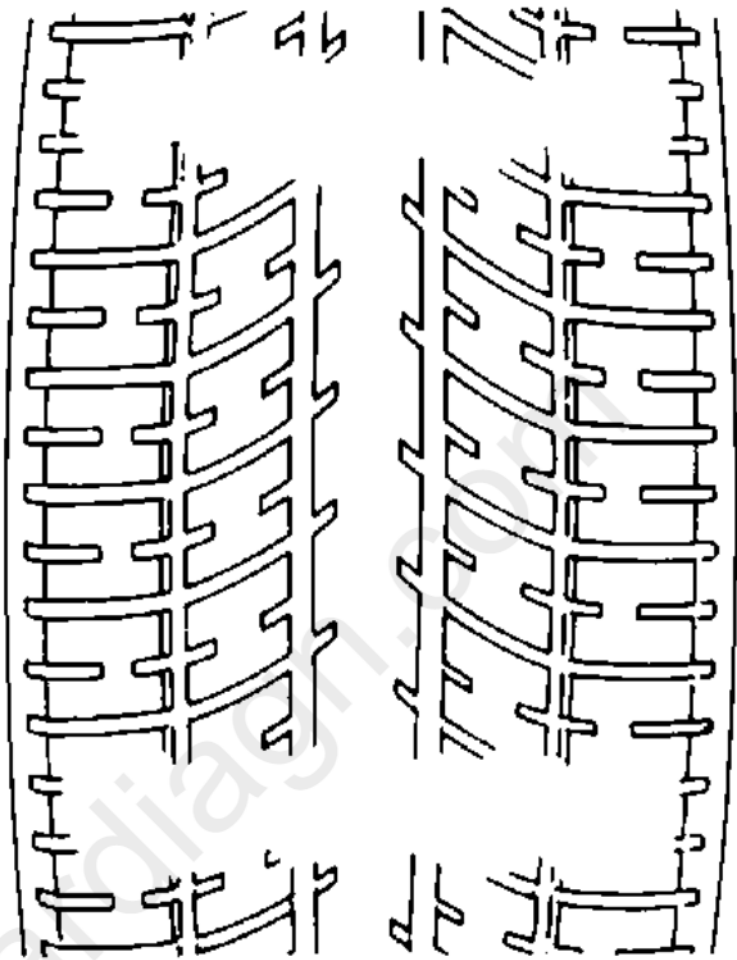


Fig. 43: Tread Wear Indicators
 Courtesy of GENERAL MOTORS COMPANY

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

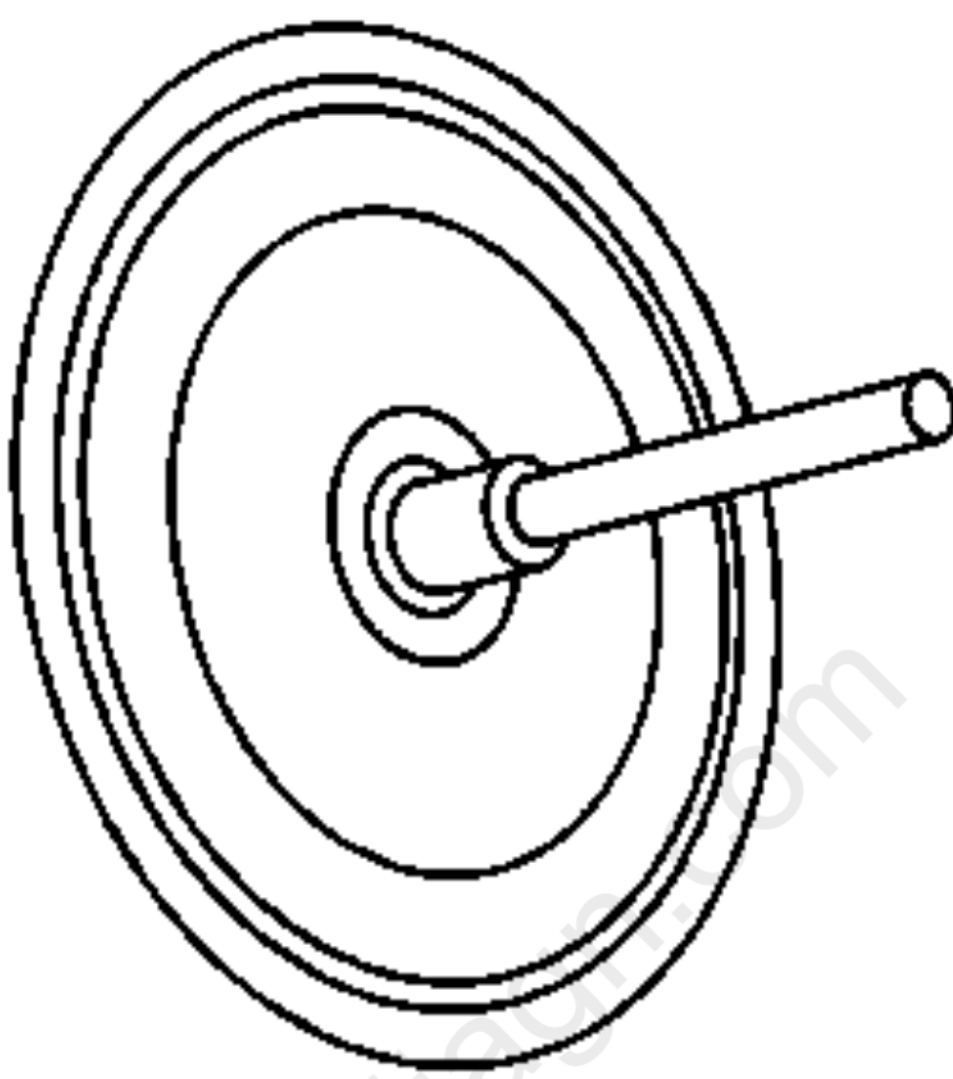
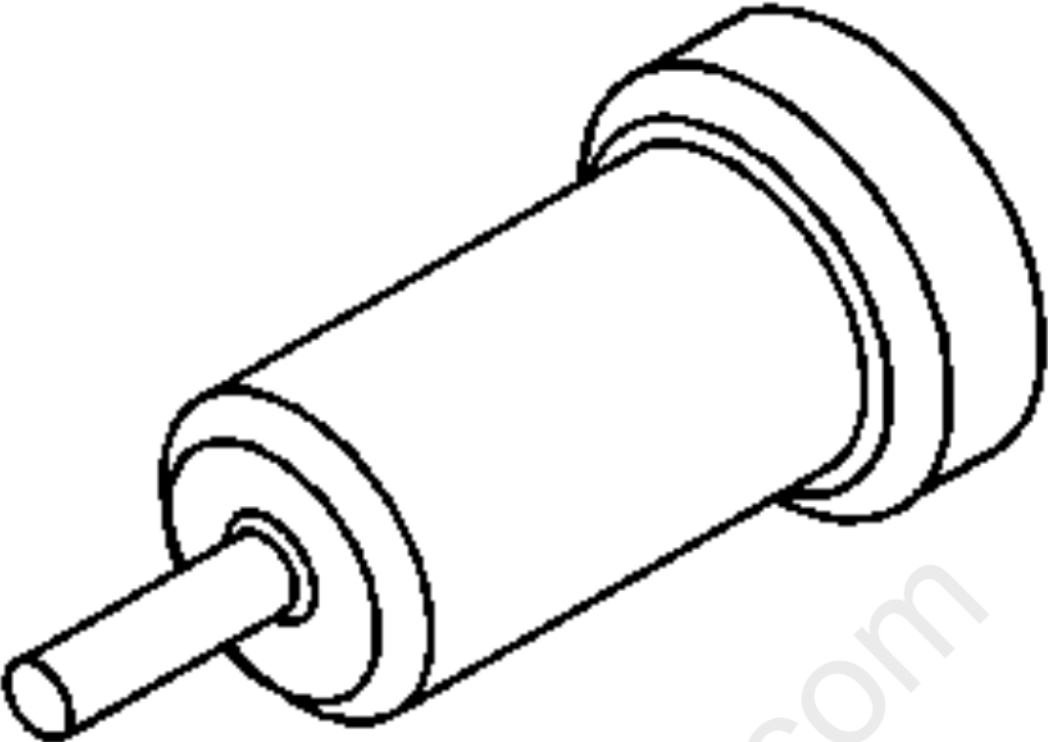
Illustration	Tool Number/Description
	CH 41013 J 41013 Rotor Resurfacing kit Not used in Europe

Illustration	Tool Number/Description
	CH 42450 - A J 42450 - A Wheel Hub Resurfacing Kit Not used in Europe