

2018 SUSPENSION

Tires And Wheels - Equinox & Terrain

SPECIFICATIONS

FASTENER SPECIFICATIONS

Reusable Threaded Fastener Tightening Specifications

NOTE:

All fasteners listed in this table can be reused after removal.

Application	Specification
	Metric (English)
Wheel Nut	140 N.m (103 lb ft)

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

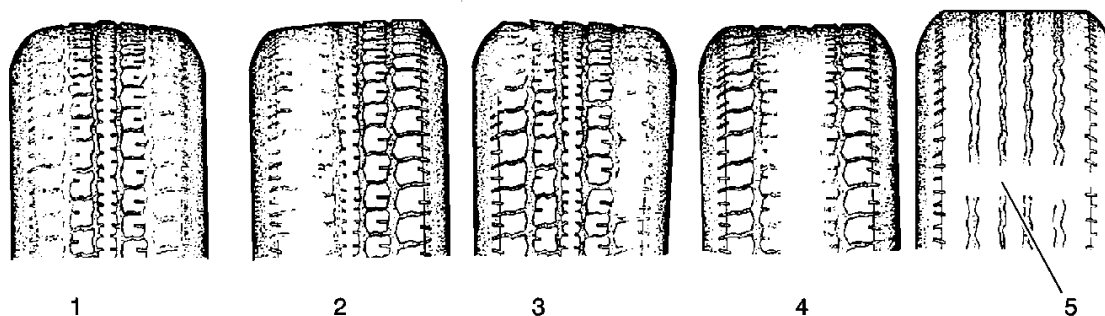


Fig. 1: Identifying Types Of Tire Wear

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

Callout	Component Name
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).

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.

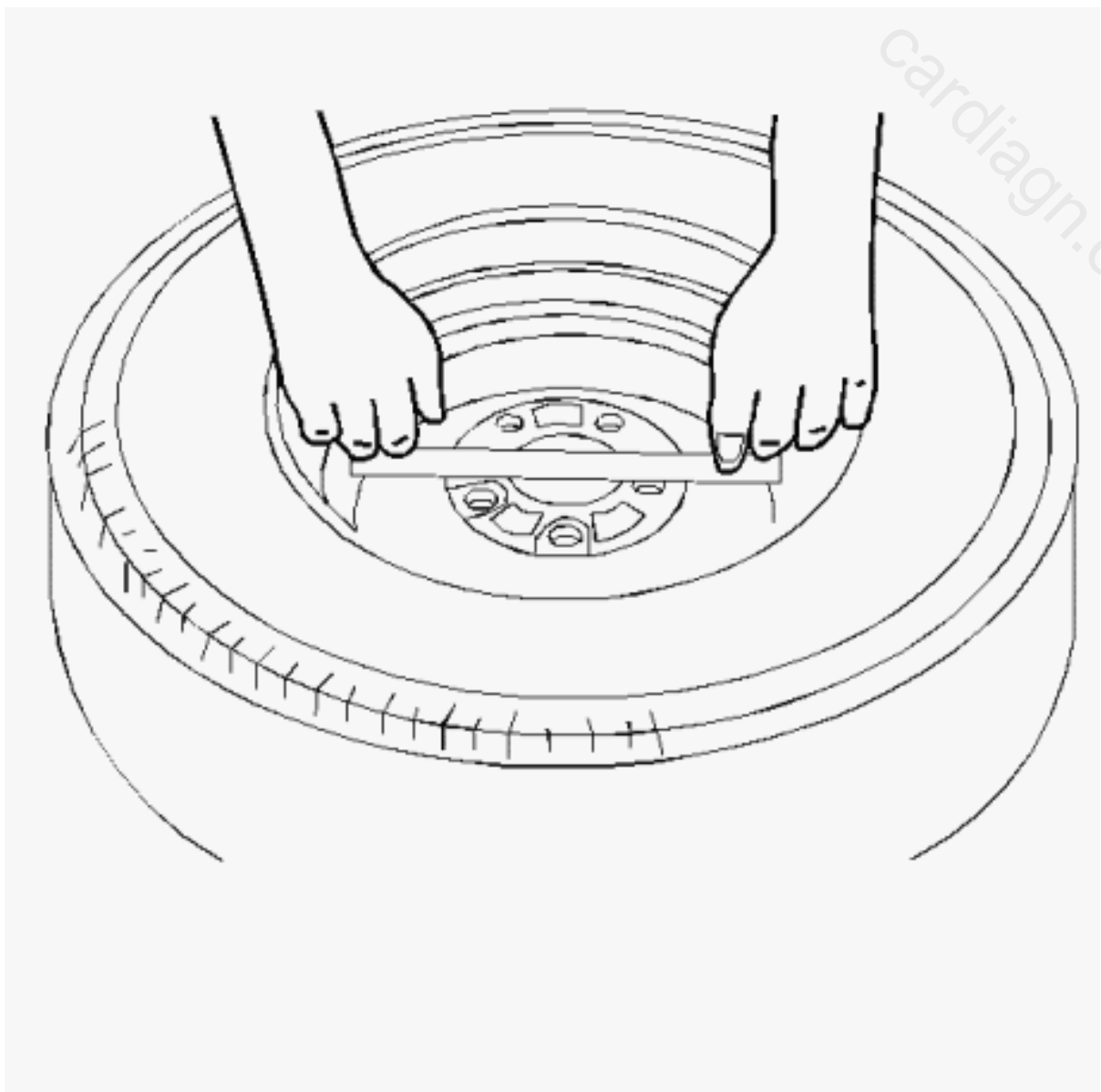


Fig. 2: Checking Wheel Mounting Surface
 Courtesy of GENERAL MOTORS COMPANY

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.

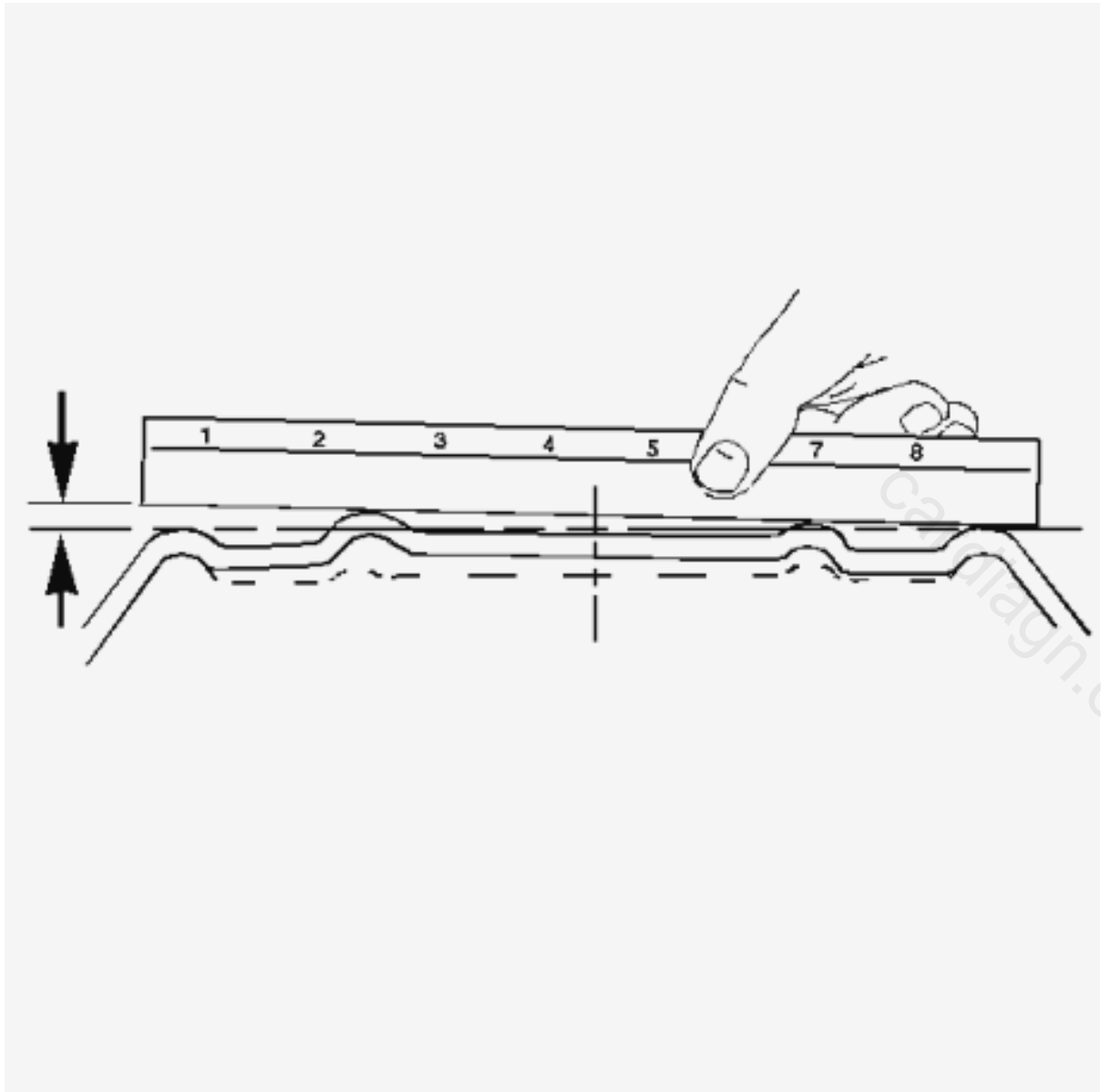


Fig. 3: Inspecting Wheel Inboard Mounting Surface
Courtesy of GENERAL MOTORS COMPANY

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.

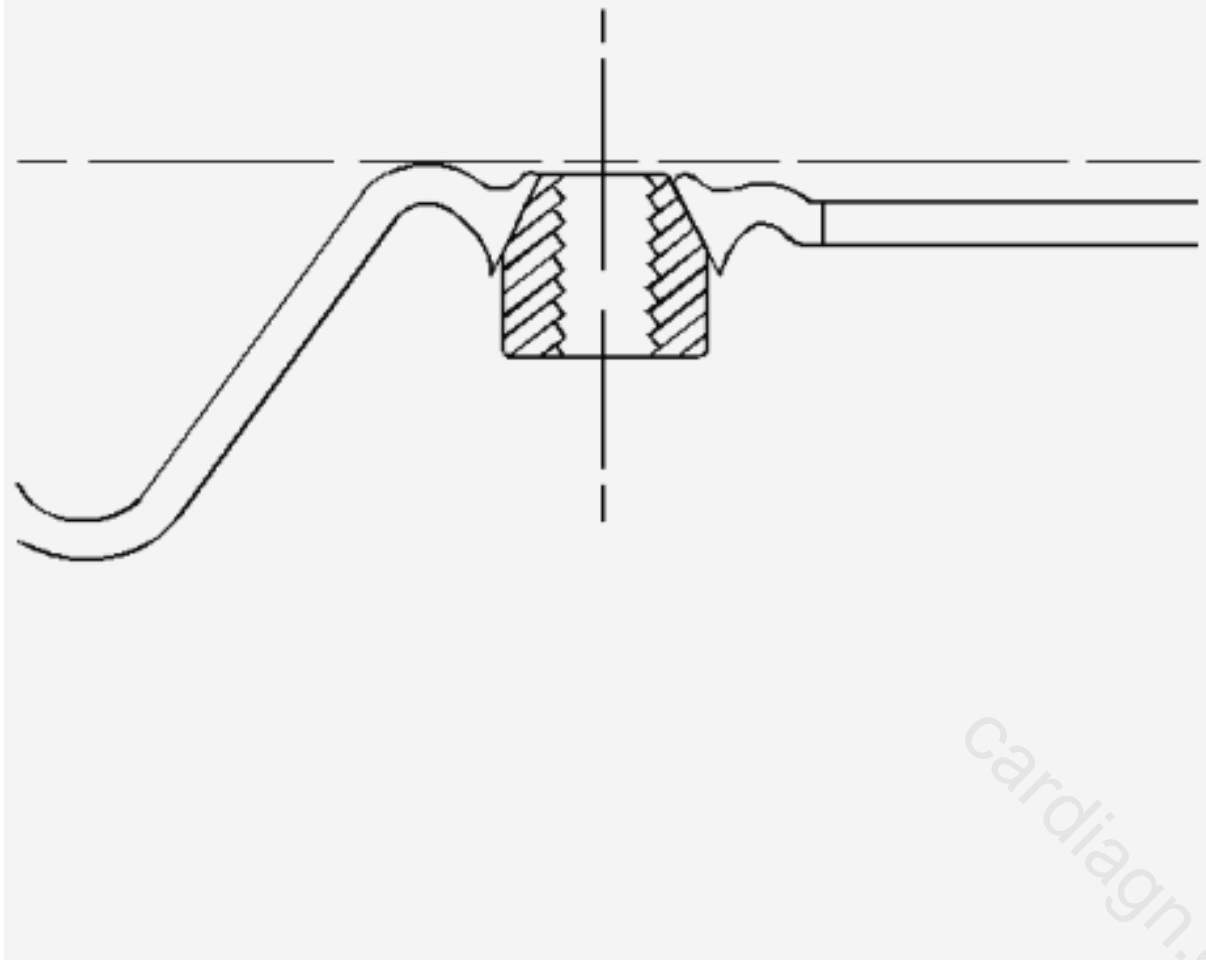


Fig. 4: Inspecting Mounting Wheel/Nut Holes For Damage Caused From Over-Torquing The Wheel/Nuts

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

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
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	-

Step	Action	Yes	No
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. [Tire and Wheel Removal and Installation](#)
2. Inflate the tire to the pressure stated on the tire placard.
3. Submerge the tire/wheel into a water bath in order to locate the leak.
4. Using a grease pencil, mark the wheel in order to indicate the leak areas.
5. Using a grease pencil, mark 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. [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. [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. [Tire Dismounting and Mounting](#)
13. Inflate the tire to the pressure stated on the tire placard.
14. Submerge the tire/wheel into a water bath in order ensure the leak is sealed.
15. Balance the tire and wheel. [Tire and Wheel Assembly Balancing - On-Vehicle](#)
16. Install the tire and wheel. [Tire and Wheel Removal and Installation](#)
17. Lower the vehicle.

ALUMINUM WHEEL REFINISHING

Aluminum Wheel Refinishing Guidelines

WARNING: To avoid personal injury when exposed to plastic media blast, hand and/or lathe sanding dust, primer, color coat, and clearcoat, you must work in a properly ventilated area, wearing an approved respirator, eye protection, earplugs and protective gloves and clothing.

Evaluating Damage

NOTE:

- Inspect the wheel for corrosion, scrapes, gouges, etc. Damage **MUST NOT** be deeper than what can be sanded or polished off.
- Inspect the wheel for cracks. If cracks are found, discard the wheel.
- **ALL** wheels with bent rim flanges must not be repaired or refinished.
- The re-machining and the re-clear coating of aluminum wheels is not recommended in the dealer environment due to concerns of repair durability.
- Do not use any re-machining process that removes aluminum. This could affect the dimensions and function of the wheel.

Aluminum Wheel Refinishing General Recommendations/Options

- Painted aluminum wheels use a primer, color coat, and clearcoat procedure. If the paint is damaged, refinishing is possible. As with polished wheels, all original coatings must be removed first. Media blasting is recommended. (See option number 1).
- If the clearcoat is damaged, it is possible to refinish with clearcoat only, however, the required refinishing process cannot be performed in the dealer environment. Refer to Refinishers Responsibility (Repair option number 2).
- Re-plating of chrome-plated aluminum wheels is not recommended.

Repair Option Number 1

Material Required/Information Resources

- The Paint Manufacturer's Color Book
- Refer to the latest GM Approved Refinish Materials Booklet (GM 4901 MD-2005) for specific products for aluminum refinishing.
- To access the booklet, go to www.gmgoodwrench.com. Click on GM Collision Parts. Click on GM Technical Repair Information, select Paint Shop.
- A Color Compatibility chart is also at this site defining what colors are used on what models.

NOTE: Chemical strippers are not recommended.

- Refer to specific Paint Manufacturers for refinish procedures and process pertaining to "Aluminum Refinishing".

The procedure requires the wheel surface to be plastic media blasted to remove old paint or clearcoat.

General Color Selection

- If the wheels being painted were previously clearcoated aluminum, and a painted aluminum look is desired, using Corsican Silver WAEQ9283 for a fine "aluminum-like" look, or Sparkle Silver WA9967 for a very bright look. Body color is another option to the customer that may also be used.
- Some specific colors may be recommended on certain models.
- If painting wheels that were previously clearcoated aluminum, it is recommended that all 4 wheels and their center caps be refinished to maintain color uniformity.

General Refinishing Procedures - Removal

1. Remove the wheels from the vehicle. The tires may remain mounted on the wheels.
2. Remove the balance weights and mark their locations on the tire.
3. Remove excess grease, etc. from the wheels with wax and grease remover.
4. Have the wheels plastic media blasted to remove the clearcoat.

NOTE: MASK OFF ALL MOUNTING SURFACES, whenever a wheel is refinished. The mounting surface and the wheel nut contact surfaces must not be painted or clearcoated. Coating these surfaces could affect the wheel nut torque.

5. Clean and mask and paint the wheels.

General Refinishing Procedures - Installation

1. Unmask the wheels.
2. Clean all wheel mounting surface of any corrosion, overspray, or dirt.

NOTE: When re-balancing a tire on an aluminum wheel, coated balance weights must be used in order to reduce the chance of future cosmetic damage.

3. Install NEW coated balance weights at marked locations.

NOTE:

Use a torque stick on an impact wrench, or a torque wrench to consistently and uniformly fasten the wheel to the specified torque for the vehicle. The star pattern must be followed.

4. Install wheels on vehicle.

Repair Option Number 2 - Outside Companies

- Some outside companies are offering wheel refinishing services. One such company, Transwheel Corporation (800 - 892 - 3733), provides this service with GM guidelines. Other companies may also exist.
- Any process that re-machines or otherwise remanufactures the wheel should not be used.
- The wheel ID must be recorded and follow the wheel throughout the process to assure that the same wheel is returned. The refinisher must permanently ID stamp the wheel and warrant the painted/clearcoated surfaces for a minimum of one year or the remainder of the new vehicle warranty, whichever is longer.
- Paint and/or clearcoat must not be present on the following surfaces, the nut chamfers, the wheel mounting surfaces and the wheel pilot hole.
- A refinishers responsibility includes inspecting for cracks using the Zyglo system or the equivalent. Any cracked wheels must not be refinished. No welding, hammering or reforming of any kind is allowed. A plastic media blast may be used for clean up of the wheel. Hand and/or lathe sanding of the machined surface and the wheel window is allowed. Material removal, though, must be kept to a minimum.

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. [Lifting and Jacking the Vehicle](#)
2. Remove the wheel cover, if equipped.

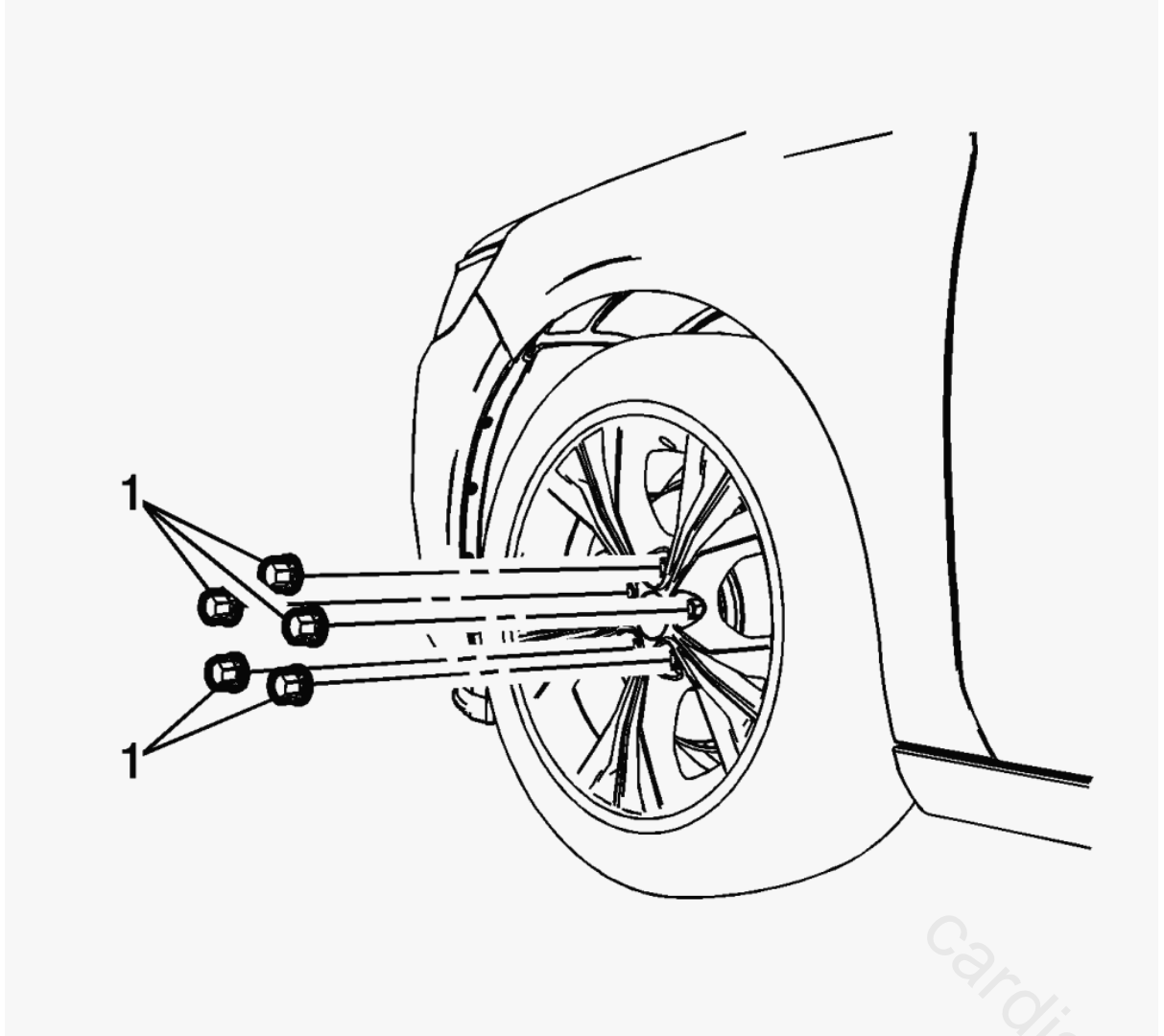


Fig. 5: Wheel Nut Caps

Courtesy of GENERAL MOTORS COMPANY

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

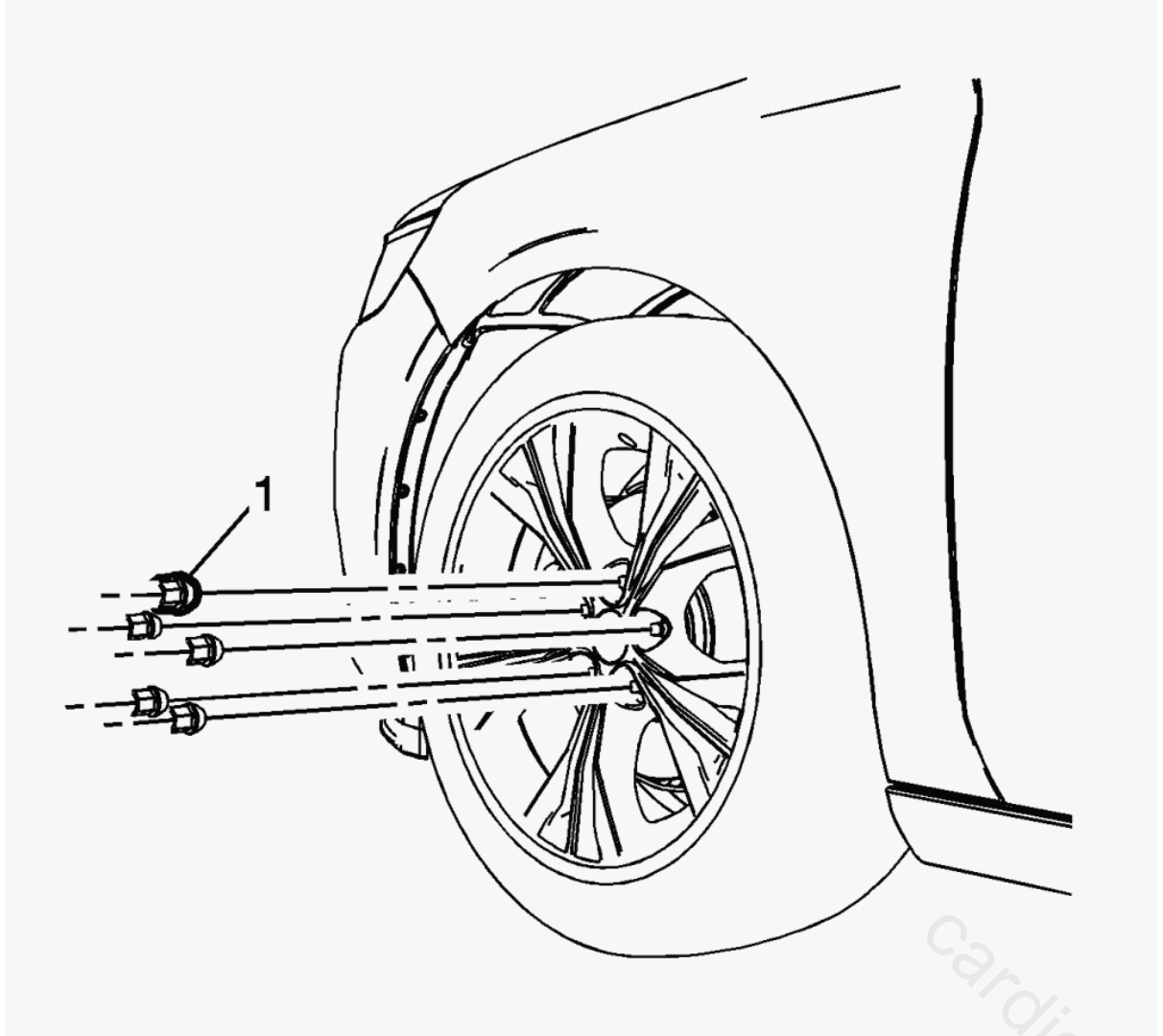


Fig. 6: Wheel Nuts

Courtesy of GENERAL MOTORS COMPANY

4. Remove the wheel nuts (1).

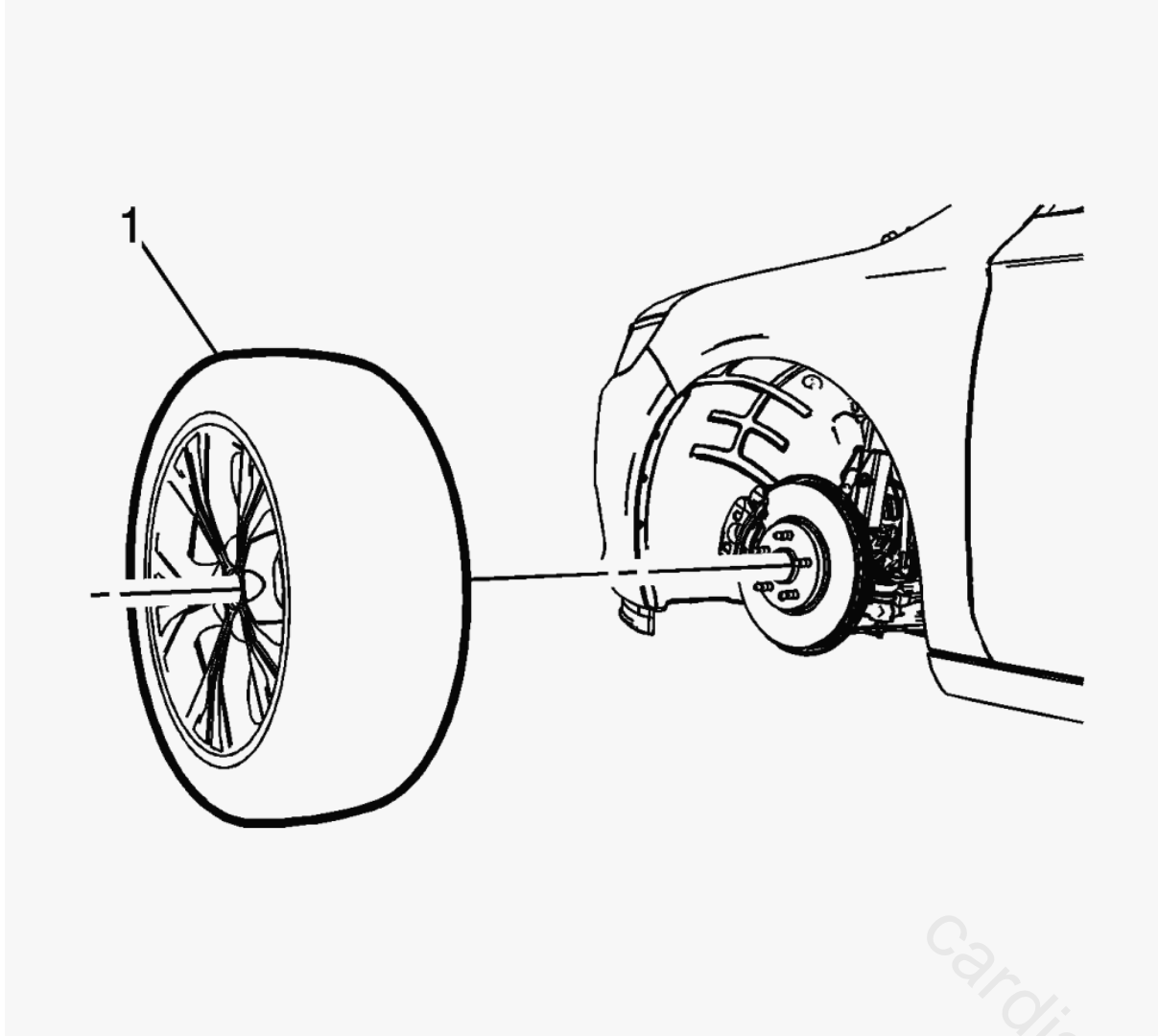


Fig. 7: Tire & Wheel Assembly

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. [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. [Wheel Stud Replacement \(Equinox, Terrain\)](#), 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. [Wheel Mounting Surface Check](#)

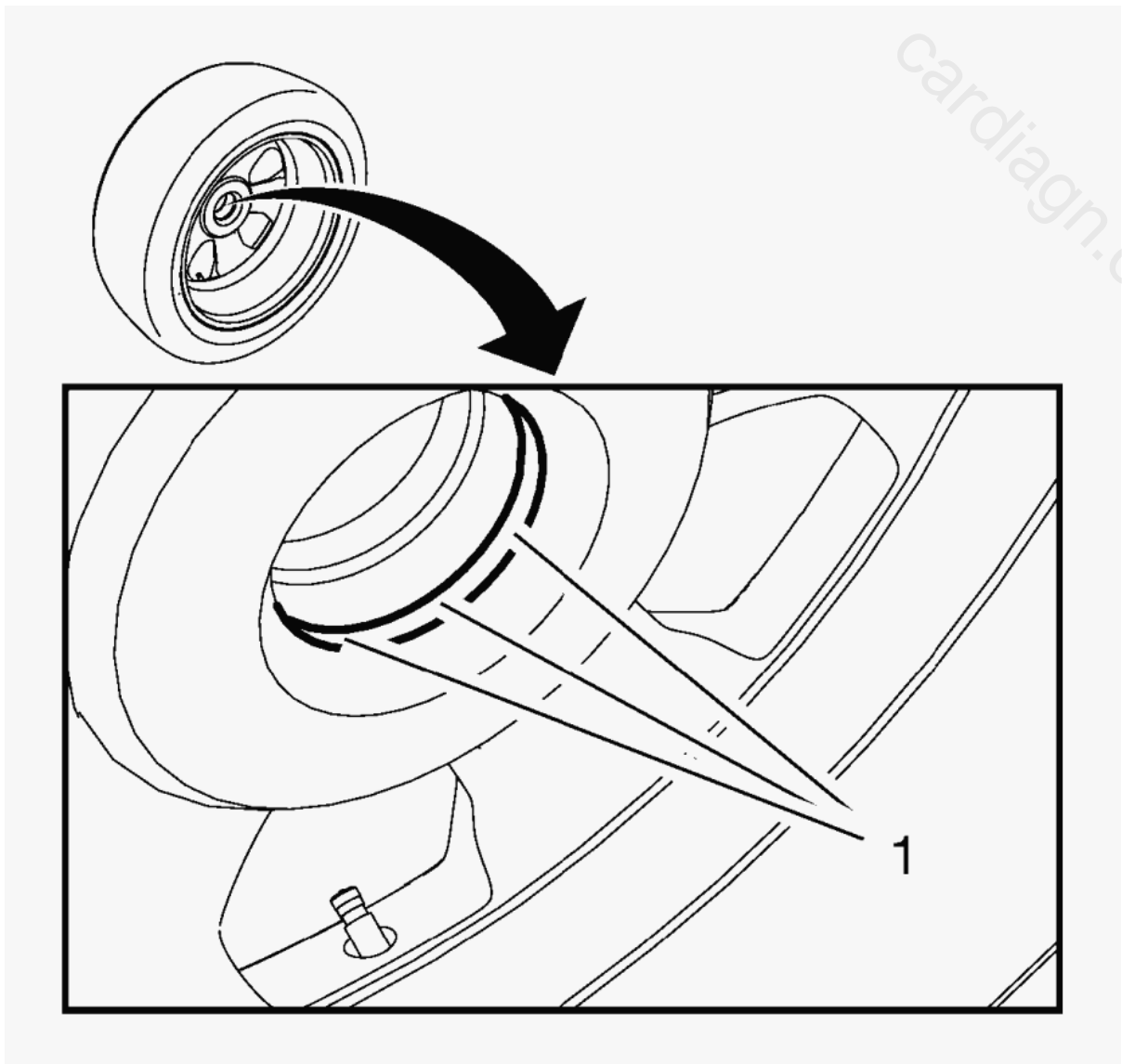


Fig. 8: Rim Inner Center Seat

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. [Adhesives, Fluids, Lubricants, and Sealers](#)

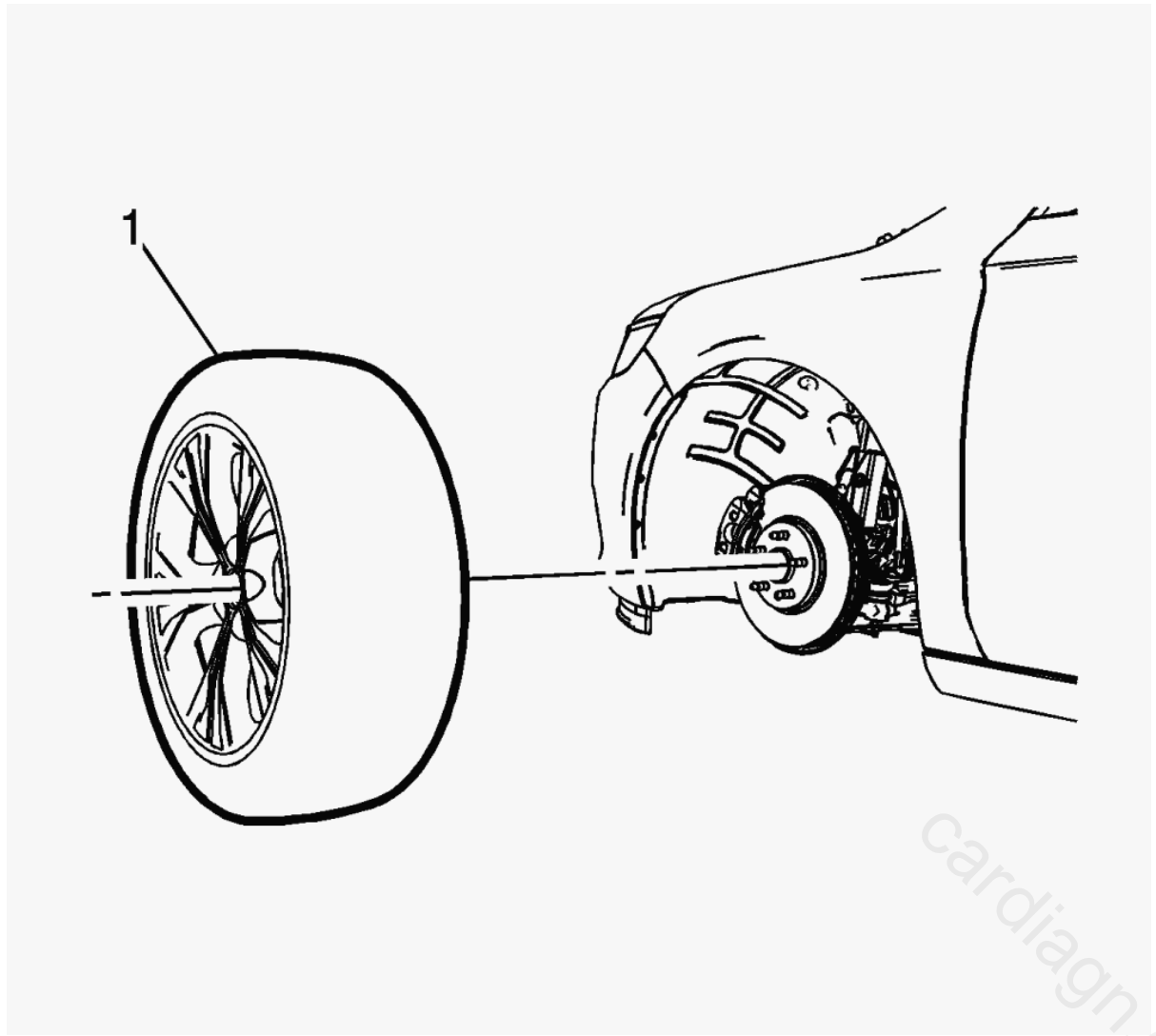


Fig. 9: Tire & Wheel Assembly

Courtesy of GENERAL MOTORS COMPANY

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

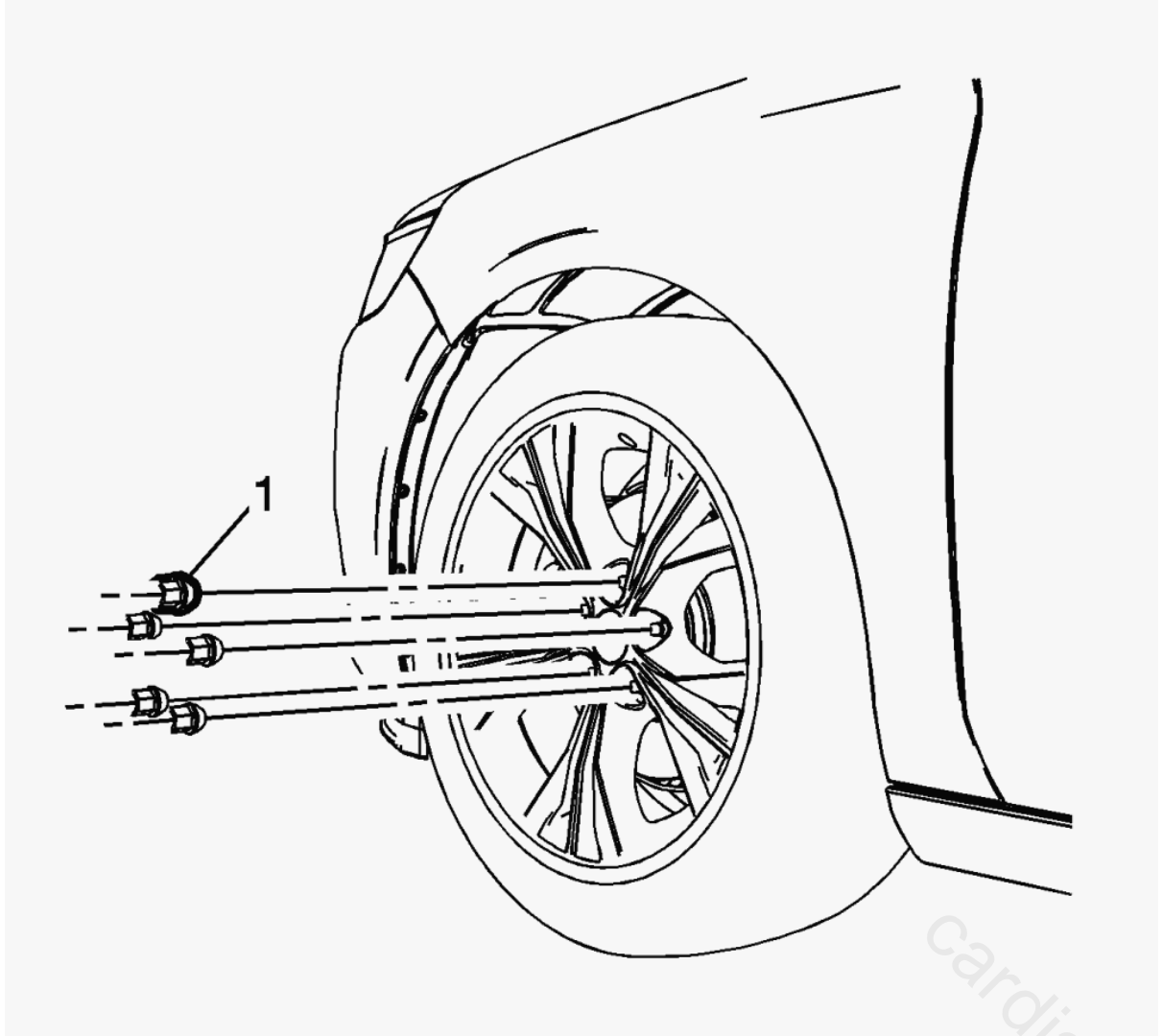


Fig. 10: Wheel Nuts

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).

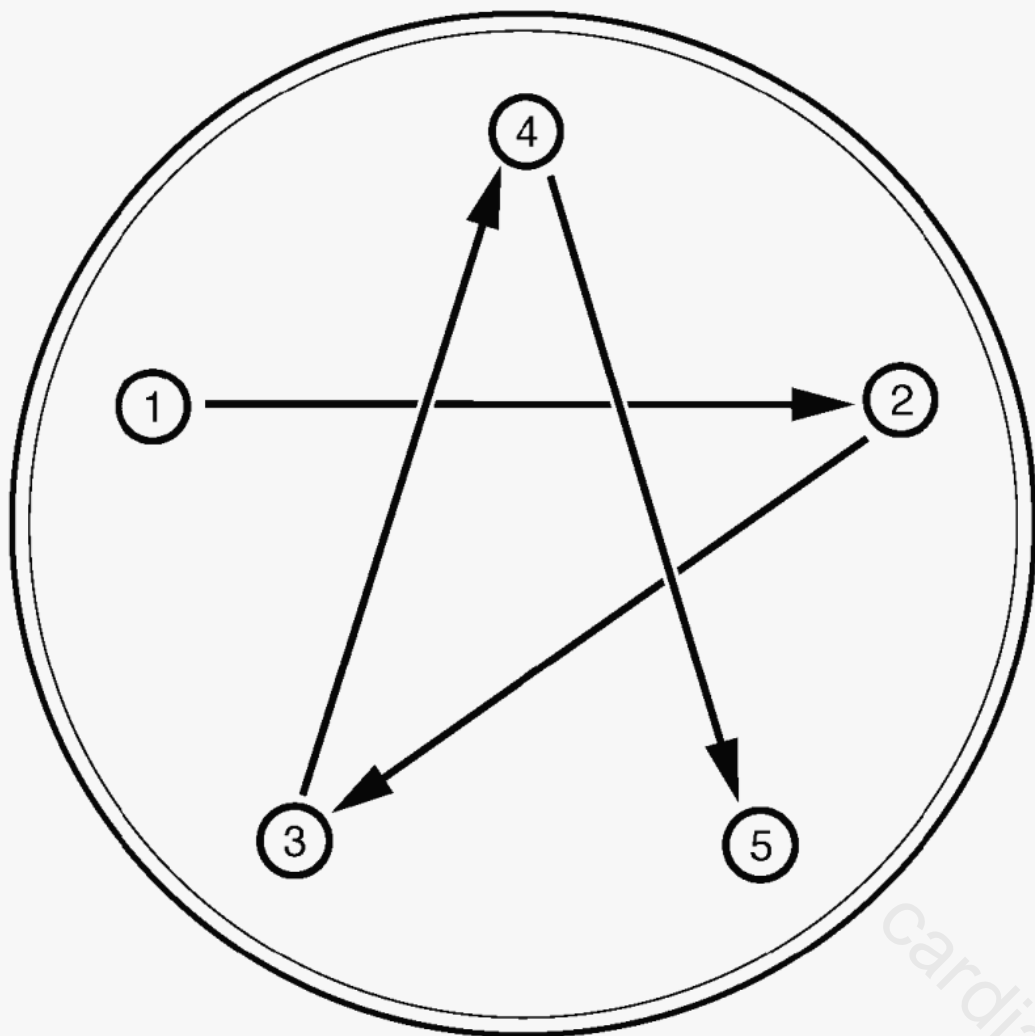


Fig. 11: Wheel Nut Tightening Sequence

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 N.m (103 lb ft) in the sequence illustrated.

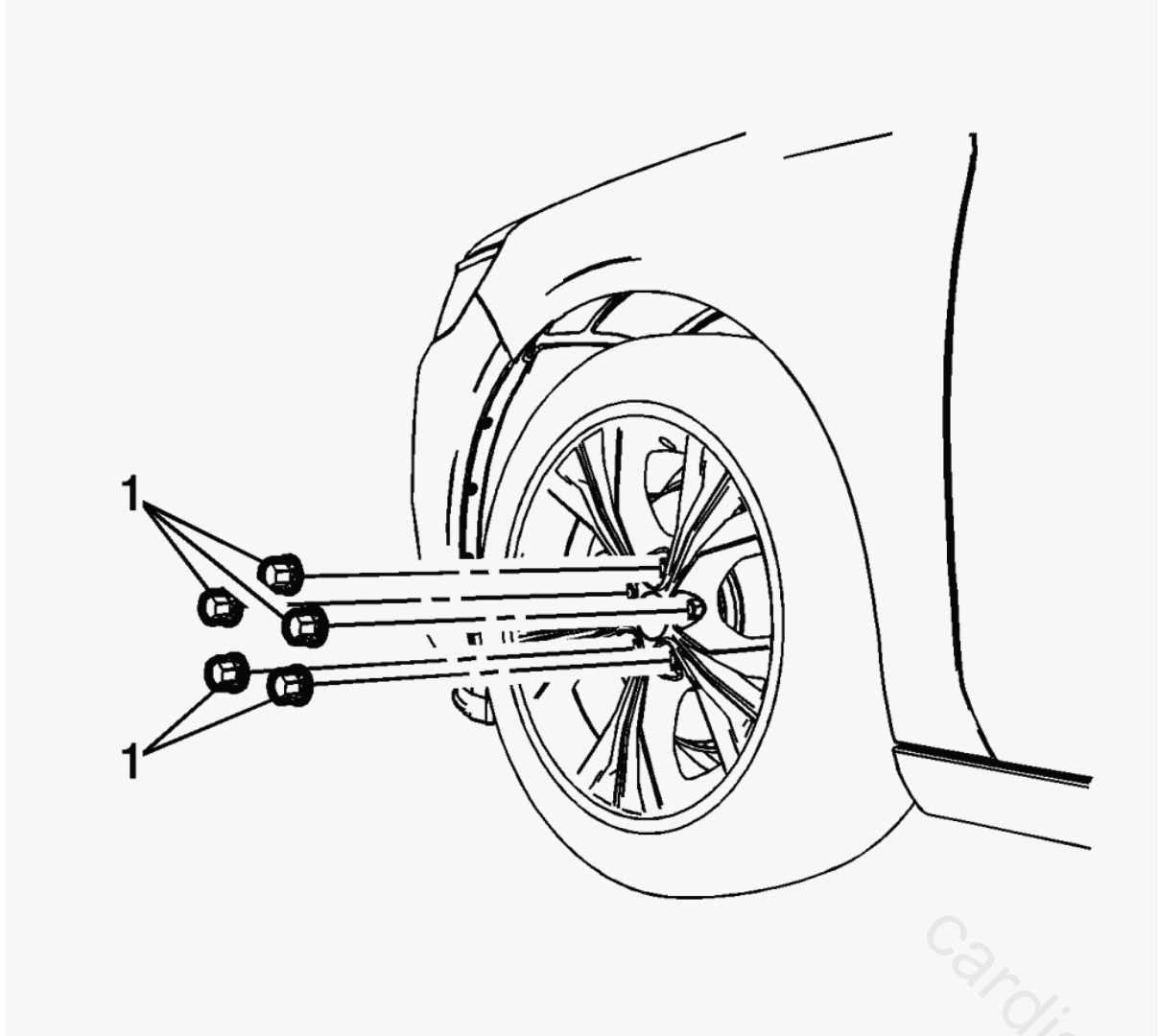


Fig. 12: Wheel Nut Caps

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 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.

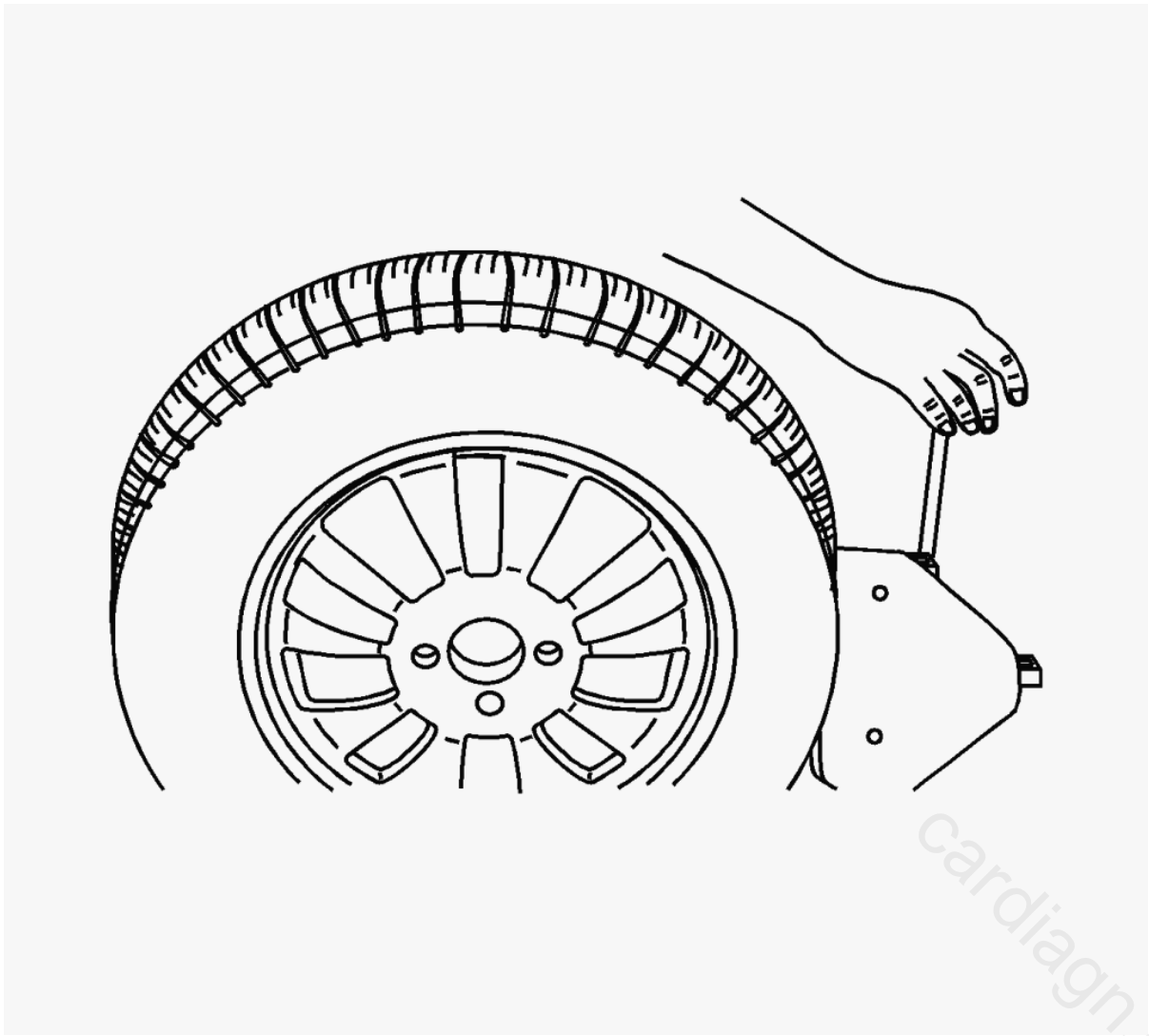


Fig. 13: Using Tire Changer to Remove Tire
Courtesy of GENERAL MOTORS COMPANY

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.

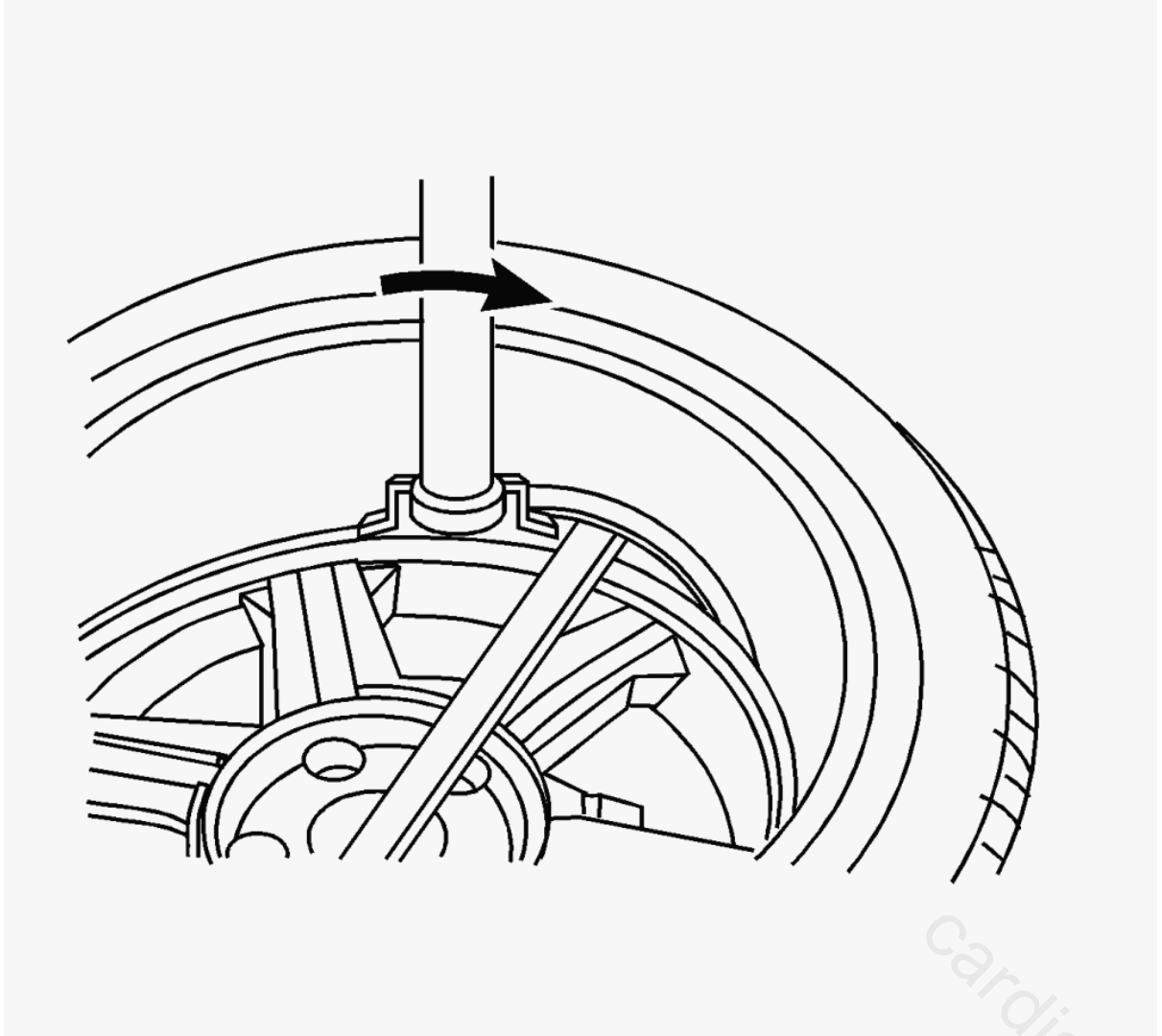


Fig. 14: Separating Tire Bead from Wheel

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](#).

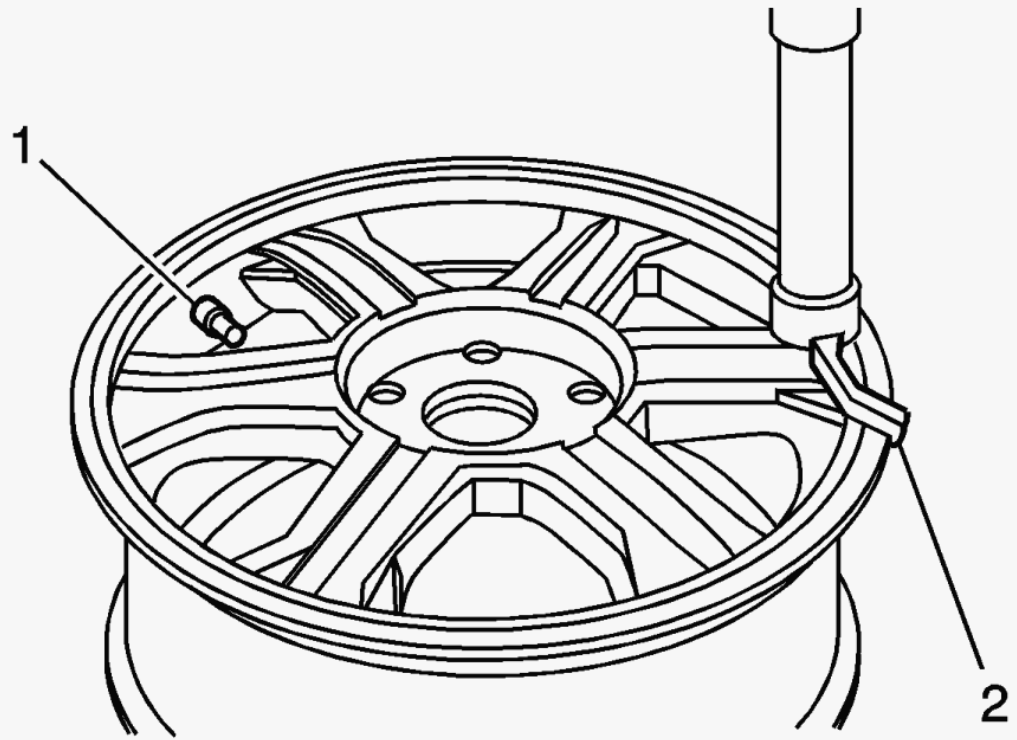


Fig. 15: Position Rim So Valve Stem Is At 7 O'clock Position Relative To Head
Courtesy of GENERAL MOTORS COMPANY

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.

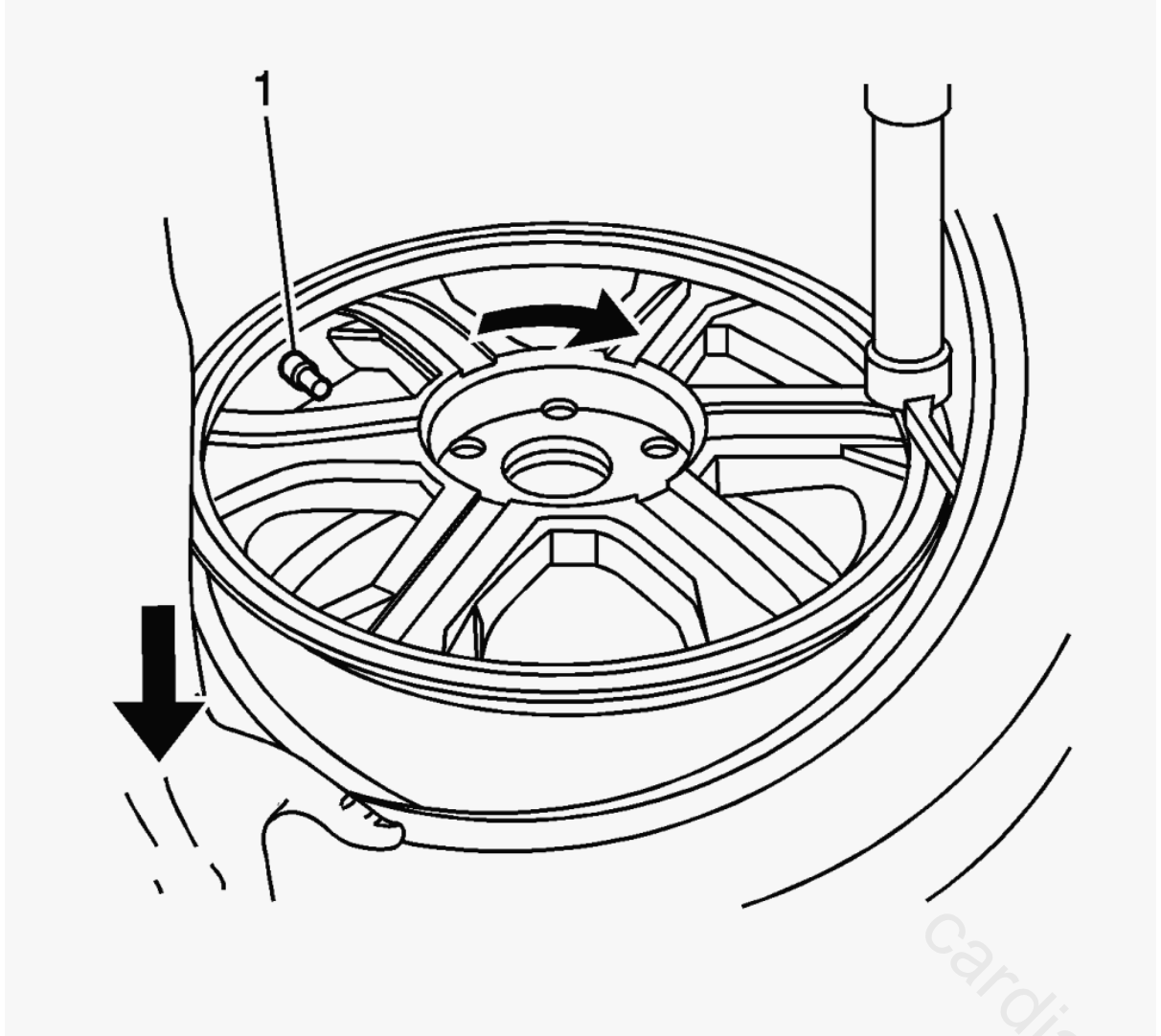


Fig. 16: Ensure Valve Stem Is At 7 O'clock Position

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.

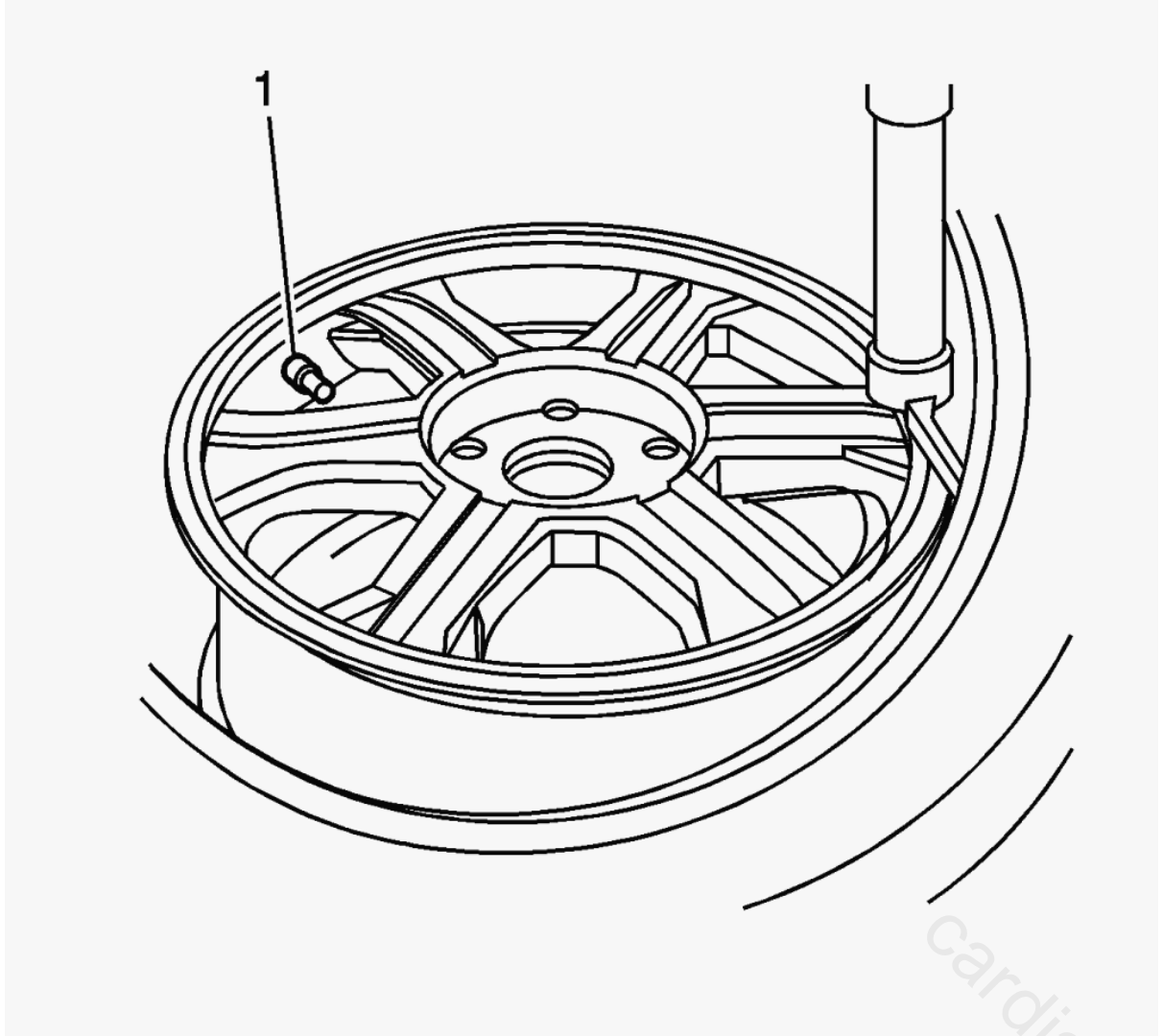


Fig. 17: Reposition Wheel And Tire So Valve Stem Is At 7 O'clock Position Relative To Head
Courtesy of GENERAL MOTORS COMPANY

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.

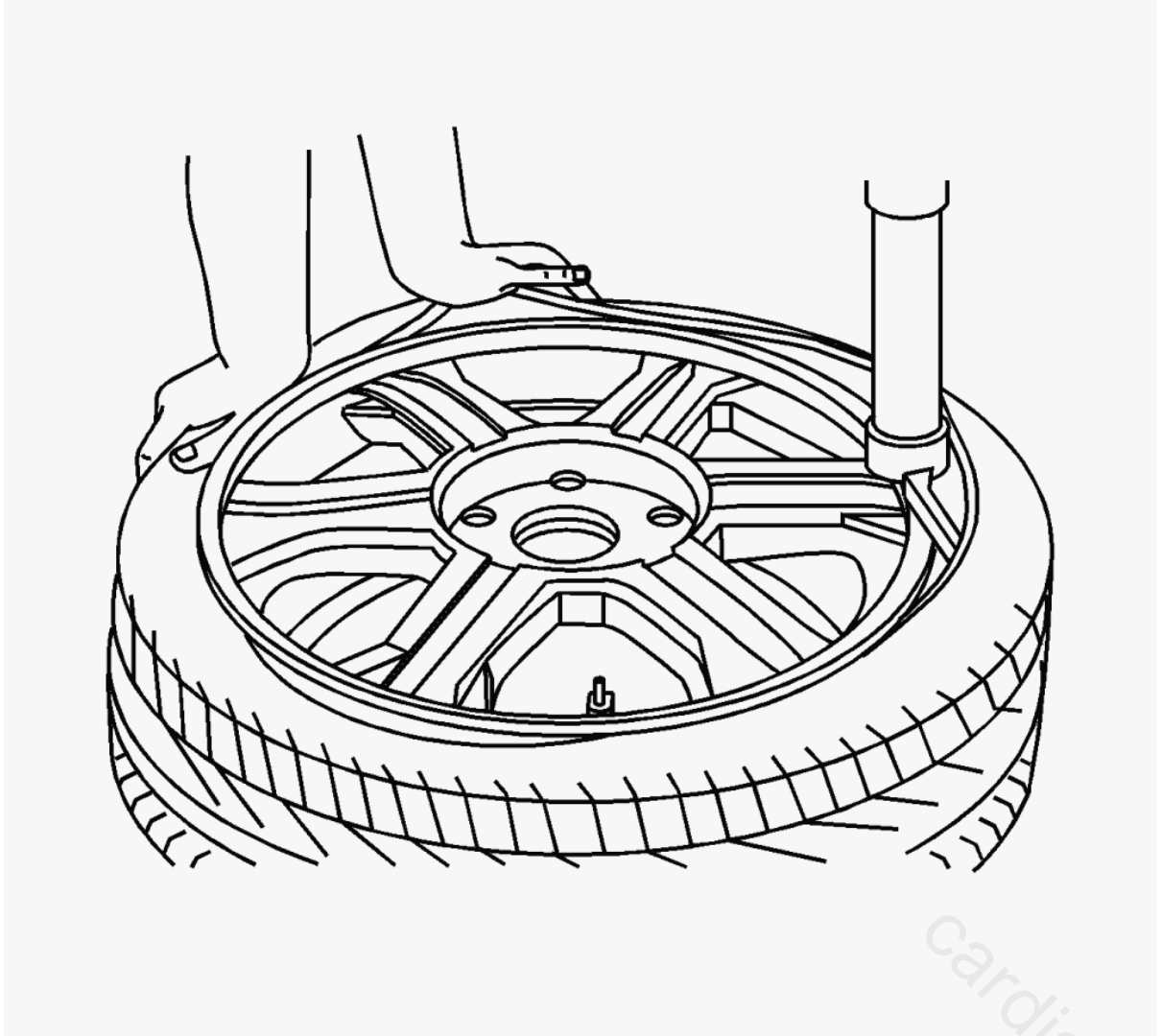


Fig. 18: Using Tire Changer

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 [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](#).

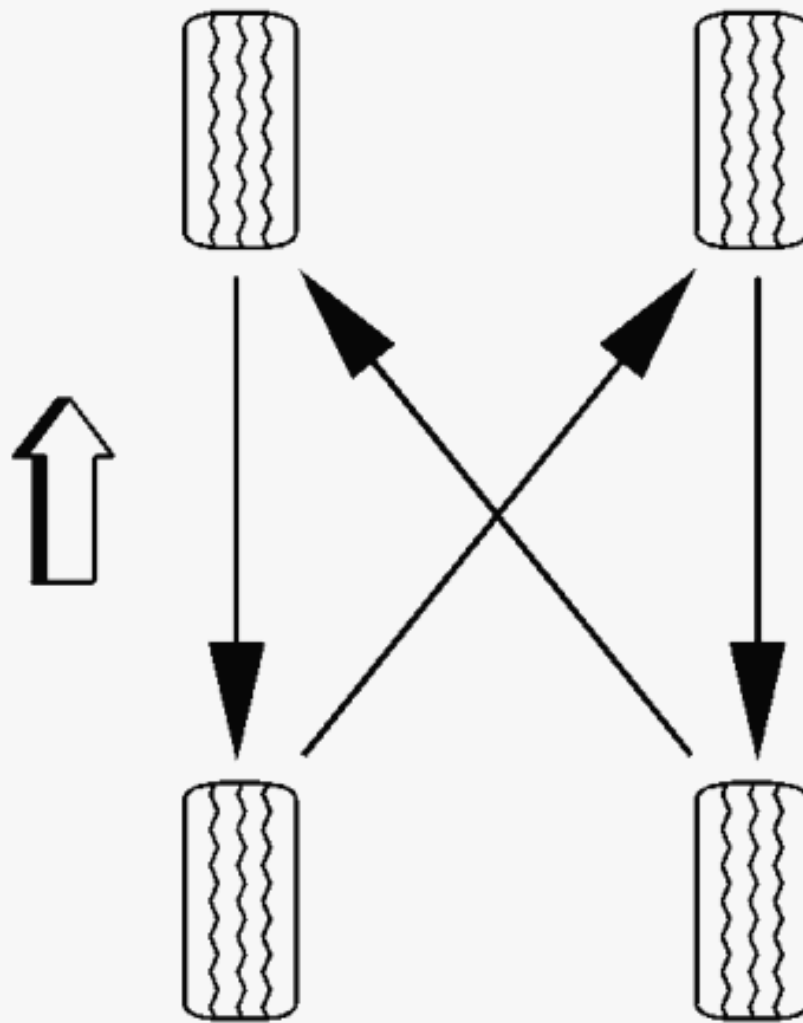


Fig. 19: Identifying Tire Rotation Pattern

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.

After the tires have been rotated, the tire pressure sensors must be reset, if applicable.

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.

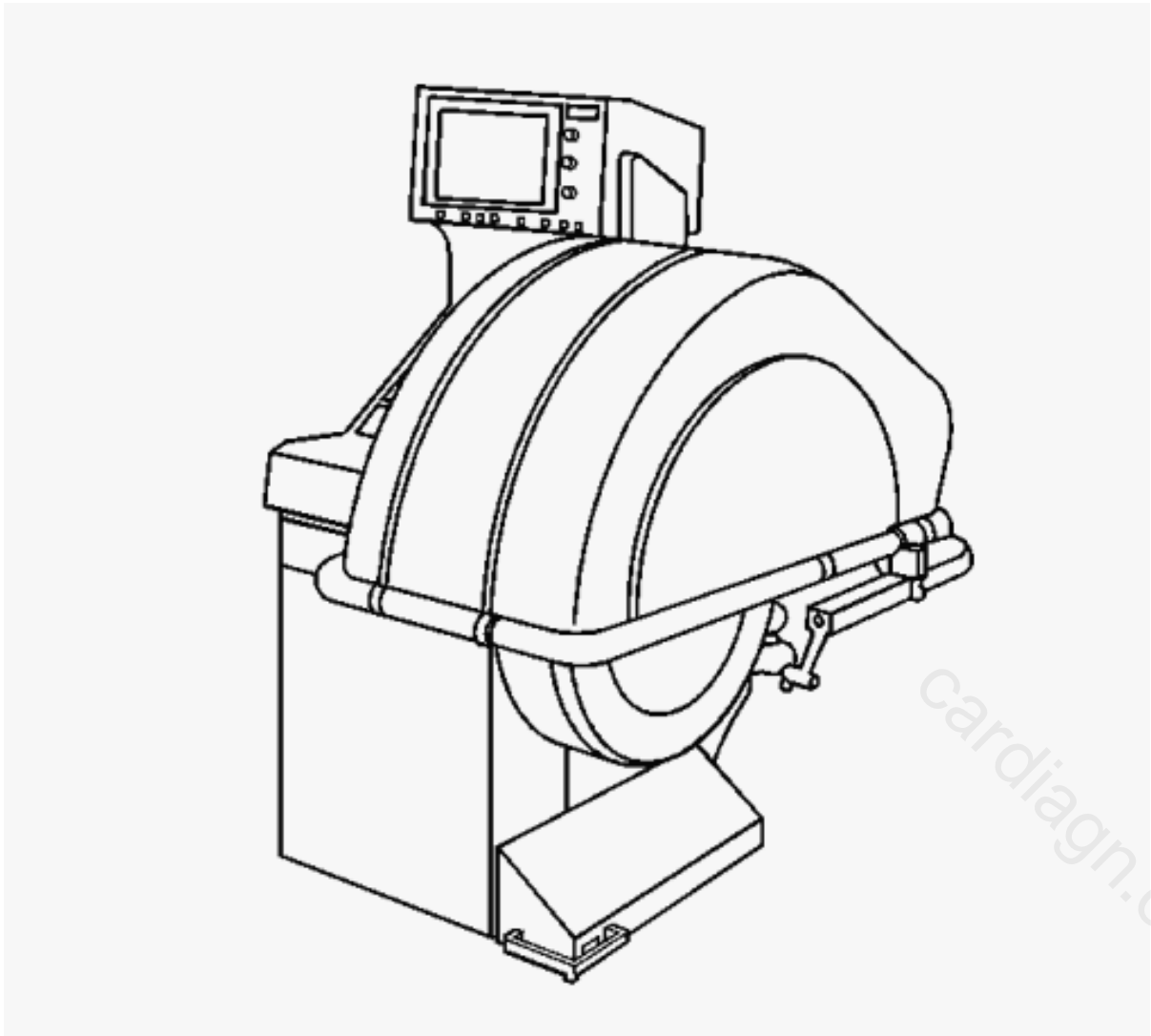


Fig. 20: View Of Tire & Wheel Assembly Balancer
Courtesy of GENERAL MOTORS COMPANY

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

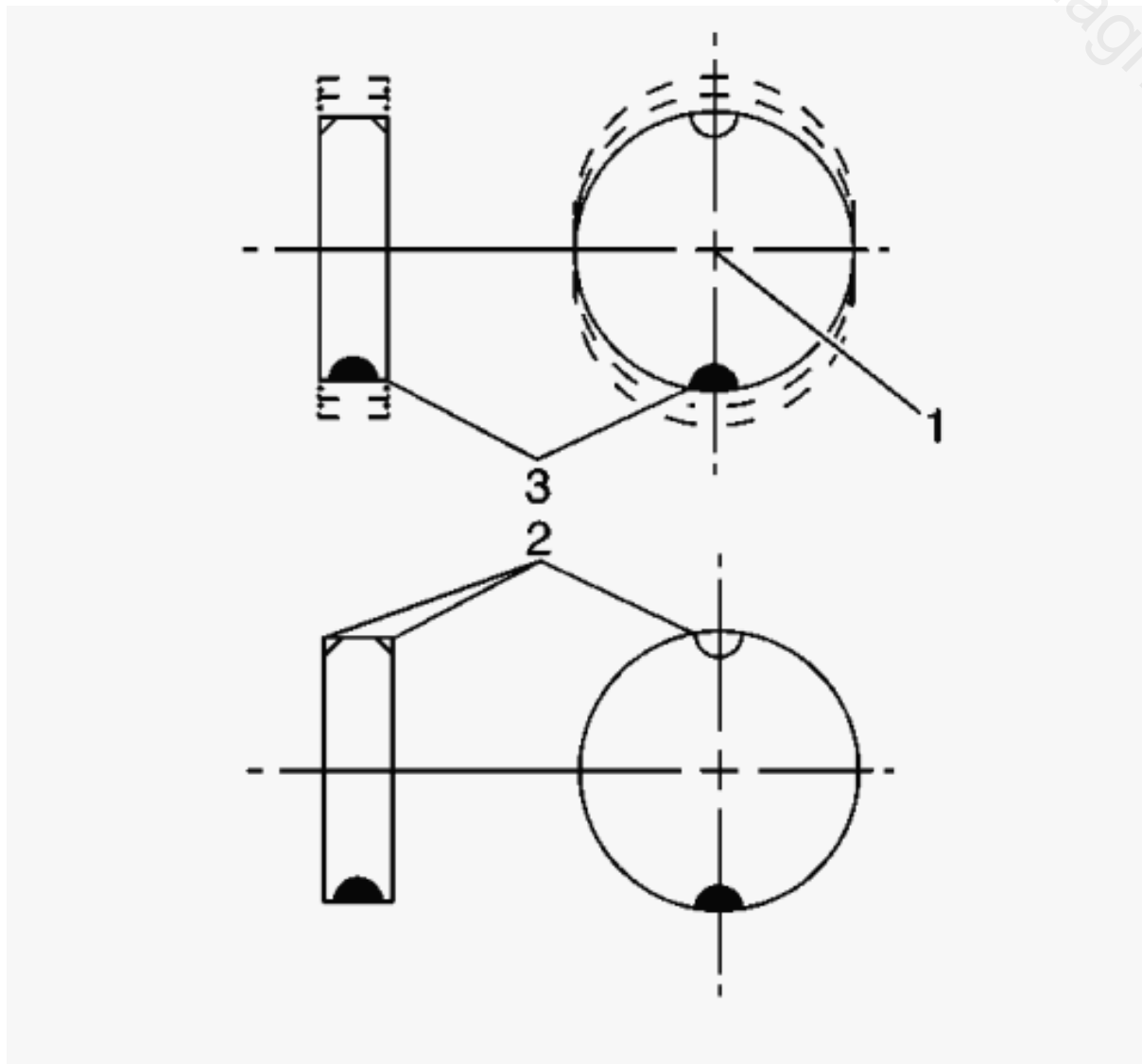


Fig. 21: View Of Static Balance

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

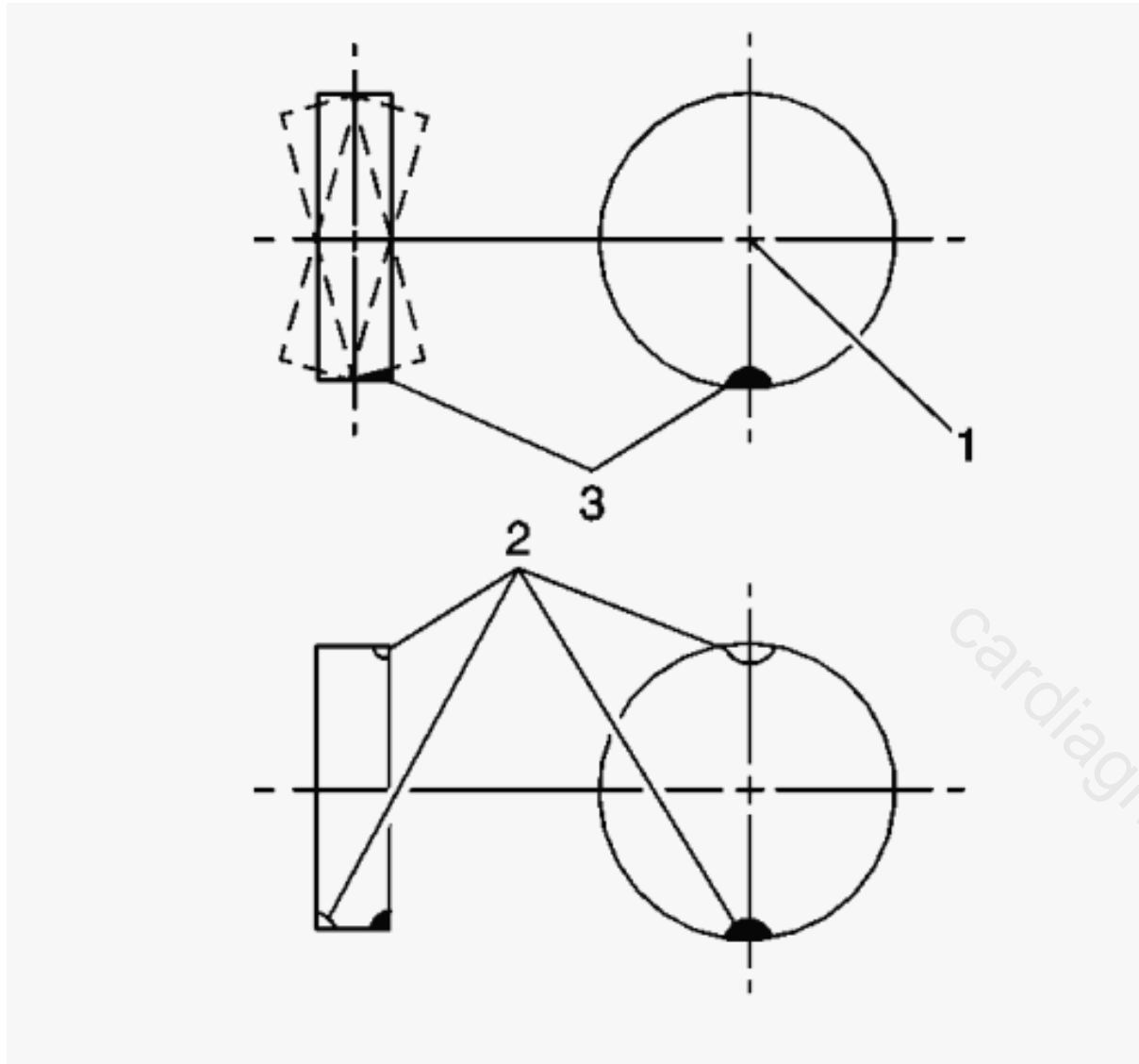


Fig. 22: View Of Dynamic Balance

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.

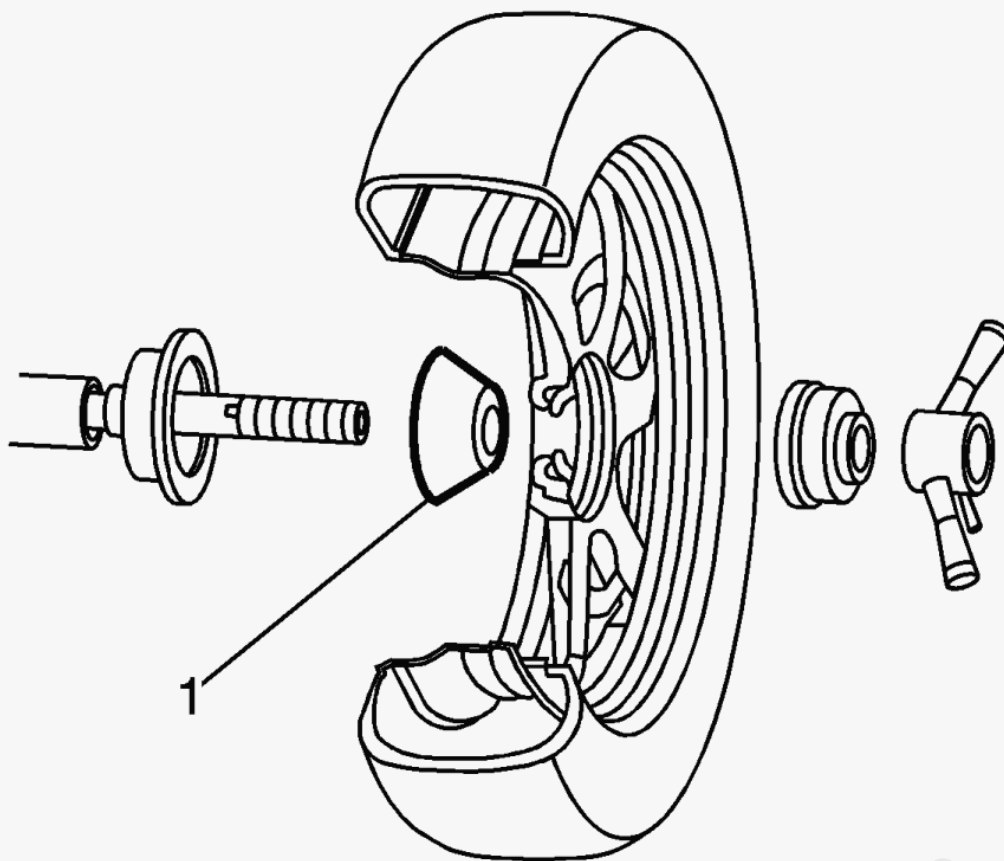


Fig. 23: Wheel Balancer Center Cone

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.

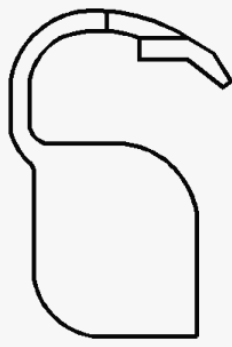
Regard aftermarket wheels, especially those incorporating universal lug patterns, as potential sources of runout and mounting concerns.

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



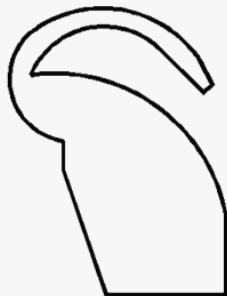
1



4



2



3

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Fig. 24: 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.

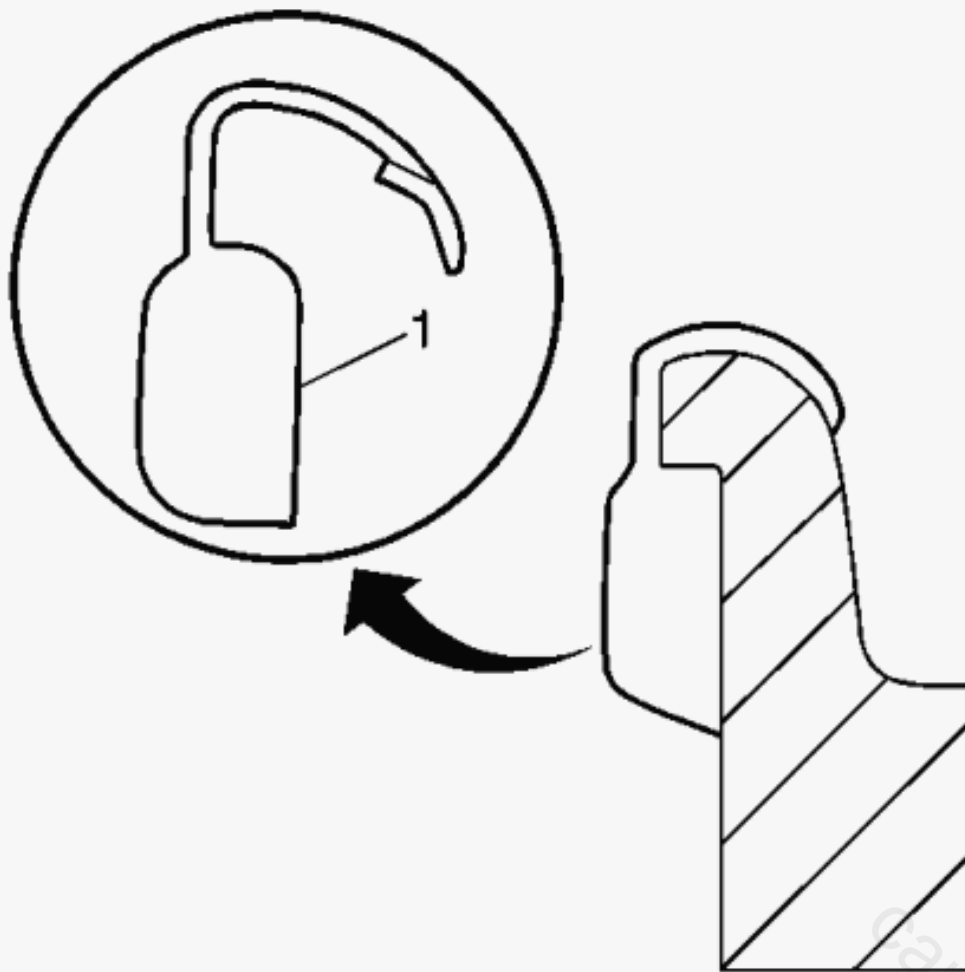


Fig. 25: Attaching Clip-On Wheel Weight
Courtesy of GENERAL MOTORS COMPANY

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

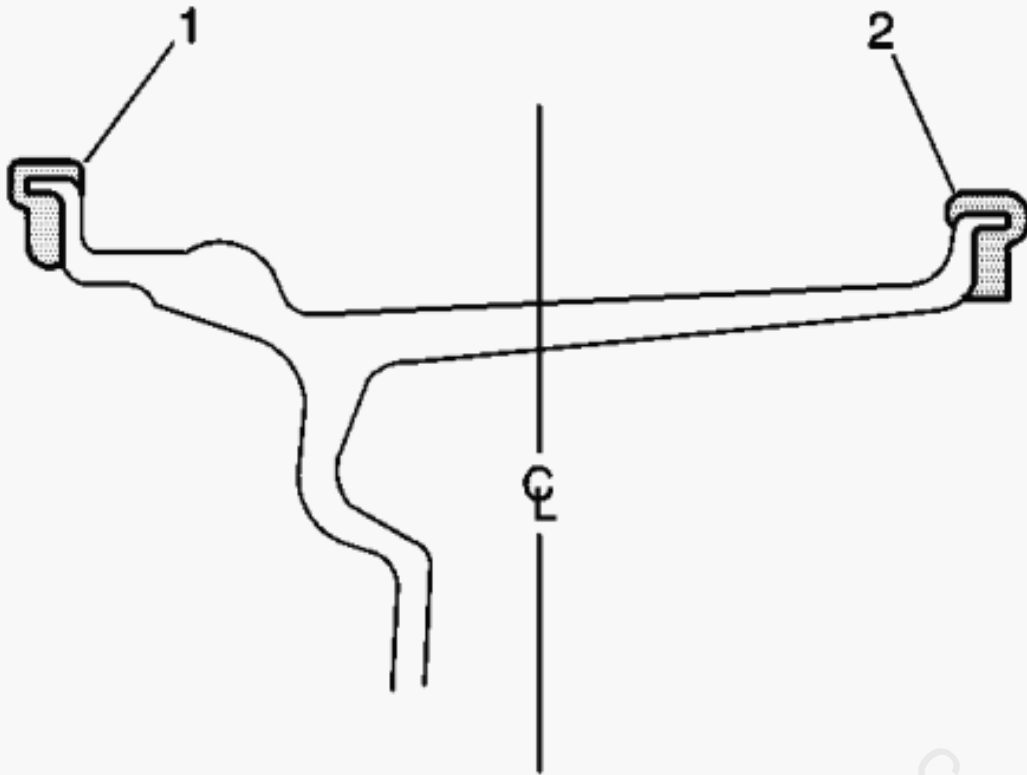


Fig. 26: Clip-On Weight Placement

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

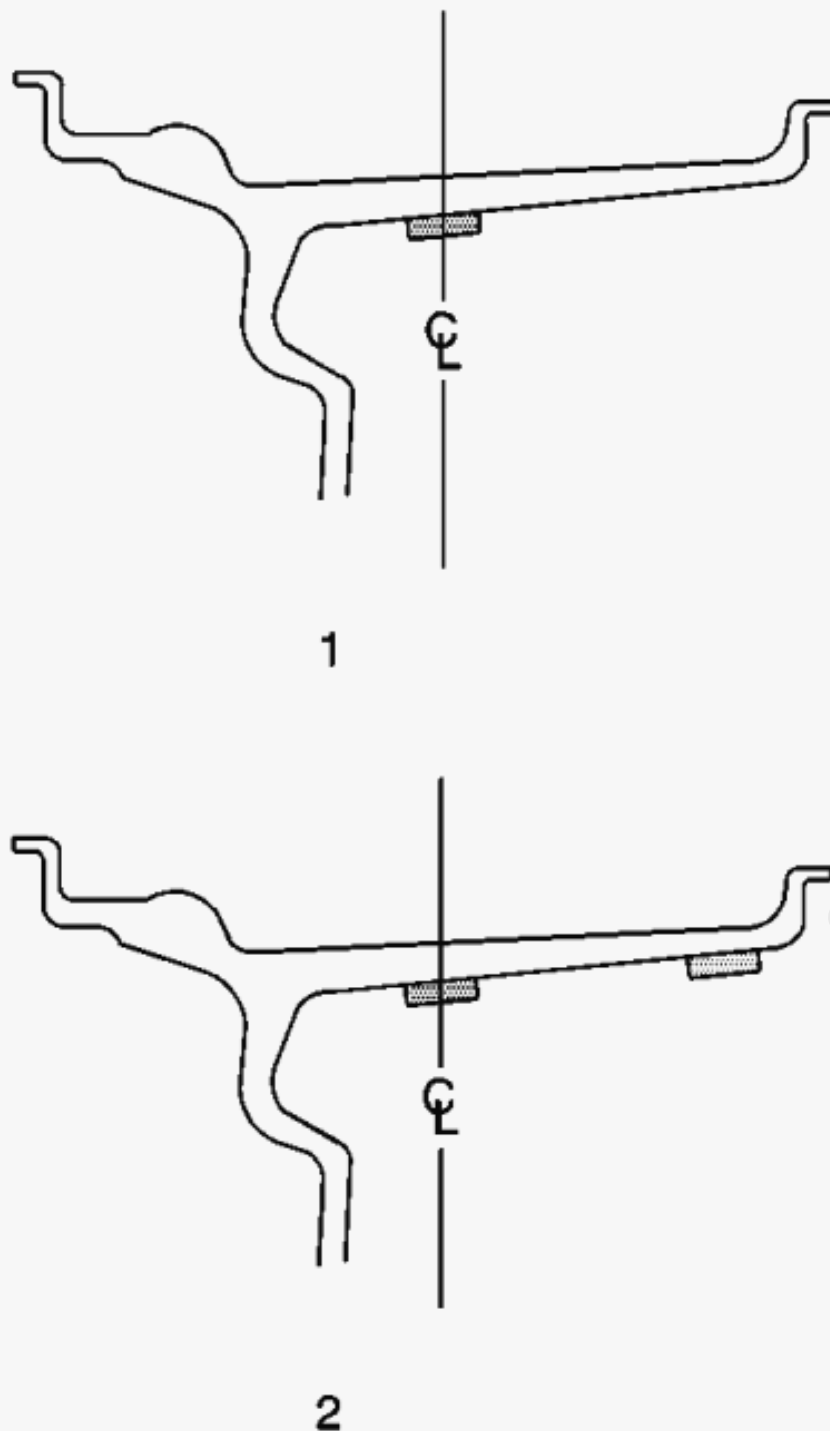


Fig. 27: Identifying Adhesive Weight Wheel Placement

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 flat area of 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 designated flat areas of 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

kPa	psi	kPa	psi
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 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

RIM AND TIRE IDENTIFICATION

Rim Identification

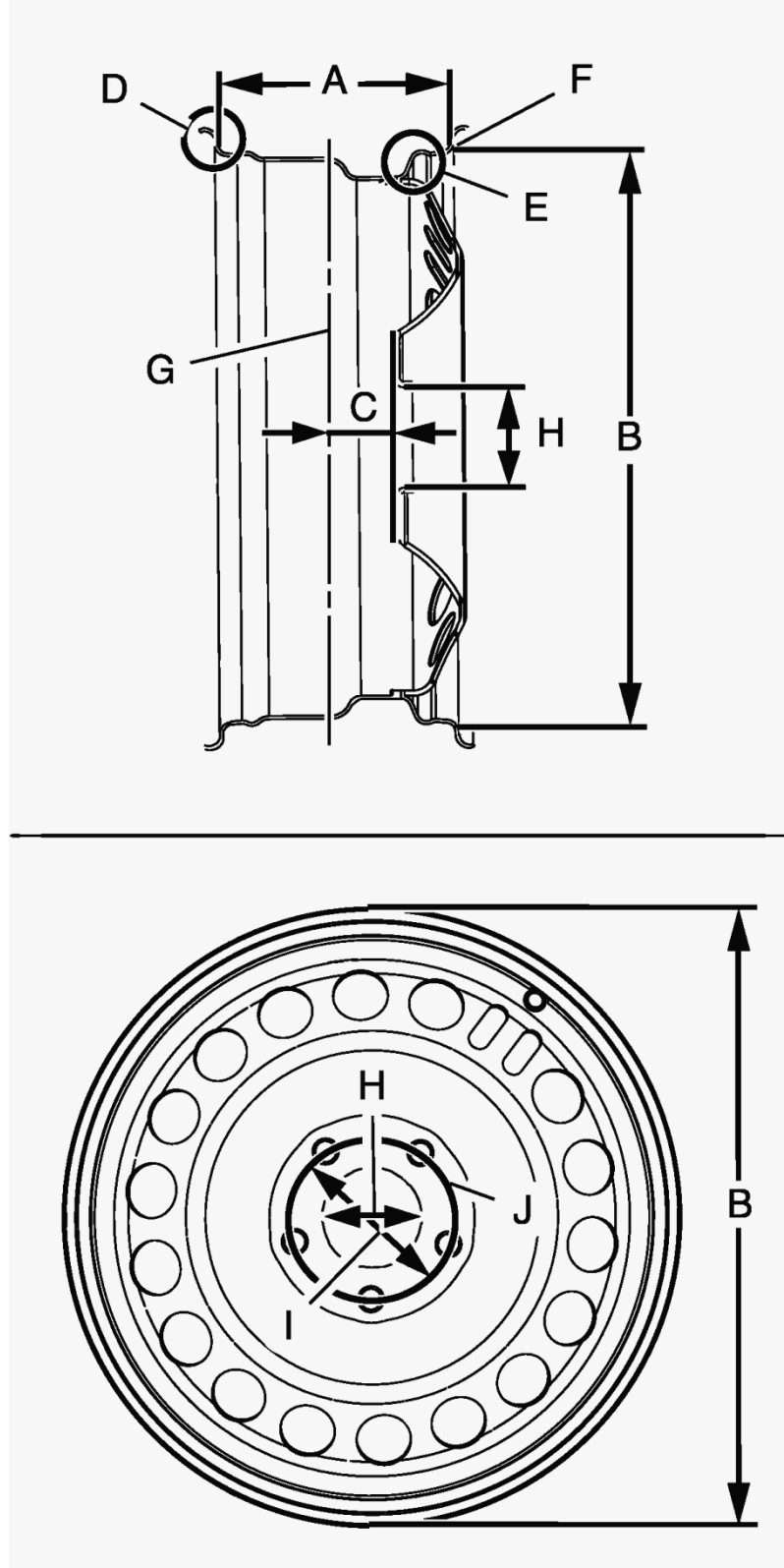


Fig. 28: Rim Identification

Courtesy of GENERAL MOTORS COMPANY

Example for a complete rim identification: 6.5Jx16H2 ET35 5X115

Measure	Meaning	Example
A	Width (Inch)	6.5 in
B	Diameter (inch)	16 in
C	Offset (ET) (Millimeter)	35 mm
D	Shape of rim flange	J
E	Rim hump	H2
F	Point for lateral runout measurement	-
G	Rim center	-
H	Rim center hole (mm)	65 mm
I	Bolt circle	115 mm

Measure	Meaning	Example
J	Number of holes	5x

Tire Identification

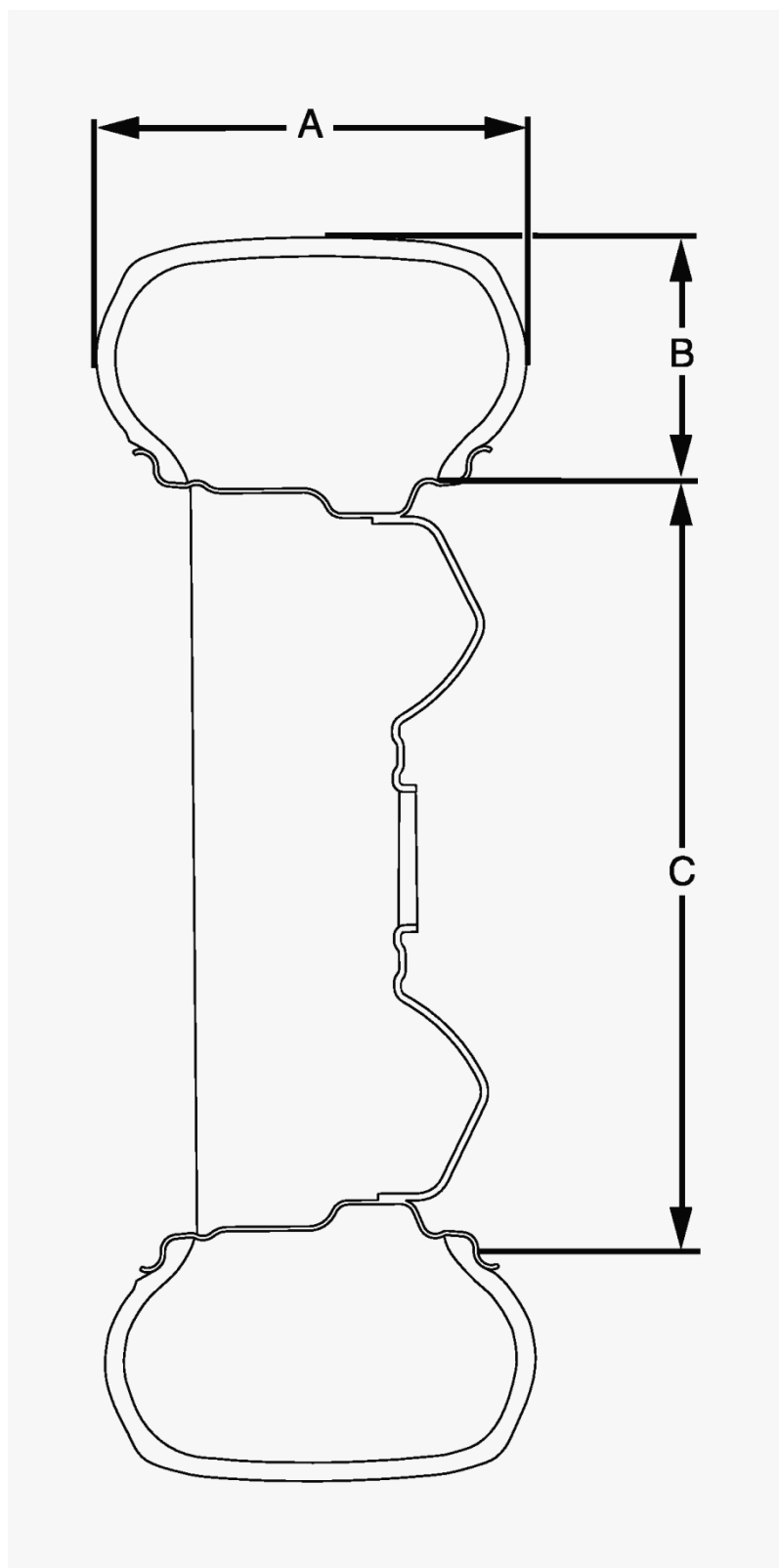


Fig. 29: Tire Identification

Courtesy of GENERAL MOTORS COMPANY

Example for a complete tire coding: 205/55 R16 91H

Code	Meaning
205	Tire width in millimeters (Measure A)
55	Percental rate between tire width and sidewall height (Measure B)
R	Constructive form
16	Inner tire diameter (Measure C)

Code	Meaning
91	Load index
H	Speed index

Tire Constructive Form Identification

Constructive Form	Identification
Bias / Cross ply	none
Radial	R
Radial-Belted / Belted bias	B

Speed Indices

Speed index	Speed limit (km/h)	Speed index	Speed limit (km/h)
E	70	R	170
F	80	S	180
G	90	T	190
J	100	U	200
K	110	H	210
L	120	V	240
M	130	VR	>210
N	140	W	270
P	150	ZR	>240
Q	160	Y	300

Load Indices

Load index	Max. wheel load (kg)	Max. axle load (kg)	Load index	Max. wheel load (kg)	Max. axle load (kg)
70	335	670	91	615	1230
71	345	690	92	630	1260
72	355	710	93	650	1300
73	365	730	94	670	1340
74	375	750	95	690	1380
75	387	774	96	710	1420
76	400	800	97	730	1460
77	412	824	98	750	1500
78	425	850	99	775	1550
79	437	874	100	800	1600
80	450	900	101	825	1650
81	462	924	102	850	1700
82	475	950	103	875	1750
83	487	974	104	900	1800
84	500	1000	105	925	1850
85	515	1030	106	950	1900
86	530	1060	107	975	1950
87	545	1090	108	1000	2000
88	560	1120	109	1030	2060
89	580	1160	110	1060	2120
90	600	1200	111	1090	2180

Important Terms

Term	Explanation
Rim Width	The rim width is measured between the inside of both rim flanges
Tire Width	The tire width is measured between the very outer ends of the tire sidewalls on an inflated tire

Term	Explanation
Outer Diameter	Diameter of an inflated tire at the most outward tread surface
Sidewall height	Half difference between inch diameter and outer tire diameter
Sidewall ratio	Percental ratio between tire width and sidewall height (for example: "55" means, that the sidewall height is 55 % of the tire width)
Tire load	The number indicates, how much weight an inflated tire (to 250 psi) can be loaded.
Tire Inflation pressure	Pressure inside the inflated and cold tire in relation to the ambient air pressure
Speed index	Indicates, how fast a tire can be driven when loaded as specified by the load index (only valid for tires up to 210 km/h)
Offset (abbr. ET)	Difference between rim center and rim to hub mounting surface

Tire Labeling

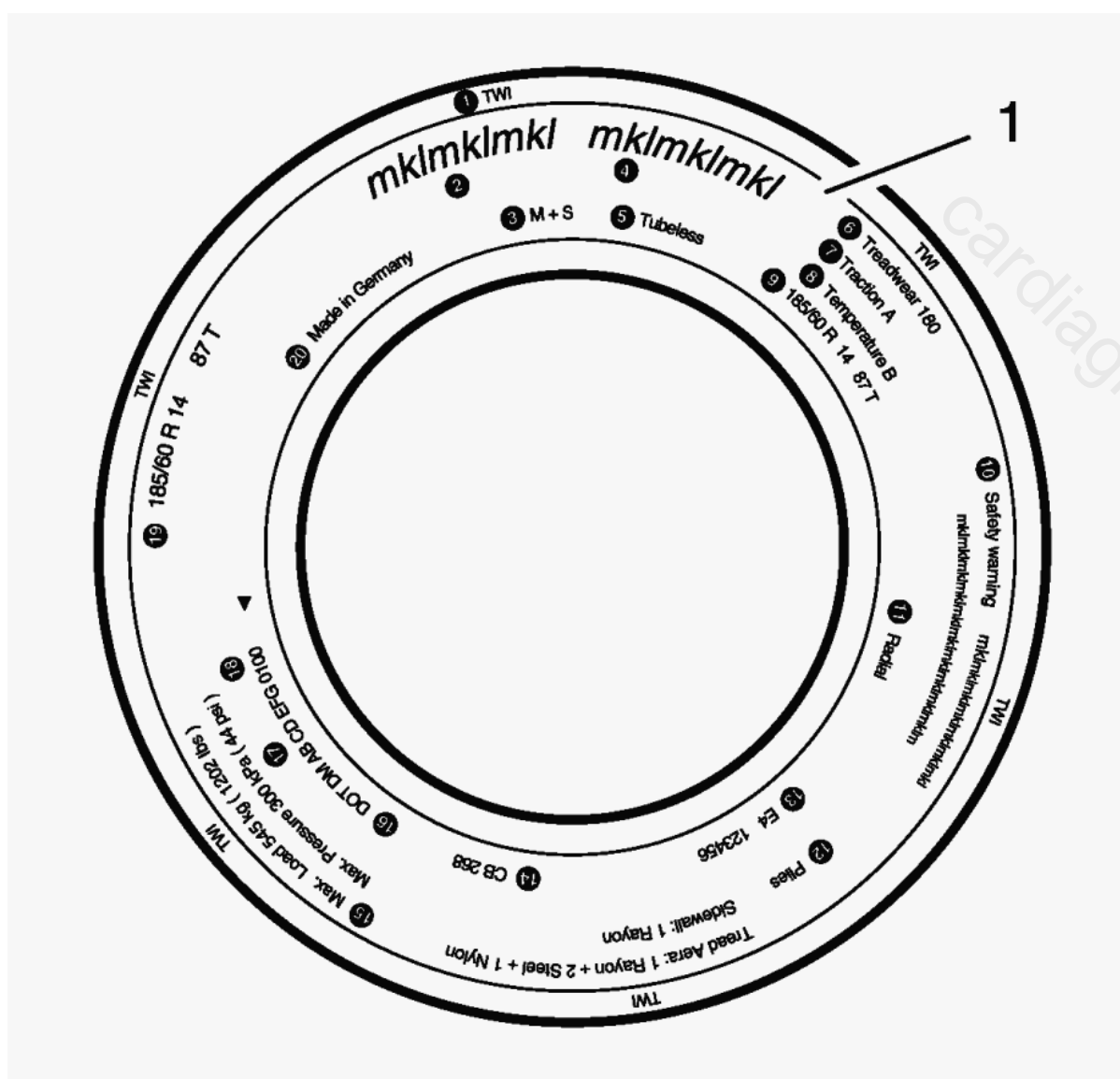


Fig. 30: Tire Labeling

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Position of Tread Wear Indicator (TWI), height 1.6 mm
2	Manufacturer
3	Indicator for special usage (mud and snow)

Callout	Component Name
4	Tread pattern name
5	Marking for tubeless tires
6	Relative life expectation (by US rating; 180 = 180%)
7	Wet braking power (by US rating; A, B or C)
8	High speed temperature stability (by US rating; A, B or C)
9	Tire size labeling
10	Safety warnings for usage or tire mounting (US-specification)
11	Constructive form (radial)
12	Amount and material of tire tread, plies and sidewall
13	Approval symbol for European directive ECE-R 30
14	Internal manufacturer code
15	Details for north American countries: maximum load and pressure
16	DOT-symbol after directives of the US department of transportation (DOT)
17	DOT-coding for factory, manufacturer and tire variant
18	Date of production (here: 1 week of 2000). Code has 4 digits since 2000. Codes before 2000 have 3 digits and are marked with a triangle. Codes before 1990 have 3 digits and no further marking. The first two digits indicate the week of production, the other digits indicate the year of production.
19	Tire size labeling (just as position number 9)
20	Country of production

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

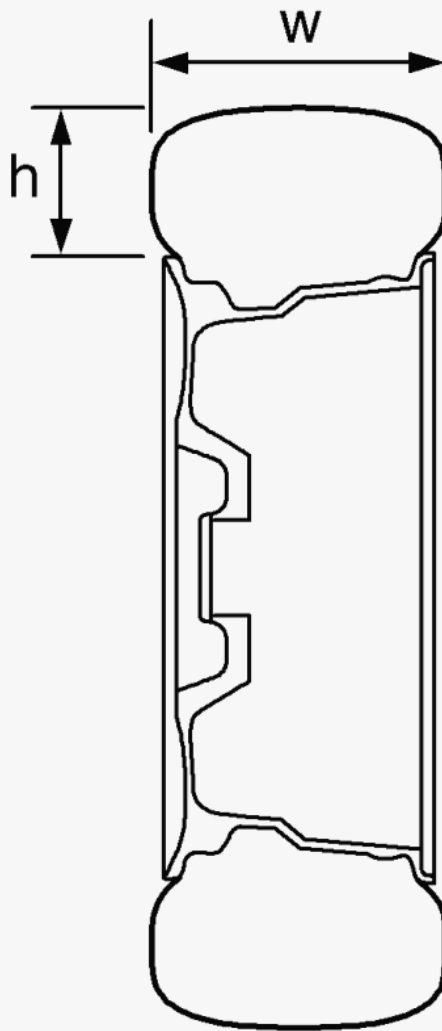


Fig. 31: View Of Tire Width & Height
 Courtesy of GENERAL MOTORS COMPANY

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

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

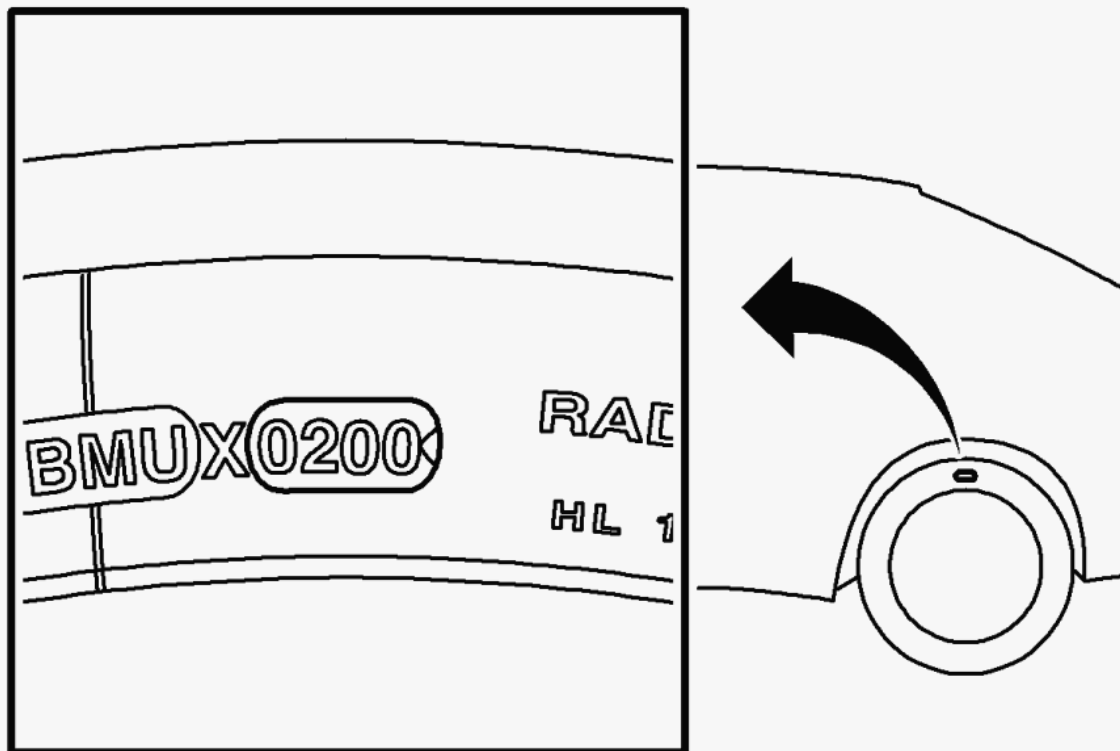


Fig. 32: Week Of Manufacture

Courtesy of GENERAL MOTORS COMPANY

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.

STEEL WHEEL REPAIR DESCRIPTION

CAUTION: Do not heat wheels in an attempt to soften them for straightening or repair damage from striking curbs, etc. Do not weld wheels. The alloy used in these wheels is heat-treated and uncontrolled heating from welding affects the properties of the material.

CAUTION: The use of tubes in tubeless tires is not a recommended repair due to the fact that speed ratings are greatly reduced.

You can repair porosity in aluminum wheels. If leaks are found in a steel wheel, replace the wheel with a wheel of original equipment quality.

TREAD WEAR INDICATORS DESCRIPTION

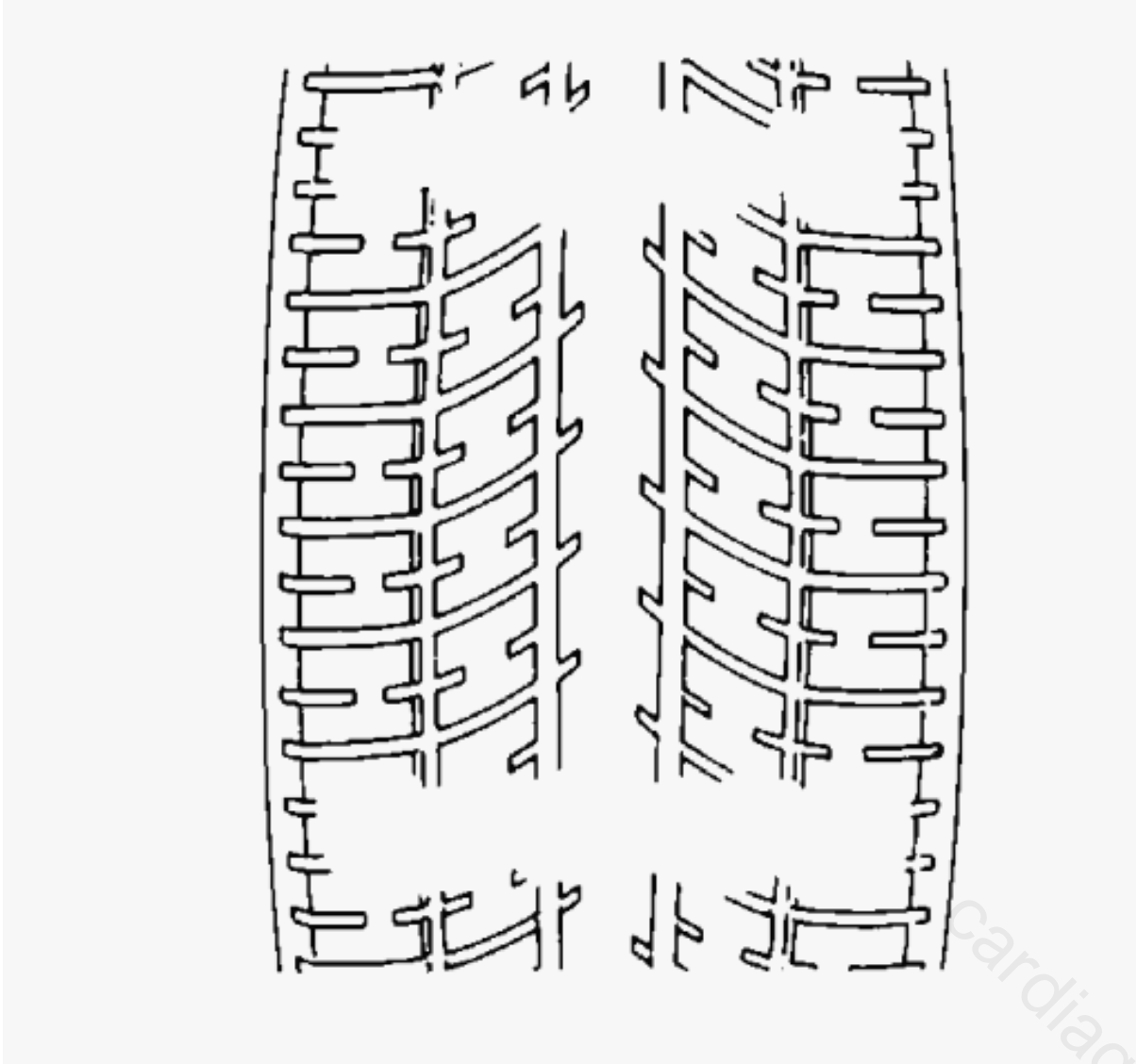


Fig. 33: View Of Tread Wear Indicators

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

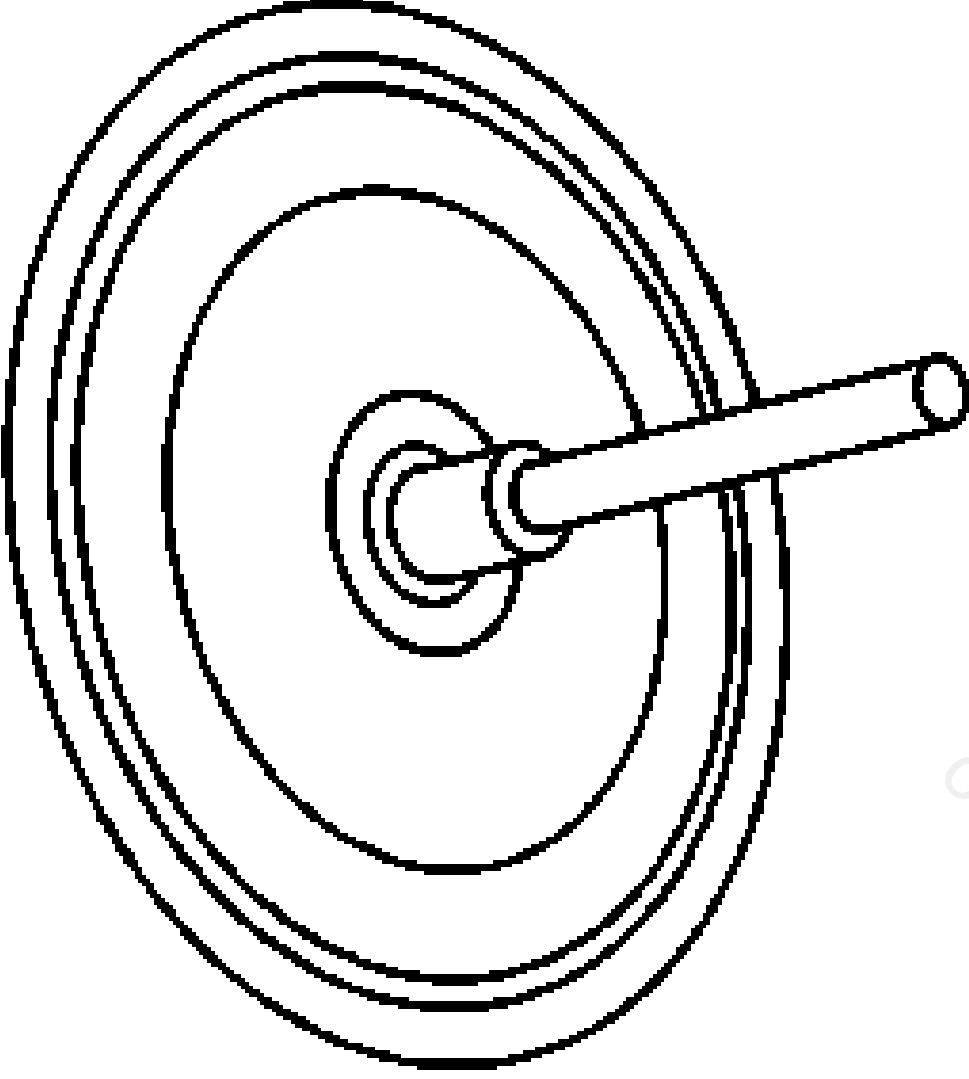
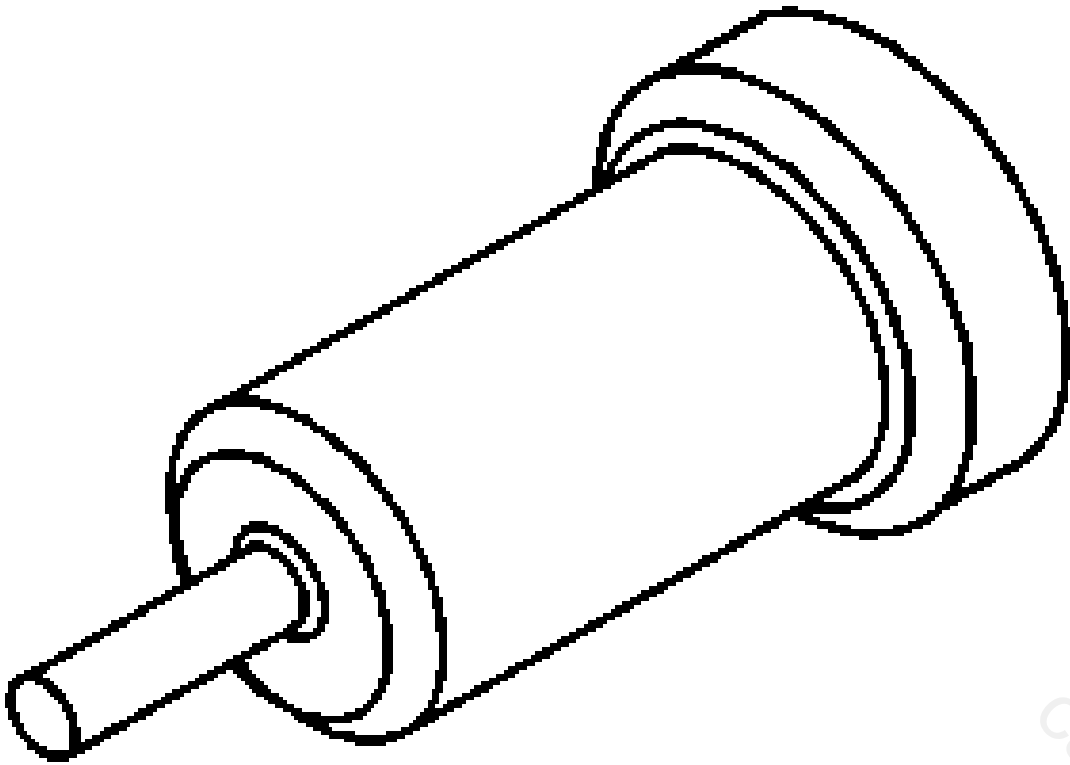
Illustration	Tool Number/ Description
	CH 41013 J 41013 Rotor Resurfacing kit cardiagn.com

Illustration	Tool Number/ Description
 A technical line drawing of a cylindrical wheel hub. It features a central shaft extending from the left. The hub has two flanges: a smaller one on the left and a larger one on the right. The drawing is oriented diagonally. A faint watermark 'cardiagn.com' is visible in the lower right area of the illustration.	CH 42450 - A J 42450 - A Wheel Hub Resurfacing Kit