

# Wheel & Rim Safety Manual

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## Overview

GKN Wheels' manufacturing facilities in the UK, Denmark, Italy, China, and the United States are equipped to supply a wide range of precisely tailored wheel technologies on a global basis.

The extensive product range covers a wide market sector, including wheels for agricultural tractors, forage and combine harvesters, trailer loaders, and lift trucks for the agricultural industry. GKN Wheels also supplies a range of single and multi-piece wheels for the light and heavy construction industries, and for use on machines such as earthmovers, diggers, dumpers, forklift trucks, and mobile cranes. GKN Wheels works in partnership with global and regional customers to better understand their key strategic aims. And, wherever the customer's manufacturing facilities, GKN Wheels provides a consistent worldwide customer interface through the use of account management systems.

At GKN Wheels, manufacturing facilities encompass a proud heritage of wheel making, backed with multi-million dollar investments in multi-piece wheel manufacturing facilities, pressing processes, and painting systems.

New materials, designs, and manufacturing processes add further value to the supply chain and contribute to innovative product ranges.

Working in partnerships with universities, industry-wide bodies, and customers, GKN Wheels ensures its new product introduction programs are always closely aligned with customers and their specific needs. New product introduction techniques and company-wide quality systems ensure products are delivered on time. Shop floor staff and senior management share a commitment in support of GKN Wheels' pursuit of business excellence through lean manufacturing, visual management, and mission-directed work teams. GKN Wheels supplies a range of components and systems to industries and applications involved in cultivating and developing the natural resources and structures of the Earth's surface i.e., agriculture, forestry, construction, and mining.

As an important global partner for its customers, the division supplies its customers with complete systems and continues to gear its activities to further system development.

## Safety warnings & general guidelines



**WARNING:** Air pressure in an inflated off-highway tire mounted on a wheel and rim creates explosive energy. This pressure can cause the tire/rim components to burst apart with great force. This is true of both single piece and multi-piece assemblies. If an exploding tire or rim component or the sudden release of air from a tire strikes you, you can be seriously or fatally injured. To help avoid accidents, follow all proper procedures as described in this manual, including OSHA Standards located in Appendix A.

Improper handling and assembly of off-highway rim wheels can cause serious or fatal accidents. Components can explode at any time when proper procedures have not been followed, including during:

- Mounting & Demounting**
- Inflation**
- Installation & Removal**
- Other Handling or Operation**

### Always Comply with the Following Guidelines:

These guidelines are explained more fully throughout this manual as well as in the OSHA Standards located in Appendix A.


**Proper Training:** Never service any tires, wheels, or rims without proper training. For information on OSHA-recommended employee training and free charts, see OSHA Standards for Servicing Multi- Piece and Single Piece Rim Wheels, 29 C.F.R.1910.177, which is located in Appendix A.

**Tire Servicing Tools & Equipment:** Always use the recommended safety equipment and tools.

**Proper Wheel Components:** Only use clean and matching components that are in good condition. Discard any worn-out, damaged, excessively rusted, or corroded parts. If you are unsure whether components match or if you cannot find size markings on the components, do not mount and inflate the tire.

**Safe Servicing & Operating Procedures:** Learn and follow safe procedures -- every time. Comply with the proper recommended procedures at all times, including when mounting or demounting, Installing or removing, inflation or deflation, and any other handling operations. Never take short cuts. If you are unsure about a procedure, stop and get expert help.

**READ, UNDERSTAND, AND FOLLOW THE INSTRUCTIONS IN THIS MANUAL TO PREVENT INJURIES AND COSTLY DAMAGE.**

Safety Warnings are located prominently throughout this manual. Pay close attention to the content of each warning. This symbol  indicates a warning message. Failure to heed warnings could lead to serious or fatal injury.

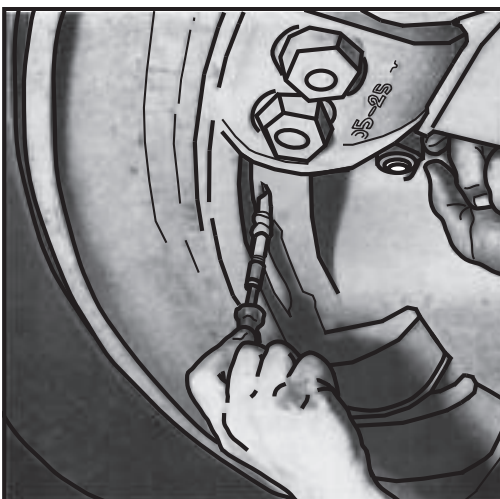
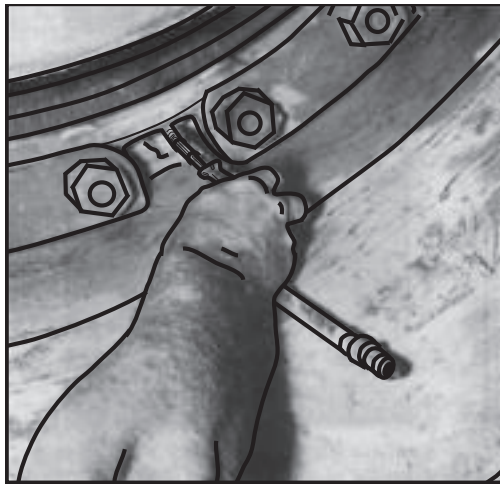
## Warning about removal of air before servicing rim wheel

**IMPORTANT!** This is the first step in all demounting operations.

For safety's sake, always remove the valve core and exhaust all air from a single tire and from both tires of a dual assembly before loosening the first clamp nut.



**WARNING:** Check the valve stem by running a piece of wire through the stem to make sure it is not plugged. If it is necessary to remove the valve core housing, removal should be done after the valve core is removed and air is exhausted.



**READ AND FOLLOW THE SAFETY INSTRUCTIONS.  
FAILURE TO DO SO COULD RESULT IN SERIOUS OR FATAL INJURY.**

For safety's sake, always remove the valve core and exhaust all air from a single tire and from both tires of a dual assembly before loosening the first clamp nut.

## Definitions of common terms used in servicing multi & single piece rim wheels

See OSHA Standards for Servicing Multi-Piece and Single Piece Rim Wheels, 29 C.F.R. 1910.177, Appendix A.

**Barrier:** Fence, wall, or other structure or object placed between a single piece rim wheel and an employee during tire inflation to contain the rim wheel components in the event of the sudden release of the contained air of the single piece rim wheel.

**Demounting a Tire:** The disassembly or taking apart of the wheel and tire components to form a rim wheel, including deflation. The opposite of “mounting.”

**Installation of a Rim Wheel:** The transfer and attachment of an assembled rim wheel onto a vehicle axle hub. The opposite of “removal.”

**Mounting a Tire:** The assembly or putting together of the wheel and tire components to form a rim wheel, including inflation. The opposite of “demounting.”

**Multi-Piece Rim Wheel:** The assemblage of a multi-piece wheel with the tire tube and other components.

**Multi-Piece Wheel:** A vehicle wheel consisting of two or more parts, one of which is a side or locking ring designed to hold the tire on the wheel by interlocking components when the tire is inflated.

**Removal of a Rim Wheel:** The detachment of an assembled rim wheel from a vehicle axle hub. The opposite of “installation.”

**Restraining Device:** An apparatus such as a cage, rack, assemblage of bars, and other components that will restrain all rim wheel components during an explosive separation of a multi-piece rim wheel or during the sudden release of the contained air of a single piece rim wheel.

**Rim Manual:** A publication containing instructions from the manufacturer or other qualified organization for correct mounting, demounting, maintenance, and safety precautions peculiar to the type of wheel being serviced.

**Rim Wheel:** An assemblage of tire, tube and liner (if appropriate), and wheel components.

**Service Area:** The area specifically used for the servicing of rim wheels or any other place where an employee services rim wheels.

**Servicing:** The mounting and demounting of rim wheels and related activities such as inflating, deflating, installing, removing, and handling.

**Single Piece Rim Wheel:** The assemblage of single piece rim wheel with the tire and other components.

**Single Piece Wheel:** A vehicle wheel consisting of one part, designed to hold the tire on the wheel when the tire is inflated.

**Trajectory:** The potential path or route that a rim wheel component may travel during an explosive separation or the sudden release of the pressurized air. In the case of a single piece rim wheel, the trajectory is the area at which an airblast may be released. The trajectory may deviate from paths that are perpendicular to the assembled position of the rim wheel at the time of separation or explosion.

**Wheel:** The portion of a rim wheel that provides the method of attachment of the assembly to the axle of a vehicle and also provides the means to contain the inflated portion of the assembly (tire and/or tube).

# Standard wheel & rim terminology

## Reference SAE Standard J751

### **Single Piece Rims**

1. Nominal Rim Width
2. Nominal Rim Diameter (Bead Seat Diameter)
3. Rim Inside Diameter
4. Valve Hole
5. Flange Height
6. Flange Width
7. Bead Seat Area

### **Multi-Piece Rims (Three Piece Style)**

Single Piece Rims

Reference SAE Standard J751

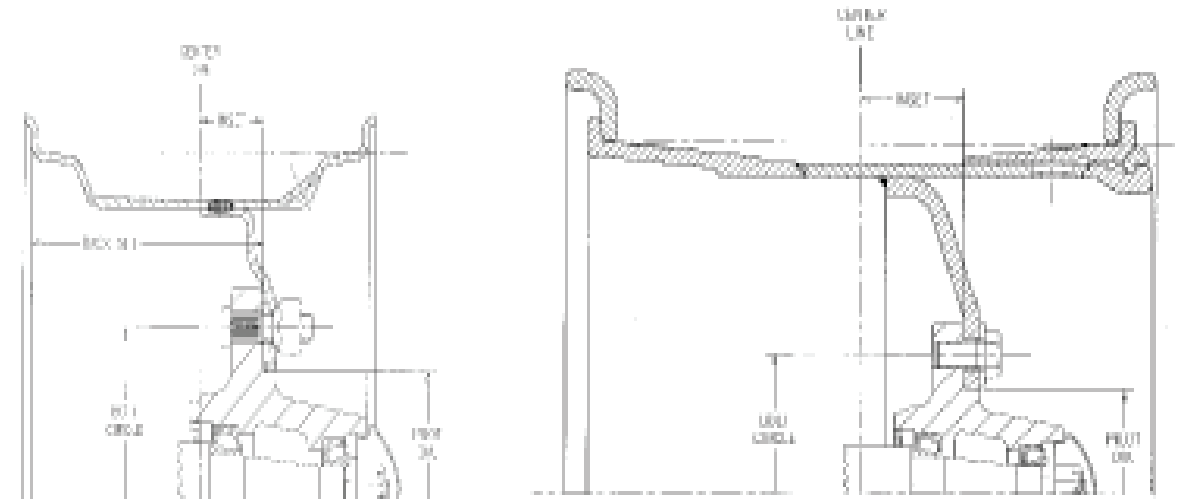
1. Nominal Rim Width
2. Nominal Rim Diameter (Bead Seat Diameter)
3. Rim Inside Diameter (ID)
4. Valve Hole
5. Flange Height
6. Flange Width
7. Side Flange (Detachable Flange)
8. Lock Ring
9. O-Ring (Rubber)
10. 28 Degree Mounting Angle
11. Lock Ring Groove
12. O-Ring Groove
13. Rim Driver (Demountable Rim)

**Multi-Piece (Five Piece Style)**

1. Nominal Rim Width
2. Nominal Rim Diameter
3. Rim Inside Diameter (Id)
4. Valve Hole
5. Flange Height
6. Flange Width
7. Flange (Removable Flange - 2 Required)
8. Lock Ring
9. O-Ring
10. 28 Degree Mounting Angle
11. Lock Ring Groove
12. O-Ring Groove
13. Rim Driver (Demountable Rim)
14. Bead Seat Band
15. Rim Knurling
16. Pry Bar Pocket



## Positive Offset (or Positive Inset)



**Offset:** The distance between the mounting face of the disk and the rim centerline. (Defined by SAE standards).

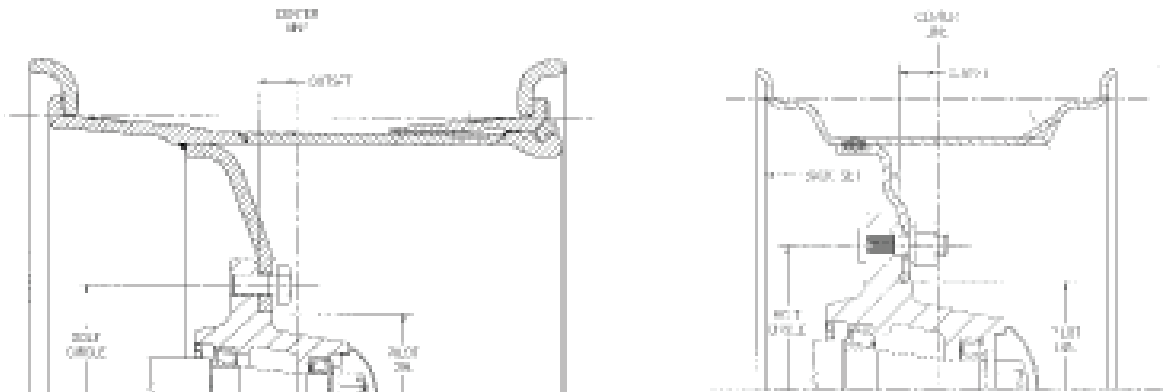
**Positive Offset:** The distance is termed positive when the mounting face is outboard of the rim centerline. This is also known as positive inset.

**Back Set:** The distance between the mounting face and inboard face of the bead seat.

## Negative Offset

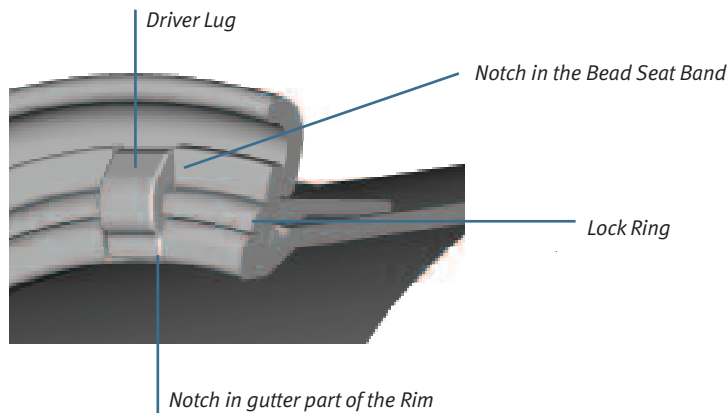
**Negative Offset:** The distance is termed negative when the mounting face is inboard of the rim centerline. This is also known as negative outset.

**Back Set:** The distance between the mounting face and inboard face of the bead set.

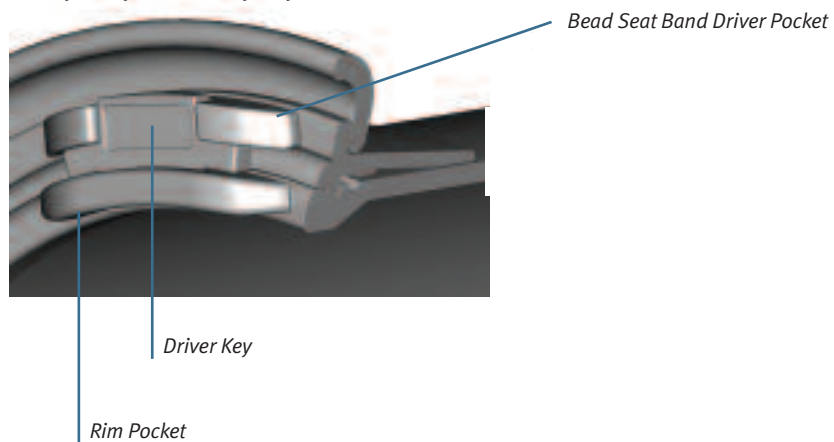


## Multi-Piece Rims – Rim Driver Locks

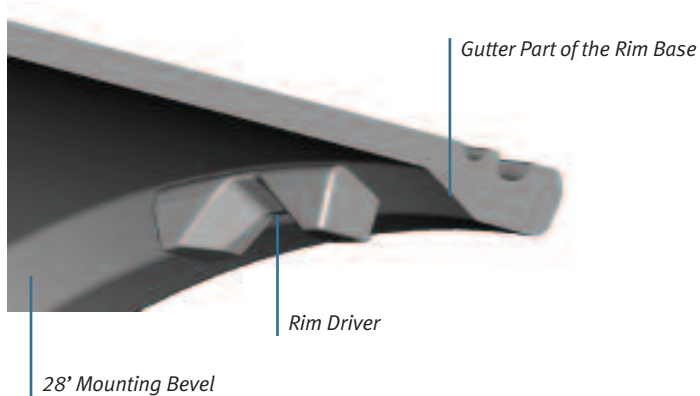
### Lug Style with Notched Gutter



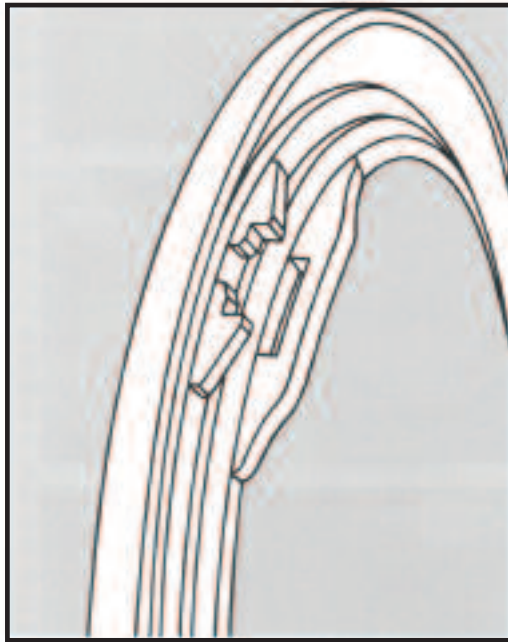
### Heavy Duty Loose Key Style



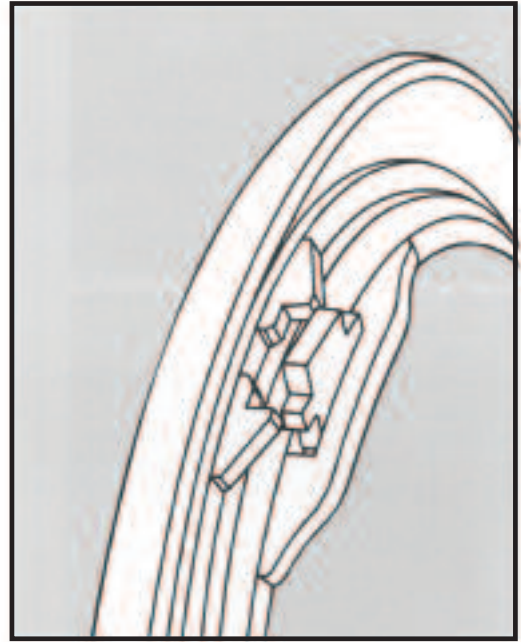
### Demountable Rim Driver



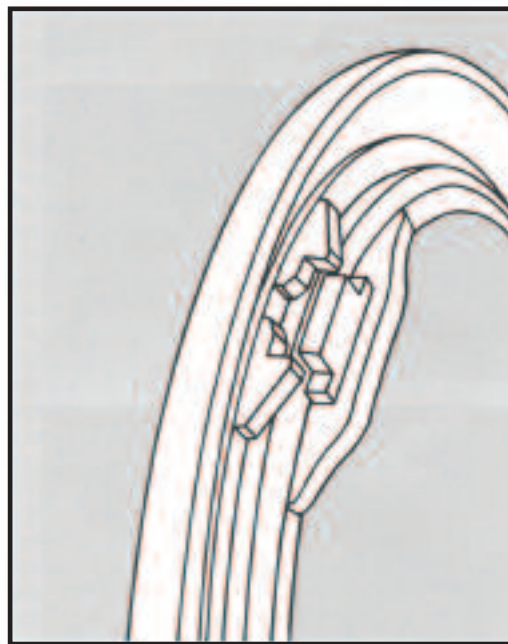
### Typical heavy duty driver application



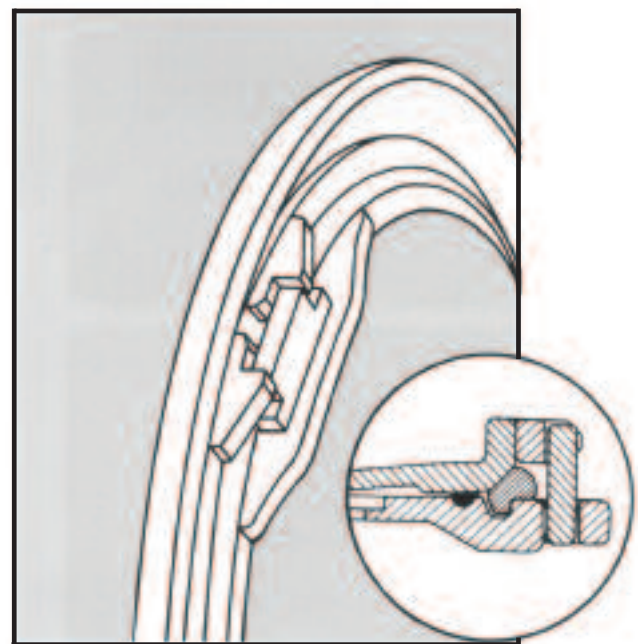
1. Align driver pockets in bead seat band and base as shown.



2. Insert driving key into driver pocket on base.



3. Make certain that all parts are properly aligned, as shown above, before inflation.



4. View of final assembly.

## Required safety equipment

The use of proper tools and safety equipment helps prevent personal injuries and other costly damage. Remember, an inflated tire contains explosive energy. This can cause the tire/rim components to burst apart with great force. Protect yourself and others by using the tools and safety equipment recommended below.

- > **Restraining Device:** Always use a safety cage or other approved restraining device to inflate tires.
- > A restraining device is the most effective safeguard against injury that may result from assembly errors.
- > A safety cage, safety chains, or other OSHA-approved restraining device is your best protection if there is an explosion during inflation.

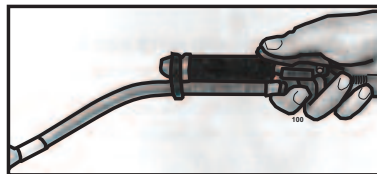


*Safety Cage*

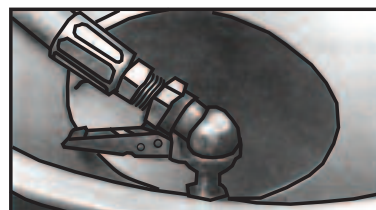


**WARNING:** Facing the side/lock rings against a wall or other permanent structure during inflation is not safe. If the assembly explodes, you can be struck by flying components. Fully restrain the rim wheel during inflation of the tire.

- > **Clip-on Chuck and In-Line Valve and Gauge:** Always use a clip-on air chuck with an in-line valve and gauge with sufficient length of hose to stand clear from the trajectory.
- > A clip-on air chuck allows you to keep your hands, arms, and body clear of the trajectory during inflation.
- > An in-line valve allows you to control the air flow while standing away from the assembly.
- > An in-line gauge allows you to monitor the air pressure going into the tire while staying clear of the trajectory.



*In-Line Valve and Gauge*



*Clip-on Air Chuck*



**WARNING:** A hand-held air chuck should never be used to inflate a tire. It is dangerous because you must put your hand inside the safety cage or the restraining device. Therefore, you are in the trajectory, which can result in serious or fatal injury.

## Proper equipment & tools for servicing

Use only recommended tools and equipment for mounting and demounting off-highway tires and servicing wheels and rims to achieve optimal safety. Use of proper tools prevents damage to the rim and components. The use of improper tools or equipment can cause personal injury.

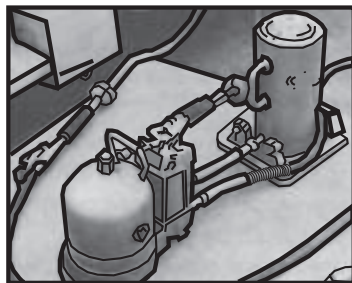
The following tools are required to service the various types of multi-piece rims included in this manual:

The following equipment may be required:

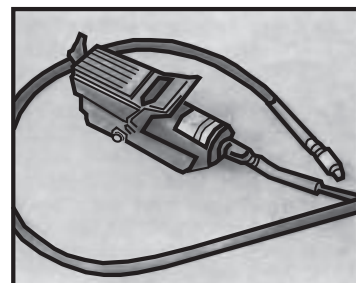
- A. Hardwood Blocks
- B. Valve Extension Tool
- C. Set of Cap and Core Removal Tools
- D. Wire Brush
- E. Chain or Cable Slings of Adequate Length
- F. Bead Lubricant (Non-Petroleum Base)
- G. Sledge Hammer
- H. Rubber Mallet or Equivalent (e.g. Babbitt Hammer)
- I. Inflation Hose with Clip-On Chuck, In-line Gauge and Control Valve.

**1. Air-Hydraulic Pump and 50-Ton Jack:**

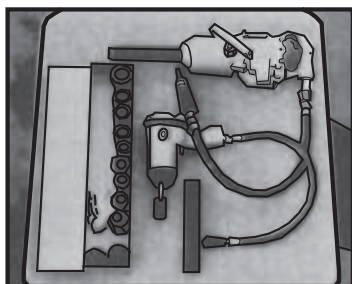
Air supplied to the pump develops hydraulic pressure to lift the jack. This equipment is essential in servicing extra-heavy construction equipment.



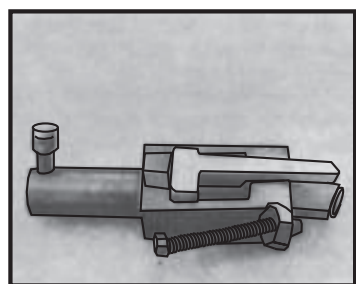
- 2. Air Hydraulic Pump:** The pump activates hydraulic tools, such as the bead breakers and hydraulic rams.



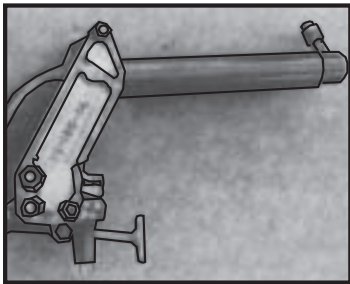
- 3. Air Wrenches:** Air wrenches and their sockets are used to tighten and loosen nuts on wheel assemblies.



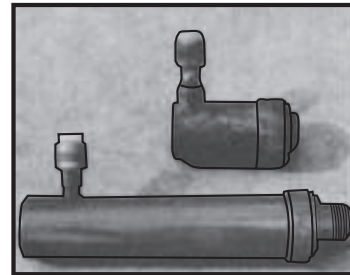
- 4. Bead Breaker:** This type of bead breaker is used for loosening tires from bead seats when the rim has prying slots.



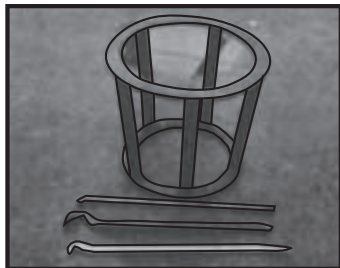
5. **Bead Breaker:** This type of bead breaker is used for loosening tires from bead seats when the rim has no prying slots.



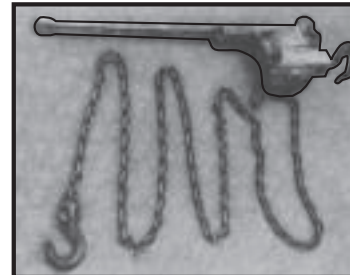
6. **Top:** 4" (100 mm) ram  
**Bottom:** 6"-8" (150–200 mm) ram  
**Ram:** A ram is used to apply pressure to the inside bead flange when removing tires from 5" (125 mm) tapered rims.



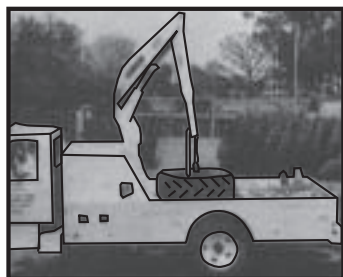
7. **Mounting Stand:** A mounting stand is used when replacing tires on rims that have been removed from a vehicle or machine.



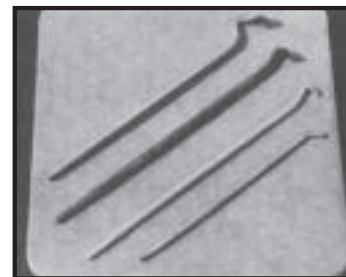
8. **1½-ton Capacity Coffin Hoist:** A hoist expands the beads on tapered bead seats so that the tire will take air.



9. **Service Truck with Hydraulic Hoist:** A hoist is essential for installing and removing heavy off-the-road tires.



10. **Tire Irons:** Tire irons pry apart wheel components.



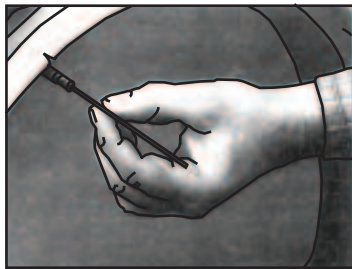
## Safety Procedures & Standards for Servicing Off-Highway Rim Wheels

1. Importance of Deflation before Servicing
2. Proper Matching of Components before Assembly
3. Ensure All Components are in Good Condition
4. Preparation of Parts before Assembly
5. Safety Precautions during Inflation
6. Safety Precautions after Inflation
7. Safe Loading
8. Safe Installation on Vehicle or Machine
9. Safe Operation While on the Vehicle or Machine



# 1. Importance of deflation before servicing

- Always deflate both tires in a dual assembly completely before removing an assembly from the vehicle or machine or a tire from a rim wheel. Unseen damage could cause the assembly to explode during removal if the tire is removed while it is still inflated. See OSHA *Standard for Servicing Multi-Piece and Single Piece Rim Wheels*, 29 C.F.R. 1910.177, Appendix A.
- Remove the valve core to ensure the tire is completely deflated before loosening any nuts or clamps or removing the assembly.
- Foreign materials may clog the valve stem during deflation or ice may form as air leaves the tire. Run a piece of heavy wire through the valve stem to make sure that no more air is in the tire and that debris or other objects have not clogged the valve.
- If working on a dual assembly, separately perform each step for each tire.
- Never deflate the tire near sparks or open flames.



Run a wire through the valve stem to ensure tire is completely deflated.



**WARNING:** Do not add air to tires that have been operated in an underinflated or flat condition. Adding air can cause the rim wheel to separate explosively. The explosion can cause serious or fatal injury.

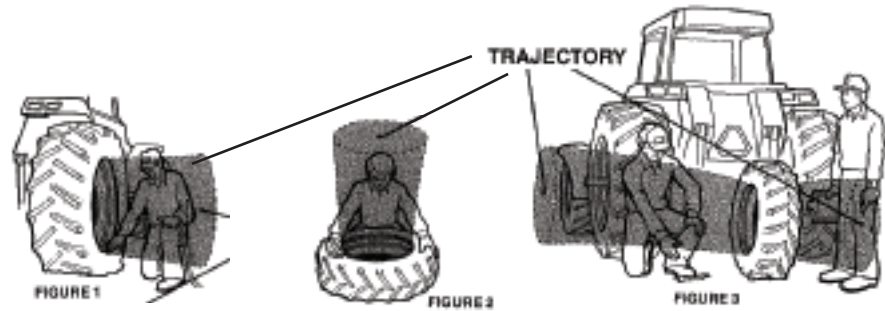
- Always deflate, remove from the vehicle or machine, disassemble, and inspect a tire and rim assembly that has been operated in a run-flat or underinflated condition (80% or less of recommended pressure). See OSHA *Standard for Servicing Multi-Piece and Single Piece Rim Wheels*, 29 C.F.R. 1910.177, Appendix A.
- Do not stand in front of a rim wheel while deflating the tire. In case of an explosive disassembly, you need to be out of the trajectory (danger zone).
- "Eyeballing" or "thumping" a tire does not provide the pressure reading. Always use an air gauge to measure tire pressure.





**WARNING:** Stay out of the trajectory as indicated by shaded area. Always use a safety cage or other restraining device in compliance with OSHA regulations.

**Note:** Under some circumstances, the trajectory may deviate from its expected path.



## 2. Proper matching of components before assembly

**Inspect All Parts for Matching Before Assembly:** Rims and rings must match by size and type. Be sure all the parts of your assembly are matched correctly. Remember: Just because parts arrive together does not mean they belong together.



**WARNING:** Mismatched tire and rim components may explode and cause serious or fatal injury.

- > The size is stamped on every GKN rim base or side/lock ring. The stamping is generally found on the rim base near the valve slot/valve hole. If you cannot read the stamping on any part, do not use the part. Such parts should be destroyed and discarded.
- > Rim components must not be interchanged except as provided for in the OSHA Multi-Piece Rim Matching Chart. For information on how to get free copies of this chart see *OSHA Standards for Servicing Multi-Piece and Single Piece Rim Wheels, 29 C.F.R. 1910.177, Appendix A.*
- > Be sure your tire size is approved for your rim. Wheels and rims may accommodate tires of varying widths.
- > Be sure the diameter shown on the tire exactly matches the diameter stamped on the rim base or side/lock ring. Do not rely on “eyeball” estimates. Even a small difference could result in an accident.
- > To aid in identifying matching components, GKN Armstrong Wheels applies a warning decal to the tire side of the rim near the valve slot/valve hole on the following rim/wheel diameters:

14.5”    16.1”    16.5”    17.5”    19.5”    22.5”    24.5”

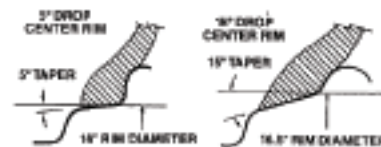


**WARNING:** There is a danger of serious injury or death if a tire of one bead diameter is installed on a rim or wheel of a different rim diameter.

Always replace a tire with another tire of exactly the same bead diameter designation and suffix letters. For example: A 16" tire goes on a 16" rim. **Never** mount a 16" tire on a 16.5" rim. A 16.5" tire goes on a 16.5" rim. **Never** mount a 16.5" tire on a 16" or 16.1" rim. For the same reason, never mount a 26" rim diameter tire on a 26.5" rim. **Never** mount a 30" rim diameter tire on a 30.5" rim.

While it is possible to pass a 16" diameter tire over the lip or flange of a 16.1" or 16.5" size diameter rim, it **cannot** be inflated enough to position itself against the rim flange. If an attempt is made to seat the tire bead by inflating, the tire bead will break with explosive force and could cause serious injury or death.

Rims of different diameters and tapers **cannot** be interchanged. The following diagram illustrates the difference between rims of two different tapers and diameters:



The following diagram shows how beads of a 16" tire will not seat on a 16.5" rim. The beads **cannot** be forced out against the rim flanges by using more air pressure because this will break the beads and the tire will explode with force sufficient to cause serious injury or death.



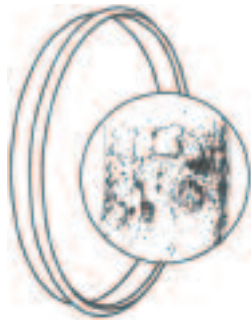
### 3. Ensure all components are in good condition



**WARNING:** Use of damaged parts is very dangerous and is prohibited by the *OSHA Standard for Servicing Multi-Piece and Single Piece Rim Wheels, 29 C.F.R. 910.117*. These parts can fail during inflation, later handling, or while on the vehicle or machine. You or someone else could be seriously or fatally injured.

**Inspect All Parts For Damage:** Examine and clean all parts carefully before assembling them. It takes only a few moments to inspect the rim and side rings/lock rings for problems. Those few moments could save your life.

- Do not use damaged, worn out, or cracked parts. A leak in a tubeless assembly maybe caused by a cracked rim. Do not try to repair cracked rims. Never put a tube in a tubeless assembly to stop a leak. Destroy any cracked rim; it could cause an accident.
- Wire brush all metal surfaces thoroughly to remove any surface rust or corrosion.
- After cleaning, check all metal parts for rust, corrosion, cracks, bent flanges, sprung side/lock rings, and deep tool marks on rings or in gutter areas. The illustrations below show some of these conditions.



*Erosion and chipping off bead seat of lock ring.*



*Sprung side ring.*



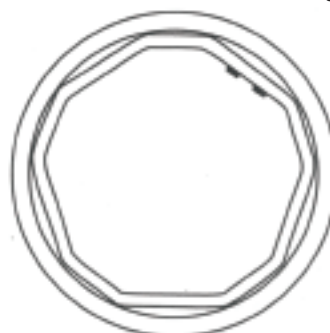
*Cracks through continuous side ring spreading laterally through the entire section.*



*Cracks in the rim base, in the back flange and gutter areas. Deep tool marks on flange and gutter.*



*Out of flat rings.*



*Out of round rims.*



*Cracks in rim base.*

- If you find parts with these or similar problems, destroy them. They cannot be repaired. For more information see Rim Wheel Components: Inspection Guidelines in this manual.

## 4. Preparation of parts before assembly



**WARNING:** Dirt and rust can cause a bead hang-up (the tire bead not seating properly) or prevent rim components from seating properly. Assembling dirty or rusty components can lead to explosive separation and result in serious or fatal injury.

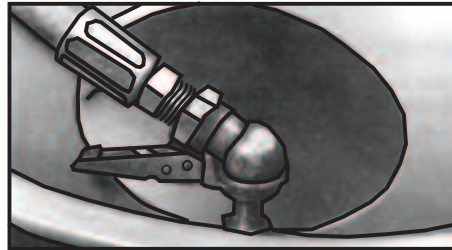
- After removing all rust, corrosion, dirt, and other foreign material from all metal surfaces, check the mating surfaces of side/lock rings in multi-piece assemblies. The parts should be prepared with paint and a recommended lubricant.
- A good way to prevent dangerous rust build-up is painting the rim with a fast-drying primer. See Rim Wheel Components: Inspection Guidelines in this manual. Always allow paint to dry before assembling components.
- Lubricate components before assembly. Apply an approved tire lubricant to the bead seat area, tire beads, tire flap, and other rim-to-tire contact surfaces just before mounting the tire.
- Use only lubricants recommended by tire makers, such as vegetable oil and animal soap solutions. If a lubricant is water based, it should contain a rust inhibitor. When dry, the lubricant should not remain slippery. Do not use petroleum, silicon, or solvent-based lubricants, as these may damage the tire rubber or cause rust buildup or tire-to-rim slippage.
- For tubeless rims, inspect the valve stem to ensure that it is in good condition, is not cracked or bent, and is capable of handling proper air pressure. Replace the valve stem as necessary.
- Replace the part if there is any loss of contour or metal thickness. Loss of contour means a wearing away of the metal mating surfaces of the rim base or side/lock rings.
- Never rework, weld, braze, or otherwise heat any cracked, broken, or damaged rim/wheel components. Repaired rim components may fail during inflation or later use.
- Never weld on a wheel or rim at any time, but especially if a tire is mounted. Heat from the welding torch causes explosive gases to be released from the rubber tire, possibly causing an explosion.
- If you suspect damage to any component, replace the part. You will be protecting yourself or others from accidents or injury and giving better service to your customer.

## 5. Safety precautions during inflation

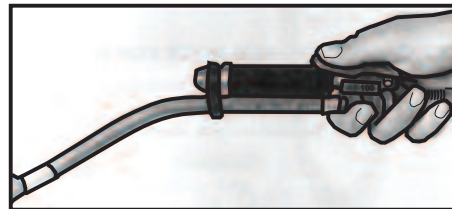
- You can protect yourself and bystanders during inflation by always observing the following safety procedures. If you cut corners, you may cause a serious or fatal accident.
- Always inflate tires in a safety cage or another OSHA-approved restraining device.
- Always use a clip-on air chuck and remote in-line valve and gauge to allow you to stand a safe distance away from the assembly while inflating the tire.
- Always stand back. Keep yourself and others away from and out of the trajectory of the inflating assembly. Do not lean or put any part of your body in or on the safety cage. The movement of the safety cage or air blast alone could cause injury should an explosion occur.



Safety Cage



Clip-on Air Chuck

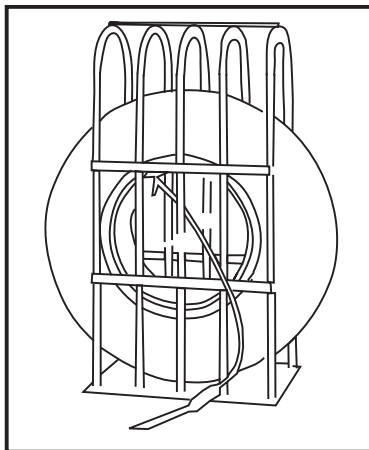


In-Line Valve and Gauge



**WARNING:** Never pour or spray any flammable substance (such as ethyl ether or gasoline) into or on to a tire and ignite it to seat the beads. This practice is very dangerous and can cause a severe explosion, undetectable damage to the rim wheel that may result in serious or fatal injury. Never put any flammable substance into or on rim wheel for any purpose whatsoever.

- When a tire is being partially inflated (without a restraining device) to round out the tube or seat the side/lock ring, do not inflate to more than 3psi (21 kPa). Further inflation could result in explosive separation. Put the tire in a restraining device or use safety chains before inflating it further.
- Tires on vehicles or machines with more than 80% of the recommended air pressure can be re-inflated on the vehicle without disassembly, as long as there is no reason to suspect the tire or rim has been damaged. For safety purposes, use an in-line valve and gauge for inflation, stand clear, and keep others out of the trajectory (danger zone).
- In dual assemblies, use an air gauge and check the pressure in both tires before adding air to either tire. You may not be able to tell from appearance if only one tire is flat or underinflated.



*Safety Cage*

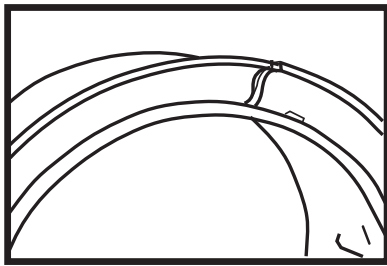


*Safety Cage*

- Never inflate to more than 40 psi (275 kPa) to seat tire beads. Additional inflation can cause a tire explosion. If tire beads do not seat when the tire is inflated to 40 psi (75 kPa), deflate the assembly, re-inspect the components, properly assemble, and follow proper inflation procedures to reinflate.
- After the tire is fully inflated, inspect the tire, rim, and rings for proper seating before you remove the assembled unit from the restraining device or safety chains.
- An incorrectly assembled or damaged multi-piece rim could have components that are not firmly locked in place.

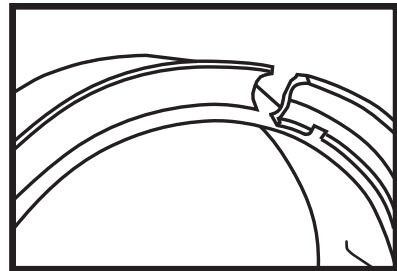
### Proper Assembly for Two-Piece Rims

#### Correct



*The components in a correctly assembled two-piece rim fit snugly and are locked together.*

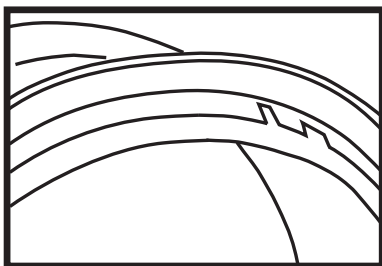
#### Incorrect



*An incorrectly assembled or damaged two-piece rim could have a large gap in the side ring. The components are not firmly locked in place.*

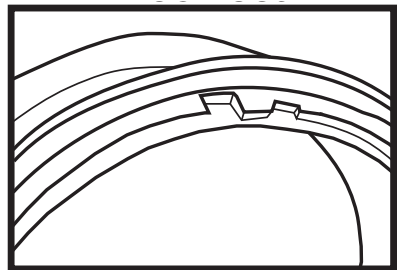
### Proper Assembly for Three-Piece Rims

#### Correct



*A three-piece rim that is correctly assembled has firmly fitted components that are locked together.*

#### Incorrect



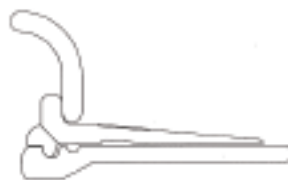
*An incorrectly assembled or damaged three-piece rim could have a large gap in the lock ring. The components are not firmly locked in place.*



### Proper Lock Ring Assembly



*Lightweight  
Three Piece Rim*



*Standard Five Piece Rim*



*Heavy Duty  
Three Piece Rim*

### Incorrect Lock Ring Assembly

(Lock Rings are in Backwards)



*Lightweight  
Three Piece Rim*



*Standard Five Piece Rim*



*Heavy Duty  
Three Piece Rim*

- Never try to correct the seating of the side/lock rings by hammering, striking, or forcing the parts during servicing, inflation, or after inflation. The components could separate explosively if you strike them.
- If the assembled unit is not fully seated, with the lock ring securely positioned in the gutter section, release all the air by using your remote in-line valve that both inflates and deflates. Then remove the valve core to make sure the tire is fully deflated, and remount.

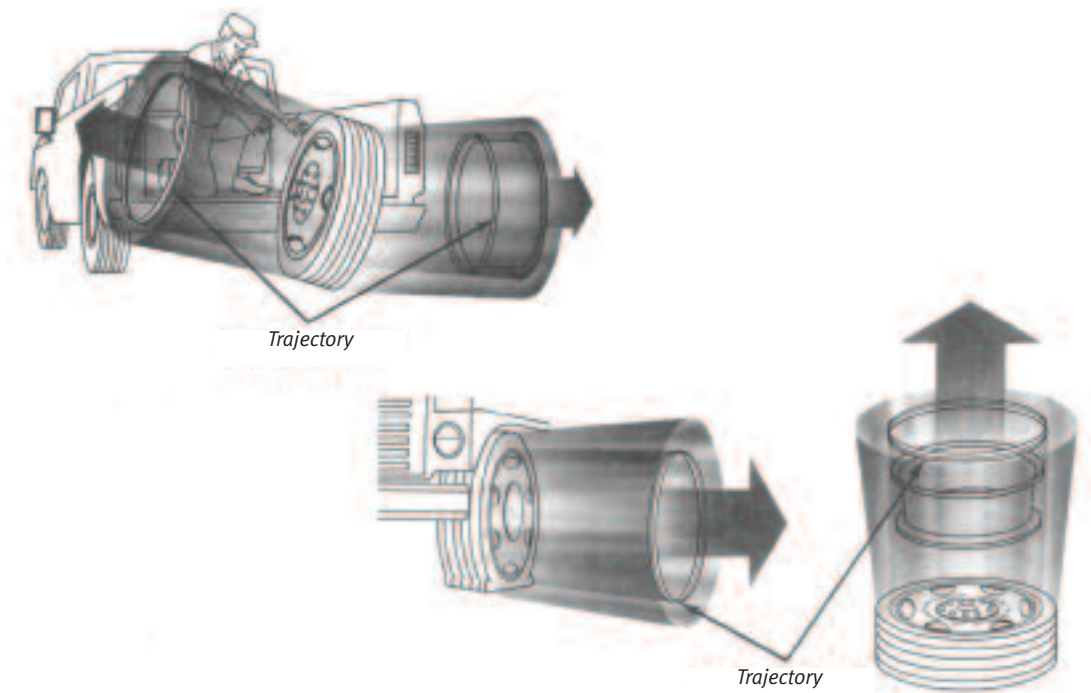
**Remember:** Tire/rim assemblies operated in a run-flat or seriously underinflated condition (80% or less of recommended pressure) can explode if you try to reinflate the tire. Deflate the tire first, remove it from the vehicle or machine, and disassemble. Then check the rim for cracks and double-check the side ring, flange, bead seat band, lock ring, and O-ring for damage. If any piece is damaged, scrap and replace it.

## 6. Safety precautions after inflation



**WARNING:** If proper servicing, maintenance, or assembly procedures have not been followed, the rim wheel may explode at any time, resulting in serious or fatal injuries to you or others.

- > Whenever handling inflated off-highway tires and wheels, stay out of the trajectory (danger zone). Warn others to stay out of the trajectory.
- > In the performance of certain servicing procedures, such as installing or removing a wheel and rim, it may be necessary to be within the trajectory. If you are in the trajectory, you should use extreme care.
- > Always deflate completely before starting to loosen the nuts to remove a rim wheel from a vehicle or machine.
- > Study the diagrams below. Learn the trajectories and stay clear of them.



## 7. Safe loading

Each tire, wheel, and axle has its own maximum rating. Do not load and inflate the tire/wheel/axle system beyond the capacity of the lowest rated component. Overloading causes tire failure and injury accidents.

- If a tire has less capacity (load/inflation) than the Gross Axle Wheel Rating (GAWR) of the wheel and rim or axle it is used with, use the capacity limits of the tire, not the wheel or axle. The GAWR can be found on the vehicle or machine placard.
- If a wheel and a rim have less capacity (load/inflation) than the tire or the axle (GAWR) it is used with, use the capacity limits of the wheel and rim, not of the tire or axle.



**WARNING:** Rims and wheels produced by GKN are designed and tested to meet the requirements of specific tires, vehicles, and/or machines. Some high load capacity/high inflation tires are being used in North America and Europe. These ratings may exceed the rated capacity for all rims and wheels produced by GKN. These high load capacity/high inflation tires cannot be used on existing rims and wheels unless you keep load and tire inflation pressure below the maximum load rating and inflation rating of the rims and wheels. If the tire itself does not indicate pressure capacity or if you are in doubt about the appropriate pressure capacity for the tire, you should contact the original equipment manufacturers, the tire manufacturer or the tire distributor to obtain this information before loading and inflating the tire.

## 8. Safe installation on vehicle or machine



**WARNING:** Improperly installed wheels can fail and lead to an accident.  
Serious or fatal injury may result.

When you install the rim wheel on the vehicle or machine, be sure to pay attention to the following:

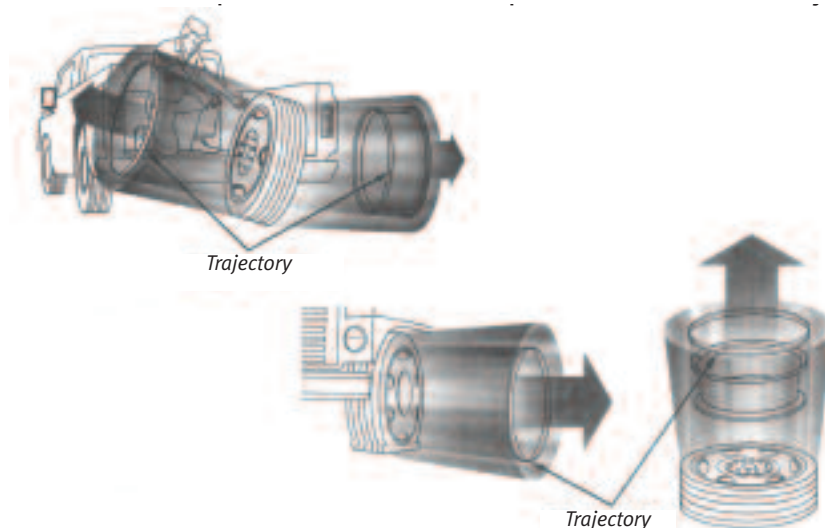
- Proper size of nut and stud (and clamp if required).
- Proper installation of spacer band on dual demountable rim assemblies.
- Correct nut tightening sequence.
- Correct torque of the nuts (tightening expressed in foot-pounds or Newton-meters). See the section on Recommended Nut/Bolt Torque Values for Installation, in this manual.

## 9. Safe operation while on the vehicle or machine



**WARNING:** Improperly maintained wheels and rims can fail and lead to an accident. Serious or fatal injury may result.

- Never operate a vehicle or machine on only one tire when using a dual assembly. If one tire loses air, the carrying capability is reduced, resulting in the other tire assembly carrying the whole load. Both tires must be inflated to equal recommended pressures before further operation.
- Tire and rim assemblies operated in a run-flat or under inflated condition (80% or less of recommended pressure) can be worn, dislodged, or damaged. If you add air to this assembly, it may explode and cause serious or fatal injury. Instead, fully deflate, remove the assembly from the vehicle/machine, and disassemble. After disassembly, check all the mating surfaces of the parts. If the parts are sound, reassemble them and inflate the assembly in a safety cage. If parts are damaged or worn, scrap them.
- Always use the recommended rim assembly for the tire and vehicle or machine. Using other parts may lead to premature component failure of the rim, tire, and/or vehicle or machine.
- Inspect wheels and rims for damage during tire checks and at periodic maintenance intervals. Early detection of potential rim failures may prevent unexpected hazards. Remove, replace, and scrap damaged or worn parts.
- If it is necessary to tap un-inflated components together during assembly, do not hammer on the components with steel or hard-faced hammers. Use only a rubber, lead, plastic, or brass-faced mallet. Steel hammers may damage or distort the components, causing improper fit or premature failure.
- The inflation equipment must have a filter to remove moisture from the airline. This filter must be checked periodically to insure that it is functioning properly.
- Place the rim wheel assembly in a safety cage or use an equivalent restraining device during inflation. If it is not possible to use a safety cage or restraining device, take all actions necessary to keep yourself and other personnel out of the potential blast and trajectory area.



# Mounting & demounting specific Off-Highway rim wheel types

## **Multi-Piece Grader & Off-Highway Tubeless Tire Rims**

Mounting Instructions

Demounting Instructions

## **Demounting 25" - 49" Diameter Rims with Pry Bar Pockets**

## **Demounting 33" & Larger Rims with Continuous Pry Bar Ledge**

## **Mounting Tires on Earthmover Rims**

## **Oversized Tires on the Vehicle**

Mounting Instructions

Demounting Rims with Pry Bar Pockets

Demounting Rims with or without Pry Bar Pockets

## **Handling Tubes & Flaps**

## **Tubeless Tires on Single Piece 15° Tapered Drop Center Rims**

Mounting & Demounting Instructions

## **Agricultural Rim Wheels**

Mounting Tires on the Vehicle

Demounting Tires on the Vehicle

Mounting Tires off of the Vehicle

Demounting Tires off of the Vehicle

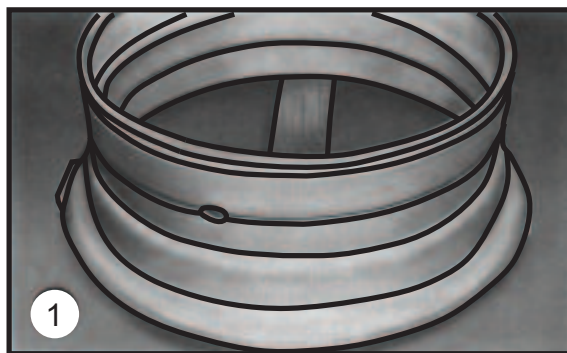
## **15.3" : 9" Width European Rims**

# Multi-piece grader & Off-Highway tubeless tire rims

## Mounting Instructions

**CAUTION:** Before mounting any tire, inspect the parts to ensure they match, are in good condition, and have been appropriately prepared. See Safety Procedures & Standards for Servicing Off-Highway Rim Wheels; Rim Wheel Components: Inspection Guidelines.

**NOTE:** Install valve stud on the rim and tighten to proper torque before proceeding with mounting.



1. Place rim base on blocks with flange side down. Lubricate tire beads and bead seat areas of rim with an appropriate rubber lubricant, such as a thin solution of neutral vegetable oil soap. (Silicone or petroleum based lubricants must not be used.)



2. Place tire over rim base. Place side flange over rim base and push straight down with hands as far as possible. Make sure side flange does not bind on rim base.



3. Lubricate a new rubber-sealing ring with an appropriate rubber lubricant and place into sealing ring (lower) groove. **NOTE:** With some tire and rim combinations it may be necessary to hold the side flange down with the flat end of the tool in order to expose the O-ring groove.



4. Stand on side flange to position it below both grooves in the rim base and walk or pry lock ring into lock ring (outer) groove. Be certain the embossed "safety bulge" on the lock ring is up toward the operator.

5. Check components (lock rings, bead seat, and flanges) to make sure the parts are correctly assembled. NOTE: Lock rings should be fully seated into lock ring groove around the circumference. Insert drive key as required. Place rim and tire in a safety cage or use another restraining device during tire inflation. Stand to the side of the tire during inflation using an air hose having a clip-on chuck and an in-line gauge and control valve. Inflate to about 5 psi (35 kPa) and again check for proper engagement of all components. Observe that the O-ring does not roll out of its groove.

If assembly is correctly positioned, continue to inflate to recommended pressure. If tube type tire is used, completely deflate tire to prevent buckling of tube. Reinflate to recommended pressure. If assembly is incorrectly positioned, STOP – DEFLATE – CORRECT THE ASSEMBLY – AND REPEAT PROCEDURE.



# Multi-piece grader & Off-Highway tubeless tire rims

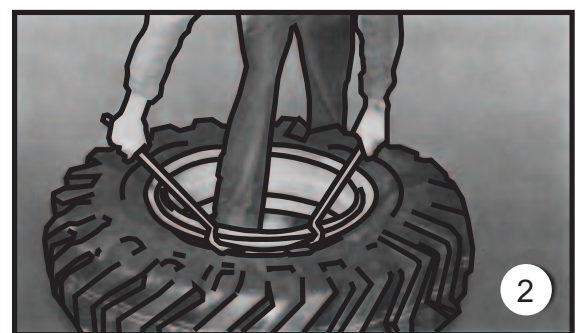
## Demounting Instructions

**CAUTION:** Always completely deflate tire by removing valve core before removing the tire from vehicle or before attempting any other demounting operation. Check the valve stem by carefully running a piece of wire through the stem to make sure it is not plugged. See Safety Procedures & Standards for Off-Highway Rim Wheels. After complete deflation, place the assembly on the floor with the loose flange side up and proceed in order of the steps below.

**Tools Required:** 2 Goose-necked beads unseating tools; rubber lubricant; and babbitt hammer.



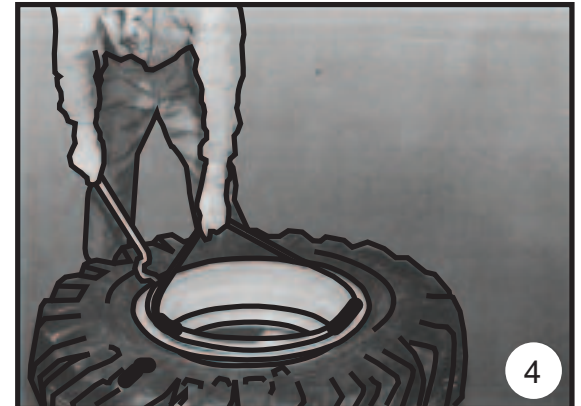
1. Drive the goose-necked ends of the unseating tools between the tire and flange about 5" (127 mm) apart.



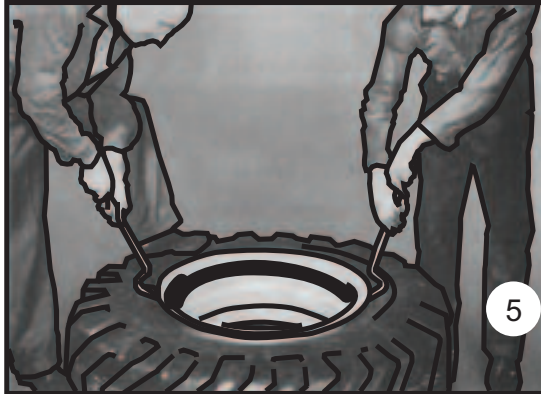
2. Pry both tools outward and sideways through an arc of about 70°. Be careful to avoid tearing the chafer fabric. Leave one tool in position and place the second about 5" (127mm) beyond. Repeat the above operation in successive steps until the tire bead is completely unseated.



3. After the tire bead is unseated, stand on the flange and tire sidewall to depress the flange down along the rim base; then try to pry the lock ring.



4. Hold the side flange down with hooked end of tool to remove the sealing ring from sealing groove.

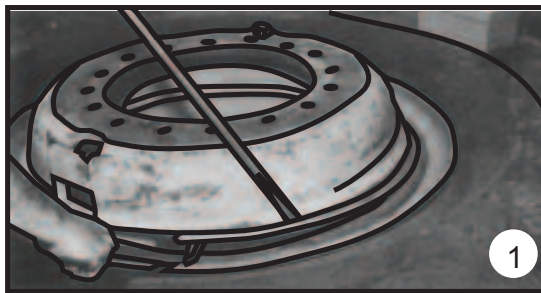


5. Remove the side flange. Turn tire and rim over and unseat second bead by inserting both tools between tire bead and rim flange as in Step 2. Repeat Steps 1 & 2 until the tire is completely unseated from the rim on the fixed flange side. Lift rim base from tire.

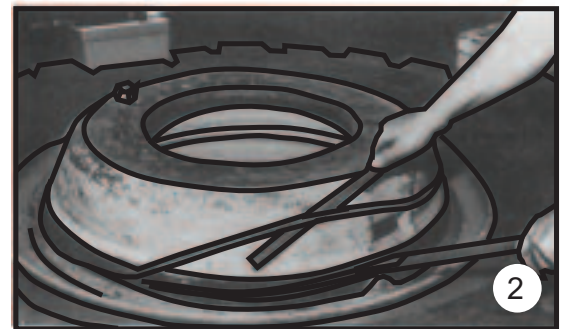
## Demounting 25" – 49" diameter rims With pry bar pockets

**CAUTION:** Always completely deflate tire by removing valve core before removing the tire from vehicle or before attempting any other demounting operation. Check the valve stem by carefully running a piece of wire through the stem to make sure it is not plugged. See Safety Procedures & Standards for Servicing Off-Highway Rim Wheels.

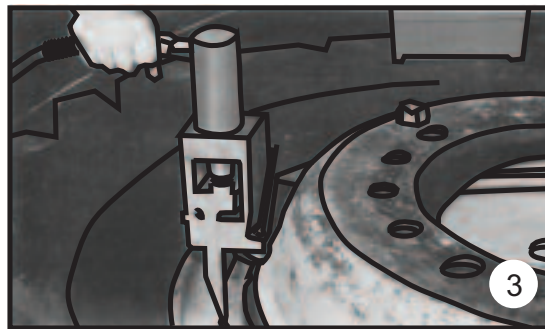
**Tool Required:** Hydraulic bead unseating ram (as shown).



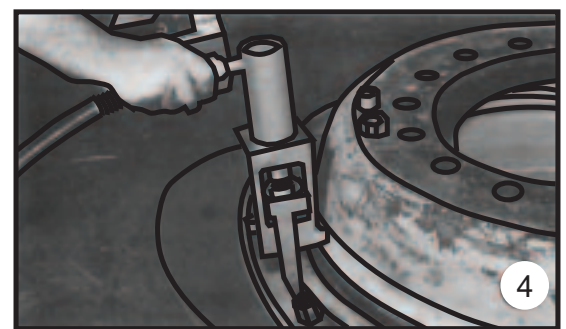
1. Depress tire and flange to remove the lock ring, using two pry bars. **NOTE:** If this is not possible, the tire bead may be unseated with the lock ring and O-ring in place.



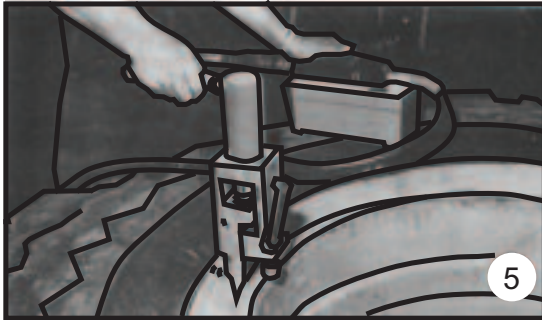
2. Remove the O-ring by depressing the bead seat and inserting a pry bar or screwdriver under the O-ring and pulling it from the groove. Cut the O-ring with a knife and dispose of it, so that a new O-ring will be used.



3. Place the hook of the hydraulic demounting tool into one of the pry bar pockets. Adjust the ram adjusting screw to enable the tool to remain vertical when under pressure. In some cases, the pressure foot may have to be removed to ensure a good hold. Activate the hydraulic pump and apply pressure.



4. Depress flange about 1/2" - 3/4" (12 - 19 mm) and place a nut or similar object between the bead seat and the flange. Always stand to the side and hold the tool with one hand. This allows control should the tool not seat properly and fly off which could cause injury to the operator.



5. Release the pressure and move tool about 2' (0.6 m) around the rim for the second bite. Continue the procedure until about  $\frac{3}{4}$  of the way around the rim, then apply pressure until the tire bead is unseated.

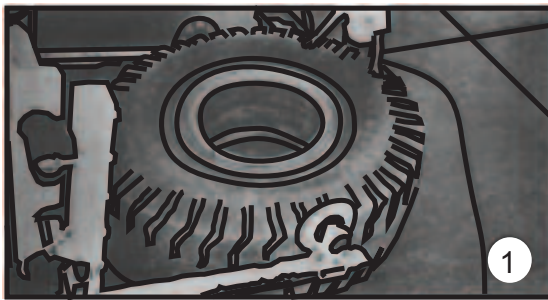
**CAUTION:** Do not use tool in the vicinity of the flange butt weld. Remove bead seat band using hoist or pry bars. Remove flange. Turn assembly over and repeat tire bead unseating procedure on the back side. Lift rim base from tire using hoist. Remove back flange.

## Demounting 33" & larger rims

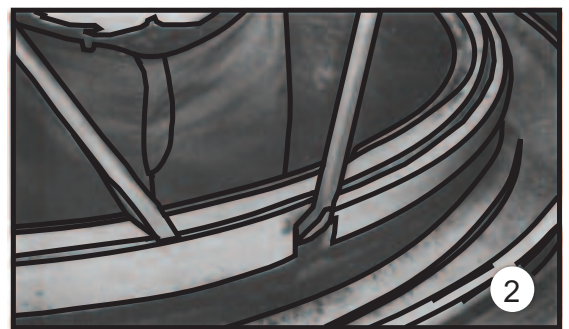
### With continuous pry bar ledge

**CAUTION:** Always completely deflate tire by removing valve core before removing the tire from vehicle or before attempting any other demounting operation. Check the valve stem by carefully running a piece of wire through the stem to make sure it is not plugged. See Safety Procedures & Standards for Servicing Off-Highway Rim Wheels.

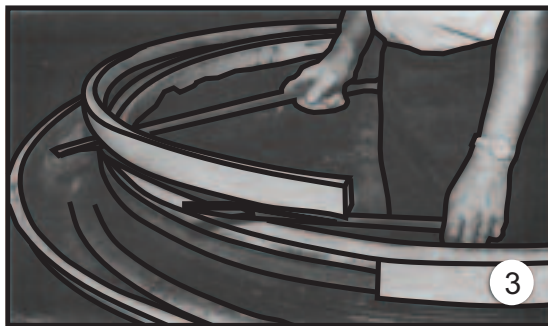
**Tool Required:** Hydraulic bead unseating ram (as shown).



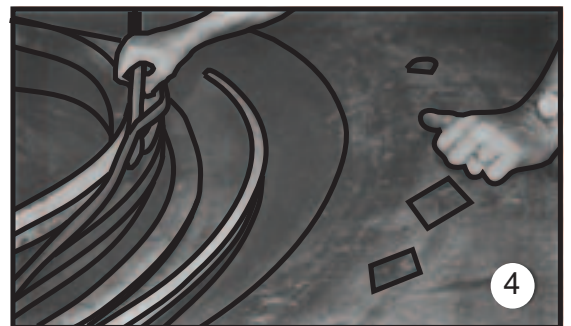
1. Remove tire and rim assembly from vehicle, and lay the assembly gutter side up on ground or floor.



2. Depress tire and flange. Stand inside rim and remove lock ring using two pry bars. Start at the split and work the tools around the ring.



3. Depress tire and flange. Remove O-ring by inserting pry bar or screwdriver under the ring and pulling it from the groove. Cut the O-ring with a knife and dispose of it, so that a new O-ring will be used.



4. Position the hydraulic bead-unseating tool so that the hooks are under the lip on the bead seat band. The initial push should be made about 30° to one side of the flange butt weld, then work away from the butt weld. Adjust the ram adjusting screw to enable the tool to be vertical when pressure is applied.

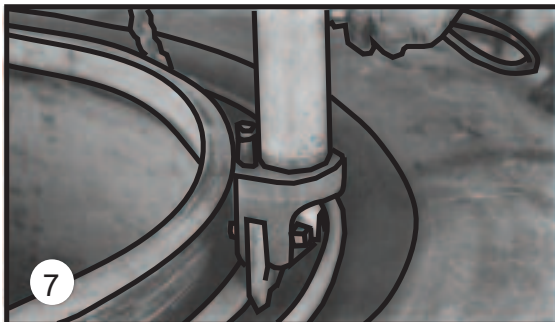




5. Activate the hydraulic pump and apply enough pressure to depress the flange about  $\frac{3}{4}$ " - 1" (19 - 25 mm). While applying pressure, the operator should stand to the side and hold the tool with one hand. This allows control should the tool not seat properly and fly off. If necessary, release the pressure and readjust the ram adjusting screw.



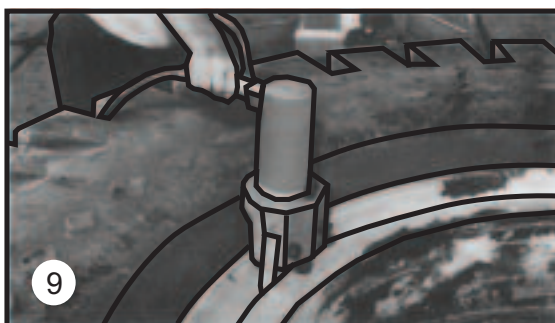
6. While the flange is depressed, place a nut or similar object between the flange and the lip of the bead seat band. **WARNING:** Do not put your fingers under the bead seat band. Lay object on the rim flange and slide it into position with screwdrivers.



7. Release the pressure and move the hydraulic bead-unseating tool approximately 2' - 3' (0.6-0.9 m) around the rim for the second bite. Continue the procedure until about  $\frac{3}{4}$  of the way around the rim, then apply pressure until the tool is completely unseated. Avoid using the tool within 12" (0.3 m) of the flange butt weld.



8. Lift out the bead seat band, using a hoist or pry bars. Then remove the front flange.



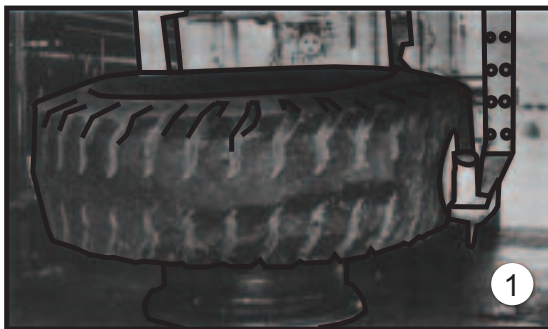
9. Turn assembly over, using a hoist or a tire handler. Then repeat the tire bead unseating procedure on the back side.



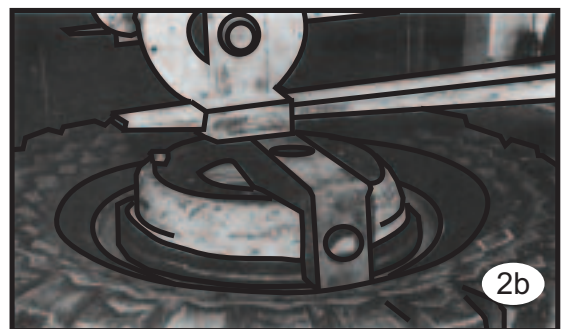
10. Lift rim base from tire using a hoist. Remove back flange.

## Mounting tires on earthmover rims

**CAUTION:** Before mounting any tire, inspect the parts to ensure they match, are in good condition, and have been appropriately prepared. See *Safety Procedures & Standards for Servicing Off-Highway Rim Wheels*; *Rim Wheel Components: Inspection Guidelines*.



1. Place base on blocks 4" - 6" (100-150 mm) high on floor, gutter side up. Place loose flange on rim base. Flange must be clear of blocks and floor. Place tire on rim using tire handler or hoist with sling.

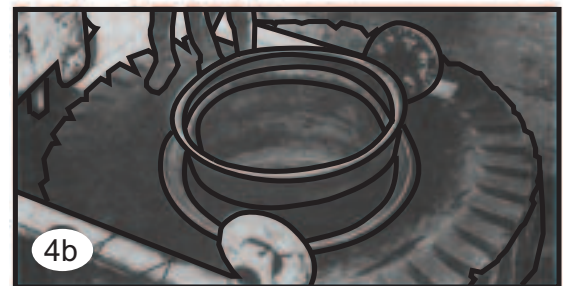


2. For ease of assembly, depress the tire in the bead area. This can be done in several ways, two of which are shown.





3. Place the second flange on the rim base.



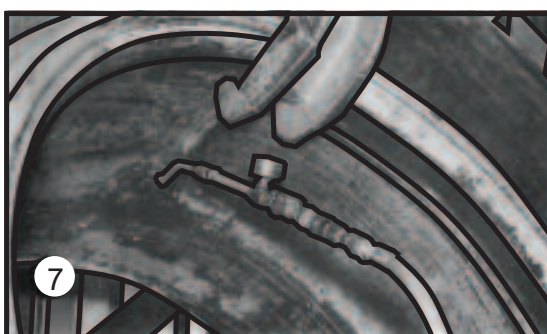
4. Lubricate both sides of bead seat band and place the bead seat band on the rim base. Due to limited clearance between bead seat and rim base, bead seat band will bind if cocked slightly. Be sure driver pockets in bead seat band and base are in line. If necessary, lift or pry upward on the bead seat band to get it to seat properly. **CAUTION:** Do not hammer the bead seat band into place.



5. Depress flange and bead seat band sufficiently to slip a new lubricated O-ring into the O-ring groove; then lubricate the entire O-ring groove area with an appropriate rubber lubricant.



6. ????



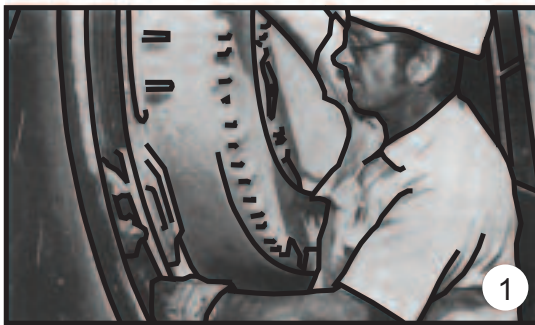
7. Check components (lock rings, bead seat, and flanges) to make sure that the parts are correctly assembled. NOTE: Lock rings should be fully seated in lock ring groove around the circumference. Insert drive key as required. Place rim and tire in a safety cage or use another restraining device during tire inflation. Stand to the side of the tire during inflation. Use clip-on chuck with in-line gauge and control valve. Inflate to approx. 5 psi (35 kPa)

and again check for proper engagement of all components. If assembly is correctly positioned, continue to inflate to recommended pressure. If tube type, then completely deflate tire to prevent buckling of tube. Reinflate to recommended pressure. If assembly is not correctly positioned, **STOP – DEFLATE – CORRECT THE ASSEMBLY – AND REPEAT PROCEDURE.**

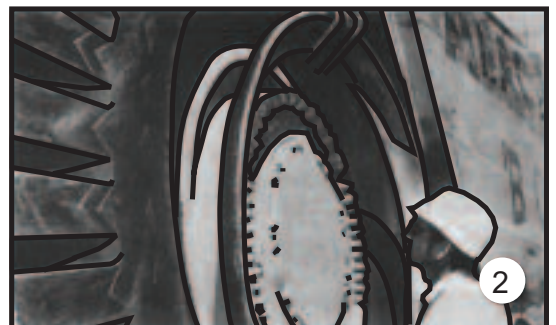
## Oversized tires on the vehicle

### Mounting instructions

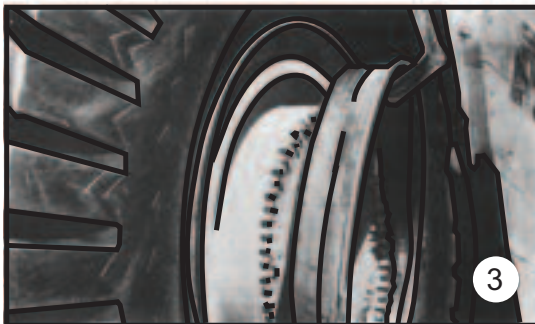
**CAUTION:** Before mounting any tire, inspect the parts to ensure they match, are in good condition, and have been appropriately prepared. See Safety Procedures & Standards for Servicing Off-Highway Rim Wheels; Rim Wheel Components: Inspection Guidelines.



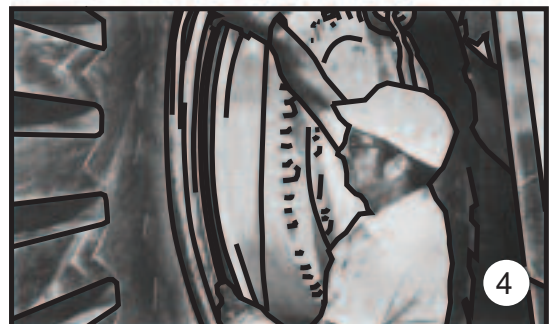
1. Clean and inspect all rim components, especially the lock ring groove and O-ring groove areas. Coat the rim with paint or a rust inhibitor. Also check the tire cavity for water or foreign matter and remove any foreign matter.



2. Place the flange on the rim base and position the tire on the rim base using a boom truck or tire handler.



3. Position the front flange on the rim base with the help of the boom.



4. Place the bead seat band on the rim base with the help of the boom. Be sure driver pocket on bead seat band lines up with pocket on rim base.



5. Using the boom to hold the rim components back out of the way, insert a new lubricated O-ring groove, and then lubricate the entire O-ring groove area with an appropriate rubber lubricant.

6. Work the lock ring into the lock ring groove. Check components (lock rings, bead seat, and flanges) to make sure that parts are correctly assembled. **NOTE:** Lock rings should be fully seated in lock ring groove around the circumference. Insert drive key as required. Use a restraining device during tire inflation. Stand to the side of the tire during inflation. Use an inflation hose having a clip-on chuck with an in-line gauge and control valve. Inflate to approximately 5 psi (35 kPa) and again check for proper engagement of all components. If assembly is correctly positioned, continue to inflate to recommended pressure. If assembly is incorrectly positioned, **STOP – DEFLATE – CORRECT THE ASSEMBLY – AND REPEAT PROCEDURE.**



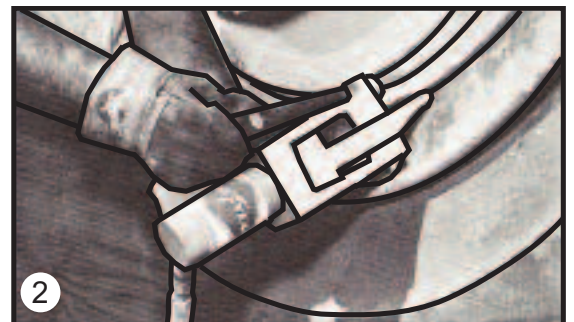
## Oversized tires on the vehicle

### Demounting rims with pry bar pockets

**CAUTION:** Always completely deflate tire by removing valve core before removing the tire from vehicle or before attempting any other demounting operation. Check the valve stem by carefully running a piece of wire through the stem to make sure it is not plugged. *See Safety Procedures & Standards for Servicing Off-Highway Rim Wheels.*



1. Be sure vehicle is safely raised and wheels are chocked.



2. Remove valve core and deflate tire completely. Check the valve stem by carefully running a piece of wire through the stem to make sure it is not plugged. Stand to the side of the rim. Remove driver key.



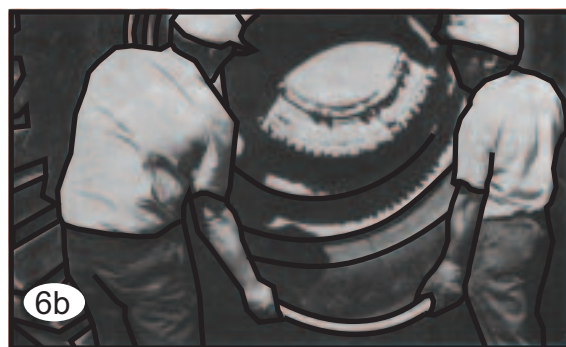
3. Place the hook of the hydraulic demounting tool into one of the pry bar pockets. Adjust the ram adjusting screw to enable the tool to be perpendicular to the wheel when under pressure.



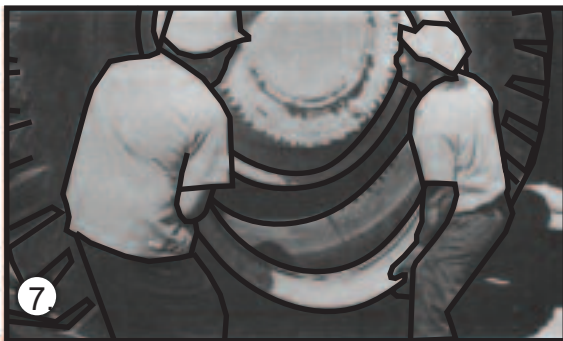
4. While applying pressure, always stand to one side of the tool and hold it with one hand as shown. Apply pressure and depress the flange about  $\frac{3}{4}$ " (20 mm). If necessary, release the pressure to readjust the tool. Place the end of a pry bar between the flange and the lip of the bead seat band and release the pressure. Now place the hook of the bead-unseating tool under the lip of the bead seat band and continue the procedure around the rim, then apply pressure until the tire bead is COMPLETELY unseated.



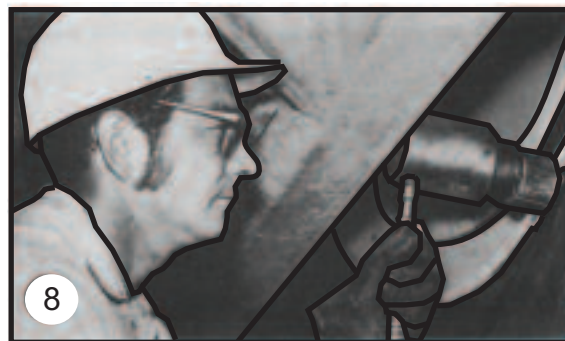
5. Depress bead seat band to remove the lock ring with a pry bar, starting near the split and working around the ring.



6. Depress bead seat band to insert tip of a pry bar under the O-ring and pull it from the groove. It is good practice to cut the O-ring with a knife to ensure that a new O-ring is used. Use a pry bar under the flange to pry the bead seat band loose, then carefully lower it to the ground and roll it out of the way. See that the loose flange does not drop off.



7. Remove the flange and carefully lower it to the ground and roll it out of the way.



8. To UNSEAT the back tire bead, use either the bead unseating tool as used on the front bead or a shorty ram between the frame of the vehicle and the flange, as shown.



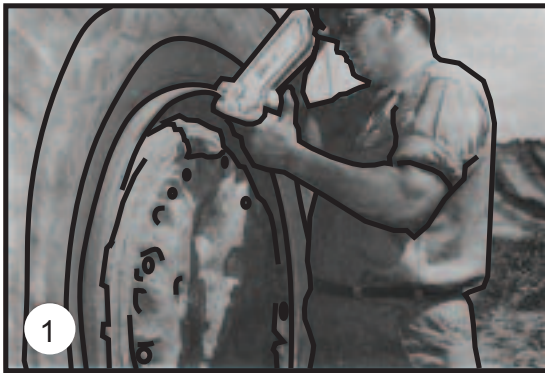
9. Remove the tire using a boom truck and sling or a tire handler. Remove the back flange to complete the disassembly.

## Oversized tires on the vehicle

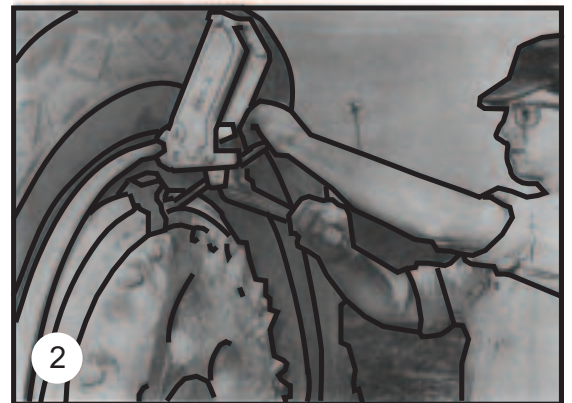
### Demounting rims with or without pry bar pockets

**CAUTION:** Always completely deflate tire by removing valve core before removing the tire from vehicle or before attempting any other demounting operation. Check the valve stem by carefully running a piece of wire through the stem to make sure it is not plugged. *See Safety Procedures & Standards for Servicing Off-Highway Rim Wheels.*

**Tool Required:** Hydraulic demounting tool.



1. Attach the tool frame assembly to the outer rim flange by slipping the clamping jaws over the outer edge of the flange.



2. Securely tighten adjusting screws at bottom of jaws. Set hand screw against lock ring and adjust until jaw assembly is in a right angle position to the plane of the flange.



3. With spade tip down and ram in retracted position, insert spade and ram assembly between open sides of frame. Place spade tip between tire bead and rim flange.



4. Lift ram until trunnion engages frame shoulder and move stop screw into support ram. Apply pressure to ram and spade by means of pump until spade has moved tire bead toward center of rim assembly far enough to permit the placing of a bead wedge between bead and flange on each side of the tool.



5. Release pump pressure. Remove spade and ram assembly from frame. Loosen clamping jaw bolts and remove tool frame from flange.
6. Move to spot approximately 90° from first application (either direction) and repeat entire procedure. Repeat procedure until tire bead is free. Four or five applications usually accomplishes this.
7. Proceed to disassemble. Depress bead seat band and remove lock ring with a pry bar, starting near the split and working around the ring.

## Handling tubes and flaps

### Demounting

1. Before working the tire off the rim, make certain that the valve will clear the gutter section.
2. Remove flap from the tire, using a tool with a rounded end to pry it out and away from the beads. On some types of tires, it may be necessary to use a tire spreader or a small auto jack to spread the beads and assist in removing the flap.
3. Remove the tube in a similar manner, being careful not to pull on the valve stem or to damage the tube.

### Mounting

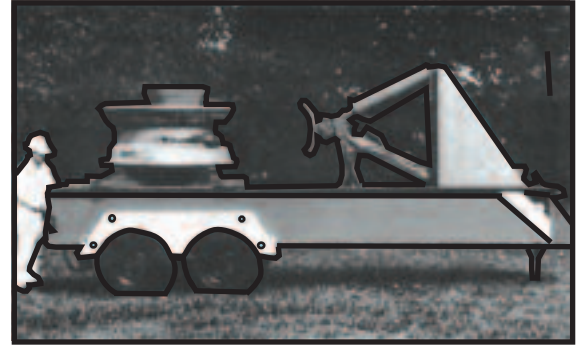
1. Before replacing the tube, inspect the tire casing carefully, inside and out, for breaks, bruises, nails, etc. Remove all dirt and foreign matter from inside the tire casing.
2. Replace the tube in the tire casing, starting at the bottom and working around the tire. Adding air as the tube is being worked in will help hold it in place and reduce the possibility of wrinkles.
3. Insert flap in the tire casing, making sure it is properly centered and free from wrinkles. Rotate the tire as the flap is worked in so the part being inserted is at the bottom of the tire. A dry lubricant, such as soapstone, may be used to lubricate the flap and tube. In some cases, it may be necessary to spread the beads, using a spreader or car jack. Lubricate beads with appropriate rubber lubricant.

# Tubeless tires on single piece 15° tapered drop centre rims

## Mounting & demounting instructions

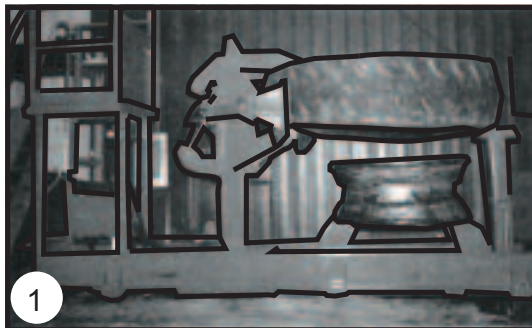
Specialized equipment is necessary for mounting and demounting tubeless tires on single piece 15° tapered drop center rims. The photographs below represent three types of machines that are currently available. The mounting and demounting instructions below are based only upon the use of the machine as shown right.

CONSULT THE MANUFACTURER OF THE TIRE OR VEHICLE FOR INFORMATION ON MOUNTING MACHINES AND DETAILED INSTRUCTIONS ON THE USE OF SUCH SPECIALIZED EQUIPMENT.

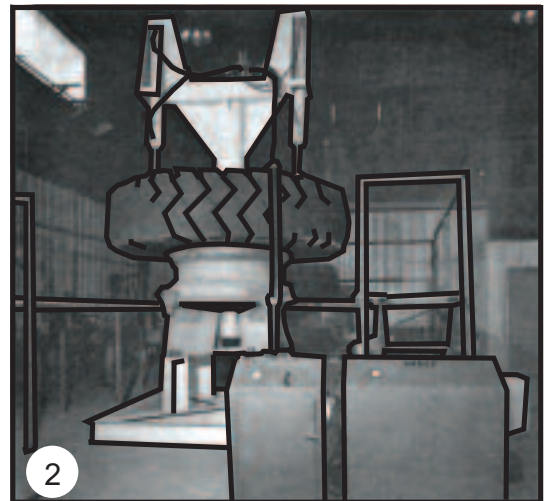


### Preliminaries-mounting:

**CAUTION:** Always completely deflate tire by removing valve core before removing the tire from vehicle or before attempting any other demounting operation. Check the valve stem by carefully running a piece of wire through the stem to make sure it is not plugged. *See Safety Procedures & Standards for Servicing Off-Highway Rim Wheels.*

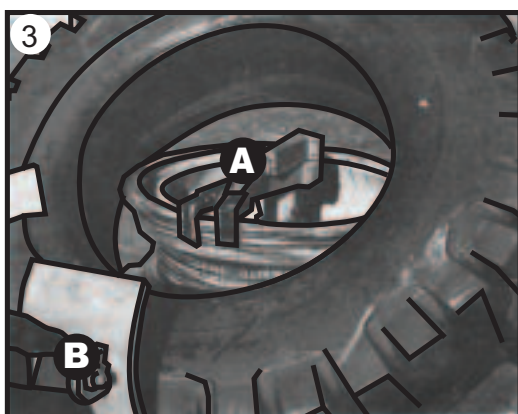


1. Remove wiper arms extension. Lower rim onto centering blocks. Expand centering blocks to secure rim.

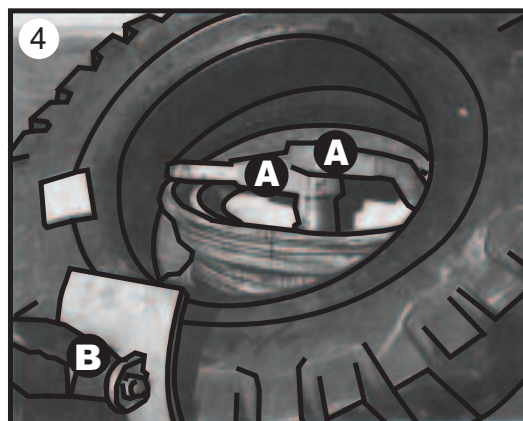


2. Insert wiper arms extensions into center post brackets. Adjust length of wiper arms so the inside edge is 3/8" (9.5 mm) from edge of rim flange. Adjust height of center post so the bottom edge of wiper arms is 3/8" (9.5 mm) above edge of rim flange. Extend wiper arms to insure clearance. Lubricate rim base and tire beads with appropriate rubber lubricant.

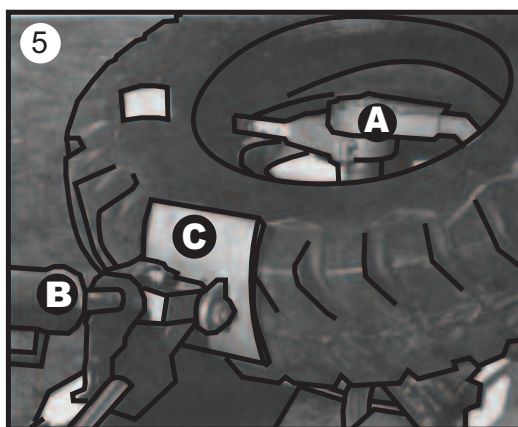
- A. Wiper Arms
- B. Hydraulic Pusher Cylinders
- C. Push-Block
- D. Demount Cylinder



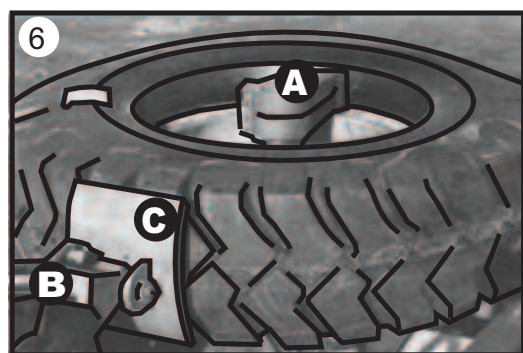
3. Starting Position  
Wiper arms and hydraulic pusher cylinders fully retracted. Lower tire into below position.



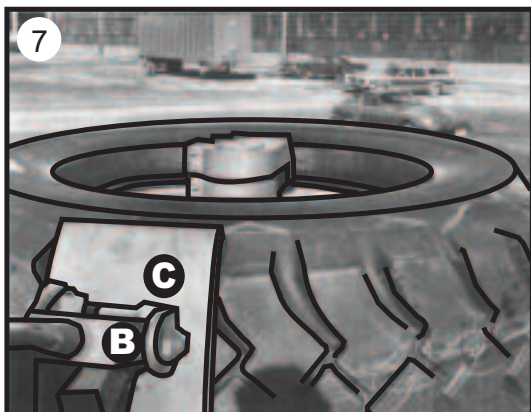
4. Extend wiper arms to draw the tire's bottom bead into the rim's drop center (rim well).



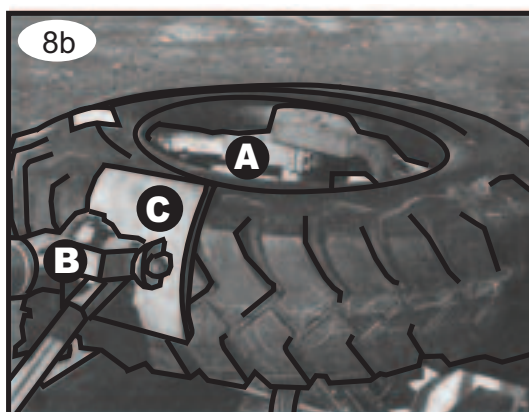
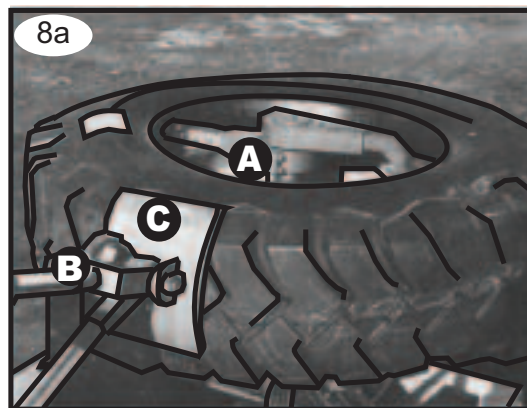
5. Extend push-block to get bottom bead firmly into the rim's drop center (rim well). Extend wiper arms to complete mounting of the bottom bead.



6. Extend wiper arms to maximum. Use push-block to push top bead over/off wiper arms. Use special care when mounting the top bead to avoid damage to the bead toe as it goes over the flange.



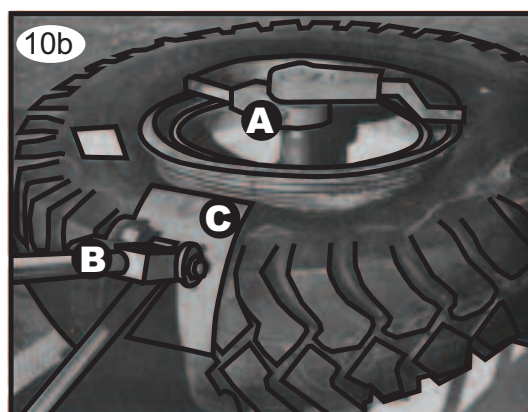
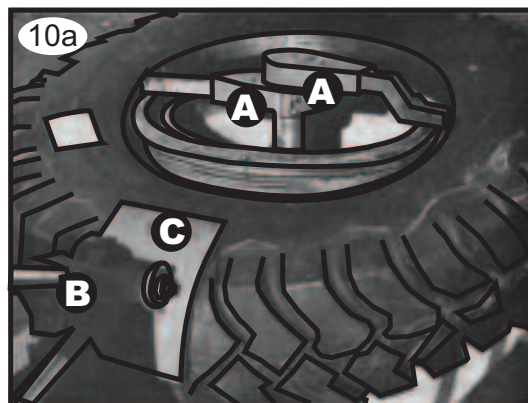
7. Position push-block on upper shoulder of tire and work push-block downward to raise top bead – opposite push-block – above the rim flange.



8. Retract wiper arms to approximately 120° partially retract push-block to permit tire to “walk” across rim. Repeat above procedure with wiper arms at 180° and 220°. At 220°, retract push-block, permitting top bead to fall below top rim flange.

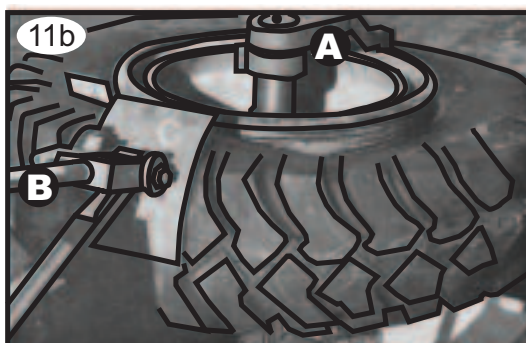
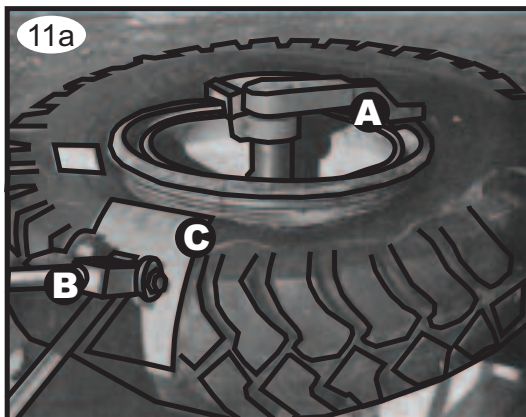


9. Extend wiper arms to draw tire up to rim.

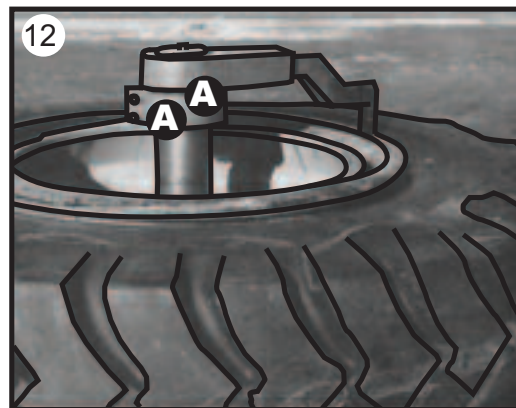


10. Position push-block on upper shoulder and “work” top bead into rim drop center (rim well). Extend wiper arms to 180° apart. To ease the mounting of the top bead, extend push-block up and down until the bead is firmly placed in the rim’s drop center (rim well).





11. Extend wiper arms and maneuver push-block to complete the mounting of the top bead. Top bead must be in rim drop center (rim well).



12. Retract push-block. Raise center post so wiper arms clear tire. Retract wiper arms to home position. Remove wiper arms from center post bracket.

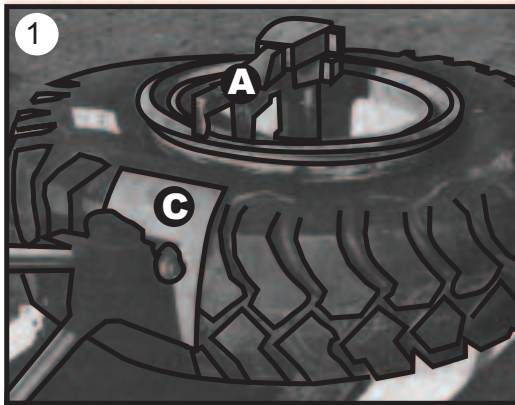
13. Inflate tire to its recommended cold operating pressure. This automatically seats the beads.

14. Prepare tire and rim assembly for removal. When tire and rim are supported, retract centering blocks and remove assembly.

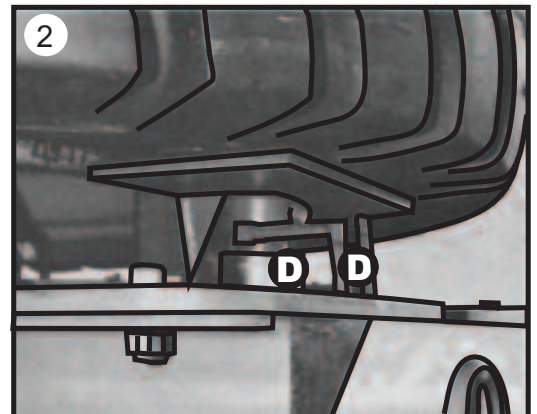
## Preliminaries

### Demounting

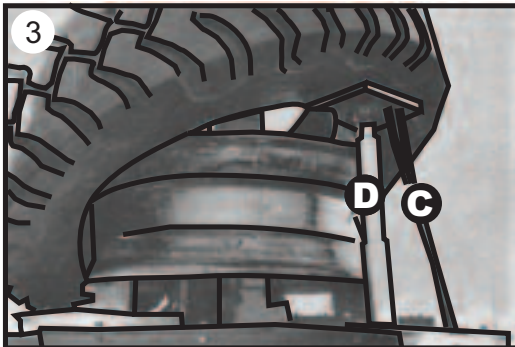
**CAUTION:** Always completely deflate tire by removing valve core before removing the tire from vehicle or before attempting any other demounting operation. Check the valve stem by carefully running a piece of wire through the stem to make sure it is not plugged. *See Safety Procedures & Standards for Servicing Off-Highway Rim Wheels.*



1. Remove wiper arm extensions from center post bracket.



2. Lower tire and rim assembly onto centering blocks. Expand blocks to secure rim.



3. Position push-block on bottom shoulder. Work the push-block upward to break the bottom bead away from rim. Position push-block on top shoulder. Work the push-block downward to break the top bead away from rim and into drop center (rim well).

4. Extend demount cylinder until top bead appears above rim flange. **CAUTION:** Partially extend demount cylinder to insure edge of plate clears rim flange. Retract push-block to home position. Continue to extend demount cylinder until bottom bead is pushed off and tire rests on machine frame.



## Agricultural rim wheels



**WARNING: SERIOUS OR FATAL INJURY MAY RESULT FROM:**

- Explosion of rim wheel due to improper mounting.

NEVER exceed 35 psi (240 kPa) of air pressure when seating beads. ALWAYS use a safety cage or other restraining device and a clip-on extension hose. ONLY specially trained persons should mount tires.

- Tire failure due to misapplication, improper inflation, overloading, or exceeding maximum speed.

Follow the tire manufacturer's instructions.

Check inflation pressure frequently with a gauge.

DO NOT overload the vehicle or exceed the maximum speed for the tire.

- Explosion of rim wheel due to welding the rim without first removing the tire.

NEVER rework, weld, heat, or braze the rim of a rim wheel. ALWAYS completely deflate the tire before removing a rim wheel from a vehicle or machine.

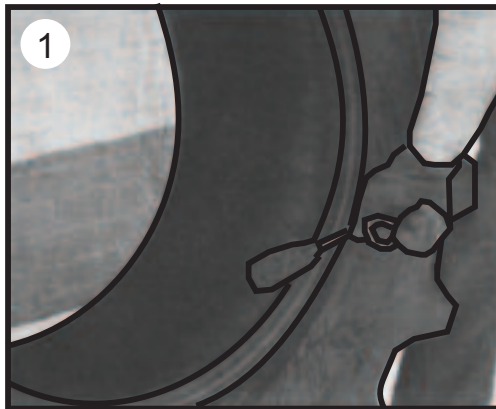
### Typical Tool Requirements:

- > Bead-Unseating Tool
- > Rubber Mallet
- > Two 36" Tire Irons
- > Two 18" Tire Irons
- > Wire Brush
- > Approved Tire Mounting Lubricant
- > Extension Hose with In-Line Gauge and Clip-on Air Chuck
- > Air/Water Inflation Gauge
- > Safety Cage or Other Restraining Device

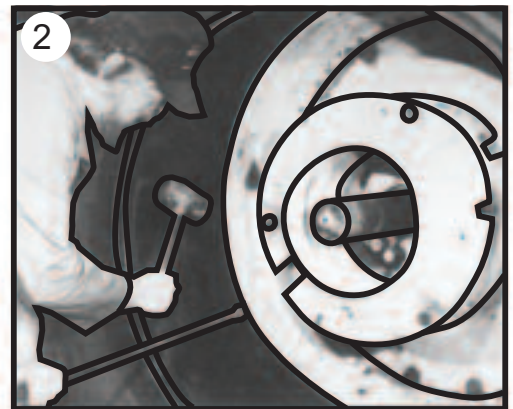
## Agricultural rim wheels

### Mounting tires on the vehicle

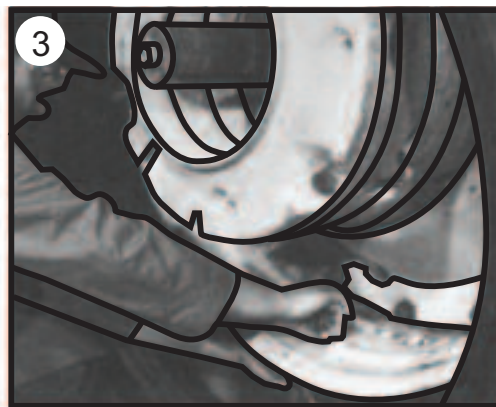
**CAUTION:** Before mounting any tire, inspect the parts to ensure they match, are in good condition, and have been appropriately prepared. See *Safety Procedures & Standards for Servicing Off-Highway Rim; Rim Wheel Components: Inspection Guidelines*.



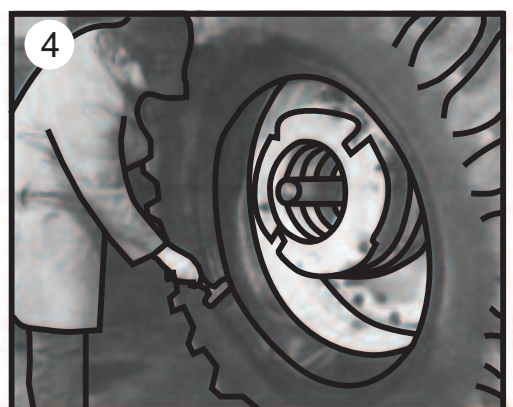
1. Thoroughly lubricate the tire bead area and rim flange with an approved tire mounting lubricant or a thin solution of vegetable oil soap in water. (Never use antifreeze, silicones, or petroleum-base lubricants.)



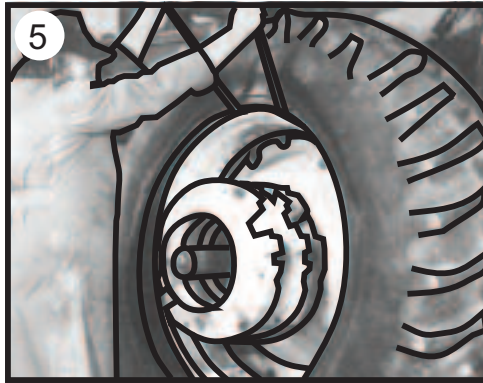
2. Before placing the tire on the rim, be sure the valve hole of the rim is at the bottom of the wheel. To put the tire on the wheel, place the inner bead over the flange at the top. Be sure the bead is not “hung up” on the bead seat, but that the bead is guided into the rim well, while using the tire irons and/or rubber mallet to work the first bead over the rim. With the first bead on the rim, pull the tire toward the outside of the rim as far as possible to make room for the tube.



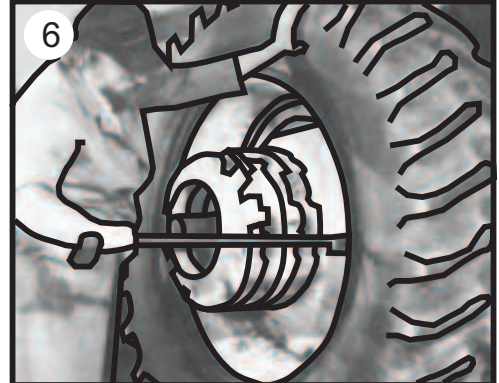
3. Before inserting a tube in a tube-type tire, be sure the valve is at the bottom of the wheel. Align the stem with the valve hole and place the tube in the tire, starting at the bottom. Place the valve in the valve hole and screw the rim nut in place. Be sure that the tube is well inside the rim before proceeding to the next step.



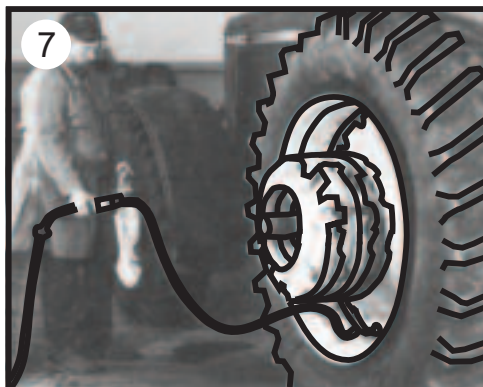
4. In tube-type tires, the tube should be partially inflated and the base area that contacts the rim should be lubricated again to prevent localized stretching.



5. Starting at the top, use tire irons to lift the outer bead up and over the rim flange, then down into the rim well. Be careful not to pinch the tube in this operation.

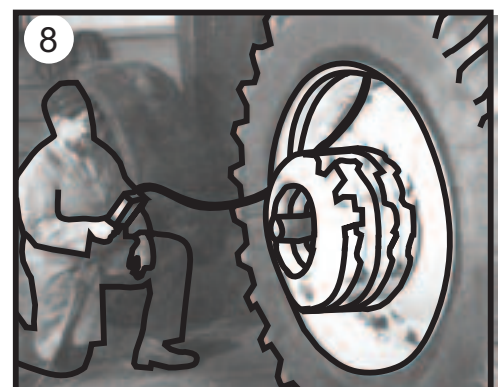


6. After getting the first section of the bead into the rim well, place one hand against that section to hold it, and then pry the remainder of the bead over the flange with the tire iron in the other hand.



7. With the valve stem at the bottom, lower the jack until the tire is centered on the rim. Centering the tire and rim assembly is extremely important to prevent broken beads. Using an extension hose with an in-line air gauge and clip-on chuck (with the valve core removed), inflate the tire to seat the beads. DO NOT EXCEED 35 PSI (240 kPa). It is essential to stand clear of the tire while inflating it. Check to see that both beads are seated all the way around the tire.

For tubeless tires, mounting depends on how well the tire's shape has been maintained. If the beads are in or near their molded position, they can be seated by inflating the tire, through the valve spud. Where the beads have been squeezed together, the use of an inflator ring (either horizontally or vertically) will be required to provide a seal between the tire bead and rim.

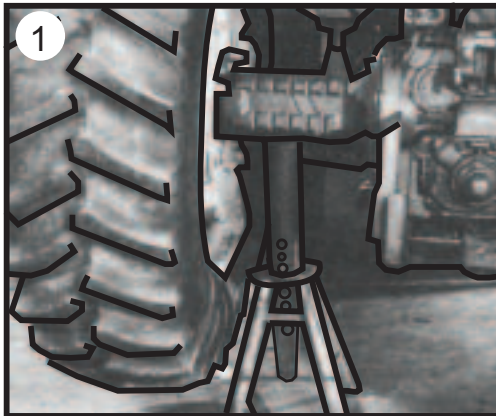


8. Raise the vehicle and rotate the wheel assembly so that the valve is at the top. If the tire is tube-type, completely deflate it by removing the valve core housing. Re-insert the valve core and inflate the tire again to the recommended operating pressure. Be sure to stand clear of the tire during inflation.

## Agricultural rim wheels

### Demounting tires on the vehicle

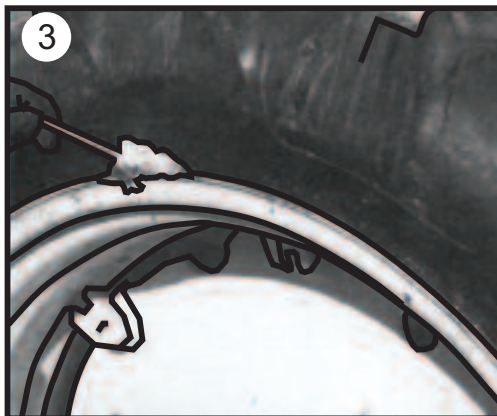
**CAUTION:** Always completely deflate tire by removing valve core before removing the tire from vehicle or before attempting any other demounting operation. Check the valve stem by carefully running a piece of wire through the stem to make sure it is not plugged. See Safety Procedures & Standards for Servicing Off-Highway Rim Wheels.



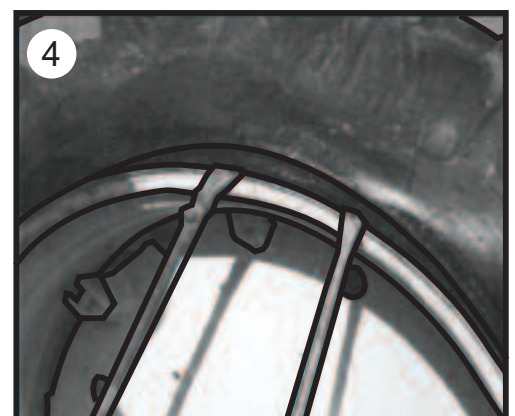
1. Jack up the vehicle, and then remove the fluid fill from the tire. Deflate the tire by removing the valve core housing. For tube-type tires, remove the rim nut and push the valve through the valve hole.



2. After the tire is completely deflated, place a hydraulic bead-unseating tool between the tire bead and rim flange and force the bead off the bead seat. Be careful not to damage the tire's bead area. The beads should be unseated on both sides of the rim.

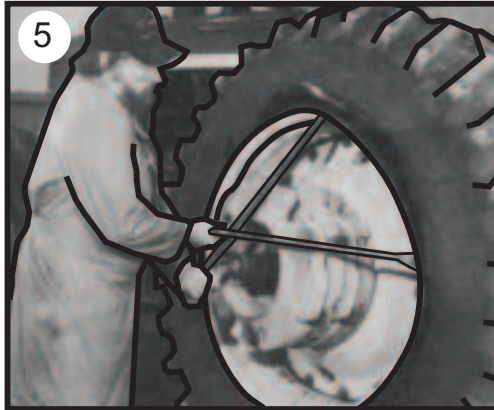


3. Thoroughly lubricate the tire bead area and the rim flange with an approved tire-mounting lubricant or a thin solution of vegetable oil soap in water. (Never use antifreeze, silicones, or petroleum-based lubricants.)

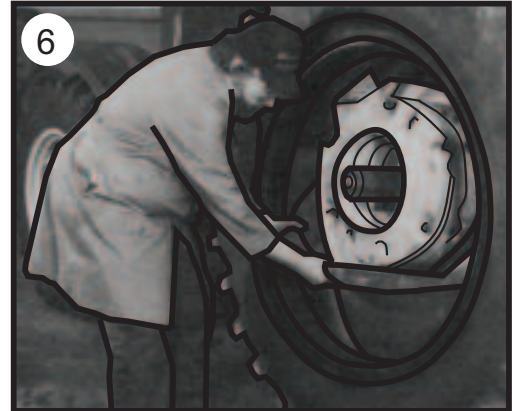


4. Lock the wheel with the valve at the top. Force the outside bead at the bottom into the well. Insert long tire irons under the bead at the top and pry the bead over the rim flange. Take small bites to avoid extremely hard prying, which will damage the tire bead.

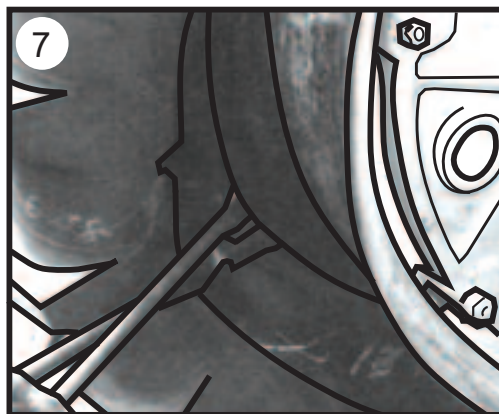




5. After the first section of the bead is over the rim flange, use one tire iron to hold that section over the flange and use another iron to pry the next section over the flange. Do not attempt to pry too large a section of the bead over the rim flange at one time. Never release your grip on either tire iron, as they may spring back.



6. Pull the tube out of the casing, starting at the bottom. If only the tube requires repair or replacement, it can be removed, repaired, and replaced in the tire without removing the tire completely from the wheel. Before reinstalling the tube, thoroughly inspect the inside of the casing for damage or foreign material. Remove any remaining fluid from inside the tire.

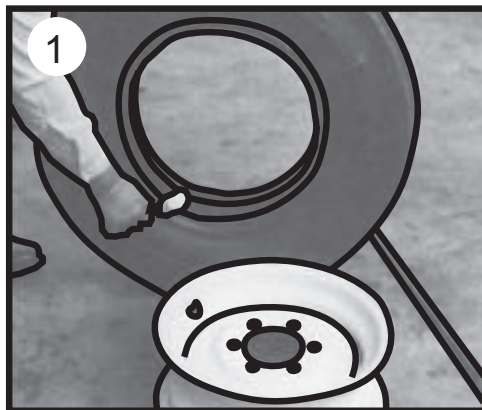


7. To remove the tire completely from the wheel, insert tire irons under the inside bead at the side of the tire. Pry the rest of the inside bead over the rim flange. When starting this operation, be sure that the bead area on the opposite side of the tire is down in the well of the rim.

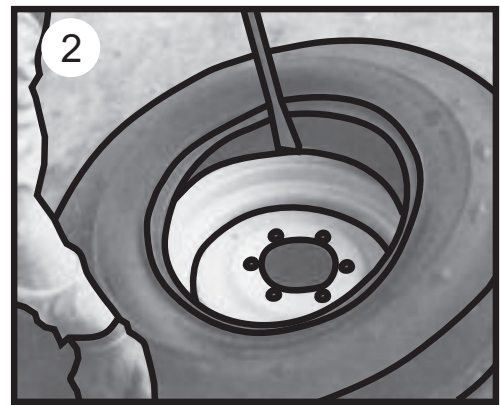
## Agricultural rim wheels

### Mounting tires off of the vehicle

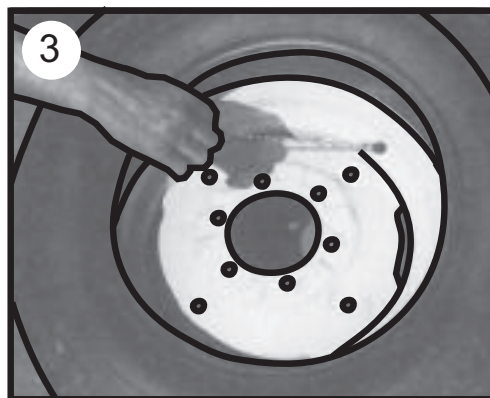
**CAUTION:** Before mounting any tire, inspect the parts to ensure they match, are in good condition, and have been appropriately prepared. See *Safety Procedures & Standards for Servicing Off-Highway Rim Wheels*; *Rim Wheel Components: Inspection Guidelines*.



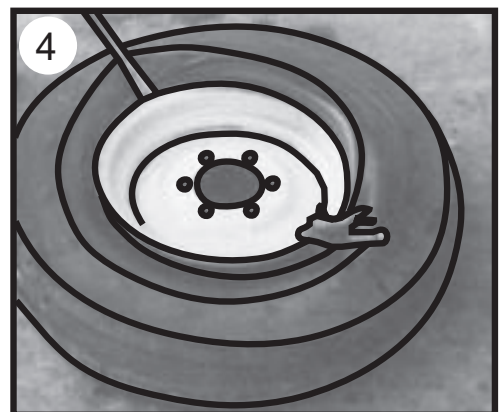
1. Lay the rim on the floor with the narrow ledge of the rim on the top. Thoroughly lubricate the tire bead area and rim flange with an approved tire mounting lubricant or a thin solution of vegetable oil soap in water. (Never use antifreeze, silicones, or petroleum-base lubricants.)



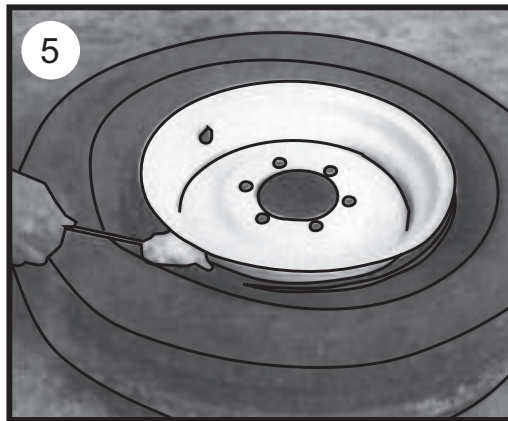
2. For tube-type tires, push the bottom bead over the rim flange as far as possible. Use 18" tire irons to work the first tire bead completely over the rim flange, taking small bites and being careful not to damage the bead.



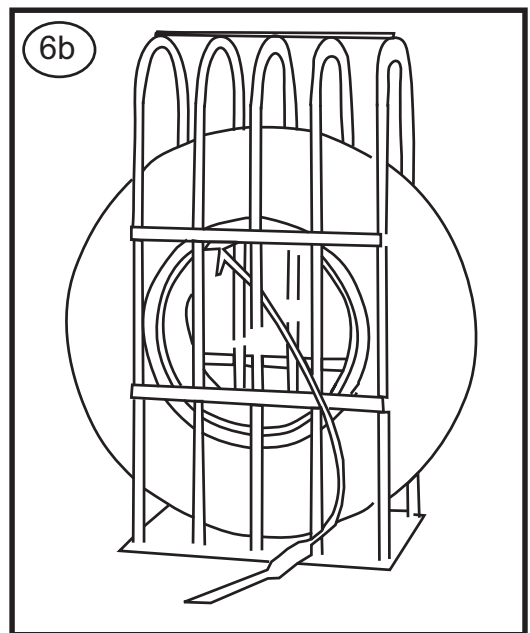
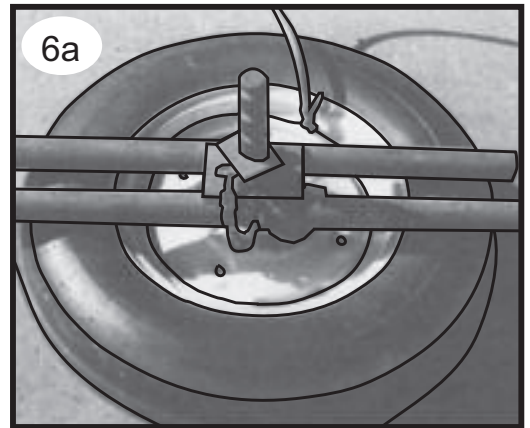
3. For tube-type tires, partially inflate the tube and insert it into the tire casing with the valve located near the valve hole in the rim. Attach a valve retrieval tool to the valve and thread the tool through the valve hole. (Placing a block under the tire may make it easier to insert the tube and attach the tool.)



4. Starting opposite the valve, use tire irons to lever the top bead over the rim flange and down into the rim well. Be careful to avoid pinching the tube with the tire irons. Locking pliers may be used to "keep your place." When the bead is well started, lubricate the remaining unmounted portion of the tire bead and rim flange. Taking small bites, spoon the tire bead over the rim flange until the final section drops over at the valve.



5. Thoroughly lubricate the tire bead area and rim bead seats on both sides of the tire.



6. Centering the tire on the rim is extremely important to prevent broken beads. Place in a safety cage or other restraining device. Using an extension hose with an in-line gauge and clip-on air chuck, inflate the tire (with the valve core removed) to seat the beads. DO NOT EXCEED 35 PSI (240 kPa). It is essential to stand clear of the tire while inflating it. Check to see that both beads are seated all the way around the tire.

If the tire is tube-type, completely deflate it (to allow repositioning of the tube) by removing the valve core housing.

For tubeless tires, mounting depends on how well the tire's shape has been maintained. If the beads are in or near their molded position, they can be seated by inflating the tire, through the valve spud. Where the beads have been squeezed together, the use of an inflator ring (either horizontally or vertically) will be required to provide a seal between the tire bead and rim. Re-insert the valve core and inflate the tire again to the recommended operating pressure.

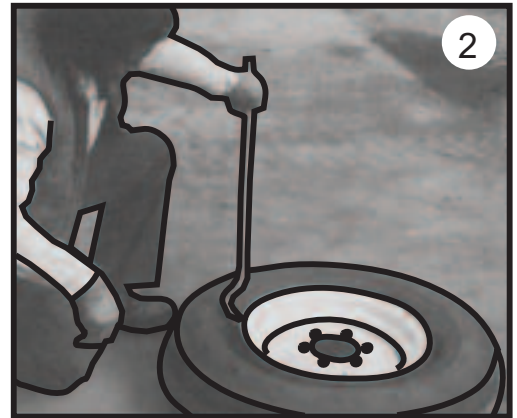
## Agricultural rim wheels

### Demounting tires off of the vehicle

**CAUTION:** Always completely deflate tire by removing valve core before removing the tire from vehicle or before attempting any other demounting operation. Check the valve stem by carefully running a piece of wire through the stem to make sure it is not plugged. *See Safety Procedures & Standards for Servicing Off-Highway Rim Wheels.*

1

1. Remove any fill from the tire. Remove the valve core and completely deflate the tire. Lay the assembly on the floor with the narrow ledge at the bottom.



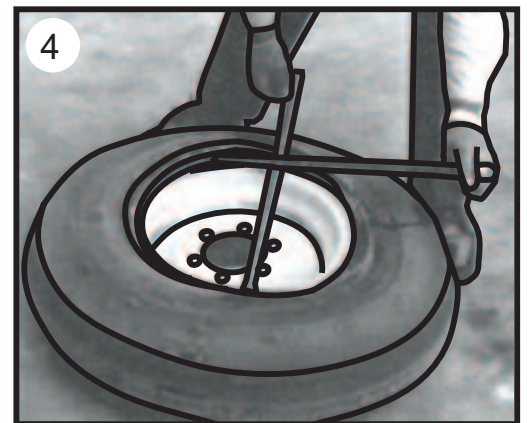
2

2. Drive a bead unseating tool between the tire bead and the rim flange, being careful not to damage the tire bead area. After the bead has been released completely around the tire, turn the tire and rim over and repeat the bead unseating procedure with the narrow ledge up.



3

3. With the narrow ledge on top, thoroughly lubricate the rim flange and tire bead area with an approved tire lubricant or a thin solution of vegetable oil soap in water. (Never use antifreeze, silicones, or petroleum-base lubricants.)



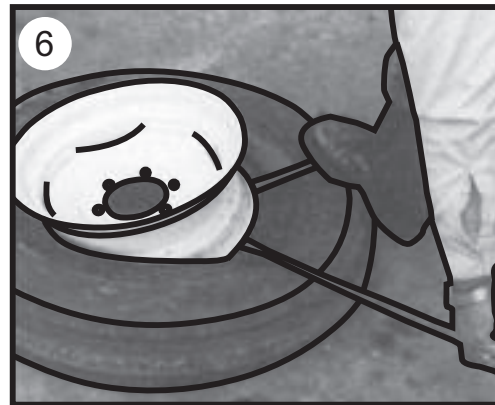
4

4. Force the part of the bead that is directly across from the valve into the well. Starting at the valve, pry the bead over the rim flange using two 18" long tire irons. Continue by taking small bites to avoid damage to the bead until the top bead is completely over the rim flange.





5. Bring the assembly to an upright position and pull the tube out of the tire. If only the tube requires repair or replacement, it can be removed, repaired, and replaced in the tire without removing the tire completely from the rim. Thoroughly inspect the inside of the casing for damage or other foreign material. Remove any remaining fluid from inside the tire.



6. To completely remove the tire from the rim, turn the assembly over so the narrow ledge is down and lubricate the second tire bead and rim flange. Be sure that the side of the bead still on the rim is in the rim well, and insert the tire irons under the opposite side of the bead. Work the rim slowly out of the tire by taking small bites alternately using both tire irons.

## 15.3" diameter: 9" width european rims



**WARNING:** Certain European farm implement equipment has been imported into North America with unique diameter rims for which no North American produced replacement tire sizes are available.

Any attempt to mount and inflate 15" nominal bead diameter tires on these rims may ultimately cause one of the tire beads to break, possibly resulting in serious physical injury or even death.

The rims in question are 15.3" in diameter and 9" wide. However, rims manufactured in 1981 and earlier are marked as 15" diameter; only those manufactured in 1982 and 1983 are marked as 15.3" diameter. **The key to avoiding this potentially dangerous situation is the 9" width.** The U.S.A. (or Canada) wheel industry does not manufacture a 9" width rim for farm implement use.

The European tire sizes that may be mounted on these rims are:

10.0/75 – 15.3 (or 15)

10.5/85 – 15.3

11.5/80 – 15.3 (or 15)

12.5/80 – 15.3

**U.S.A. (or Canada) produced farm implement tires are not to be mounted on any 9" wide farm implement RIV.**

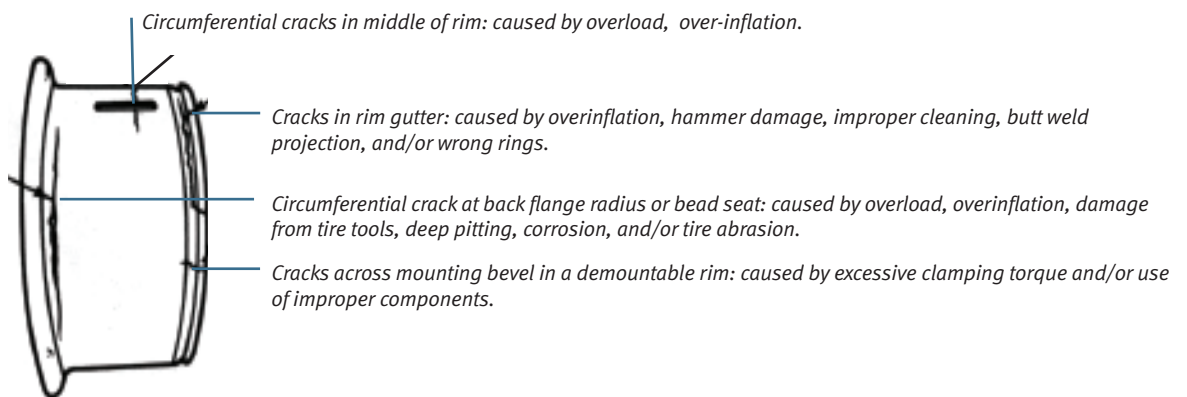
## Rim Wheel Components: Inspection guidelines

- Identification of Damaged Components
- Proper Maintenance of Rim Wheel Components

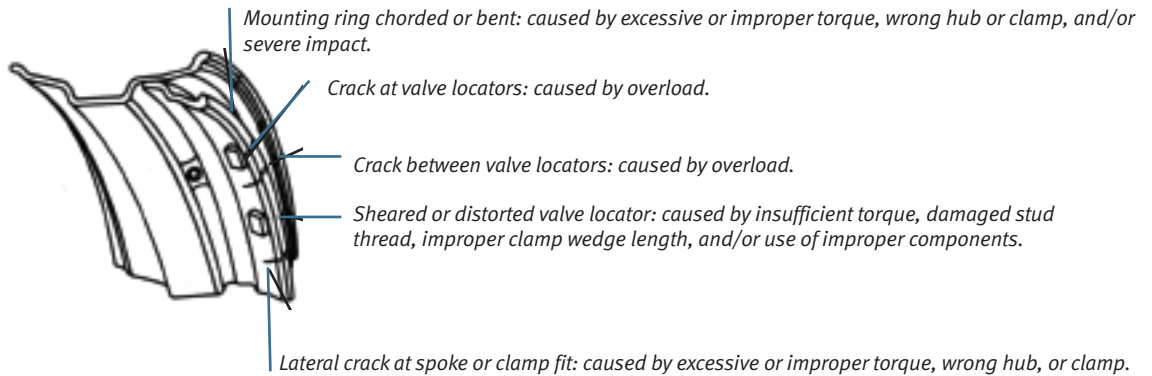
## Identification of damaged components

Wheel and rim components can become damaged. Check all metal surfaces for rust or corrosion buildup, cracks in metal, bent flanges or side rings, and deep rim tool marks on rings or in gutter areas. Watch for the problems illustrated on the next three pages and take corrective actions to prevent further damage. Remember, it is dangerous to assemble cracked, bent, severely corroded, or sprung components. Such items should be removed from service, discarded, and destroyed.

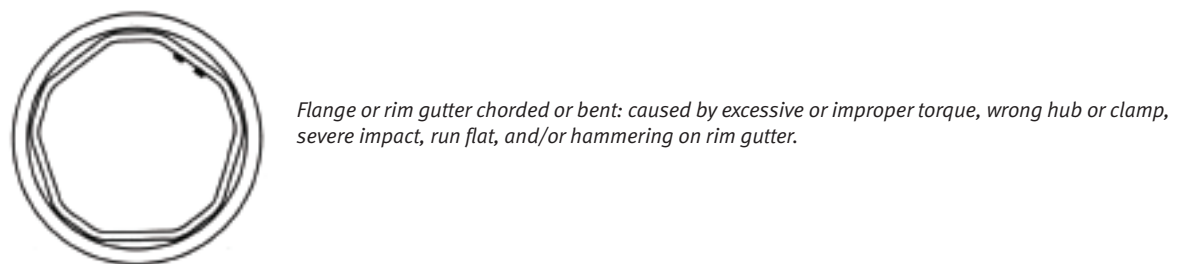
### Rim Base Cracks



### Mounting Ring Problems



### Rim Base Distortion

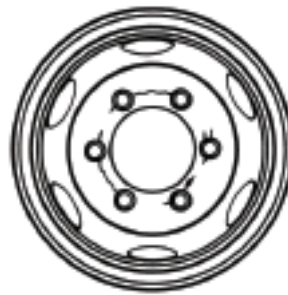


## Disc wheel cracks/bolt hole distortions

### Disc Wheel Cracks/Bolt Hole Distortions



*Handhold to handhole, handhold to bolt hole, handhole to rim: caused by overloading.*

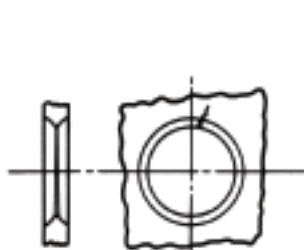


*Bolt hole to bolt hole: caused by loose cap nuts and/or small hub backup.*

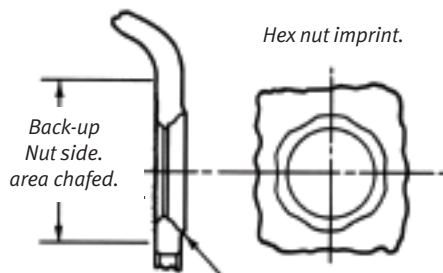


*Cracks at disc nave and/or handhole: caused by bad fit-up, damaged hub, overload and/or sharp edge at handhole.*

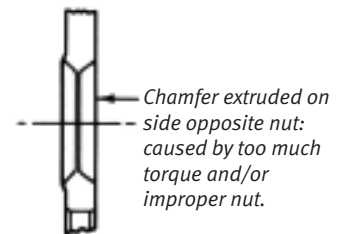
### Cap Nut and Nut Torque Cracks



*Crack originating from thinned edge of stud hole: caused by damaged and/or worn-out at chamfers.*

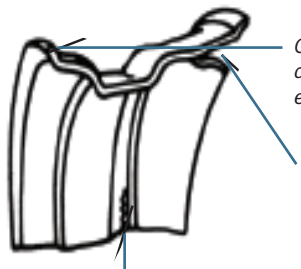


*Chamfer enlarged or walled out by nut: caused by loose cap nuts or insufficient nut torque due to damaged threads, improper torquing, and/or worn-out nut.*



*Chamfer extruded on side opposite nut: caused by too much torque and/or improper nut.*

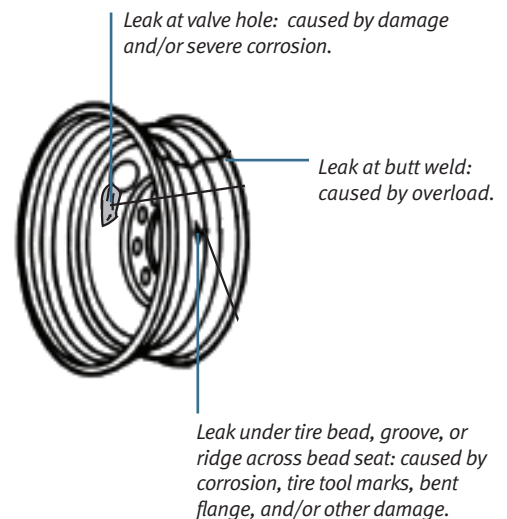
### Tubeless Rim Leaks



*Circumferential cracks at bead seat: caused by moisture, pitting, and/or erosion by the tire bead.*

*Circumferential cracks in well radius: caused by overload, overinflation, corrosion due to water from the air lines, improper mounting lubricant, balance, and/or sealer.*

*Circumferential cracks at attachment weld: caused by overload, overinflation, and/or loose mounting on vehicle or machine.*



*Leak at valve hole: caused by damage and/or severe corrosion.*

*Leak at butt weld: caused by overload.*

*Leak under tire bead, groove, or ridge across bead seat: caused by corrosion, tire tool marks, bent flange, and/or other damage.*

## Continuous Flange Cracks



**Lateral Crack Through Section:** caused by overloading, overinflation, damaged mating surfaces, bent ring, excessive corrosion/erosion, and/or excessive clamp torque on demountable rims.



**Sprung ring:** mishapen caused by improper installation and/or improper removal.

## Split Side Ring Problems



**Split Ring:** caused by overload, over-inflation, improper installation, and/or improper removal.

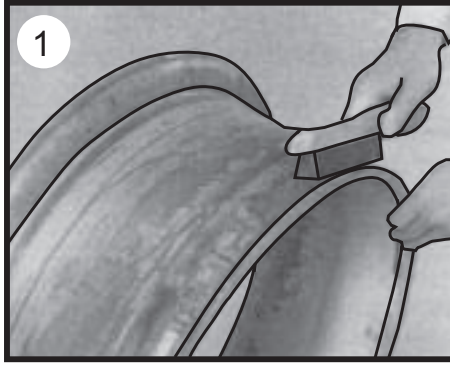
## Split Lock Ring Problems



**Excessive corrosion/erosion:** caused by improper maintenance and/or mounting lubricant.

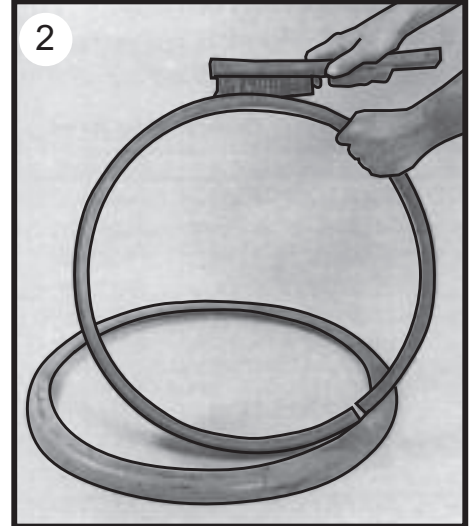
**Circumferential and lateral cracks:** caused by corrosion, improper fit-up due to damaged parts, hammer blows, dents, and/or other severe impacts.

## Proper maintenance of rim wheel components



1. Thoroughly remove all rust, dirt, and any other foreign material from all surfaces. Use hand-held or electric wire brushes or sanding tool.

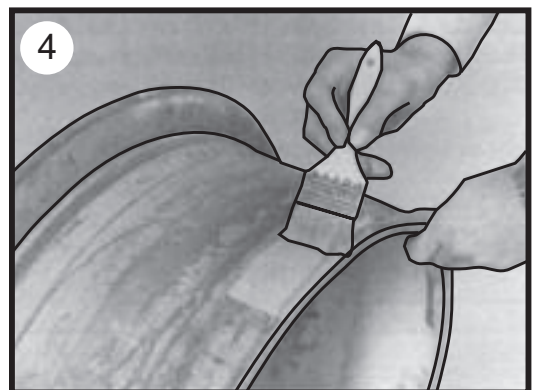
The gutter of the rim base should be cleared of all rust and other materials that could obstruct proper seating of rings.



2. Rings should be cleaned thoroughly with wire brushes. Pay particular attention to the seating surfaces and bead seat areas.



3. Bead seat areas of the rim should be free of rust and rubber deposits. This is especially important for drop-center tubeless rims because the bead seat is the air-sealing element.



4. Paint the rim by brush or spray with a fast-drying metal primer. Surfaces should be clean and dry before they are painted. Be sure to cover bare metal areas on the outside or tire side of the rim with paint. This is especially important on drop-center tubeless rims because warm or moist air is in constant contact with the metal surface on the tire side of the rim.



## Preparation for hardware installation

- Remember to use a wire brush to remove excessive paint, rust, and/or foreign material on the mating surfaces of the wheel and hub. *See Rim Wheel Components: Inspection Guidelines.* Excessive material between the wheel disc and the hub can cause torque loss of the wheel fasteners.
- A calibrated torque wrench is recommended to verify that the fasteners have been tightened to the correct torque value.
- If air wrenches are used, they must be periodically calibrated for proper torque output.
- Use a torque wrench to verify the output of the air wrench. If the output of the air wrench is not correct, then take the steps necessary to adjust the output.

### Installation procedure for ball seat and conical nut hardware

- For wheels with studs installed in the hubs, slide the wheel over the studs. Be careful not to damage the treads of the stud.
- Lift the wheel assembly to center one stud within one of the bolt holes. At the same time install one nut-finger tight.
- Repeat that process with another nut about 180° from the first nut.
- Install the remaining nuts.
- Snug up the nuts to 30% of the recommended torque value. Use a criss-cross tightening pattern sequence. Do not tighten the nuts fully until all of the nuts have been seated.
- Following these steps will allow for the uniform seating of the nuts and ensure an even face-to-face contact of the wheel against the hub.
- Tighten the nuts to the recommended torque values using the same criss-cross tightening pattern sequence.



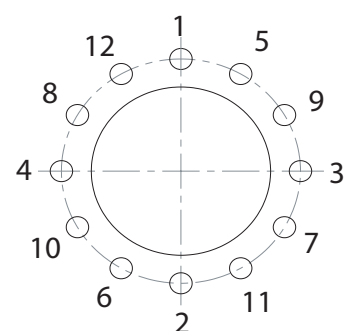
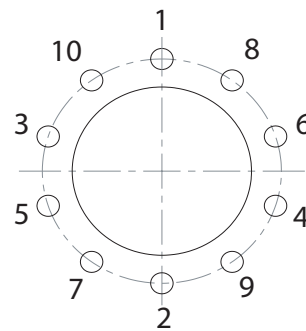
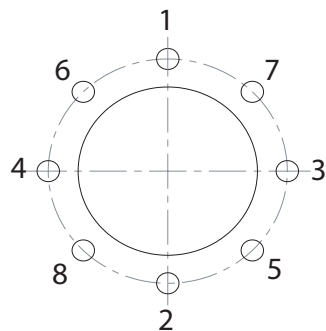
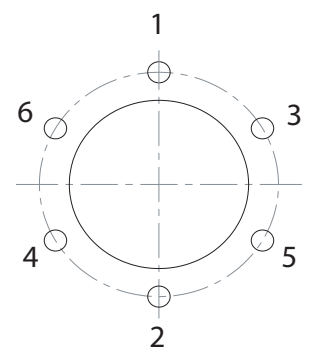
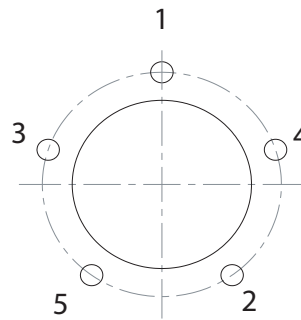
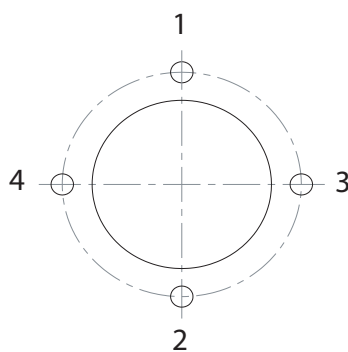
### Installation procedure for wheel bolt hardware

- Position the wheel over the hub so that the bolt holes of the wheel align with the bolt holes in the hub.
- Thread a wheel bolt into the hole until finger tight. Be careful not to damage the threads of the wheel bolt.
- Repeat the process with another wheel bolt about 180° from the first.
- Install the remaining wheel bolts.
- Snug up the wheel bolts to 30% of the recommended torque value. Use a criss-cross tightening pattern sequence. Do not tighten the bolts fully until all of the bolts have been seated.
- Following these steps will allow for the uniform seating of the wheel bolts and ensure an even face-to-face contact of the wheel against the hub.
- Tighten the wheel bolts to the recommended torque values using the same criss-cross tightening pattern sequence.



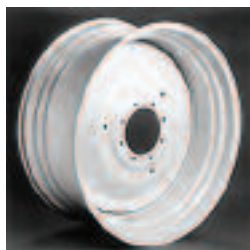
## Installation procedure for hub piloted wheels using flanged nut hardware

- > Position the wheel over the hub so that the bolt holes of the wheel align with the studs in the hub.
- > Install the nuts at the 12 o'clock and 6 o'clock positions and make these nuts finger tight. Install the remaining nuts, making them finger tight as well.
- > Snug up the wheel bolts to 30% of the recommended torque value. Use a criss-cross tightening pattern sequence.
- > Following these steps will allow for the uniform seating of the wheel bolts and ensure an even face-to-face contact of the wheel against the hub. Tighten the wheel bolts to the recommended torque values using the same criss-cross tightening pattern sequence.

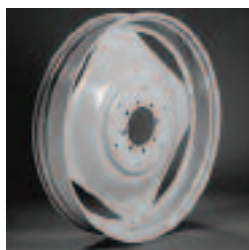


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## GKN OffHighway Wheels' Products



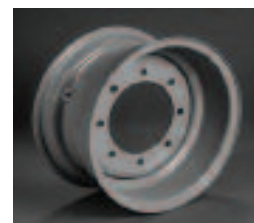
*Agricultural Tractors  
Compact Tractors  
Mid-Range Tractors  
Large Tractors*



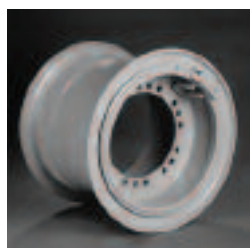
*Agricultural Implements  
Self Propelling Sprayers  
Other Implements*



*Harvesting Wheels  
Combine Harvester  
Self-Propelled Harvester*



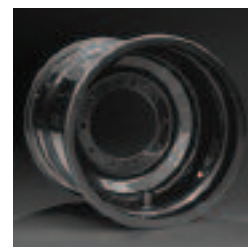
*Light Construction  
Site Dumper  
Compact Loader  
Backhoe Loader  
Excavator  
Skid Steer Loader  
Road Roller  
Telehandler  
Motor Grader*



*Heavy Construction Wheels  
Wheel Loader  
Articulated Dump Truck  
Mobile Crane  
Rigid Dump Truck  
Underground Mining Loader*



*Material Handling Wheels  
Counterbalance Forklift  
Container Handling Equip  
Rough Terrain Forklift Truck*



*Other Wheels  
Trailers  
Aerial Platforms  
Irrigation Equipment  
Airport Ground Support  
Equipment  
Railroad Maintenance  
Equipment  
Specialist Equipment  
Forestry Equipment*



*Hubs & Spindle*



*Non-driven Axles  
High Speed Axles  
Agricultural Axle*

## Appendices

- > **OSHA STANDARD: 29 CFR Part 1910.177**  
(Servicing Multi & Single Piece Rim Wheels)
- > **Mine Safety & Health Administration Regulations**
- > **EUWA Safety & Service Recommendations for Wheels**
- > **Other Sources of Rim Wheel Safety & Servicing Information**

## Appendix A

### OSHA Standard: 29 CFR PART 1910.177 (Servicing multi & single piece rim wheels)

#### **Sec. 1910.177 Servicing multi-piece and single piece rim wheels.**

##### **(a) Scope.**

- (1) This section applies to the servicing of multi-piece and single piece rim wheels used on large vehicles such as trucks, tractors, trailers, buses, and off-road machines. It does not apply to the servicing of rim wheels used on automobiles, or on pickup trucks and vans utilizing automobile tires or truck tires designated "LT."
- (2) This section does not apply to employers and places of employment regulated under the Construction Safety Standards, 29 CFR Part 1926; the Agriculture Standards, 29 CFR Part 1928; the Shipyard Standards, 29 CFR part 1915; or the Longshoring Standards, 29 CFR part 1918.
- (3) All provisions of this section apply to the servicing of both single piece rim wheels and multi-piece rim wheels unless designated otherwise.

##### **(b) Definitions.**

Barrier means a fence, wall or other structure or object placed between a single piece rim wheel and an employee during tire inflation, to contain the rim wheel components in the event of the sudden release of the contained air of the single piece rim wheel.

**Charts** means the U.S. Department of Labor, Occupational Safety and Health Administration publications entitled "Demounting and Mounting Procedures for Truck/Bus Tires" and "Multi-piece Rim Matching Chart," the National Highway Traffic Safety Administration (NHTSA) publications entitled "Demounting and Mounting Procedures Truck/Bus Tires" and "Multi-piece Rim Matching Chart," or any other poster which contains at least the same instructions, safety precautions, and other information contained in the charts that is applicable to the types of wheels being serviced.

**Installing a rim wheel** means the transfer and attachment of an assembled rim wheel onto a vehicle axle hub. Removing means the opposite of installing.

**Mounting a tire** means the assemblage or putting together of the wheel and tire components to form a rim wheel, including inflation.

**Demounting** means the opposite of mounting.

**Multi-piece rim wheel** means the assemblage of a multi-piece wheel with the tire tube and other components. Multi-piece wheel means a vehicle

wheel consisting of two or more parts, one of which is a side or locking ring designed to hold the tire on the wheel by interlocking components when the tire is inflated.

**Restraining device** means an apparatus such as a cage, rack, assemblage of bars, and other components that will constrain all rim wheel components during an explosive separation of a multi-piece rim wheel, or during the sudden release of the contained air of a single piece rim wheel.

**Rim manual** means a publication containing instructions from the manufacturer or other qualified organization for correct mounting, demounting, maintenance, and safety precautions peculiar to the type of wheel being serviced.

**Rim wheel** means an assemblage of tire, tube and liner (where appropriate), and wheel components.

**Service or servicing** means the mounting and demounting of rim wheels, and related activities such as inflating, deflating, installing, removing, and handling.



**Service area** means that part of an employer's premises used for the servicing of rim wheels, or any other place where an employee services rim wheels.

**Single piece rim wheel** means the assemblage of single piece rim wheel with the tire and other components.

**Single piece wheel** means a vehicle wheel consisting of one part, designed to hold the tire on the wheel when the tire is inflated.

**Trajectory** means any potential path or route that a rim wheel component may travel during an

explosive separation, or the sudden release of the pressurized air, or an area at which an airblast from a single piece rim wheel may be released. The trajectory may deviate from paths which are perpendicular to the assembled position of the rim wheel at the time of separation or explosion. (See Appendix A of this manual for examples of trajectories.)

**Wheel** means that portion of a rim wheel which provides the method of attachment of the assembly to the axle of a vehicle and also provides the means to contain the inflated portion of the assembly (i.e., the tire and/or tube).

### **(c) Employee training.**

- (1)** The employer shall provide a program to train all employees who service rim wheels in the hazards involved in servicing those rim wheels and the safety procedures to be followed.
  - (i) The employer shall assure that no employee services any rim wheel unless the employee has been trained and instructed in correct procedures of servicing the type of wheel being serviced, and in the safe operating procedures described in paragraphs (f) and (g) of this section.
  - (ii) Information to be used in the training program shall include, at a minimum, the applicable data contained in the charts (rim manuals) and the contents of this standard.
  - (iii) Where an employer knows or has reason to believe that any of his employees is unable to read and understand the charts or rim manual, the employer shall assure that the employee is instructed concerning the contents of the charts and rim manual in a manner which the employee is able to understand.
- (2)** The employer shall assure that each employee demonstrates and maintains the ability to service rim wheels safely, including performance of the following tasks:
  - (i) Demounting of tires (including deflation);
  - (ii) Inspection and identification of the rim wheel components;
  - (iii) Mounting of tires (including inflation with a restraining device or other safeguard required by this section);
  - (iv) Use of the restraining device or barrier, and other equipment required by this section;
  - (v) Handling of rim wheels
  - (vi) Inflation of the tire when a single piece rim wheel is mounted on a vehicle;
  - (vii) An understanding of the necessity of standing outside the trajectory both during inflation of the tire and during inspection of the rim wheel following inflation; and

(viii) Installation and removal of rim wheels.

- (3) The employer shall evaluate each employee's ability to perform these tasks and to service rim wheels safely, and shall provide additional training as necessary to assure that each employee maintains his or her proficiency.

**(d) Tire servicing equipment.**

- (1) The employer shall furnish a restraining device for inflating tires on multi-piece wheels.
- (2) The employer shall provide a restraining device or barrier for inflating tires on single piece wheels unless the rim wheel will be bolted onto a vehicle during inflation.
- (3) Restraining devices and barriers shall comply with the following requirements:
  - (i) Each restraining device or barrier shall have the capacity to withstand the maximum force that would be transferred to it during a rim wheel separation occurring at 150% of the maximum tire specification pressure for the type of rim wheel being serviced.
  - (ii) Restraining devices and barriers shall be capable of preventing the rim wheel components from being thrown outside or beyond the device or barrier for any rim wheel positioned within or behind the device.
  - (iii) Restraining devices and barriers shall be visually inspected prior to each day's use and after any separation of the rim wheel components or sudden release of contained air. Any restraining device or barrier exhibiting damage such as the following defects shall be immediately removed from service:
    - (a) Cracks at welds;
    - (b) Cracked or broken components;
    - (c) Bent or sprung components caused by mishandling, abuse, tire explosion, or rim wheel separation;
    - (d) Pitting of components due to corrosion; or
    - (e) Other structural damage which would decrease its effectiveness.
  - (iv) Restraining devices or barriers removed from service shall not be returned to service until they are repaired and reinspected. Restraining devices or barriers requiring structural repair such as component replacement or rewelding shall not be returned to service until they are certified by either the manufacturer or a Registered Professional Engineer as meeting the strength requirements of paragraph (D)(3)(i) of this section.
- (4) The employer shall furnish and assure that an air line assembly consisting of the following components be used for inflating tires:
  - (i) A clip-on chuck;
  - (ii) An in-line valve with a pressure gauge or a presettable regulator; and
  - (iii) A sufficient length of hose between the clip-on chuck and the in-line valve (if one is used) to allow the employee to stand outside the trajectory.

- (5) Current charts or rim manuals containing instructions for the type of wheels being serviced shall be available in the service area.
- (6) The employer shall furnish and assure that only tools recommended in the rim manual for the type of wheel being serviced are used to service rim wheels.

**(e) Wheel component acceptability.**

- (1) Multi-piece wheel components shall not be interchanged except as provided in the charts or in the applicable rim manual.
- (2) Multi-piece wheel components and single piece wheels shall be inspected prior to assembly. Any wheel or wheel component which is bent out of shape, pitted from corrosion, broken, or cracked shall not be used and shall be marked or tagged unserviceable and removed from the service area. Damaged or leaky valves shall be replaced.
- (3) Rim flanges, rim gutters, rings, bead seating surfaces, and the bead areas of tires shall be free of any dirt, surface rust, scale, or loose or flaked rubber build-up prior to mounting and inflation.
- (4) The size (bead diameter and tire/wheel widths) and type of both the tire and the wheel shall be checked for compatibility prior to assembly of the rim wheel.

**(f) Safe operating procedure-multi-piece rim wheels.**

The employer shall establish a safe operating procedure for servicing multi-piece rim wheels and shall assure that employees are instructed in and follow that procedure. The procedure shall include at least the following elements:

- (1) Tires shall be completely deflated before demounting by removal of the valve core.
- (2) Tires shall be completely deflated by removing the valve core before a rim wheel is removed from the axle in either of the following situations:
  - (i) When the tire has been driven under-inflated at 80% or less of its recommended pressure, or
  - (ii) When there is obvious or suspected damage to the tire or wheel components.
- (3) Rubber lubricant shall be applied to bead and rim mating surfaces during assembly of the wheel and inflation of the tire, unless the tire or wheel manufacturer recommends against it.
- (4) If a tire on a vehicle is underinflated but has more than 80% of the recommended pressure, the tire may be inflated while the rim wheel is on the vehicle provided remote control inflation equipment is used, and no employees remain in the trajectory during inflation.
- (5) Tires shall be inflated outside a restraining device only to a pressure sufficient to force the tire bead onto the rim ledge and create an airtight seal with the tire and bead.
- (6) Whenever a rim wheel is in a restraining device the employee shall not rest or lean any part of his body or equipment on or against the restraining device.

- (7) After tire inflation, the tire and wheel components shall be inspected while still within the restraining device to make sure that they are properly seated and locked. If further adjustment to the tire or wheel components is necessary, the tire shall be deflated by removal of the valve core before the adjustment is made.
- (8) No attempt shall be made to correct the seating of side and lock rings by hammering, striking, or forcing the components while the tire is pressurized.
- (9) Cracked, broken, bent, or otherwise damaged rim components shall not be reworked, welded, brazed, or otherwise heated.
- (10) Whenever multi-piece rim wheels are being handled, employees shall stay out of the trajectory unless the employer can demonstrate that performance of the servicing makes the employee's presence in the trajectory necessary.
- (11) No heat shall be applied to a multi-piece wheel or wheel component.

**(g) Safe operating procedure--single piece rim wheels.**

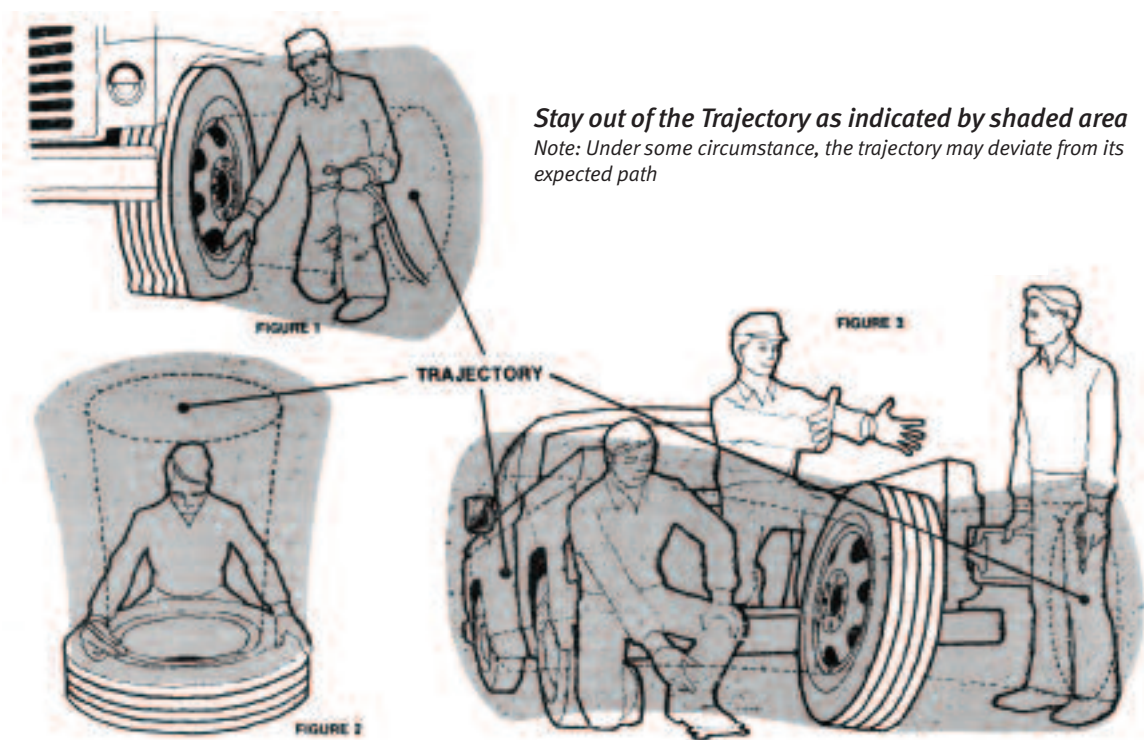
The employer shall establish a safe operating procedure for servicing single piece rim wheels and shall assure that employees are instructed in and follow that procedure. The procedure shall include at least the following elements:

- (1) Tires shall be completely deflated by removal of the valve core before demounting.
- (2) Mounting and demounting of the tire shall be done only from the narrow ledge side of the wheel. Care shall be taken to avoid damaging the tire beads while mounting tires on wheels. Tires shall be mounted only on compatible wheels of matching bead diameter and width.
- (3) Nonflammable rubber lubricant shall be applied to bead and wheel mating surfaces before assembly of the rim wheel, unless the tire or wheel manufacturer recommends against the use of any rubber lubricant.
- (4) If a tire changing machine is used, the tire shall be inflated only to the minimum pressure necessary to force the tire bead onto the rim ledge while on the tire changing machine.
- (5) If a bead expander is used, it shall be removed before the valve core is installed and as soon as the rim wheel becomes airtight (the tire bead slips onto the bead seat).
- (6) Tires may be inflated only when contained within a restraining device, positioned behind a barrier, or bolted on the vehicle with the lug nuts fully tightened.
- (7) Tires shall not be inflated when any flat, solid surface is in the trajectory and within one foot of the sidewall.
- (8) Employees shall stay out of the trajectory when inflating a tire.
- (9) Tires shall not be inflated to more than the inflation pressure stamped in the sidewall unless a higher pressure is recommended by the manufacturer.
- (10) Tires shall not be inflated above the maximum pressure recommended by the manufacturer to seat the tire bead firmly against the rim flange.

(11) No heat shall be applied to a single piece wheel.

(12) Cracked, broken, bent, or otherwise damaged wheels shall not be reworked, welded, brazed, or otherwise heated.

### Trajectory warning – 1910.177 App. A



## Ordering Information for NHTSA Charts - 1910.177 App. B

OSHA has printed two charts entitled “Demounting and Mounting Procedures for Truck/Bus Tires” and “Multi-piece Rim Matching Chart,” as part of a continuing campaign to reduce accidents among employees who service large vehicle rim wheels.

Reprints of the charts are available through the Occupational Safety and Health Administration (OSHA) Area and Regional Offices. The address and telephone number of the nearest OSHA office can be obtained by looking in the local telephone directory under U.S. Government, U.S. Department of Labor, Occupational Safety and Health Administration. Single copies are available without charge.

Individuals, establishments and other organizations desiring single or multiple copies of these charts may order them from the OSHA Publications Office, U.S. Department of Labor, Room N-3101, Washington, DC 20210. Telephone: (202) 693-1888, Fax: (202) 693-2498, Web site: [www.osha.gov](http://www.osha.gov).



## Appendix B

### Mine safety & health administration (“MSHA”) regulations pertaining to tire and rim safety

This section contains the following regulations pertaining to tire and rim safety from Title 30 of the Code of Federal Regulations, issued by the U.S. Department of Labor, Mine Safety and Health Administration (“MSHA”).

30 CFR 56/57.14100	Safety defects; examination, correction, and records.
30 CFR 56/57.14104	Tire repairs.
30 CFR 56/57.14105	Procedures during repairs or maintenance.
30 CFR 56/57.14211	Blocking equipment in a raised position.
30 CFR 56/57.16007	Taglines, hitches, and slings.
30 CFR 56/57.16009	Suspended loads.
30 CFR 77.210	Hoisting of materials.
30 CFR 77.404	Machinery and equipment; operation and maintenance.
30 CFR 77.405	Performing work from a raised position; safeguards.
30 CFR 77.1606 (a, c)	Loading and haulage equipment; inspection and maintenance.
30 CFR 77.1607(l)	Loading and haulage equipment; operation.

#### **30 C.F.R. § 56.14100, 30 C.F.R. § 57.14100: Safety defects; examination, correction and records.**

- (a) Self-propelled mobile equipment to be used during a shift shall be inspected by the equipment operator before being placed in operation on that shift.
- (b) Defects on any equipment, machine, and tools that affect safety shall be corrected in a timely manner to prevent the creation of a hazard to persons.
- (c) When defects make continued operation hazardous to persons, the defective items including self-propelled mobile equipment shall be taken out of service and placed in a designated area posted for that purpose, or a tag or other effective method of marking the defective items shall be used to prohibit further use until the defects are corrected.
- (d) Defects on self-propelled mobile equipment affecting safety, which are not corrected immediately, shall be reported to and recorded by the mine operator. The records shall be kept at the mine or nearest mine office from the date the defects are recorded, until the defects are corrected. Such records shall be made available for inspection by an authorized representative of the Secretary.

#### **30 C.F.R. § 56.14104, 30 C.F.R. § 57.14104: Tire repairs.**

- (a) Before a tire is removed from a vehicle for tire repair, the valve core shall be partially removed to allow for gradual deflation and then removed. During deflation, to the extent possible, persons shall stand outside of the potential trajectory of the lock ring of a multi-piece wheel rim.

- (b) To prevent injury from wheel rims during tire inflation, one of the following shall be used:
1. A wheel cage or other restraining device that will constrain all wheel rim components during an explosive separation of a multi-piece wheel rim, or during the sudden release of contained air in a single piece rim wheel; or
  2. A stand-off inflation device which permits persons to stand outside of the potential trajectory of wheel components.

**30 C.F.R. § 56.14105, 30 C.F.R. § 57.14105: Procedures during repairs or maintenance.**

Repairs or maintenance of machinery or equipment shall be performed only after the power is off, and the machinery or equipment blocked against hazardous motion. Machinery or equipment motion or activation is permitted to the extent that adjustments or testing cannot be performed without motion or activation, provided that persons are effectively protected from hazardous motion.

**30 C.F.R. § 56.14211, 30 C.F.R. § 57.14211: Blocking equipment in a raised position.**

- (a) Persons shall not work on top of, under, or work from mobile equipment in a raised position until the equipment has been blocked or mechanically secured to prevent it from rolling or falling accidentally.
- (b) Persons shall not work on top of, under, or work from a raised component of mobile equipment until the component has been blocked or mechanically secured to prevent accidental lowering. The equipment must also be blocked or secured to prevent rolling.
- (c) A raised component must be secured to prevent accidental lowering when persons are working on or around mobile equipment and are exposed to the hazard of accidental lowering of the component.
- (d) Under this section, a raised component of mobile equipment is considered to be blocked or mechanically secured if provided with a functional lock-locking device or a device which prevents free and uncontrolled descent.
- (e) Blocking or mechanical securing of the raised component is required during repair or maintenance of elevated mobile work platforms.

**30 C.F.R. § 56.16007, 30 C.F.R. § 57.16007: Taglines, hitches, and slings.**

- (a) Taglines shall be attached to loads that may require steadying or guidance while suspended.
- (b) Hitches and slings used to hoist materials shall be suitable for the particular material handled.

**30 C.F.R. § 56.16009, 30 C.F.R. § 57.16009: Suspended loads.**

Persons shall stay clear of suspended loads.

**30 C.F.R. § 77.210: Hoisting of materials.**

- (a) Hitches and slings used to hoist materials shall be suitable for handling the type of materials being hoisted.
- (b) Men shall stay clear of hoisted loads.
- (c) Taglines shall be attached to hoisted materials that require steadying or guidance.

**30 C.F.R. § 77.404: Machinery and equipment; operation and maintenance.**

- (a) Mobile and stationary machinery and equipment shall be maintained in safe operating condition and machinery or equipment in unsafe condition shall be removed from service immediately.
- (b) Machinery and equipment shall be operated only by persons trained in the use of and authorized to operate such machinery or equipment.
- (c) Repairs or maintenance shall not be performed on machinery until the power is off and the machinery is blocked against motion, except where machinery motion is necessary to make adjustments.
- (d) Machinery shall not be lubricated while in motion where a hazard exists, unless equipped with extended fittings or cups.

**30 C.F.R. § 77.405: Performing work from a raised position; safeguards.**

- (a) Men shall not work on or from a piece of mobile equipment in a raised position until it has been blocked in place securely. This does not preclude the use of equipment specifically designed as elevated mobile work platforms.
- (b) No work shall be performed under machinery or equipment that has been raised until such machinery or equipment has been securely blocked in position.

**30 C.F.R. § 77.1606(a, c): Loading and haulage equipment; inspection and maintenance.**

- (a) Mobile loading and haulage equipment shall be inspected by a competent person before such equipment is placed in operation. Equipment defects affecting safety shall be recorded and reported to the mine operator.
- (b) Equipment defects affecting safety shall be corrected before the equipment is used.

**30 C.F.R. § 77.1607(l): Loading and haulage equipment; operation.**

- (l) Tires shall be deflated before repairs on them are started and adequate means shall be provided to prevent wheel locking rims from creating a hazard during tire inflation.

## Appendix C

### EUWA safety & service recommendations for wheels

#### Safety and service recommendations for wheels

**Developed by EUWA - Association of European Wheel Manufacturers**

*Members of EUWA represent the main manufacturers of wheels, for all types of vehicles*



The wheel makers are continuously improving the design and the manufacture of their products in order to obtain the highest degree of accuracy, strength and reliability. It is however essential that the people charged with wheel/tyre servicing are properly trained and will follow the established procedures.

This paper, most of whose content is taken from the published EUWA Standards, is therefore addressed to all operators working in the field of "wheels", drawing their attention to the risks connected with inadequate checks, insufficient maintenance, replacement with wrong components, carelessness of safety norms, and so on.

Through the wide diffusion of these "safety and service recommendations" agreed by qualified experts of the EUWA members, we intend to prevent possible problems in service to an improper use, unsafe mounting/demounting or other dangerous operations.

#### 1 - Safety is important

The wheel is a highly stressed component of the vehicle that in service may be subjected to extreme forces. Therefore it is absolutely necessary to check the wheels periodically and to pay particular attention to their mounting, removal and maintenance in order to ensure safe operations and to prevent any possible risk.

The following recommendations refer to all types of wheels, made of steel or of light alloy for: passenger cars, agricultural tractors, off-the-road machines, industrial vehicles, but especially to the wheels of commercial vehicles (trucks, buses and road trailers, where high capacity loads and inflation pressures are involved).

Particular care has to be used to handle the wheels having multi-piece rims.

Improper or unsafe wheel/tire servicing practices can lead to serious accidents.

Therefore, all service operations must be performed only by qualified personnel, appropriately trained: they have to use correct procedures, proper equipment and tools, and safety precautions.

## 2 - General safety and maintenance recommendations

### 2.1 - Wheels and wheel components

Never use wheels or wheel components which cannot be well identified, even if they appear to have the correct dimensions and the same correct function.

The identifications impressed on the bolt hole area of the wheel disc and/or on the rim/rings -- see picture No.1 -- will help to ensure the correct replacement with another component having identical characteristics and performance, as required by the vehicle manufacturer.

The geometric characteristics of the wheel disc must correspond exactly to the matching vehicle parts (axle hub and brake) in order to guarantee the proper fitting and an effective load transmission.

The use of the correct replacement part becomes particularly important for the removable rings of a multi-piece rim, since the ring of a given rim size may not be interchangeable with the one belonging to another rim type.

For the proper choice of the component to be mounted as replacement, careful attention has to be paid to these items: size of ring - system of assembly - execution details (shape and dimensions).

Even small differences may in fact be critical. Consequently for safety reasons, in the case of multi-piece rims, the origin of the components must be the same.

Mismatched or wrong rings mounted on a multi-piece rim can cause serious mounting or service accidents or, at the least, the wheel failure, without any prior warning.

### 2.2 - Removal of wheel and tire demounting

The personnel responsible for the wheel mounting/demounting operations must be qualified and have proper training.

In the case of divided (bolted) wheels, wheels with multi-piece rims of both single and twin mounting, or similar, **it is a mandatory rule for safety reasons that, before starting to unbolt the tire-wheel assembly from the vehicle axle, that the tire must be fully deflated** even when a low inflation pressure is involved.

Unseen damages could cause the explosion of the assembly during removal, if the tire still contains air under pressure.

To ensure a complete tire deflation, remove the valve core.

Remove, disassemble, and inspect a tire-rim assembly that has been operated in a run-flat or in under-inflated condition (that is, 80% or less of the recommended pressure). To carry out these operations, use suitable tools and follow the demounting procedure prescribed by the vehicle or tire/wheel manufacturer. For mounting/demounting a tire from a wheel with a multi-piece rim, see picture No. 2.

For detailed tire mounting/demounting instructions of commercial vehicle wheels equipped with 15° drop center rims and protected valves, see Annex "A".

For the similar procedure for the TRILEX® wheel system, see Annex "B".

### 2.3 - Identify a damaged rim/wheel

Periodically check the wheel conditions: a complete cleaning of all surfaces before inspection will help in finding more easily and surely possible defects.

Check closely all components after removal, to ensure that they are in good condition and look for any possible non-conformity -- see picture No. 3.

In order to avoid damage to tires, during mounting or while in use, any sharp edges, burrs or uneven areas which might have occurred during service should be deburred and covered with a suitable paint to protect against corrosion.

The matching surfaces between the wheel and the vehicle as well as those of the components in a multi-piece rim must be cleaned and protected against corrosion, also.

The wheel as a safety part, must not show fractures, deformations, distortions, severe corrosion, excessive wear, buckled, or twisted rings (where existing) or other similar defects. Such pieces must not be reused, but destroyed and scrapped.

Also in the event of a suspected damage or if in doubt about the suitability of a wheel/rim component, the involved part must be replaced.

The replacement has to be carried out with new pieces having completely identical characteristics.

In the event that the correct removable rings are not available, a new complete rim/wheel should be fitted.

Typical defects that require the parts replacement are:

- cracks in the wheel disc face, in particular the bolt holes area and the ventilation holes can be concerned
- deformations or abnormal imprints in the seats of the bolts/studs fixings
- leaks in tubeless tires derived by micro-cracks in the rim or by wear and tear marks on the rim-tire matching surface
- bent rim flanges (generally due to impacts against obstacles)
- circumferential cracks on the rear flange or at the gutter in the base of multipiece rims
- broken, buckled side/kombi ring or excessive corrosion on rings of multipiece rims
- twisted rings, in particular lock and 'kombi' rings

It is not allowed to perform any technical modification on the wheel.

**The repair of a damaged rim or disc by heating, by welding, by addition or removal of material is absolutely forbidden.**

**No guarantee on repaired parts is acceptable since such changes may introduce additional stresses in critical, high stressed areas.**

Wear on rim flanges (top of the flanges) can be tolerated up to a maximum of 10 % of the initial thickness of the rim material.



#### **2.4 - Mounting of tire onto wheel rim**

This operation must be carried out by trained personnel only.

Be sure that the rim size and diameter are the right ones for the tire to be mounted.

Inspect the wheels and its components to verify that all parts are in good condition.

**Do not use damaged, worn out, or cracked parts and do not try to repair them.**

Do not fit an inner tube to a tubeless tire to overcome a problem of air leakage.

Check all matching surfaces, i.e., hub, studs, nuts, disc attachment face -- and in case of multi-piece rims all contact surfaces for a correct ring seating -- removing dirt, rust, scratches, and other similar surface defects.

To clear such surfaces, hand or electric wire brushes or sand blasting may be used.

In particular, drop center rims fitted with tubeless tires must have the bead seat areas free from rust and rubber deposit, in order to ensure air-sealing.

Especially for tubeless tires, inspect the valve and replace the stem, if necessary.

Use a neutral non-aggressive mounting paste to lubricate the outside of both rim seats and tire beads. Do not use solvent-based lubricants as these could damage the tire, nor starting flammable fluids to lubricate or seal the beads.

On wheels with drop center rims (single piece), place the tire over the small bead seat side of the rim, push the lower bead over the rim flange and then, progressively, into the rim well. Using the first lever to keep in place the upper tire bead, work by short steps with the second lever to complete the fitting of the tire -- see picture No. 4.

On the multi-piece rims, the correct positioning of the removable 'kombi' ring or of the side/lock rings has to be carefully checked prior to inflation and later on after having applied about 0.3-0.5 bar of air pressure. Never stand in front of the wheel.

An inflated tire, even with low air pressure, must never be worked on with a hammer while trying to correct an improper position of the rings. In such a case, all air has to be let out of the tire before the necessary correction can be done.

For detailed instructions concerning the tire mounting/demounting on commercial vehicle wheels having 15° drop center rims and protected valves, see Annex "A".

For the TRILEX® wheel system, refer to Annex "B".

To complete the tire inflation use a "safety cage", designed with suitable strength -- see picture No. 5 -- or at least put safety chains around the wheel, always avoiding to stay in the potentially dangerous areas.

Particular precaution must be taken by the operator, and any other people present whenever handling an inflated tire/wheel assembly or while checking the pressure of a tire mounted on the vehicle, and never to remain in front of the wheel. This especially if it is a large dimension with high inflation pressure -- see picture No. 6.

Extreme care should be taken: the sudden release of the air contained in the tire can cause serious injury.

Always use an air gauge to measure the tire pressure. The correct value, specified for the tire, must be maintained to avoid damage to tire or fracture of the wheel/rim.

### **2.5 - Mounting of wheel to the vehicle - studs and nuts**

The tire/wheel assembly must be correctly positioned relative to the hub when mounting on the vehicle.

Be sure that: the diameter of pilot hole - diameter of stud holes - number and shape of stud holes - wheel offset or inset - type and kind of bolts/studs and nuts correspond to the characteristics of the vehicle axle hub.

All mounting parts such as studs, spherical or conical nuts, nuts with captive washer, special parts for steel and light alloy wheels, must fit exactly to the wheel being mounted.

Any incorrect combination of parts (different type, different shape of radius/angle, different length) may cause nut loosening or the wheel failure.

To prevent rusting, small amounts of oil may be applied to the wheel nut and stud threads. Care must be taken not to over lubricate.

Studs and nuts of all disc wheels have to be fastened in accordance with the vehicle manufacturer's instructions, either using a torque spanner or by means of a tool designed to reach the torque value specified by the vehicle manufacturer.

As far as the recommended amount of the torque is concerned, the instructions of the vehicle producer must be followed. The torque specified by the agricultural tractor manufacturer, must also be applied to the bolts connecting the disc to the rim lugs, for the case of wheels having variable track.

The correct tightening sequence is crosswise for the wheel disc, that is to tighten one nut then the opposite one or the farthest away -- see some examples in picture No. 7.

However, for the TRILEX® wheel system the correct tightening sequence is around the wheel spider, for example tighten the adjacent nuts in a clockwise direction (i.e., do not tighten crosswise). Tighten progressively to the final torque, not in one go.

Excessive nut tightening may cause deformation of wheel disc or of bolt/stud failure. An insufficient tightening may cause the wheel loosening.

On a new vehicle and always after a wheel/tire replacement, it is imperative to verify the mounting torque after approximately 50-100 km of operation and, where necessary, to re-tight the wheel nuts to the correct value.

It is recommended to periodically check the nut torque.

## 2.6 - Wheel maintenance

Burrs, marks, and rust must be removed before mounting the tire, to avoid damage to the tire.

When repainting, it must be borne in mind that on the wheel mounting contact areas the total thickness of coating, including the base coat, should not exceed 50 microns, except where stated differently by the vehicle manufacturer.

On the TRILEX® wheel system, however, the 15/18°-cones of rim and spoke head must not be painted at all.

In any event, avoid to paint the countersink of bolt seats (where existing) and in general the nut contact area, on the wheel disc.

Before installing on vehicle and periodically during the use, all parts must be inspected to ensure that they are clean and free from rust and deposits.

Do not load and inflate the tire/wheel/axle system beyond the rating of the lowest rated component. Regular checks of the tire inflation pressure are to be made.

The type of balance weights, when used, must be in accordance with the profile of the rim flange.

Follow the vehicle or rim/wheel manufacturer's current manuals for installation instructions, recommendations and any other additional information.

## 2.7 - Maintenance of wire spoke wheel

Particular attention must be devoted to the wheels with wire spoke for passenger cars and motorcycles.

The wire spoke is the most critical component, therefore a careful check is recommended after an initial short running and then at periodical intervals.

When one damaged wire spoke is replaced, the relevant nipple must be replaced, too; moreover, the qualified charged personnel must verify the efficiency and tensioning of all other spokes.

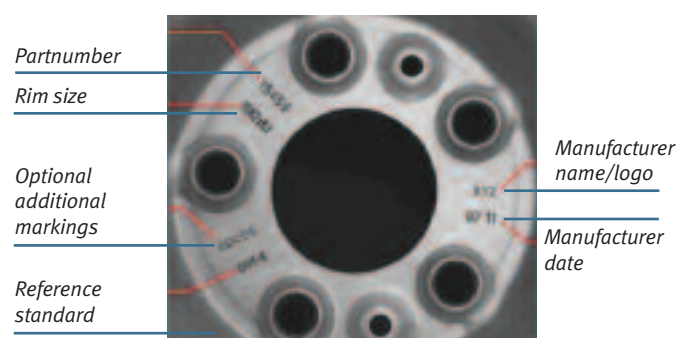
For replacements, always original spare parts must be used.

Similar care must be given to the coupling parts between the wheel center member and the vehicle axle, both in the "Rudge" system (locking through a conical nut and connecting teeth) and in the types having bolts on a conventional fixing.

Attention has to be paid to the thread directions (right wheel, left thread and vice-versa).

Picture No. 1 - Typical stampings to identify the wheel (i.e. rim size, manufacturer's name/logo, manufacturing date, part number and possible other additional markings of interest).

Similar markings also may appear on the rim and rings, where existing.

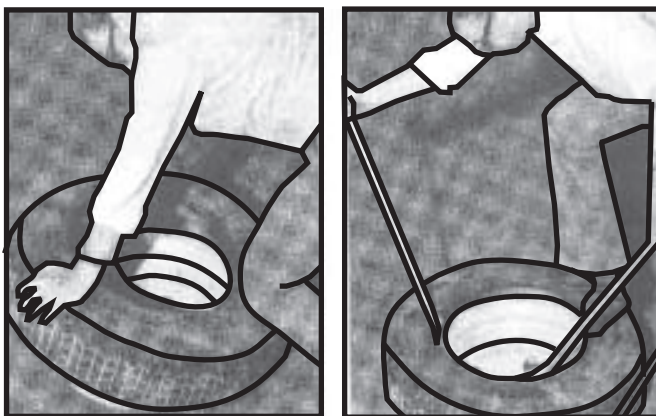


Picture No. 4 – Mounting a tyre on a wheel with drop center rim

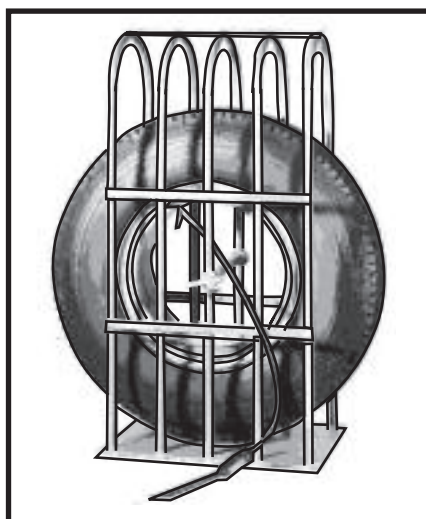
The picture shows the manual mounting of a commercial vehicle wheel with a 15° drop centre rim.

Differently from the photos, presently the mounting/demounting operations of the tire are no longer carried out manually but on special machines. In any event, carefully clean and check all matching surfaces. Inspect with attention the valve. Properly lubricate the tire bead seats.

Inflate the tire, whenever it is possible, in a safety cage. Periodically check the tire pressure.



Picture No. 5 – Safety cage, to be used when inflating a tire-wheel assembly



Trajectory (danger zone) to be avoided when handling multi-piece rim wheels

Examples of nut tightening sequence related to commercial vehicle disc wheels having 6, 8, 10 bolt fixing and to the TRILEX® wheel system.

*6 bolt fixing*



*8 bolt fixing*



*10 bolt fixing*



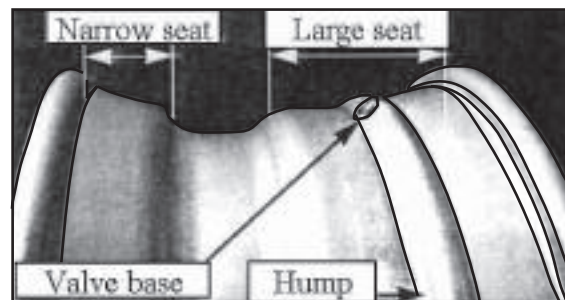
*TRILEX system*



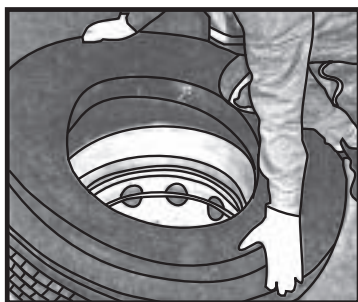
Specific tire mounting-demounting procedure for wheels with 15° D.C. rim and protected valve.

The “45° valve” types used for these wheels must have a spherical valve base. This is required in order:

- To avoid risk of tire damage caused by the valve base during mounting/demounting.
- To ensure the tire inflation after mounting.

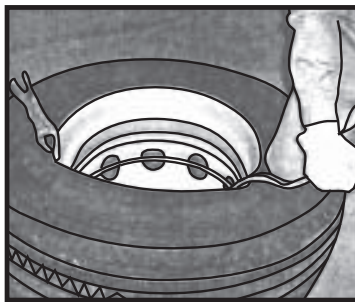


**MOUNTING:** Lubricate the whole rim surface as well as the tire bead. Place the wheel on a wooden block, with disc downwards, i.e., the narrower rim bead seat at the top.



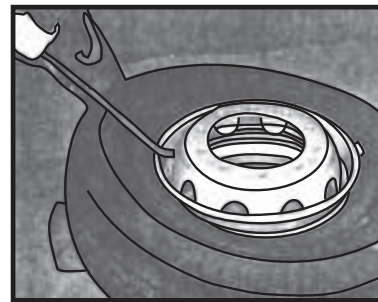
**Mounting first tire bead**

Place the tire concentrically on the rim flange. First press the adjacent bead over the rim flange into the rim well. Then press progressively the whole bead over the flange. In event of difficulties use a suitable bent lever.



**Mounting second tire bead**

Press the bead in the valve area over the rim flange into the rim well and lock it by means of pliers on the rim flange. Then fit progressively the whole bead using a bent lever.

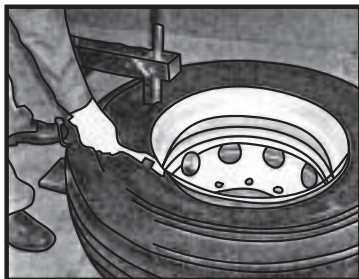


**Pressure lock – inflation**

Ensure that the valve core is removed. Place the assembly vertically and start inflation following the safety rules. In case of difficulty (tire bead has not overcome the valve base) place the wheel on the ground with the disc upward. Lift the bead in the valve area using a lever. When the tire is correctly positioned fit the valve core and inflate the tire to the prescribed air pressure.

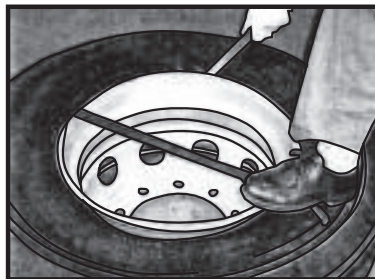


## Demounting



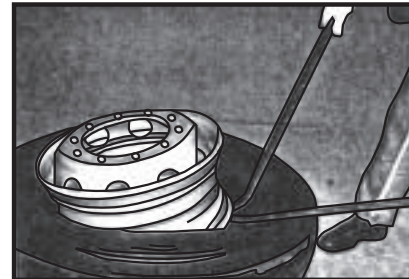
### **Demounting – Unlocking**

Deflate the tyre completely by removing the valve core. Starting with the narrow seat side, apply pressure with a tool to push the bead over the bead seat. Then unlock the opposite bead. Lubricate freely the areas previously in contact (tyre bead and rim seat).



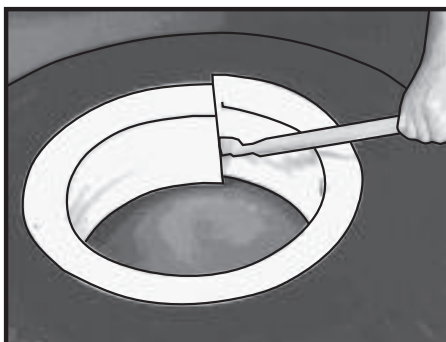
### **Demounting the first tyre bead**

To be carried out on the rim narrower seat using suitable tools. Place the wheel on an appropriate floor, wheel disc downwards. Engage 2 flat levers spaced at about 20 cm. on each side of the valve. Keeping in position one lever, use the other in small steps in order to ease the bead completely over the rim flange.



### **Demounting the second bead**

Turn the assembly over the floor (disc upwards) with the tyre bead positioned at the bottom of the rim well. Lift the wheel with the help of a lever, then complete the demounting of the second tyre bead with the use of a second lever.



Mounting/demounting procedure for “TRILEX® wheel system”

## **Annex B**

### **Trilex® rim demounting**

Completely deflate the tyre by removing valve core and using a draining valve.

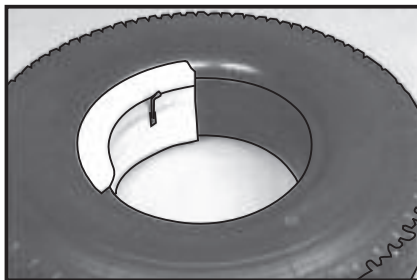
Before opening the rim, the tyre bead has to be made completely free, by pushing down from the rim.

Open the rim by using a suitable double-ended lever.

## Assembling of the Trilex® rim segments into tire

Lubricate tire beads and flap. This will ease assembling work and prevent sticking of tire. Clean rust pitted rims and coat with rust-resisting paint (zinc dust paint).

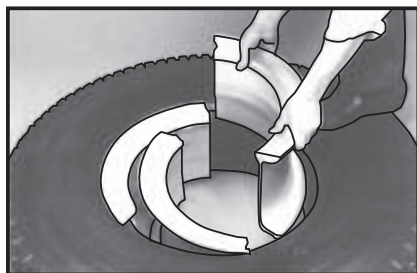
Remove burrs, if any, at segments ends by filing. Round off transition rim base/rim flange.



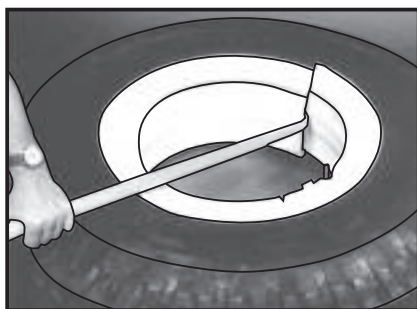
*Place tire on the ground, valve pointing upwards. Insert valve segment, right side first, as illustrated.*

*Seen from above, valve rests against left side of valve slot.*

*Rim base to rest all along against tyre bead. Retreated tires, having generally a large bead width, may have to be compressed until play between tire bead and rim flange is obtained on both sides.*



*Third segment is joined to valve segment.*



*Slide the segment, now in front of valve segment, along into locking position. Check position of valve! As seen from above, valve must rest against left side of the valve slot.*

*Close rim by using double lever steadily along rim mounting bevel (do not pull upwards). Once rim is locked, valve to be located in the center of the valve slot.*

## Appendix D

### Other sources of rim wheel safety and servicing information

#### OSHA Publications

Copies of the OSHA “Demounting & Mounting Procedures for Truck/Bus Tires” chart and the OSHA “Multi-Piece Rim Matching Chart” can be ordered through OSHA’s web site, [www.osha.gov](http://www.osha.gov), at [www.osha.gov/pls/publications/pubindex.list#posters1](http://www.osha.gov/pls/publications/pubindex.list#posters1) or [www.osha.gov/pls/publications/pubindex.list](http://www.osha.gov/pls/publications/pubindex.list).

These charts also are available on-line in PDF format on the Tire Industry Association’s (“TIA’s”) web site, [www.tireindustry.org](http://www.tireindustry.org) at: [www.tireindustry.org/pdf/osha\\_Demount-Mount.pdf](http://www.tireindustry.org/pdf/osha_Demount-Mount.pdf) and [www.tireindustry.org/pdf/osha\\_Rim%20Matching.pdf](http://www.tireindustry.org/pdf/osha_Rim%20Matching.pdf).

OSHA Publication No. 3086, “Servicing Single-Piece and Multi-Piece Rim Wheels” (revised 1998) is available on-line in PDF format on OSHA’s web site, [www.osha.gov](http://www.osha.gov), at: [www.osha.gov/Publications/osha3086.pdf](http://www.osha.gov/Publications/osha3086.pdf).

This information is available at no cost from the local OSHA office listed in the telephone directory. Ask for Rules and Regulations 1910.177 “Servicing Multi-Piece and Single Piece Rim Wheels” or contact the U.S. Department of Labor, Publications Distributions Office, Room N1401, Washington, D.C. 20210 (202-523-9667).

#### MSHA Publications

The U.S. Department of Labor Mine Safety and Health Administration (“MSHA”) instruction entitled “Tire and Rim Safety Awareness Program” (MSHA IG 60, revised 1996) is available on-line in PDF format on MSHA’s web site, [www.msha.gov](http://www.msha.gov), at: [www.msha.gov/S&HINFO/IG60.PDF](http://www.msha.gov/S&HINFO/IG60.PDF).

The MSHA’s Accident Prevention Program Safety Ideas document entitled “Rim Wheel Assembly Hazards” is available on-line in PDF format from MSHA’s web site, [www.msha.gov](http://www.msha.gov), at: <http://www.msha.gov/accident%5Fprevention/ideas/rimwheel.pdf>.

#### RMA Publications

The Rubber Manufacturers Association (“RMA”) publishes a considerable amount of safety and instructional information concerning tire and wheel servicing.

Copies of RMA publications such as the “Demounting and Mounting Procedures for Agricultural Tires - Wall Chart” (FTMP-8/90); “Demounting and Mounting Procedures for Truck/Bus Tires - Wall Chart” (TTMP-7/95); “Multipiece Rim Matching Chart” (RMC-7/93); “Care and Service of Off-The-Highway Tires - Manual” (OHM-882); “Tire Installer Safety Kit” (KTISI-01/05); “Care and Service for Truck and Light Truck Tires Kit” (KTLT-0105); and “Care and Service of Farm Tires - Manual and Kit” (FTK-10/90) can be purchased at low cost from RMA through RMA’s web site, [www.rma.org](http://www.rma.org) at: [www.rma.org/publications/tire\\_service\\_professionals](http://www.rma.org/publications/tire_service_professionals).

#### SAE Publications

SAE International publishes standards addressing safety and instructional information concerning tire and wheel servicing. Copies of SAE Standards such as a “Off-Road Rim Maintenance Procedures and Service Precautions” (Standard J1337, May 1997) can be purchased from SAE through SAE’s website, [www.sae.org](http://www.sae.org).