SECTION 2E

TIRES AND WHEELS

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DESCRIPTION AND OPERATION

GENERAL

Tire And Wheel Balancing

There are two types of the tire and wheel balancing: static and dynamic.

Static balance is the equal distribution of weight around the wheel. Assemblies that are statically unbalanced cause a bouncing action called wheel tramp. This condition may eventually cause uneven tire wear.

Dynamic balance is the equal distribution of weight on each side of the centerline so that when the assembly spins there is no tendency for it to move from side to side. Assemblies that are dynamically unbalanced may cause wheel shimmy.

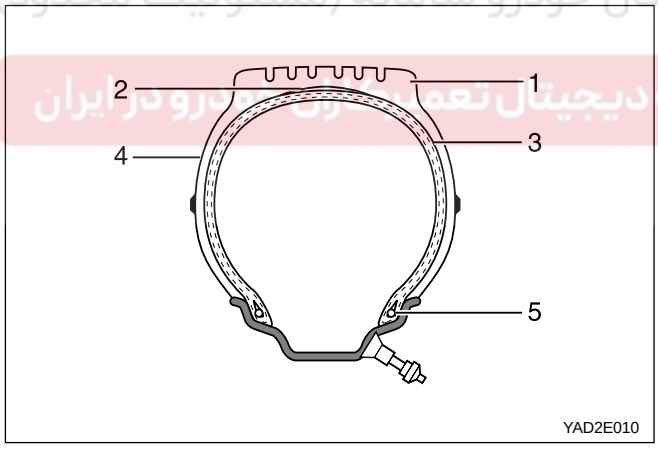
General Balance Precautions

Remove all deposits of foreign material from the inside of the wheel.

Caution: Remove stones from the tread in order to avoid operator injury during spin balancing.

Inspect the tire for any damage. Balance the tire according to the equipment manufacturer's recommendations.

Structure of Tubeless Tube



The tire structure is different slightly according to the types of the tire but a various type of the tire has the common structure as following;

1. Tread

   A part (that contacts) road surfaces directly is fixed on the outsude of carcass and breaker.

   It is a strong rubber coat made of high anti-abrasion rubber. Its running performance depends on is surface profile.

2. Breaker

   A cord belt between tread and carcass prevents damages of inner code due to outer shock and vibration.

3. Carcass

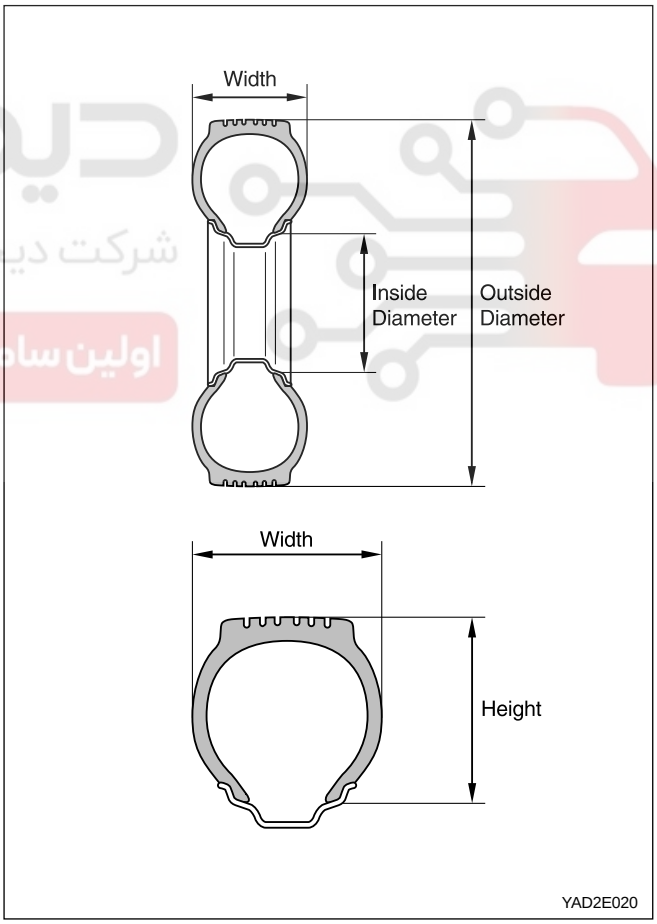
   This major part made by pilling code papers of strong synthetic fiber forms a structure of tire. Since it maintains tire pressure and endures applied load and shock to tire, it should have a high anti-fatigue characteristic.

4. Side Wall

   It is provided to improve the comfortable driving by protecting carcass and cushion movement.

5. Bead

   A steel wire winding the ending part of carcass code, coated with rubber film and wrapped with nylon cord papers. It fixes tire to a rim.



Convention for Radial Tire

P 225 / 75 R - 15 102 T

- T — Max Speed : 190 km/h
- 102 — Load Index : 850 kg
- 15 — Rim Diameter : 15 inch.
- R — Radial Tire
- 75 — Aspect Ratio = (Section Height ÷ Section Width) x 100 : 75 %
- 225 — Section Width : 225 mm
- P — Passenger Car

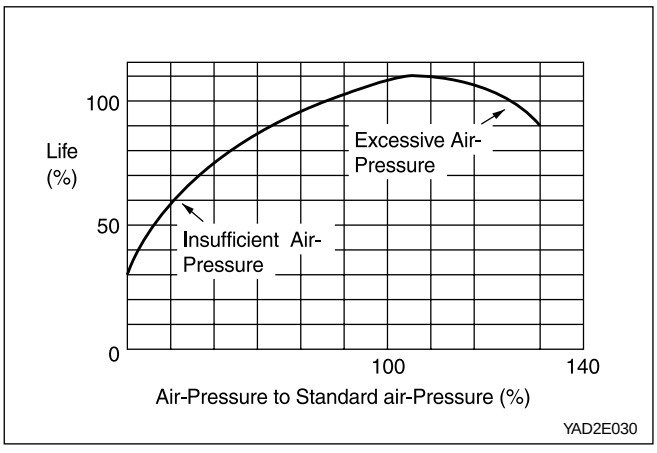
Max Speed Symbol

Symbol	Limit Speed (km/h)
F	80
M	130
N	140
P	150
Q	160
R	170
S	180
T	190
U	200
H	210
V	240
Z	Above 240

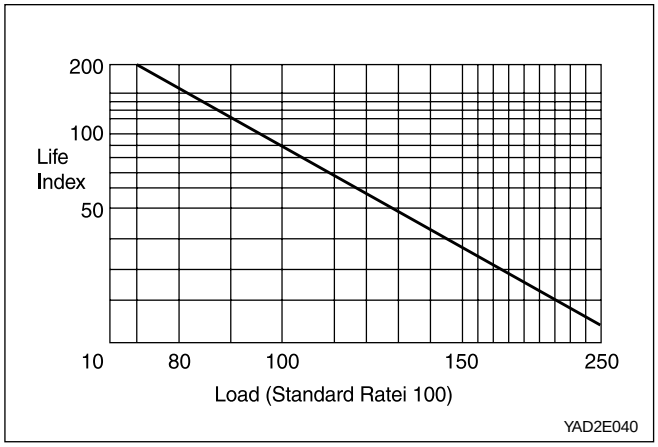
Load Index

Symbol	Limit Speed (km/h)
94	670
95	690
96	710
97	730
98	750
99	775
100	800
101	825
102	850
103	875
104	900
105	925

The Relation Between Inflation Pressure and Tire

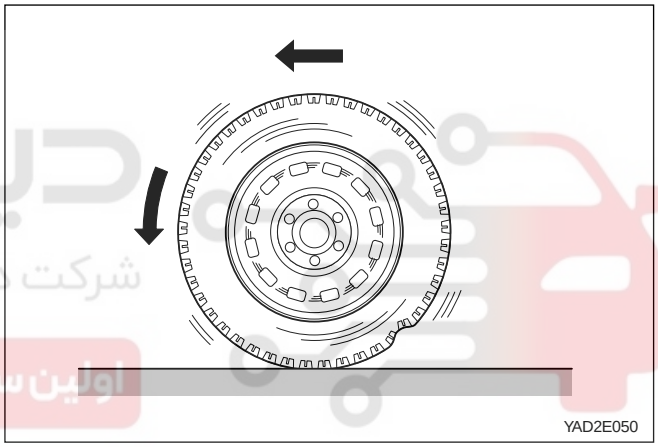


The Relation Between Load and Tire



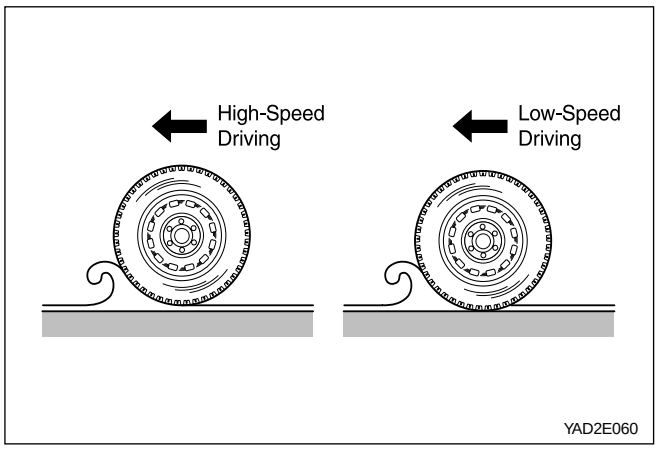
TIRE'S ABNORMAL ACTION

Standing Wave



During running the rotating tire repeats deformation and restoring movement generated in tread. But when the wheel rotating speed reaches high, the next deformation applied to tire before restoring last deformation so the trembling wave appears in the tread portion. The lower the tire pressure the severe the trembling wave appears during the high speed.

Hydroplaning



The condition of driving a vehicle fast on the road surface covered with water can cause tires to fail to rotate with a good contact on the surface, so results in remaining them a float. This is so-called hydroplaning. It causes brake failure, lower tractive force and losing the steering performance so it is very vulnerable condition.

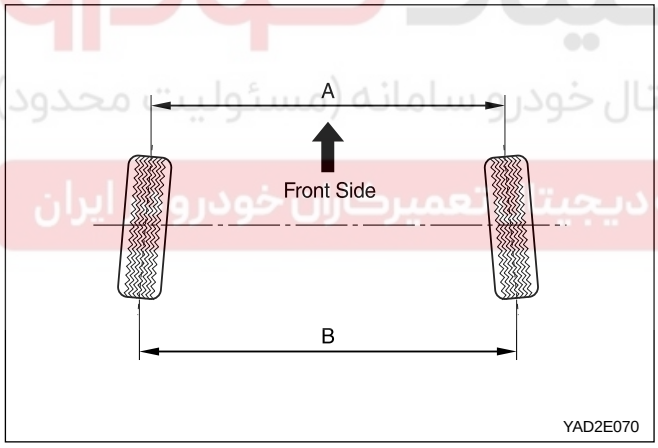
WHEEL ALIGNMENT

The first responsibility of engineering is to design safe steering and suspension systems. Each component must be strong enough to with stand and absorb extreme punishment. Both the steering system and the front and the rear suspension must function geometrically with the body mass.

The steering and suspension systems require that the front wheels self-return and that the tire rolling effort and the road friction be held to a negligible force in order to allow the customer to direct the vehicle with the least effort and the most comfort.

A complete wheel alignment check should include measurements of the rear toe and camber.

Toe-in



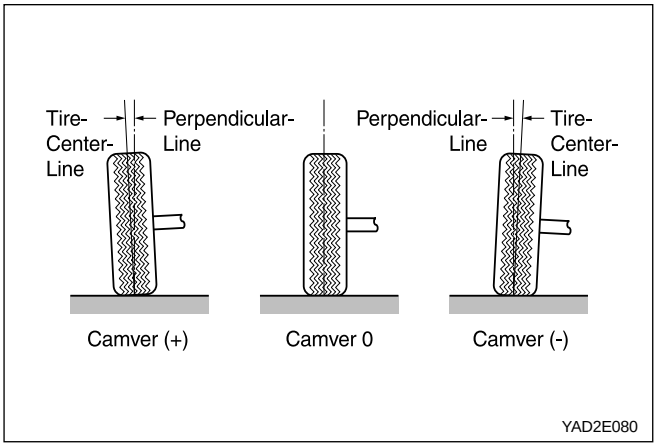
Toe-in is the turning in of the tires, while toe-out is the turning out of the tires from the geometric centerline or thrust line. The toe ensures parallel rolling of the wheels.

The toe serves to offset the small deflections of the wheel support system which occur when the vehicle is rolling forward.

The specified toe angle is the setting which achieves-degrees “0¡Æ” of toe when the vehicle is moving.

Incorrect toe-in or toe-out will cause tire wear and reduced fuel economy. As the individual steering and suspension components wear from vehicle mileage, additional toe will be needed to compensate for the wear. Always correct the toe dimension last.

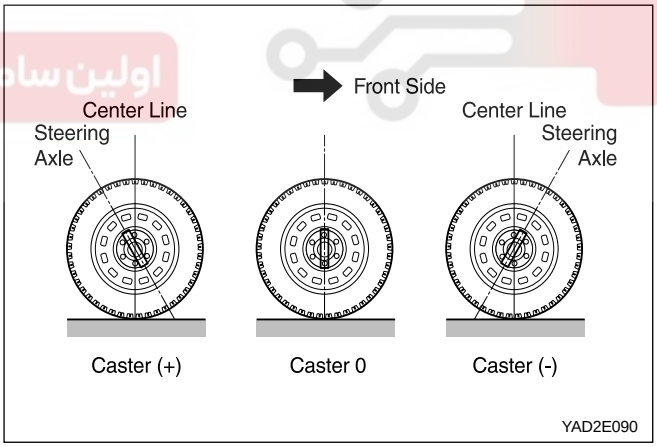
Camber



Camber is the tilting of the top of the tire from the vertical when viewed from the front of the vehicle. When the tires tilt outward, the camber is positive. When the tires tilt inward, the camber is negative. The camber angle is measured in degrees from the vertical. Camber influnces both directional control and tire wear.

If the vehicle has too much positive camber, the outside shoulder of the tire will wear. If the vehicle has too much negative camber, the inside shoulder of the tire will wear. Camber is measured in degrees and is not adjustable.

Caster



Caster is the tilting of the uppermost point of the steering axis either forward or backward from the vertical when viewed from the side of the vehicle. A backward tilt is positive and a forward tilt negative. Caster influences directional control of the steering but does not affect tire wear.

Weak springs or overloading a vehicle will affect caster. One wheel with more positive caster will pull toward the center of the car. This condition will cause the car to move or lean toward the side with the least amount of positive caster. Caster is measures in degrees and is not adjustable.

SPECIFICATIONS

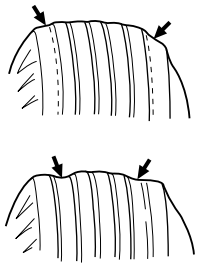
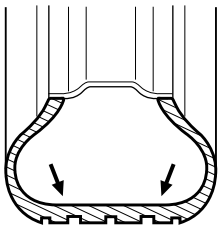
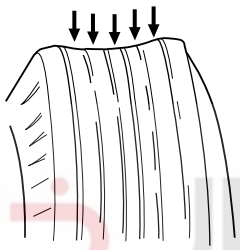
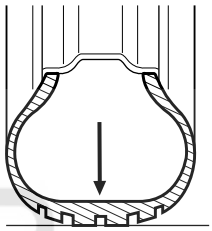
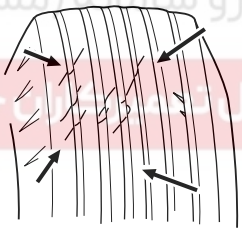
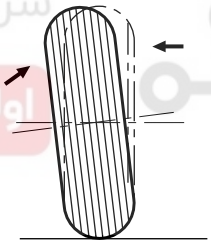
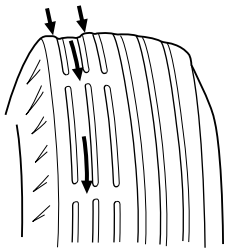
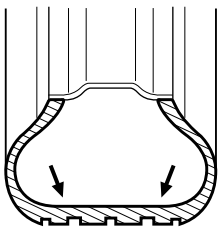
Wheel	Size	Aluminum Type	7JJ x 16
		Steel Type	6.5JJ x 16
	Wheel Nut Tightening Torque	Aluminum Wheel	8 - 12 kgf.m
		Steel Wheel	11 - 13 kgf.m
Tire	Type	Radial Tire	Radial Tire
	Inflation Pressure (psi)	P225/75R15	30 psi
		P235/70R16	30 psi
		P255/65R16	30 psi
Wheel Alignment	Toe-in	2 ± 2 mm	
	Camber	0° ± 30’ (Below 30' the difference between right and left)	
	Caster	2° 45 ± 30’ (Below 30' the difference between right and left)	

DIAGNOSTIC INFORMATION AND PROCEDURES

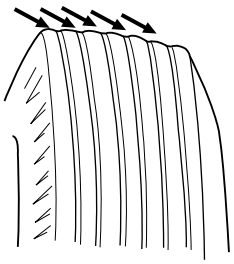
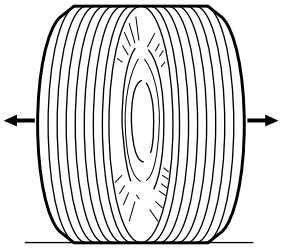
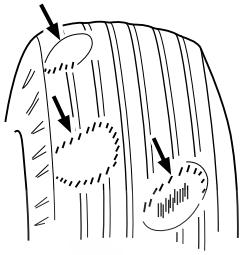
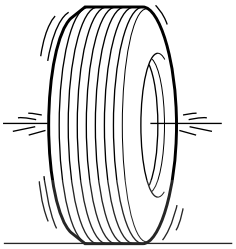
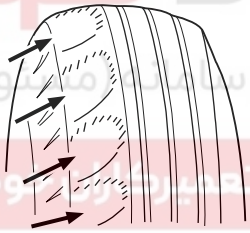
Condition	Cause	Action
Irregular tires wear	Improper tire inflation pressure	Adjust
	Poor wheel balance	Adjust
	Improper tire rotation	Rotation tires on the maintenance schedule
	Poor toe-in	Adjust
	Poor adjusting the pre-load of the wheel bearing	Adjust
	Poor braking performance	Adjust
Driving noise, Vibration	Low tire inflation pressure	Adjust
	Poor balance of wheels, tires	Adjust
	Severe vibration due to wheels, tires	Adjust or replacement
	Irregular tires wear	Check and adjust
Rapid wear	Excessive tire inflation pressure	Adjust
	High speed driving with low tire pressure	Adjust
	Excessive vehicle weight	Proper weight

GENERAL INSPECTION

INSPECTION THE APPEARANCE

Condition	Cause	Action
Rapid wear at shoulders  YAD2E100	Under inflation or lack of rotation  YAD2E110	Adjust inflation pressure
Rapid wear at center  YAD2E120	Over inflation or rotation  YAD2E130	
Tread damage  YAD2E140	Low the inflation pressure  YAD2E150	
Uneven wear  YAD2E160	Incorrect camber Incorrect toe-in  YAD2E110	Adjust camber

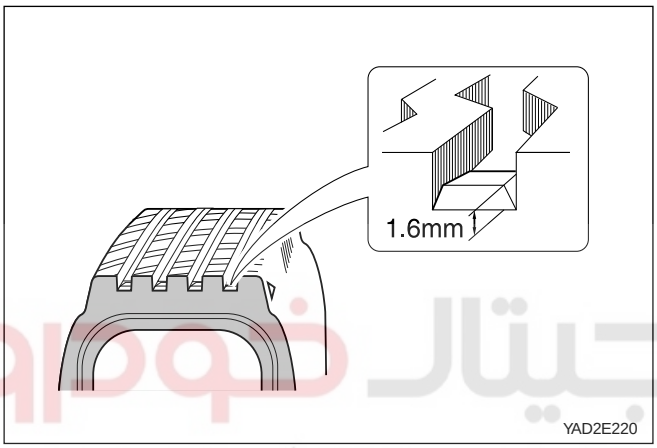
Inspection The Appearance (Cont'd)

Condition	Cause	Action
Feathered edge  YAD2E170	Incorrect toe-in  YAD2E180	Adjust toe-in
Bold spot  YAD2E190	Unbalanced wheel  YAD2E200	Adjust wheel balance
Sharply wear at the tread outside  YAD2E210	Unbalanced wheel	Adjust
	Wheel bearing play	Check play Check pre-load
	Ball joint play	Check
	Faulty shock absorber	Check

GENERAL INSPECTION

Inspection Tread

Inspect the tread condition on the tire surface and various damages resulting from the foreign material, crack, stone or nail etc. If there is any damage in the tire, repair or replace it.

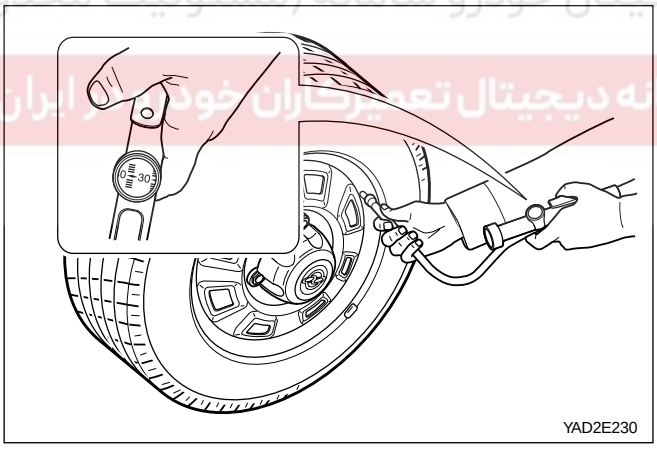


Tire Wear

- Measure the depth of the tire tread. If the depth of the tread is below the specified value, replace the tire.

Limit of the Tread Wear	1.6 mm (0.06 in.)

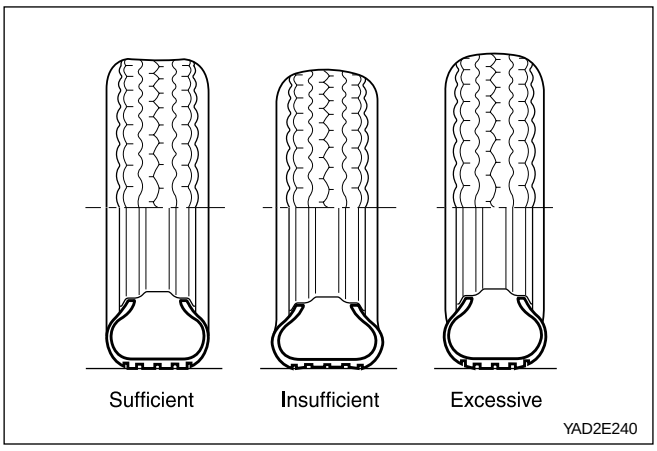
- You can see the mark '▲' in the groove, this is the indicator of the tread wear limit.
- The limit of the tread wear for all season tires are 1.6 mm as same as the general tires and the platform mark indicates as '↓' .



Inspection the Inflation of Tires

1. Inflation pressure

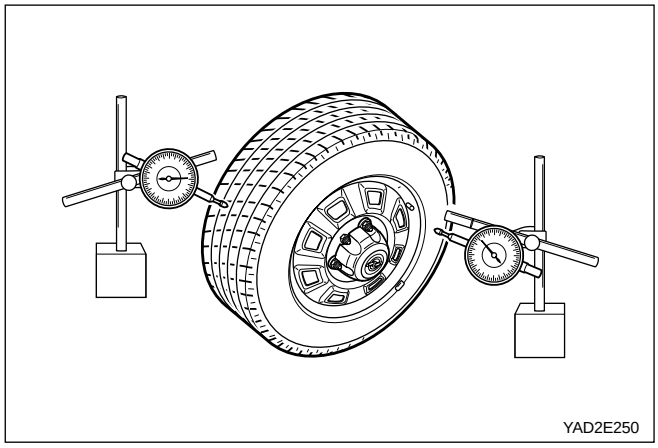
Front/Rear	2.1 kg/cm² (30 psi)



2. Inspect the pressure of the tire surface and check the inflation pressure.

Notice:

- Lower than recommended pressure can cause tire squeal on turns, hard steering, tire cord breakage and tire rim bruises, etc.
- Higher than recommended pressure can cause hard ride, tire bruising or damage and rapid tread wear at the center of the tire.


YAD2E250

Inspection Wheel Runout

- Measure wheel runout with an accurate dial indicator. Measurement may be taken with the wheels either on or off the vehicle, using an accurate mounting surface such as a wheel balancer. Measurements may be taken with or without the tire mounted on the wheel.

1. Measure the dial runout and lateral runout on both the inboard and outboard rim flanges.

   Specification

   Steel Wheel

   - Radial runout : 0.8 mm (0.03 inch)
   - Lateral runout : 1.0 mm (0.04 inch)

   Alloy Wheels

   - Radial runout : 0.8 mm (0.03 inch)
   - Lateral runout : 1.0 mm (0.04 inch)

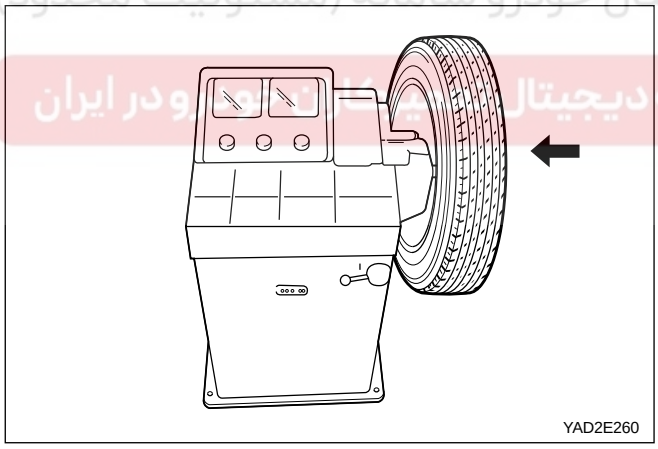
2. Measure free radial runout on the tire tread.

   Specification

   Steel and Alloy Wheels

   - Free radial runout : 1.5 mm (0.06 inch)
   - Free lateral runout : 1.5 mm (0.06 inch)

   Notice: If any measurement exceeds the above specifications, replace the applicable tires or wheels.

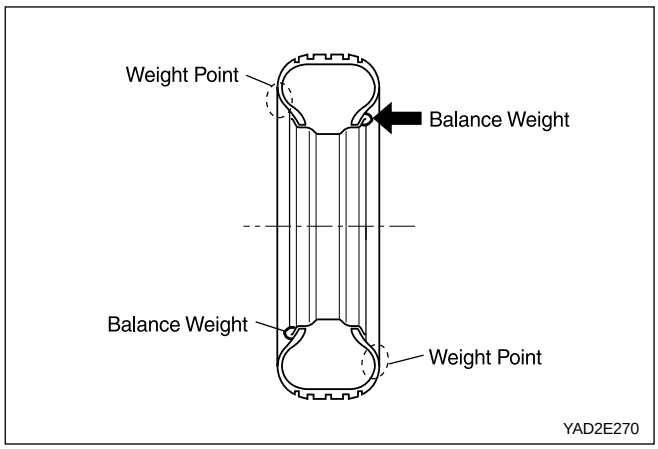

YAD2E260

Wheel Balance

Balance is the easiest procedure to perform and should be done first if the vibration occurs at high speeds or if the tires or the wheels are replaced.

When proceeding the wheel balancing procedure refer to the following;

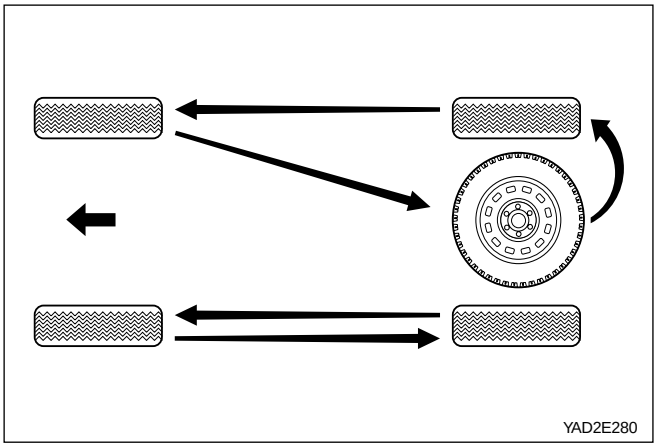
1. Do not the wheel weight over two at the inboard and the outboard flanges.
2. The total weight ofthe wheel weight should not exceed the 100 g (3.5 ounces)
3. Balancing the assemblies with the factory aluminum wheels requires the use of the special nylon-coated, clip-on wheel weights.



YAD2E270

Balance Weight

10 g	20 g	30 g	40 g	50 g	60 g
0.4 oz	0.7 oz	1.10 oz	1.40 oz	1.80 oz	2.10 oz



Rotation Tires

- Front and rear tires perform different jobs and can wear differently depending on the tires of road driven, driving condition, etc.

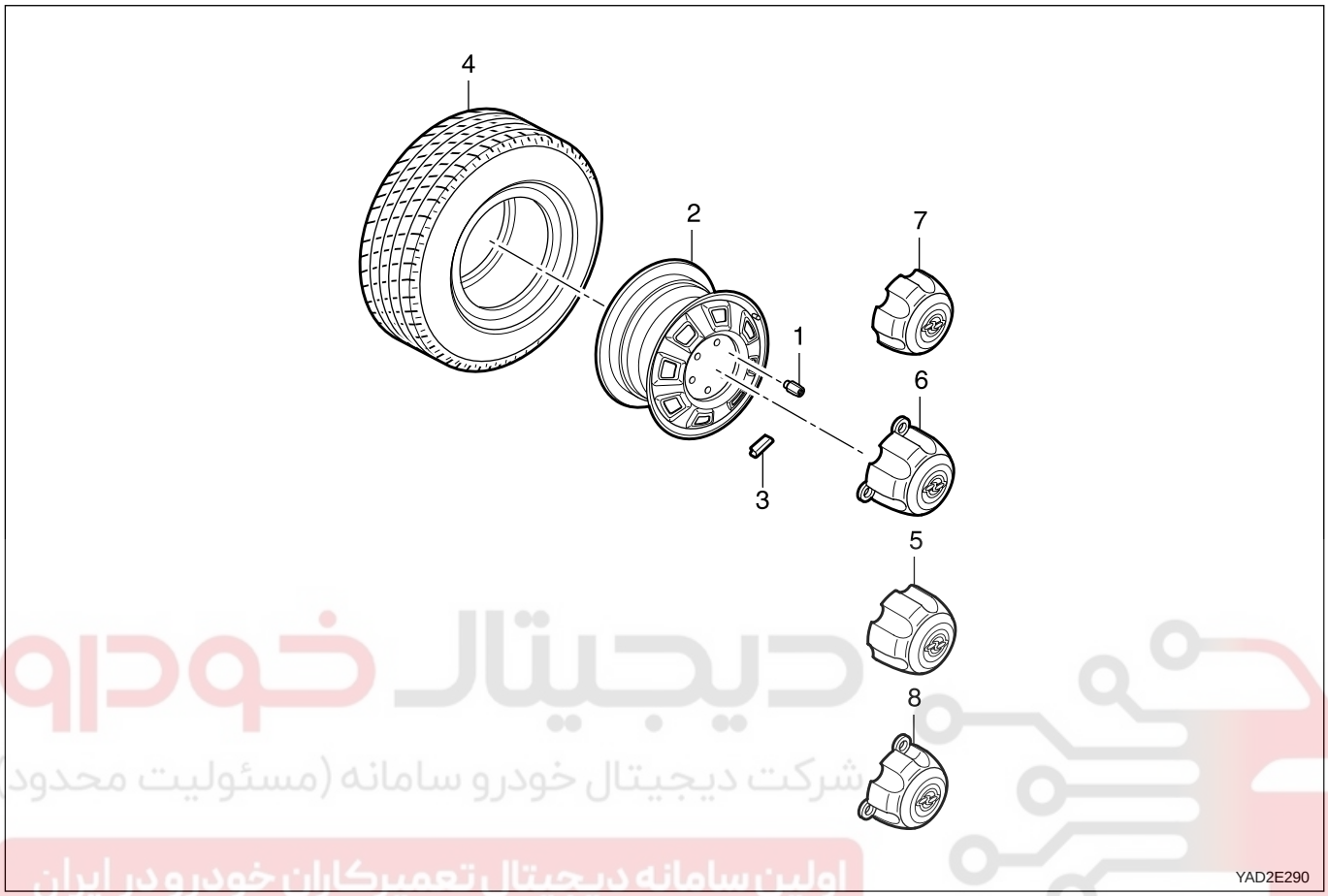
  The front tires will wear faster than the rear ones. To avoid uneven wear of tires and to prolong tire life, inspect and rotate the tires every 5,000 km (3,100 miles). After rotating the tires, adjust the tire inflation pressures and be sure to check wheel nuts tightness.

Caution at replacement tires

- Do not mix different types of tires on the same vehicle such as radial, bias and bias-belted tires except in emergencies, because vehicle handling may be seriously affected and may result in loss of control.

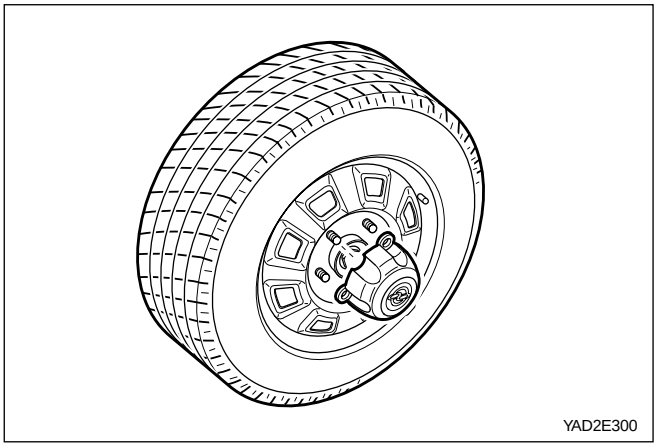
COMPONENT LOCATOR

TIRE AND WHEEL ASSEMBLY



1 Wheel Nut
2 Wheel
3 Balance Weight
4 Tire
5 Wheel Cap
6 Wheel Cap
7 Wheel Cap
8 Wheel Cap

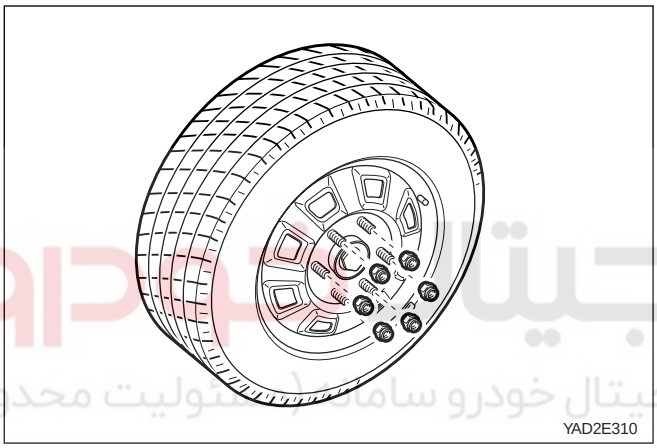
REPAIR INSTRUCTIONS


YAD2E300

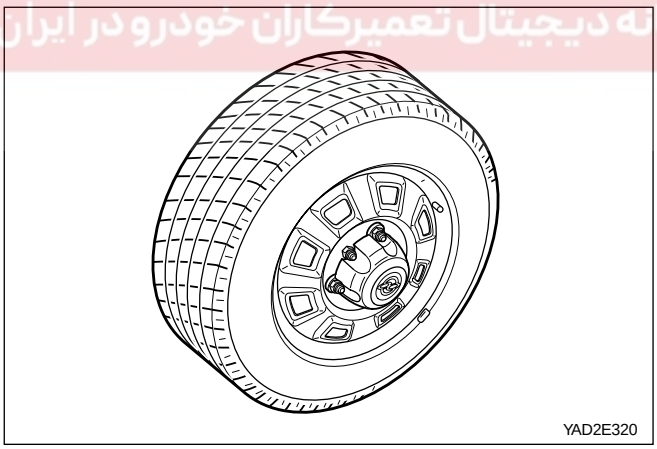
ON-VEHICLE SERVICE

GENERAL TIRE

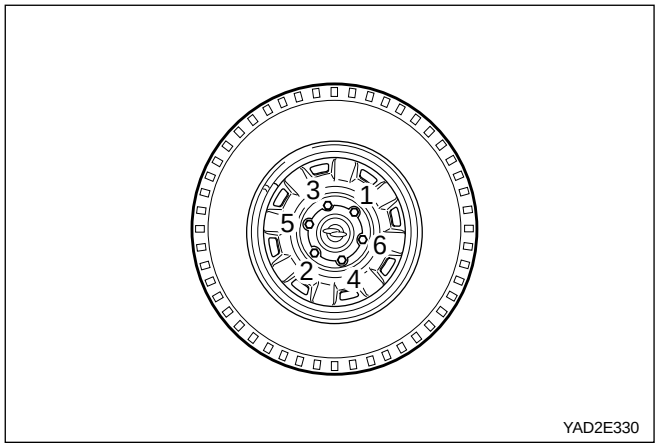
1. Remove the wheel cap.


YAD2E310

2. Loosen the wheel nuts and then raise and suitably support the vehicle.
3. Remove the wheel nuts.


YAD2E320

4. Installation should follow the removal procedure in the reverse order.

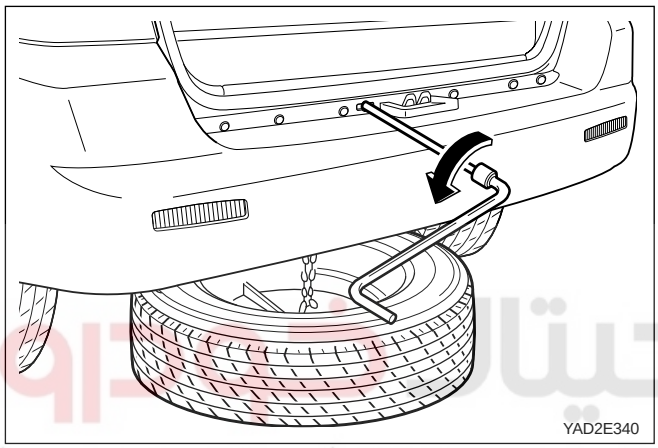


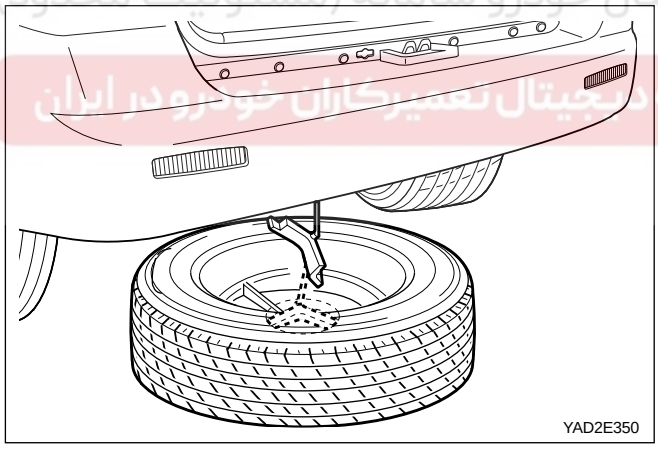
YAD2E330

General Instruction

- Clean the contact surface between the wheel and the hub.
- Do not apply oil or grease to the nuts and bolts (cause the wheel to work loose).
- Raise the tires 3 cm off the ground using the jacket.
- Tighten the wheel nuts diagonally as shown.

Tightening Torque	Steel Wheel: 80 - 120 N•m
	Alloy Wheel: 120 - 130 N•m


YAD2E340


YAD2E350

SPARE TIRE

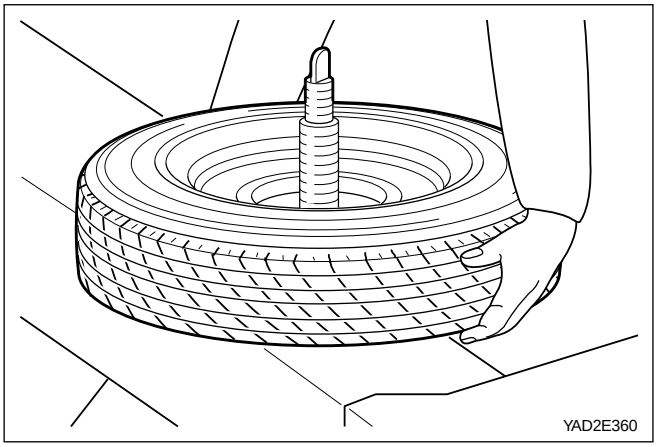
Removal Procedure

1. Prepare the spare tire handle and the wheel nut wrench.
2. Install the handle through the hole at the rear side of the vehicle.
3. Install the wheel nut wrench at the end of the handle.
4. Turn the wheel nut wrench counterclockwise until the spare tire takes down the ground.
5. Pull out the lift plate as shown.
6. Install the lift plate in the center of the wheel for installation.
7. Turn the handle clockwise until listen the sound “click”.
8. Remove the handle and the wheel nut wrench.

Notice:

- Keep the spare tire available always.
- When reinstall the spare tire, install the tire tightly.
- If the spare tire may move after installation, reinstall the tire or contact to the approved service shop for repair.
- For installing the spare tire on the vehicle, follow the installation direction. If you may install the tire in reverse direction, it is not possible to install it correctly.

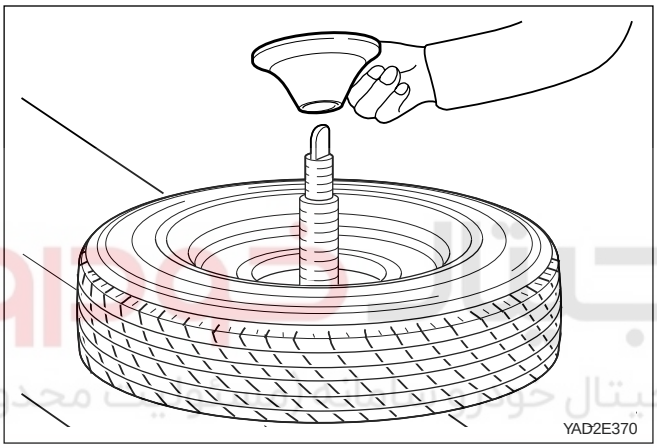
MAINTENANCE AND REPLACEMENT



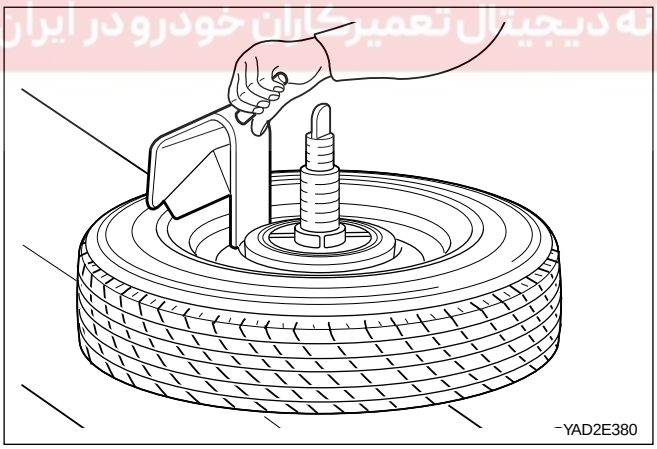
SEPARATION

1. Fix the tire into the equipment and pull out the valve core from the tire. Discharge the air inside the tire completely.

   Notice: The assembly and disassembly of the tire is dangerous working job. So, only the skillful worker must work this job following the approved procedures.

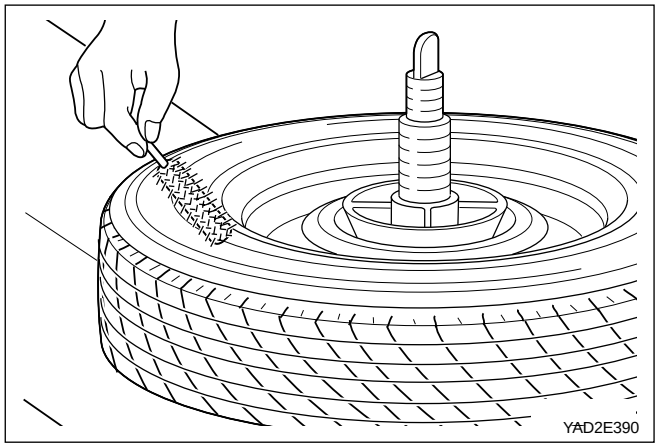


2. Tighten the locker in the center of the equipment to assemble the rim to the equipment.
3. Remove the balance weight on the rim.

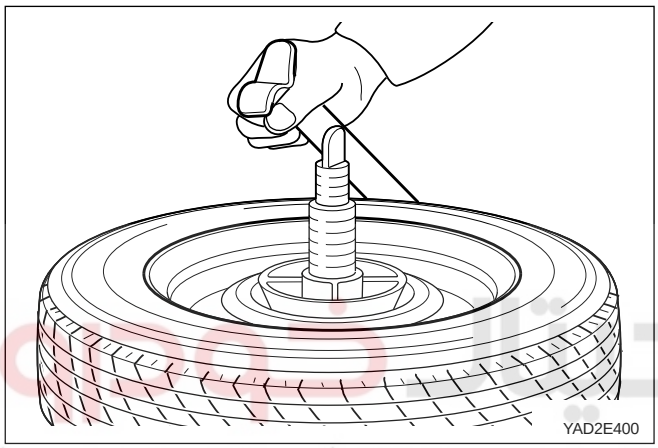


4. Separate the tire's bead from the rim flange using the approved lubricant.

   Notice: Do not use silicone, synthetic detergent and gasoline, etc.

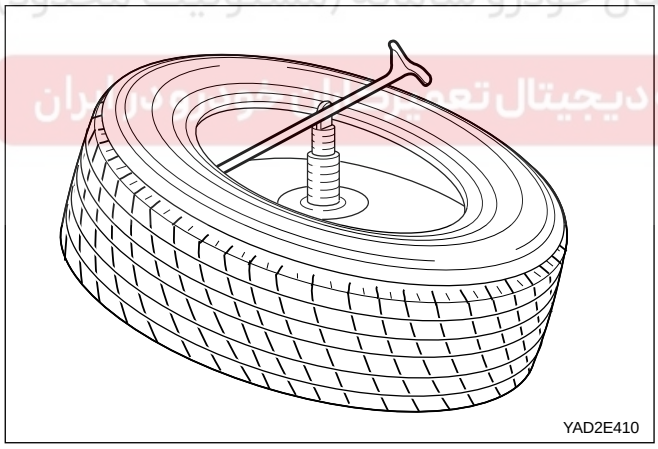

YAD2E390

5. Apply the lubricant between the rim and the bead.


YAD2E400

6. Insert the removal lever between the tire's bead and the rim and separate the rim from the tire.

   Notice: Do not use the tool that may cause any damage such as pipe, damaged bar.


YAD2E410

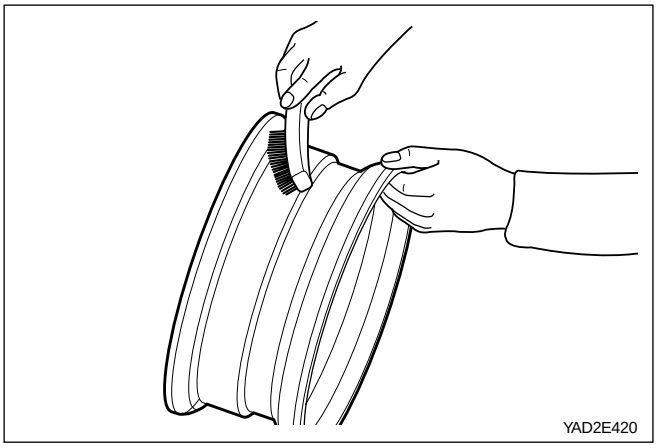
7. Pull out the opposite bead upward using the lever and then separate the bead from the rim.

MAINTENANCE

1. Check any damage the rim and replace as needed.

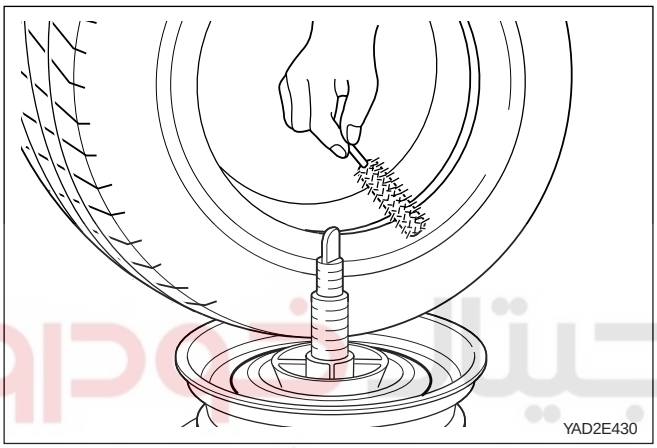
   Notice:

   - Do not repair the rim as welding or soldering.
   - Replace the new valve as replaces new tire.

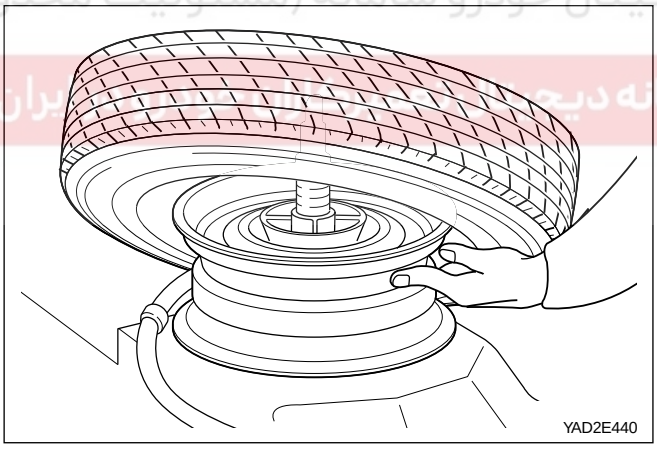

YAD2E420

INSTALLATION

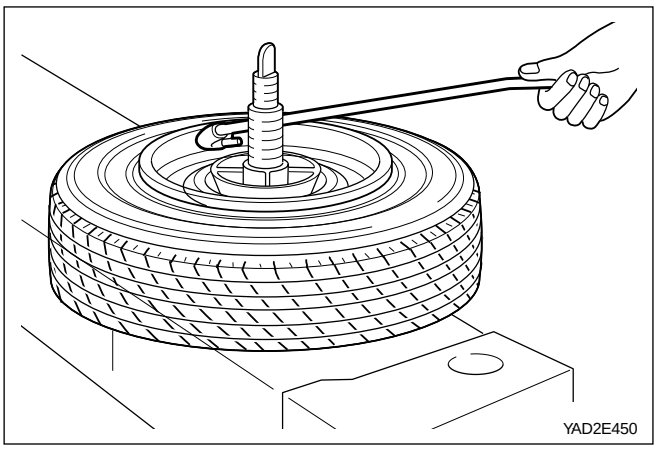
1. Clean the rust, damaged rubber and dust, etc on the rim's surface with the brush.


YAD2E430

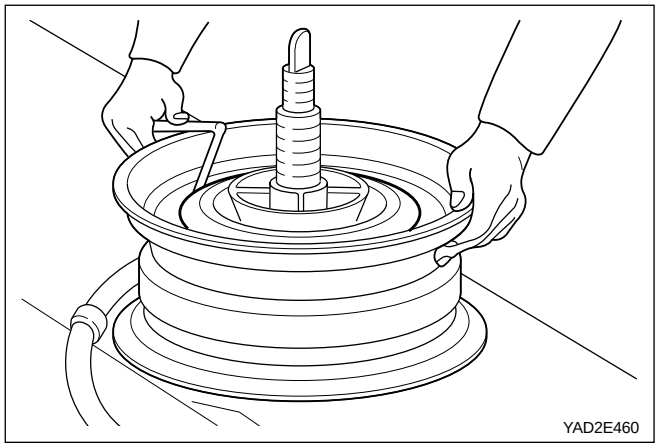
2. Install the rim to the equipment with the valve upward.
3. Tighten the locker in the center of the equipment to assemble the rim to the equipment.


YAD2E440

4. Apply the lubricant at the both bead portions and both rim's flange of the tire.


YAD2E450

5. Check any foreign material or liquid for the tire inside and then install to push down the tire.



6. Set the tire pressure to the specifications.

   Notice: Do not remove the tire from the equipment before setting the tire pressure.

Specification of the tire pressure	2.1 kg•cm^2 (30 psi)