

SECTION 4F

WHEEL AND TIRE

| | |
|----------------------------------|-----------------|
| GENERAL DESCRIPTION | 4F — 243 |
| Tire | 4F — 244 |
| Inspection | 4F — 249 |
| TROUBLESHOOTING | 4F — 250 |
| ON-CAR SERVICE | 4F — 253 |

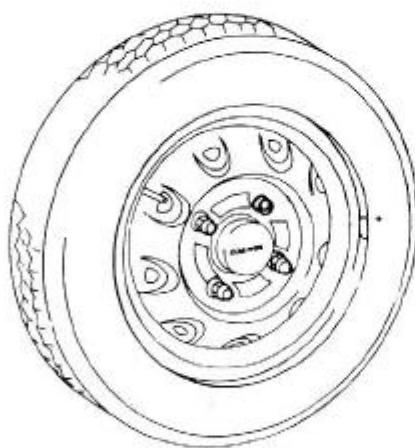
GENERAL DESCRIPTION

FIG. 4F — 1 WHEEL AND TIRE

Size and Specified Air Pressure

| Size | Air pressure | |
|------------------------|--------------------|-----|
| | kg/cm ² | PSI |
| 135 SR 12 | 1.8 | 26 |
| 155/70 SR 12(Optional) | 1.9 | 27 |

TIRE

Structure and Function

- ① Tread
- ② Breaker
- ③ Carcass
- ④ Side wall
- ⑤ Rubbing strake
- ⑥ Tube
- ⑦ Bead
- ⑧ Bead wire
- ⑨ Tube valve

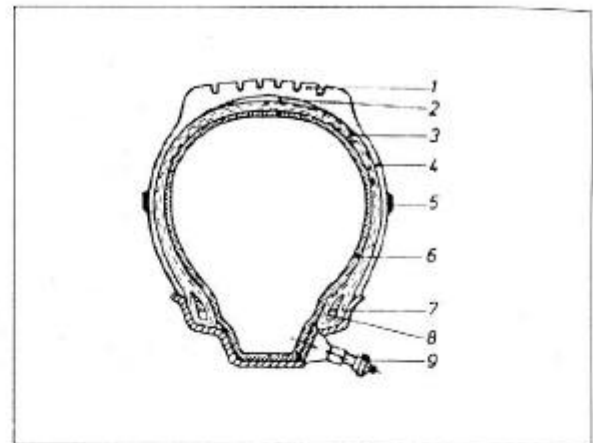
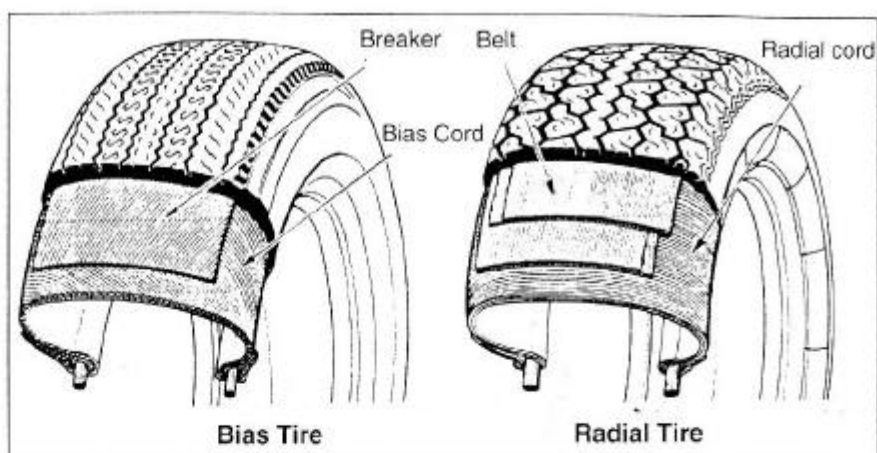


FIG. 4F — 2 STRUCTURE OF TIRE

- Tread : A part(that contacts) road surfaces directly is fixed on the outside of carcass and breaker. It is a strong rubber coat made of high antiabrasion rubber. Its running performance depends on its surface profile.
- Breaker : A codebelt between tread and carcass prevents damages of inner code due to outer shock and vibration.
- Carcass : This major part made by piling 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.
- 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.
- Tube : Tires used in current vehicle are mostly tubeless tires.
- Side wall : It is provide to improve the comfortable driving by protecting carcass and cushion movement.

Type and Nomenclature

(Type of Tire)

FIG. 4F — 3
TYPE OF TIRE

(Nomenclature)

(Example) • 6.40 — 13

• 155 SR 13

• 185/70 SR 13

• 175/70 R 13 82 S

| | |
|------|---|
| 6.40 | Width (6.40 inch) |
| — | Bias tire (up to 150 km/h) |
| 13 | Rim diameter (=tire I.D.) (13 inch) |
| 155 | Width (155mm) |
| SR | Speed Radial |
| 13 | Rim diameter (=tire I.D.) (13 inch) |
| 185 | Width (185 mm) |
| /70 | Height/Width = 70% |
| SR | Speed Radial |
| 13 | Rim diameter (=tire I.D.) (13 inch) |
| 175 | Width (175 mm) |
| /70 | Height/Width = 70% (* Flatness ratio 70%) |
| R | Radial |
| 13 | Rim diameter (=tire I.D.) (13 inch) |
| 82 | Max. load index |
| S | Max. speed symbol (up to 210 km/h) |

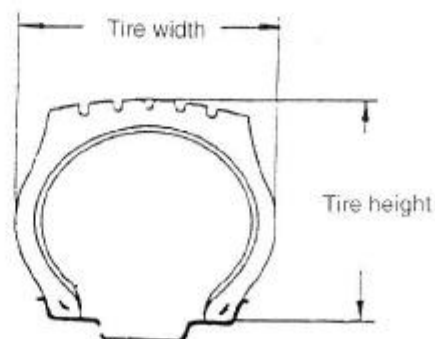
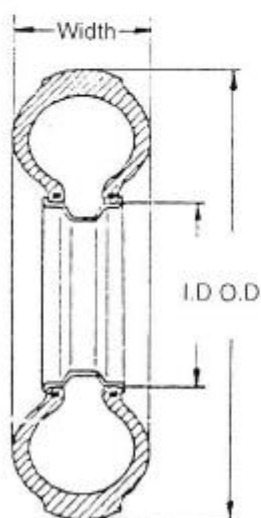


FIG. 4F — 4 TYPE NOMENCLATURE

Associated Phenomena and Reasons of Tire

Hydroplaning, aquaplane

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 afloat. This is so-called hydroplaning. It causes brake failure, lower tractive force, and losing the steering performance so it is very vulnerable condition.

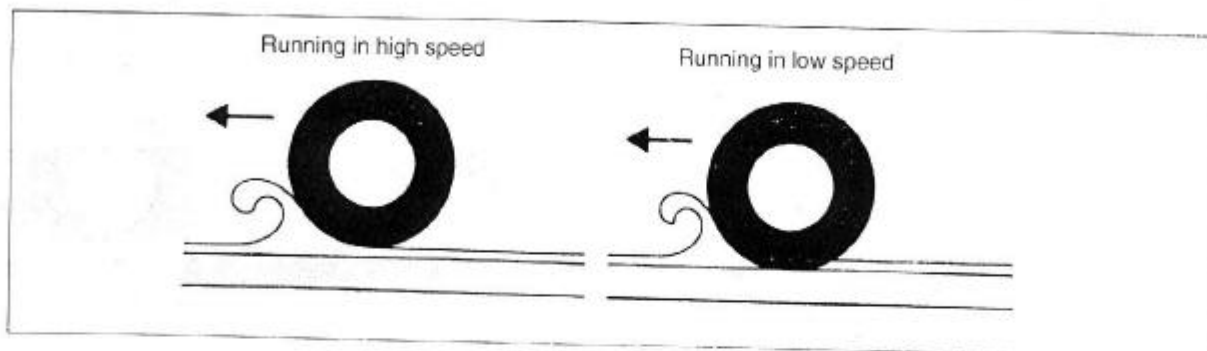


FIG. 4F — 5 HYDROPLANING

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.

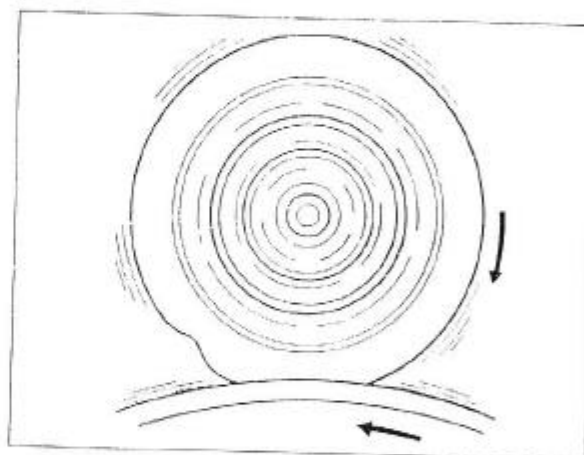





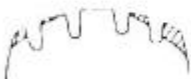
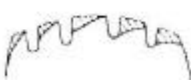


FIG. 4F — 6 STANDING WAVE

Major Cause of Tire Life Time

1. Driver's style and habit
2. Road condition
3. Air pressure
4. Load
5. Front wheel alignment
6. Wheel balancing
7. Driving speed
8. Suspension unit and damping strut

Major Cause Of Deflective Wear

| Configuration | Wear Condition | Inspection Point |
|---|--|---|
|  | Irregular wear Shoulder area is gradually transformed into polygon | <ol style="list-style-type: none"> 1. Vibration level check for tire and wheel 2. Deformation check for hub and knuckle 3. Lube condition check for bearing and ball joints 4. Unbalance of related parts |
|  | Excessive wear, one side only | <ol style="list-style-type: none"> 1. Unbalance of related parts 2. Vibration level check of tire and wheel 3. Deformation check of hub and knuckle (vibration, bent) |
|  | Excessive wear, one point only | <ol style="list-style-type: none"> 1. Sudden stop and start |
|  | Excessive wear of shoulder area (Excessive wear mostly result in outer shoulder wear) | <ol style="list-style-type: none"> 1. Incorrect adjustment of camber and toe-in 2. Excessive wear by over revolution |
|  | Excessive wear of adverse part of shoulder | <ol style="list-style-type: none"> 1. Vibration level check of tire and wheel 2. Check hub bearing and ball joints for lubrication and working condition |
|  | Shoulder wear | <ol style="list-style-type: none"> 1. Low air pressure condition |
|  | Comb shaped wear of tread | <ol style="list-style-type: none"> 1. Condition due to high speed revolution 2. Toe-in and camber faulty |

Tire Replacement

When replacement is required, the specified size tire should be used and recommended pressure should be supplied. Replacement tires should be of the same size, load range and construction as those originally equipped on the car. Use of any other tire of different size or type may badly affected ride, handling, speedometer calibration, car ground clearance and body or chassis.

CAUTION

Do not mix different types of tires on the same car, except in emergencies. Because handling may be seriously affected and may result in loss of control.

It is recommended that new tires be installed in pairs on the same axle. If it is necessary to replace only one tire, it should be paired with the tire having the most tread to reduce the variation of braking force.

Wheel Replacement

Wheels must be replaced when they are bent, damaged, and have excessive lateral or radial vibration, or when appeared exposure of welding point, enlargement of bolt holes, and corrosion.

Replacement wheel should be same as original part with load, diameter, rim width, offset and installing style. Use of any other wheel of different size or type may affected wheel or bearing life time, brake cooling, speedometer indication and car ground clearance.

| | | |
|----------------|--------------|-------|
| Wheel size(mm) | Offset | 45 |
| | Pitch circle | 114.3 |

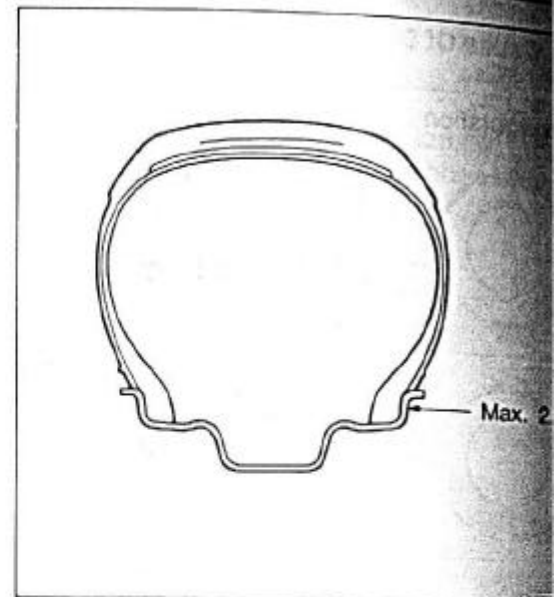


FIG. 4F — 7 WHEEL STRAIN

- * **Maximum vibration of indicator**
Vibration by welding point and paint is ignore

INSPECTION

Air Pressure Check

During running, the tire air pressure tends to increase. Check tire air pressure when temperature is low.

Tire Rotation

To equalize wear, rotate tires periodically.

Higher than Recommended Pressure Can Cause;

1. Hard riding condition
2. Carcass damage
3. Rapid wear of tire center tread

Lower Than Recommended Pressure Can Cause;

1. Abnormal abrasion when it turns.
2. Heavy steering control
3. Uneven wear of tread end
4. Scar or damage of tire rim
5. Increase of tire temperature
6. Break of tire cord
7. Unstable handling
8. High fuel consumption

Unequal Pressure on Same Axle Can Cause;

1. Reduced braking performance
2. Handle trembling
3. Unstable steering
4. Swerve on acceleration

Tire Size and Pressure

| | |
|--------------------------------|-----------------------|
| Size | 135 SR 12 (155/10R12) |
| Pressure (kg/cm ²) | 2.0(1.9) |

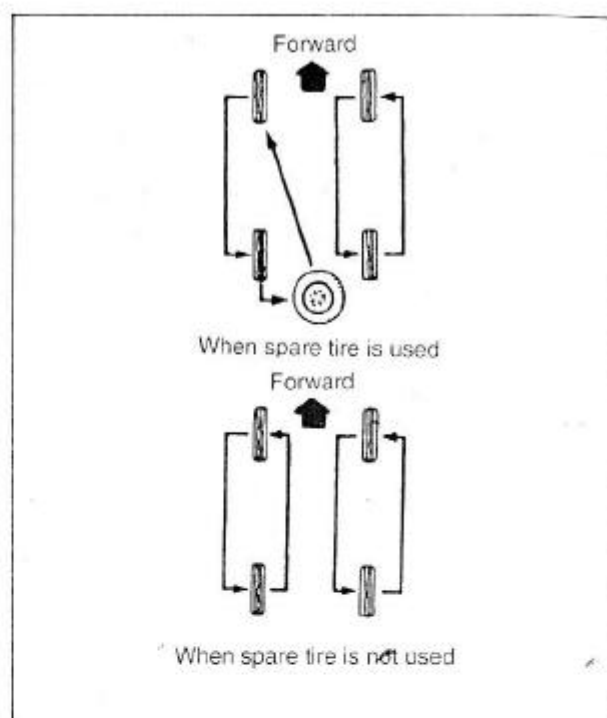


FIG. 4F — 8 TIRE ROTATION

Wheel Stud Bolt

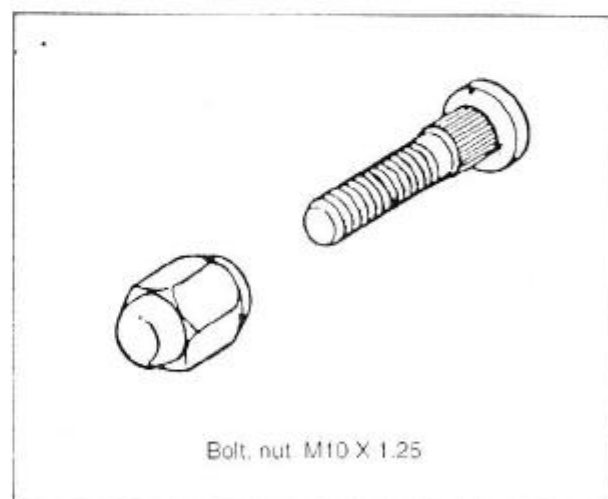


FIG. 4F — 9 STUD BOLT AND NUT

TROUBLESHOOTING (STEERING, SUSPENSION, WHEEL OR TIRE)

Road test and preliminary check should be performed prior to troubleshooting because **steering, suspension, wheel and tire system** are related with each other.

Preliminary check

1. Check the tire for pressure, abrasion and wear.
2. Lift up the car and check the front and rear suspension or steering system for relaxation, damage and deformation.
3. Turn wheels and check the tire for balance and deformation or bent of rim, wear and play of wheel bearing, the condition of wear surface.

| Condition | Probable Cause | Correction |
|--|--|---|
| Tire strain | <ol style="list-style-type: none"> 1. Unbalanced and uneven tire 2. Unsuitable tire pressure 3. Broken or weakened spring 4. Lateral force of radial tire 5. Unsuitable wheel alignment 6. Braking deflection 7. Relax, deformation, breakage of suspension | Replace tire Adjust tire pressure Replace spring Replace tire Check and adjust alignment Check and repair brake Retighten or replace suspension parts |
| Abnormal tire faulty (Excessive wear) | <ol style="list-style-type: none"> 1. Broken spring 2. Unbalance wheel 3. Wheel alignment faulty 4. Shock absorber failure 5. Over crusing 6. Over loadage 7. Relax or wear of wheel bearing 8. Rotation of unbalance wheel condition 9. Unsuitable tire pressure | Replace spring Adjust balance, replace tire Check and adjust balance Replace shock absorber Replace tire Replace tire Replace bearing Replace wheel rim or tire Adjust pressure |
| Wheel revolution faulty | <ol style="list-style-type: none"> 1. Partial expansion of tire 2. Shock absorber operation faulty | Replace tire Replace shock absorber |
| Damage or vibration | <ol style="list-style-type: none"> 1. Unbalance of tire or wheel 2. Damage of wheel bearing 3. Wear of tie rod end 4. Wear of lower ball joint 5. Excessive vibration of tire 6. Partial deformation of tire 7. Excessive vibration of tire wheel assembly radial direction 8. Front wheel alignment faulty 9. Relax or wear of steering linkage system 10. Relax of steering gear case bolt | Adjust wheel balance or replace tire Replace wheel bearing Replace tie rod end Replace tie rod end Replace front suspension control arm Replace wheel or tire Replace wheel or tire Adjust alignment Retighten or replace of steering system Tighten case bolt |

| Condition | Probable Cause | Correction |
|-----------------------------------|--|--|
| Control difficulty | <ol style="list-style-type: none"> 1. Sticking, malfunction, lube faulty of tie rod end ball stud or lower ball joint 2. Front wheel alignment faulty 3. Incorrect adjustment of steering gear box 4. Improper tire pressure 5. Sticking or lack of lubrication oil of steering column | Replace tie rod end or front suspension control arm Adjust alignment Adjust repair or replace steering gear box Charge proper pressure Repair |
| Excessive free play of handle | <ol style="list-style-type: none"> 1. Wear of wheel bearing 2. Misalignment of rack & pinion 3. Wear of steering shaft joint 4. Wear of tie rod end ball joint 5. Wear of lower ball joint | Replace wheel bearing Check and adjust rack & pinion Replace joint Replace tie rod end Replace suspension control arm |
| Restoration faulty of handle | <ol style="list-style-type: none"> 1. Sticking of tie rod end ball stud 2. Sticking of ball joint 3. Sticking of steering column 4. Front wheel alignment faulty 5. Improper tire pressure | Replace tie rod end Replace ball joint Repair and replace Adjust alignment Adjust pressure with proper value |
| Strange sound of steering | <ol style="list-style-type: none"> 1. Looseness of bolt and nut 2. Damage or breakage of wheel bearing 3. Wear and sticking of tie rod end | Tighten Replace Replace |
| Abnormal sound | <ol style="list-style-type: none"> 1. Wear, sticking, looseness of tie rod end, tie rod, drive shaft joint or lower ball joint 2. Damage of shock absorber strut or mount 3. Wear of control arm bushing 4. Looseness of stabilizer bar 5. Looseness of wheel nut 6. Looseness of suspension bolt or nut 7. Breakage or damage of wheel bearing 8. Breakage of suspension spring 9. Lubrication faulty or wear of strut bearing | Replace tie rod end, control arm, tie rod and drive shaft Replace and repair Replace bushing Tighten bolt or replace bushing Tighten Tighten bolt or nut Replace wheel bearing Replace spring Lubricate or replace strut bearing |
| Steering vibration or instability | <ol style="list-style-type: none"> 1. Tire unbalance or uneven 2. Looseness of ball joint 3. Shock absorber strut or mounting faulty 4. Looseness of stabilizer bar 5. Breakage or deformation of spring 6. Steering gear box adjustment faulty 7. Wheel alignment faulty | Charge pressure with proper value or replace Replace suspension control arm or tie rod end Replace shock absorber, strut or mount Tighten stabilizer bushing or replace Replace spring Adjust steering gear box Adjust alignment |

| Condition | Probable Cause | Correction |
|--|---|--|
| Handle inclination when brake actuated | <ol style="list-style-type: none"> 1. Wheel bearing wear 2. Breakage or deformation of spring 3. Oil leakage of wheel cylinder or caliper 4. Disc deformation 5. Partial wear of brake lining 6. Drum vibration level faulty 7. Uneven tire expansion 8. Wheel cylinder faulty 9. Front wheel alignment faulty | Replace wheel bearing Replace spring Repair or replace wheel cylinder and caliper Replace disc Replace brake lining(shoe) Replace brake drum Adjust pressure with proper value Replace wheel cylinder Check and adjust alignment |
| Uneven fender height | <ol style="list-style-type: none"> 1. Breakage or deformation of spring 2. Overload(excessive loadage) 3. Unsuitable spring | Replace spring Loadage check Replace spring |
| Too much smooth suspension | <ol style="list-style-type: none"> 1. Shock absorber or strut condition faulty | Replace shock absorber or strut |
| Suspension falling down | <ol style="list-style-type: none"> 1. Overload 2. Shock absorber or strut condition faulty 3. Unsuitable, breakage, weaken or performance reducing of spring | Loadage check Replace shock absorber or strut Replace spring |
| Rolling or yawing at the corner | <ol style="list-style-type: none"> 1. Looseness of stabilizer 2. Shock absorber, strut or mount condition faulty 3. Breakage, weaken or performance reducing of spring 4. Overload | Tighten bolt or replace bushing Replace shock absorber, strut or tighten mount Replace spring Check loadage and load |
| Rapid wear of tire | <ol style="list-style-type: none"> 1. Strut condition faulty 2. Wear, or breakage of wheel bearing 3. Excess vibration of tire wheel 4. Wear of ball joint 5. Wheel balance faulty | Replace strut Replace wheel bearing Replace tire or wheel Replace suspension control arm Check and adjust wheel balance |

ON-CAR SERVICE

Removal

1. Loosen wheel nut by approximately 180°.
2. Lift up the car with jack.
3. Loosen wheel nut and remove wheel tire.

Installation

Install wheel nut with crisscross pattern to avoid deformation of wheel, brake drum or disc.

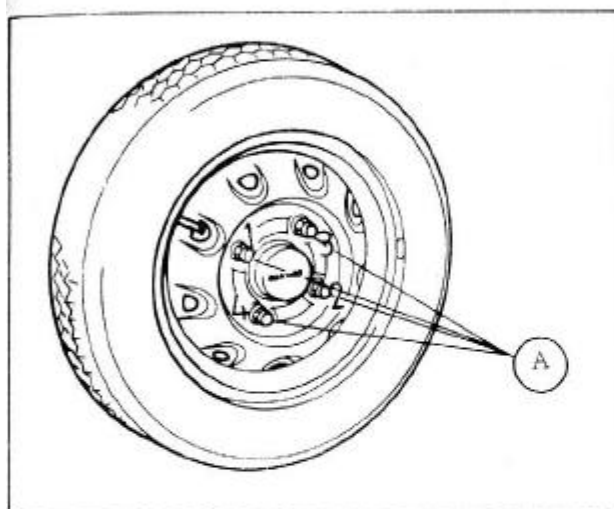


FIG. 4F — 10 TIRE INSTALLATION

CAUTION

Before installing wheel nut, remove any build-up of corrosion on wheel mounting surface and brake drum or disc mounting surface with scraper or wire brush.

Recommend torque should be applied. If not, can cause wheel nuts to loosen and it may released when running.

Replacement Tires

When replacing tires of wheels, use tire replacing device. Replacing by hand tools or tire lever only can cause damage to tire bead and wheel rim. Apply lubrication oil to bead seat of rim after removing strange materials such as old rubber debris or corrossions.

After installing, charge pressure by specified limit so that bead is closely contacted.

Adjustment Wheel Balance

Wheel tire balance is divided into static balance and dynamic balance and both are adjusted by wheel balance.

CAUTION

Do not attach balance weight more than two per one side. Weight of one wheel should be less than 100g. If adjustment is impossible, readjust by rotating wheel and tire.

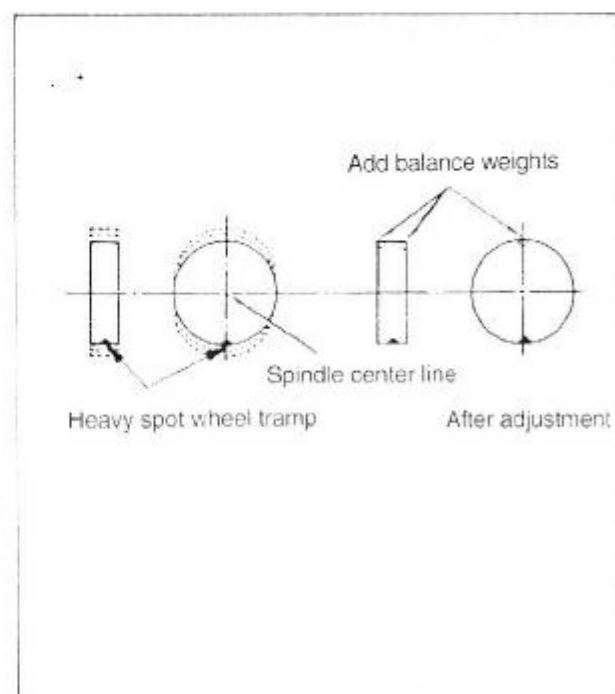


FIG. 4F — 11 STATIC BALANCE ADJUSTMENT

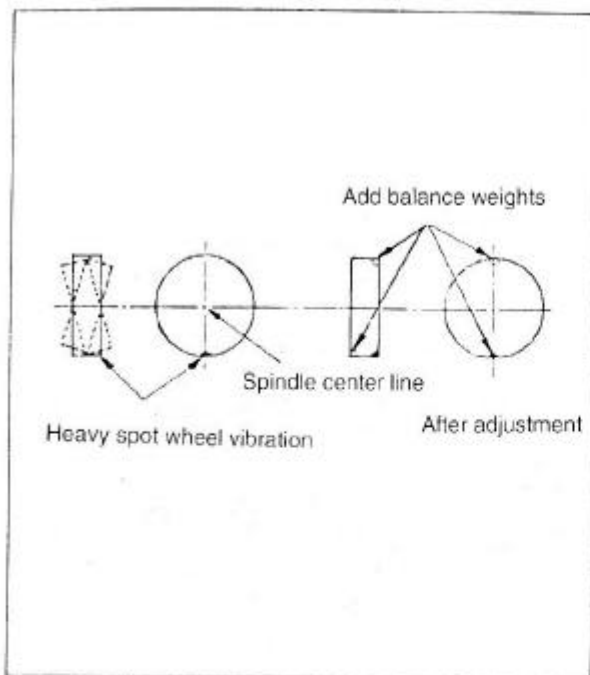


FIG. 4F — 12 DYNAMIC BALANCE ADJUSTMENT

CAUTION

Stones and any strange materials should be removed from between patterns in order to avoid operator injury during rotation balancing.

Specified Tightening Torque

| | |
|---|-----------|
| Tightening torque for wheel nut(kg • cm) | 400 — 700 |
|---|-----------|

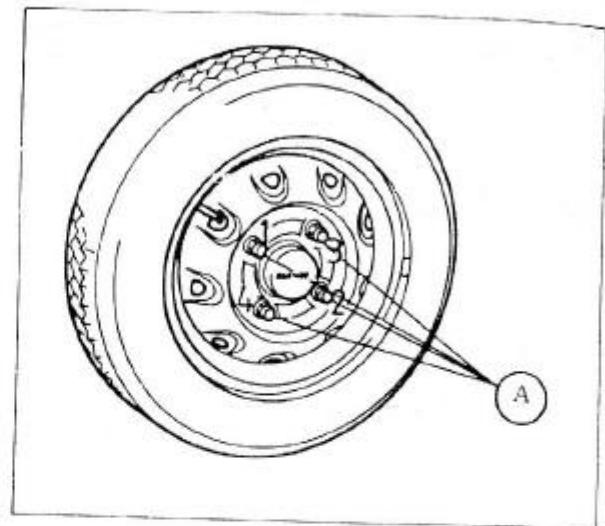


FIG. 4F — 13 TIGHTENING OF WHEEL NUT