GROUP 22 — WHEELS, TYRES, AND FRONT WHEEL BEARINGS

SECTION 0 — INDEX

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

SECTION 1 — SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
WEAR AT SHOULDERS	(a) Tyre under inflated (b) Vehicle operated under overload conditions.	(a) Reset to recommended pressures. (b) Inform owner of the maximum tyre load ratings.
WEAR ON INSIDE SHOULDER	(a) Excessive negative camber.	(a) Locate and correct cause of excessive negative camber.
WEAR ON OUTSIDE SHOULDER	(a) Excessive positive camber.	(a) Locate and correct cause of excessive positive camber.
WEAR AT CENTRE	(a) Tyres over-inflated.	(a) Reset to recommended pressures.
FEATHERED EDGES	(a) Incorrect toe-in setting.	(a) Reset to specifications.
TYRE THUMP, TRAMP, SQUEAL	(a) Fabric damage. (b) Out of balance condition. (c) Incorrect air pressure. (d) Incorrect steering geometry.	(a) Replace tyre. (b) Balance wheel and tyre assembly. (c) Reset to recommended pressures. (d) Adjust wheel alignment to specifications.
ABRASIVE ROUGHNESS ACROSS TREAD	(a) Excessive cornering speed.	(a) Reduce cornering speed.
IRREGULAR SPOTTY WEAR	(a) Tyres under-inflated. (b) Loose or worn suspension components or shock absorbers. (c) Excessive tyre or rim runout. (d) Incorrect wheel bearing adjustment. (e) Wheel and tyre out of balance.	(a) Reset to recommended pressure. (b) Inspect, secure and/or replace any worn components. (c) Correct any non-standard conditions. (d) Reset to specifications. (e) Balance wheel and tyre assembly.
STEERING WHEEL VIBRATION	(a) Tyres worn unevenly. (b) Tyres worn bald. (c) Worn steering balljoints. (d) Excessive tyre or rim runout. (e) Incorrect wheel bearing adjustment. (f) Wheel and tyre out of balance.	(a) Replace tyres and rebalance. (b) Replace tyres and rebalance. (c) Replace worn components. (d) Correct any non-standard conditions. (e) Reset to specifications. (f) Balance wheel and tyre assembly.

SECTION 2 — WHEELS, TYRES & FRONT WHEEL BEARINGS

SPECIFICATIONS

		Sedan and Wagon Models		Two Door and 2,6 ℓ Models
	Steel (Imported)*	Steel (Local)*	Aluminium	Aluminium
Wheels				
Type	Drop centre safety	<——	<——	<——
Size	5J x 13	5JJ x 13	5.5JJ x 13	5.5JJ x 14
Material	Pressed steel	<——	Aluminium alloy	<——
Offset disc to rim	31,0 mm (1.22")	<——	28,6 mm (1.13")	24,0 mm (0.94")
No. of hub bolts	4	<——	<——	<——
Bolt hole pitch circle dia.	114,3 mm (4.5")	<——	<——	<——
Max. radial run-out	1,0 mm (0.040")	0,8 mm (0.030")	0,38 mm (0.015")	<——
Max. lateral run-out	1,0 mm (0.040")	1,0 mm (0.040")	0,38 mm (0.015")	<——

* Identified by 'Topy' on well section of imported rim and date code on disc section of local manufactured rim.

Tyres

Type, size and rating	Refer tyre placard attached to the trailing edge of right front door or door pillar.			
Ø Max. radial run-out	1,5 mm (0.060")	<——	<——	<——
Ø Max. lateral run-out	2,0 mm (0.080")	<——	<——	<——

Ø Maximum figures for a wheel and tyre assembly (refer to written text on following pages)

NOTE: Tyre, pressure and rim combinations are covered by Australian Design Rule Nos. 20 and 24. Approved combinations for each vehicle are listed on the placard located on the trailing edge of the right front door or door pillar. Any deviation from these specifications requires approval by State Registration Authorities prior to installation or the vehicle may subsequently be refused registration.

Front Wheel Bearings

Front wheel bearing end float .... 0,013-0,076 mm (0.0005-0.003")

TORQUE SPECIFICATIONS

	Nm	lbs./ft.	lb./in.
Wheel nuts (in diagonal sequence) — Sedan and Wagon	69-79	51-58	
— Two Door	78-98	57-72	
Front wheel bearing nut	8		71

GENERAL INFORMATION

The factory installed tyres on the vehicle are selected to provide the best all round tyre performance for all normal operation when inflated as recommended on the placard located on the forward edge of the right hand front door pillar. These tyres have load carrying capacity, when properly inflated, to operate satisfactorily at the loads and speeds specified on the placard.

The following is a description of the various tyre designs used (refer Fig. 1).

Cross-ply

Cross-ply tyre body cords extend from bead to bead at an angle across the centreline of the tread. Alternate plies cross at opposite angles.

Belted-bias

Belted-bias tyres are similar in construction to cross-ply tyres but have an additional two ply belt laid under the tread with cords at an angle of 26 to 30 degrees to the circumferential line.

Radial-ply

Radial ply tyres also have belts circling the tyre under the tread from tread shoulder to tread shoulder. The body cords cross the centre line of the tread at approximately right angles, from bead to bead. The body cords 'radiate' from the centre point of the tyre hence the term 'radial ply'.

Radial ply tyres provide improved tread life, better roadholding and smoother high speed ride. The radial ply tyres fitted as standard equipment to some models and optional equipment on others are identified by the letter "R" in their size description.

CAUTION:

- **Never mix Cross-ply, Belted-bias or Radial-ply tyres.**
- **Don't mix textile cord belt radials with steel cord belt radials.**
- **Don't use tyres with different profiles on the same axle.**

Tyre Profile

Tyre profile is the **tyre** section height expressed as a percentage of the tyre section width, which is also called 'aspect ratio'. Reduction of tyre section height in relation to the section width results in a softer cushion ride. A variety of low, squat profile shapes are currently used and for this reason interchangeability of different make tyres is not always possible due to the variations in tyre diamensions, tyre profile and tread depth.

NOTE: Tyres with large differences in profile should not be used on the same axle.

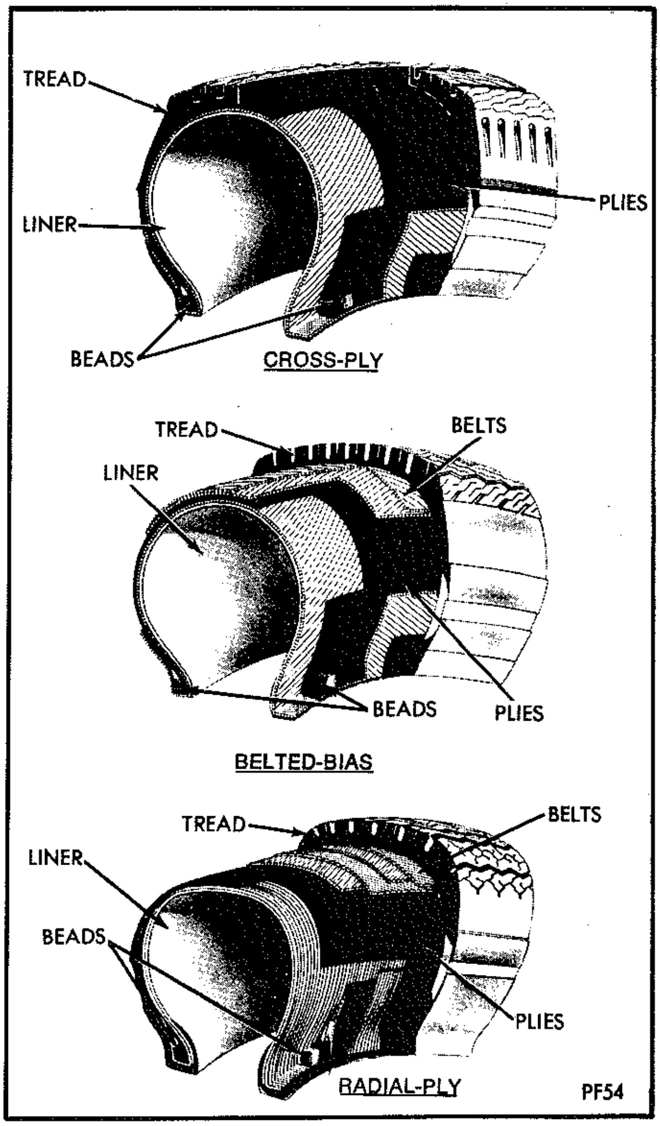

Fig. 1—Types of tyre construction

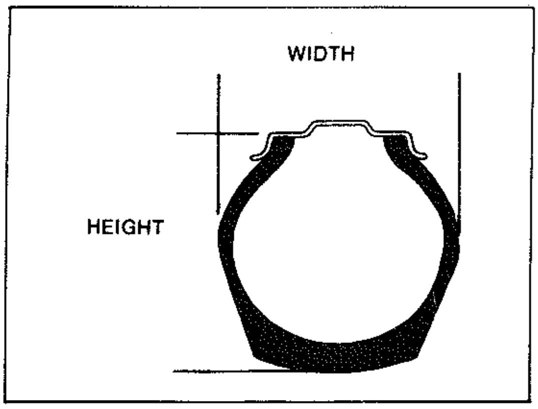

Fig. 2—Tyre profile or aspect ratio

TYRE TREAD DEPTH

The control of a vehicle in any weather conditions depends finally upon the frictional forces generated between the contact patches of the four tyres and the road surface. These contact patches are not large, being about the equivalent in area of a size 10 shoe.

On a dry road, a smooth rubber surface, such as on a bald tyre, has a high co-efficient of friction, quite sufficient to maintain the required degree of braking, accelerating and cornering control. However, in wet conditions the co-efficient of friction between a smooth tyre and the road surface falls to an extremely low value.

Grooves are incorporated in the tread pattern to clear water away from the contact patch area thus providing a relatively 'dry' surface so that a reasonable degree of road adhesion is maintained.

The inclusion of siping slots in the tread, which provide edges to break through the film of water, also helps clear water from the contact patch.

A tyre wear indicator marker is moulded into the tyre tread. When these evenly and traversely set markers are flush with the tyre tread surface, the tyre must be replaced. It is an offence under road traffic regulations to drive a vehicle which has less tread depth (Fig. 3).

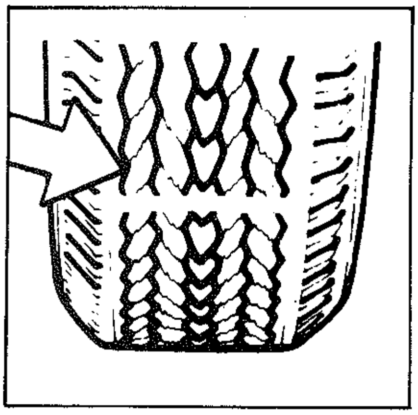

Fig. 3—Tyre tread wear indicators

TYRE CARE

There are many factors which can affect the rate of tread wear and tyre life — speed, cornering, braking, acceleration, tyre inflation pressures, wheel and front end alignment, road surface and terrain, and climatic conditions.

Wear rates also vary for differing types of tread patterns.

With so many factors, there is seldom a common basis for comparing tyre performance, and thus there can be marked differences between the tyre life obtained by motorists driving similar vehicles on similar tyres.

Driving habits have more effect on tyre life than any other factor. Careful drivers in most cases, will obtain greater tyre life than severe or careless drivers. All new tyres should be initially run-in at speeds below 80 km/h for the first 100 km.

Tyres used at low speeds, in cool climates, and with light loads will have longer life than tyres used for high speed driving in hot climates with heavy loads. Abrasive road surfaces will also accelerate tyre wear.

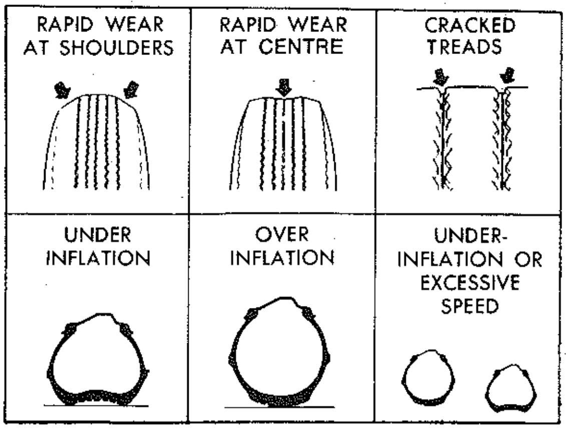

Fig. 4—Incorrect tyre inflation pressures

The means of obtaining satisfactory tyre life include—

Tyre inflation pressure (Fig. 4).

Correct inflation pressure is the basis of tyre care, for it is the air in a tyre, not the tyre itself, that carries the weight of a vehicle and its load.

Incorrect pressure, whether over-inflation or under-inflation, has a marked effect upon the rate of tread wear, and on the life of the casing.

Further, inflation pressures have a direct bearing upon driving safety, for vehicles with their accurately adjusted steering, front-end and suspension systems, are sensitive to relatively small variations in tyre pressures which can have a considerable effect upon handling performance.

The vehicle tyre placard lists the tyre pressure combinations that will give optimum performance in terms of comfort, safety and stablity in normal driving conditions. Always check pressures with a known accurate gauge.

Under-inflation is the most common tyre pressure fault.

A tyre always flexes as it rolls along the road, and this flexing in turn generates heat. Under correct inflation pressure and load, this heat build-up does no harm.

However, an under-inflated tyre undergoes far greater flexing than normal as it runs, and the heat generation is consequently greater. The temperature of the tyre can rise to the stage where the rubber compounds that bind the tyre together are softened and weakened — and in extreme conditions the tread may separate from the casing, or the casing plies may separate from each other.

Heat generation is further exaggerated if the under-inflated tyre is run at high speed, or if the car is overloaded. The effects of over-loading are practically the same as those of under-inflation, permitting the excessive deflection and flexing movements that increase temperature.

Under-inflation of the tyre causes the casing cords to flex excessively, which can lead to fatigue breaks.

Over-inflation also reduces tread life, and can result in damage to the casing which renders it unsafe for further use.

Excessive pressure puts extra strain upon the casing cords, reducing their ability to withstand the impact shocks of driving. The rubber cuts and snags more easily as the tread is stretched tight, and cracks can develop rapidly. Additional strain is placed upon tyre beads. Over-inflation reduces the tread area in contact with the road, and the centre of the tread wears more rapidly.

Tyre valve caps should always be reinstalled after checking pressures to prevent ingress of moisture and subsequent corrosion of the valve.

Incorrect Toe-in Setting

Excessive toe-in or toe-out causes wear on the edges of the front tyres. An excessive amount of toe-in either direction actually drags the tyre instead of letting it roll freely. This wear condition will usually produce a tapered or feathered edge on the outsde ribs. To correct this condition reset the toe-in to specifications.

Excessive Wheel Camber

Excessive wheel camber, either positive or negative causes the tyre to run at an angle to the road, and one side of the tread will wear more than the other. For best corrective results, adjust the front wheel alignment to specifications, refer "Group 2" and rotate tyres.

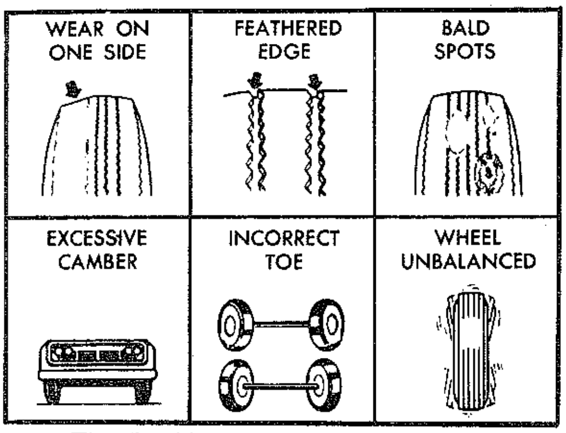

Fig. 5—Abnormal tyre wear patterns

Faulty Shock Absorbers or Wheel Balance

Worn or faulty shock absorbers can cause irregular wear on tyres which usually shows up as spot or cupping wear around the circumference. Out-of-balance wheels are also a common cause of uneven tread wear. Check or replace faulty shock absorbers and balance the road wheel and tyre assemblies if required. Usually faulty wheel balance is accompanied by vibration through the steering while driving the vehicle over a smooth straight highway.

Static unbalance can cause the wheel to bounce or tramp along the road. When an unbalanced wheel is allowed to spin freely (such as when the car is jacked up) it will come to rest in the same position because one part is heavier than the others. This type of unbalance can only be corrected by equally loading both sides of the rim, opposite the heavy spot.

Dynamic unbalance is caused by a point on one side of the wheel unit centreline being heavier than the other. The wheel tends to shake sideways about the axle with each revolution. Wheel wobble or shimmy produced is usually noticeable at a particular speed range and can cause handling difficulties at high speeds.

Precision machines are required to check static and dynamic balance. The wheel balance can then be corrected if necessary by replacement of weights about the rim.

NOTE: To maintain correct wheel balance on the vehicle always mark the wheel to hub/axle location prior to removing each wheel. This will ensure correct balance is maintained on re-assembly.

NOTE: Select and fit balance weights that provide adequate clearance to brakes, dust shields, steering parts, trim rings and wheel covers. Use care when removing stick-on type balance weights from the alloy wheels of two door models. Failure to do so, may lead to damage to the rim surface.

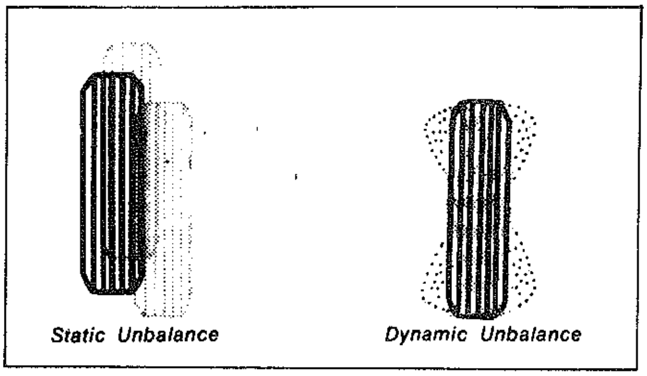

Fig. 6—Types of wheel unbalance

Wheel Rotation

Providing tyre pressures are maintained and steering geometry is correctly aligned, there is normally little difference in the rate of wear between front and rear tyres. Rotation of tyres is not recommended unless specifically requested by an owner. In most cases it is false economy because an additional wheel balancing operation is usually required (at extra cost to the customer).

If an owner requests wheel rotation the patterns illustrated may be used for either four or five (including spare) wheel rotation systems (Fig. 7). After rotating the wheels always tighten the wheel nuts using a diagonal sequence. Tighten all nuts to approximately half the specified torque first, and then repeat sequence tightening to specified torque. (Fig. 8). Road test and rebalance wheels if necessary.

TYRE AND RIM RUNOUT

Tyre and rim runout should be checked if out-of-round tyre problems are experienced or when wheel and tyre assemblies do not respond to normal balancing methods.

Check radial and lateral run-out of both tyre and rim against specifications.

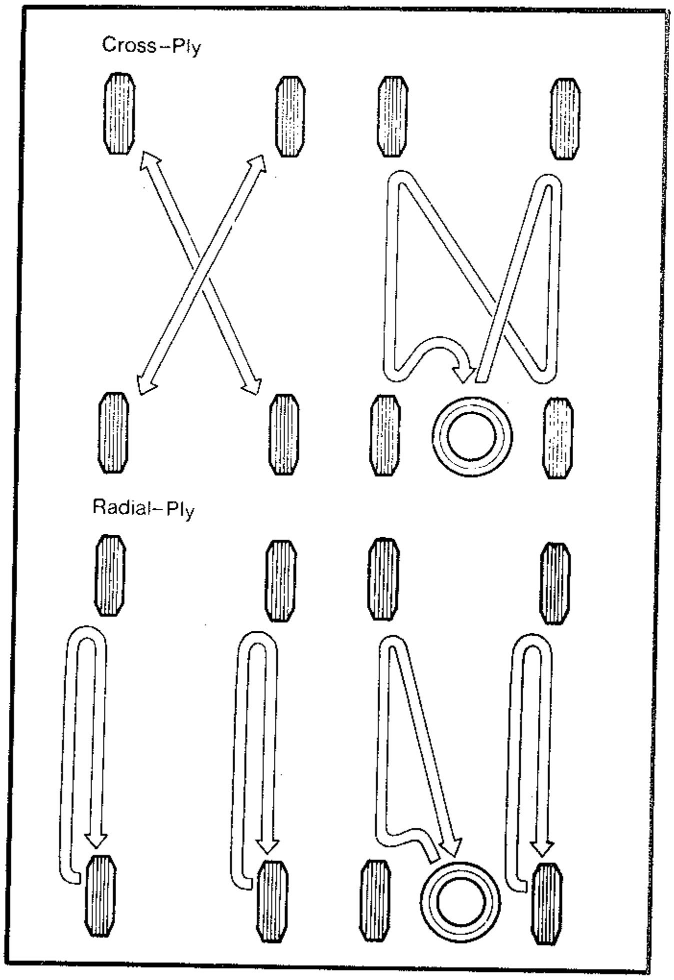

Fig. 7—Wheel rotation patterns (Four and Five wheel systems)

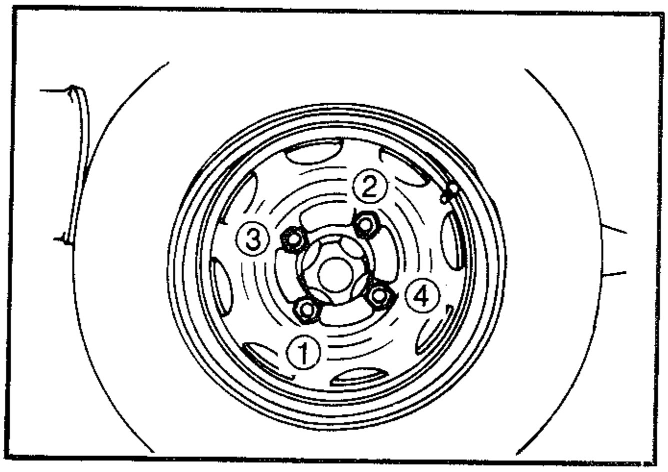

Fig. 8—Road wheel tightening sequence

Radial runout is the difference between high and low points on the circumference of the tyre or rim.

Radial runout is much more likely to cause high speed/ smooth road shake than lateral runout. If radial runout, measured at the tyre tread, is 2,5 mm (0.100") or more, it is almost certain to cause shake problems. Radial runout in the 1,5 mm (0.060") to 2,5 mm (0.100") range may cause a shake problem. Less than 1,5 mm (0.060") radial runout seldom causes a problem.

Lateral runout is the difference between high and low points on the side wall of either tyre or rim (wobble).

Although lateral runout is not a common cause of shake, it should be measured. More than 2,0 mm (0.080") lateral runout could cause a problem. This much runout is not common unless the tyre is improperly mounted, wheel nuts are improperly torqued, or the wheel itself is damaged.

NOTE: Prior to checking runout of a tyre the vehicle should be driven sufficient distance to warm up the tyre and the vehicle immediately lifted from the ground so that "flat spotting" of the tyre (from being parked) does not affect the runout measurement.

Check the accuracy of the brake drum at the mounting bolts. Ensure that the front wheel bearings are properly adjusted. Check that all wheel nuts are tightened to specifications (in the correct sequence).

Checking Procedure

Ensure the dial indicator is attached rigidly to a firm base when checking runout readings.

(1) To check tyre radial runout place the dial indicator plunger against a centre rib in the tyre tread and rotate the wheel slowly. Maximum reading must not exceed specifications.

(2) To check lateral runout (wobble) position the dial indicator against the tyre side wall and rotate wheel slowly.

(3) Sometimes radial runout can be reduced by relocating the wheel on the mounting studs. Remove the wheel and tyre assembly and remount it two studs from its original position. If excessive runout was caused by a stack-up of wheel and stud tolerances, this may bring the runout within specifications. Retorque the wheel nuts in the recommended sequence.

(4) If excessive runout is still evident, make a chalk mark (or similar) across the tyre sidewall and the rim. Mark the relationship of the rim to a wheel stud for remounting of the tyre and rim assembly to the original position. Remove tyre from rim and remount the rim in the same position on the wheel studs. Check the rim against specifications.

NOTE: When checking wheel rim runout ensure it is checked in the area where the tyre beading normally contacts the rim profile (Fig. 9). The extreme outer edge of the rim should not be used as this metal has been sheared in the manufacturing process and is not an even surface.

If the rim runout is within specifications and the point of greatest runout is near the original chalk mark on the rim, remount the tyre with the tyre and rim chalk marks 180 degrees apart. Recheck that the runout of the tyre and rim assembly is now within specifications.

NOTE: Correcting radial runout by removing tread rubber with an off-car truer is not recommended. Removing tread rubber may not reduce the shake problem and there is a good chance that it will introduce or increase tyre roughness . . . a condition that can be heard as well as felt.
Tyre trueing to correct radial runout requires the removal of a significant amount of tread rubber. This reduces the useful life of the tyre and for that reason should not even be considered except as a possible last resort. Trueing should not be performed without the owner's knowledge and consent.

From a safety aspect, a tyre should not continue in service where any of the following conditions are evident.

(1) Where the tyre wear indicators are exposed. (See description earlier in this Section.)

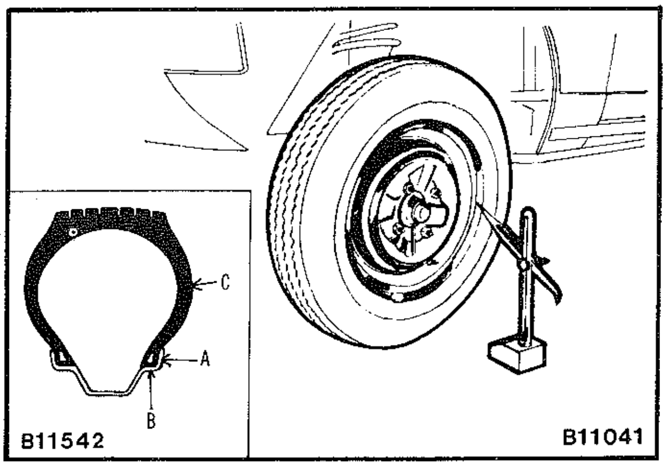

Fig. 9—Checking tyre and rim runout

(2) Fabric breaks, exposed or broken bead wires.

(3) Tread and side wall cracks, ruptures, cuts or localised wear any of which are deep enough to expose the body cords.

(4) Tread, side wall and ply separation or partial casing failure as indicated by any bump or bulge on the tyre surface including the bead area.

(5) Regrooving or recutting below the original tread pattern depth.

(6) Where a tyre is matched on the same axle with a tyre of totally different construction, for example a cross ply tyre with a radial ply tyre.

(7) Where a tyre is operated at an inflation pressure less than the minimum recommended for the load being carried taking into account the speed of operation.

(8) Where a tyre is fitted to a damaged rim, a rim of incorrect size, or is not properly seated on its rim.

(9) Where a tyre is fitted with a tube of a size not recommended by the manufacturer.

NOTE: Any tyre that has been damaged as mentioned in the appropriate items above, should be inspected internally and externally by a competent technician to establish whether it could be repaired or should be scrapped.

TYRE REPAIR AND REPLACEMENT

As the puncturing object could remain in the tyre it may be necessary to submerge the tyre and rim in water to locate the leak.

NOTE: Small holes in the tread such as nail holes must not under any circumstances be plugged. Repairs should only be made from inside the tyre using an approved cold vulcanizing method.

Tyre Removal

Remove the valve core, and exhaust all air from the tyre.

Free each bead from its bead seat. In modern safety rims the bead will have to be pushed well away from the rim flange so that it slips over the seating hump into the well of the rim.

Place rim on floor or machine. The narrow bead seat side should be uppermost for rims with different size bead seats.

Lubricate the beads, and bead seats, to ease removal.

Insert levers or fitting tool under the top bead, and ease it over the rim flange in small bites.

Repeat the action for the second bead, making sure that the loose section of the bead is positioned well down in the well of the rim.

NOTE: Tyres can be damaged by the use of wrong tools, or by using tools in poor condition. Steel hammers or mallets should never be used directly on a tyre — a rubber mallet is ideal. Tyre levers should have smooth edges, free of nicks or burrs. The use of poor tools can easily damage the beads, ruining the air seal in a tubeless tyre.

Tyre Installation

Make sure the rim is clean and in good condition. Check the edges of the flanges, smoothing sharp or burred edges with a file.

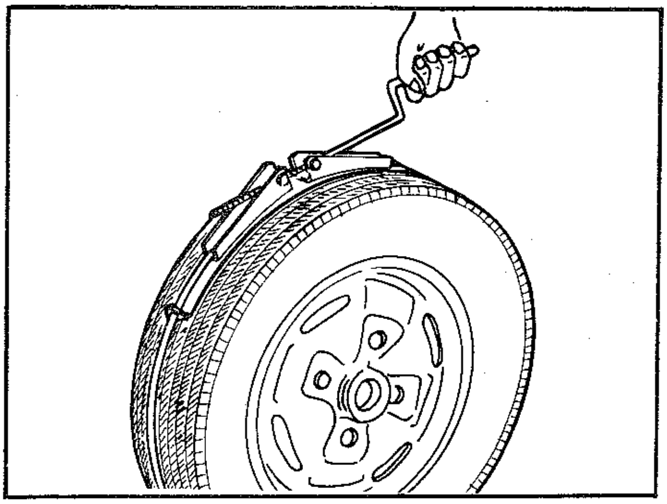

Fig. 10—Expanding tyre beads

It is advisable to fit a new valve in tubeless tyre rims when fitting a new tyre. Make sure the valve is of the correct diameter and length — lubricate with water or soapy solution to help it snap into position in the valve hole.

NOTE: Tyre valve protection sleeves are used on some models to prevent the trim ring/wheel cover cutting into the valve core, always refit the sleeves whenever removal has been necessary.

Inspect the inside of the tyre, making sure all foreign material is removed.

Lubricate the tyre beads. One part of liquid detergent to four parts of water is a good lubricant.

Place rim on floor or machine. The narrow bead seat side should be uppermost for rims with different size bead seats.

Fit one bead at a time.

Slip one section of the bead over the side of the rim, so that it rests in the well of the rim. The remaining section of the bead should be eased over the rim flange in small bites using a rubber mallet, levers or fitting tool.

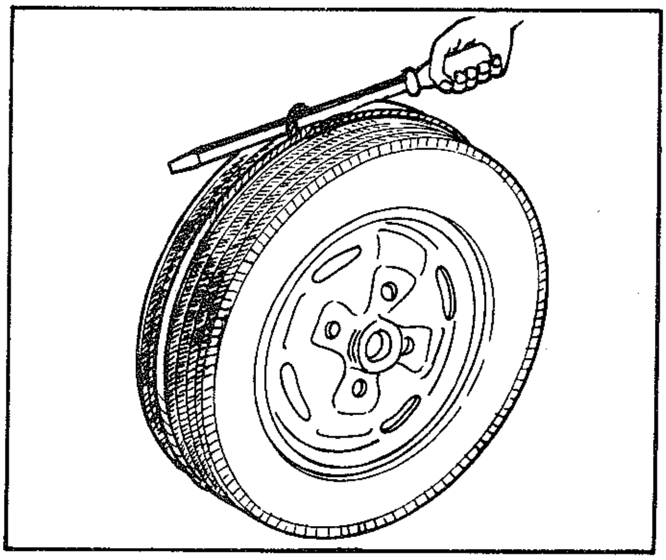

Fig. 11—Expanding tyre beads (rope tourniquet)

Repeat the operation for the second bead, again making sure that the beads are resting in the centre of the rim well.

Centre the tyre on the rim, and inflate. Do not lean over the tyre during inflation. The tyre beads may be expanded using methods shown in Figs. 10 and 11 when necessary.

Apply more bead lubricant, if necessary and inflate until the beads slip into position in the bead seats on the rim. Inflate all tubeless tyres to a maximum of 300 kPa (45 p.s.i.).

If the beads will not seat at these pressures, deflate and investigate the reason, which could be a dirty rim, damaged bead chafer, insufficient lubricant, or incorrect rim or tyre size.

Deflate the tyre to the correct pressure for driving.

For tubed tyres, remove the valve core and exhaust all air. This will allow the tube to seat itself correctly inside the tyre. Replace the valve core and inflate to the correct driving pressure.

When fitting a tubed type tyre, make sure the tube is of the correct size. Dry the tube and dust it with talc (French chalk) and slightly inflate before putting it inside the tyre after the first bead has been slipped on to the rim.

NOTE: Radial ply tyres require special tubes, and care must be taken to ensure that the correct tube is fitted.

Valve caps should always be used to keep dirt and moisture out of the valve core.

FRONT WHEEL BEARINGS

Front wheel bearing lubricant should be changed at the intervals stated in the "Lubrication and Maintenance Schedule". The recommended lubricant is Lithium Base Multi-Purpose NLGI EP No. 2 Grease. This grease should not be mixed with other types of lubricants.

Removal

(1) Loosen front wheel retaining nuts, raise the front of the vehicle and place on safety jacks.

(2) Mark the position of front wheels to hub for correct balance on reassembly. Remove wheels.

(3) Remove the caliper assembly as detailed in "Group 5" — brakes.

NOTE: DO NOT allow caliper assembly to hang by brake hose, as possible hose damage may result.

(4) Remove the grease cap, split pin, lock and outer bearing then slide the disc assembly carefully off the spindle.

(5) Using a suitable size soft steel punch, drive out the inner oil seal and remove inner bearing cone and bearing cups, if necessary.

Clean and Inspect

(1) Clean the hub assembly and bearing cones with suitable solvent (not kerosene).

(2) Examine the bearing cups for pits, brinnel marks or other imperfections. If cups are damaged, drive them

from the hub, again using a soft steel punch, positioned in the slots in the hub.

(3) The cones and rollers should have smooth, unbroken surfaces. The end of the rollers and both cone flanges should also be smooth and free from chipping or other damage.

Installation

(1) If bearing cups are removed install the new cups into the hub evenly, driving them flush with the hub, using a soft steel block and a hammer. Seat the cups against the shoulders in the hub using a soft steel drift and hammer.

(2) Fill the hub cavity with the recommended lubricant and force lubricant between bearing cone rollers or repack with a suitable bearing packer.

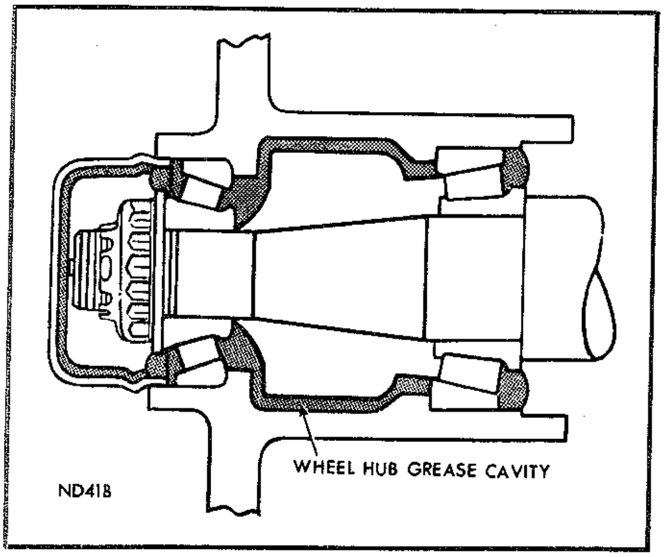

Fig. 12—Fill cavity with lubricant

(3) Install inner cone and a new oil seal with lip of seal facing inwards. Use a block of wood and hammer to install flush with end of hub. Clean spindle and install hub assembly.

(4) Install the outer bearing cone, flat washer and adjusting nut.

(5) Install caliper as detailed in Group 5 — Brakes.

(6) Install wheel and tyre assembly in the previously marked position to retain wheel balance and tighten nuts.

Adjustment

(1) Tighten the wheel bearing adjustment nut to 8 Nm (71 lbs. in.), using a tension wrench and rotating the wheel while tightening the nut.

(2) Position the nut lock on the adjusting nut so that one pair of split pin holes align with the pin hole in the spindle.

(3) Back off adjusting nut and nut lock assembly one hole and install split pin.

(4) Check end float by moving the wheel in and out axially on the spindle.

(5) Clean the grease cap, coat the inside with lubricant (do not fill) and install the cap.

(6) Apply the foot brake, release, then check that the hub rotates by hand.

(7) Lower the vehicle and tighten nuts to specified torque in two stages, using a diagonal sequence.

CAUTION: Always apply brake pedal before moving the vehicle to ensure the brake pads are correctly seated.

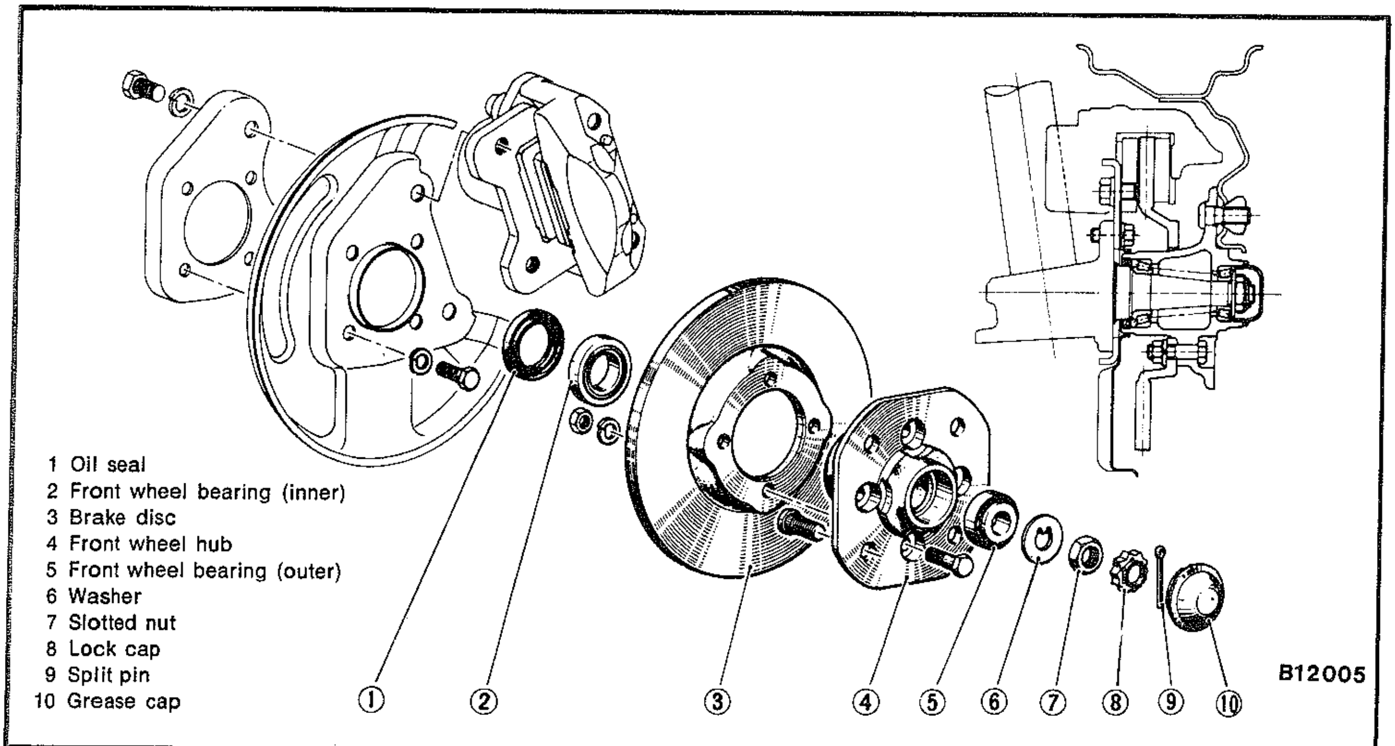

Fig. 13—Exploded view of front hub (Two Door)