TOYOTA
REPAIR MANUAL
MODEL FJ

FRONT AXLE
STEERING

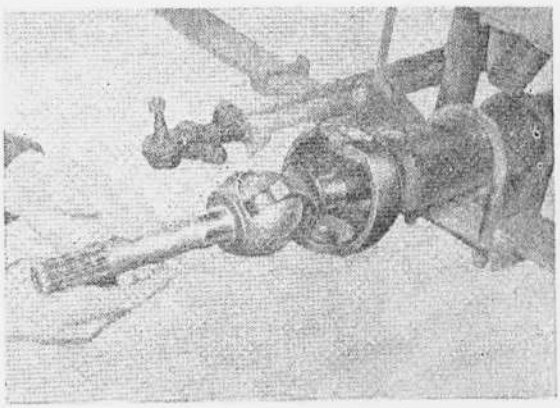
FRONT AXLE

Front Axle Specifications

Type	Full floating
Drive	Hotchkiss type
Connection Joint	Ball joint type

CONSTRUCTION

Depending upon the requirements, the Toyota Land Cruiser is made such that the engine torque can be transmitted through the transfer case to drive the front wheels. The front axle is of the full floating type in which the load and the drive force of the front wheels are completely carried by the axle housing, the front wheel axle serving only to transmit the power. The method of drive is the so-called Hotchkiss type in which driving force is transmitted to the frame through the chassis springs, and has the advantages of simple construction and easy manufacture and maintenance. The differential housing is placed of center to the right side in order to provide more road clearance and to have the front propeller shaft in straight line from the transfer case. The front wheels are driven by the front drive shaft. This drive shaft links on through the wheel joint inside the steering knuckle, to the axle shaft spline-connected to the differential side gear.

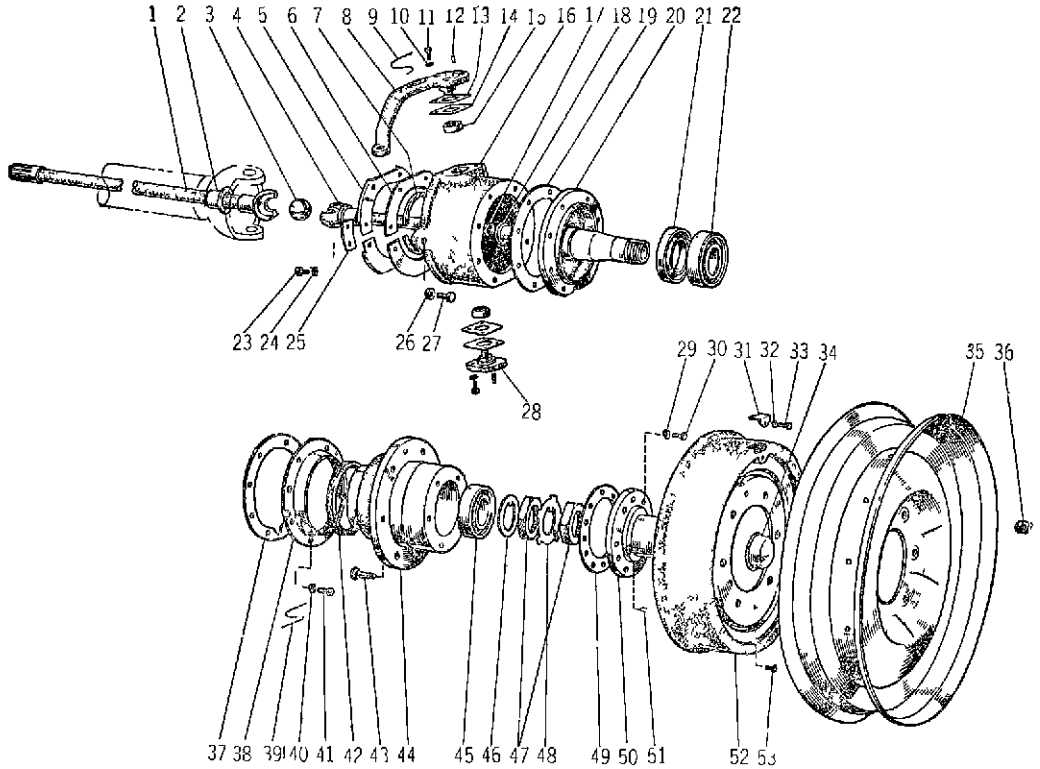


The power is transmitted from the transfer case through the propeller shaft when gears are shifted in the transfer case.

The differential assembly is identical with that used on the rear axle. Inside the ball joint case welded on to the outer end of the front axle housing is the steering knuckle. The upper part of the case is connected to the knuckle arm and the lower part to the knuckle shaft. Two tapered roller bearings provide smooth action to the knuckle. The knuckle spindle is attached to the knuckle with 8 bolts and between this spindle and the axle hub are the inner and outer wheel bearings (tapered roller bearings) to provide smooth rotation to the wheels.

The front drive shaft flange is bolted on to the axle hub and is provided with

Front Axle Shaft and Disc Wheel



① *Axle Shaft*
② *Bushing*
③ *Ball Joint*
④ *Drive Shaft*
⑤ *Oil Retainer*
⑥ *Packing*
⑦ *Oil Retainer*
⑧ *Knuckle Arm*
⑨ *Lock Wire*
⑩ *Spring Washer SWH 10*
⑪ *Bolt TBT 10801*
⑫ *Knock Pin*
⑬ *Packing*
⑭ *Shim*
⑮ *Bearing*
⑯ *Knuckle*
⑰ *Snap Ring*
⑱ *Bushing*
⑲ *Packing*
⑳ *Knuckle Spindle*
㉑ *Grease Retainer*
㉒ *Inner Bearing*
㉓ *Bolt JBN 0612*
㉔ *Spring Washer SWH 06*
㉕ *Dust Cover*
㉖ *Nut TNN 1210*
㉗ *Knuckle Stop Adjusting Bolt*
㉘ *Knuckle Shaft*
㉙ *Spring Washer SWH 08*
㉚ *Bolt TBK 08301*
㉛ *Inspection Hole Strap*
㉜ *Spring Washer SWL 05*
㉝ *Bolt*
㉞ *Cap*
㉟ *Disc Wheel*
㊱ *Axle Nut*
㊲ *Packing*
㊳ *Oil Retainer*
㊴ *Lock Wire*
㊵ *Spring Washer SWH 08*
㊶ *Bolt TBK 08301*
㊷ *Oil Retainer*
㊸ *Hub Bolt*
㊹ *Hub*
㊺ *Outer Bearing*
㊻ *Adjusting Nut Washer*
㊼ *Adjusting Washer*
㊽ *Lock Washer*
㊾ *Flange Packing*
㊿ *Drive Shaft Flange*
(51) *Flange Knock*
(52) *Brake Drum*
(53) *Set Screw*

splines on the inside which connects on to the drive shaft for transmitting power. The outer end of the drive shaft is secured with snap ring from the outer side of the flange and the inner end connects on to the axle shaft through the ball joint. The drive shaft transmits power and at the same time is free to turn when steered.

One end of the knuckle arm is connected to the steering connecting rod and the other end to the tie rod end to govern the steering and at the same time serve as king pin.

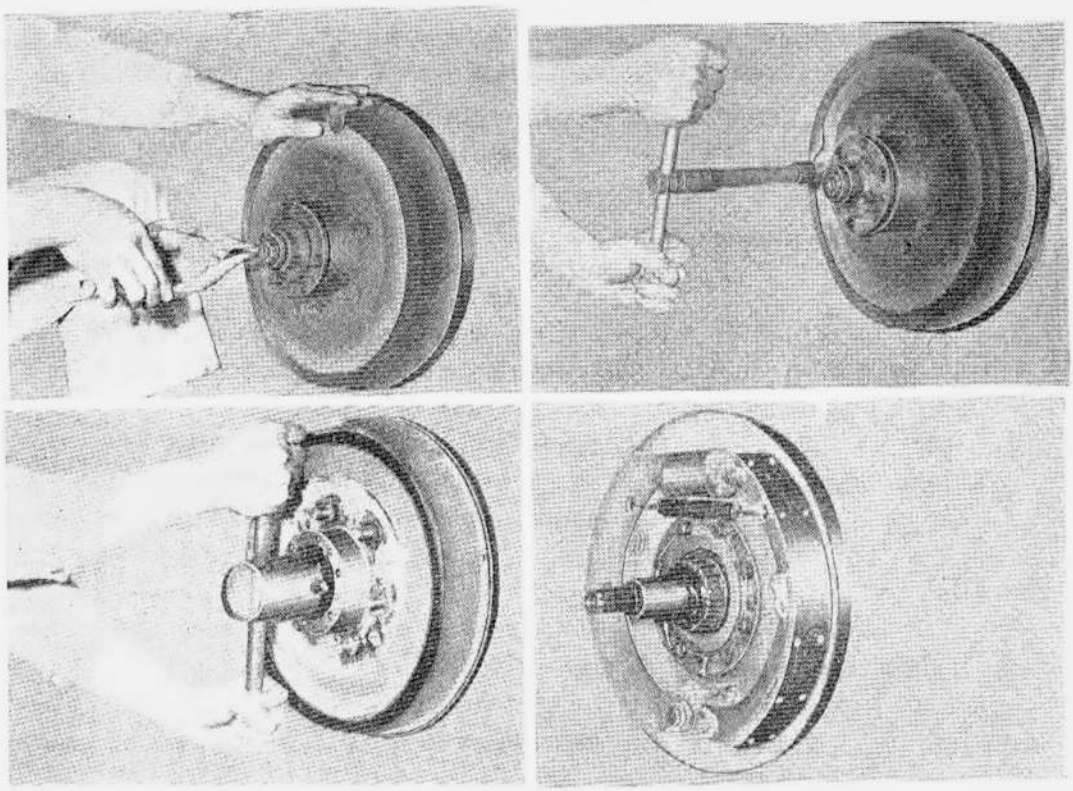
DISASSEMBLING FRONT AXLE

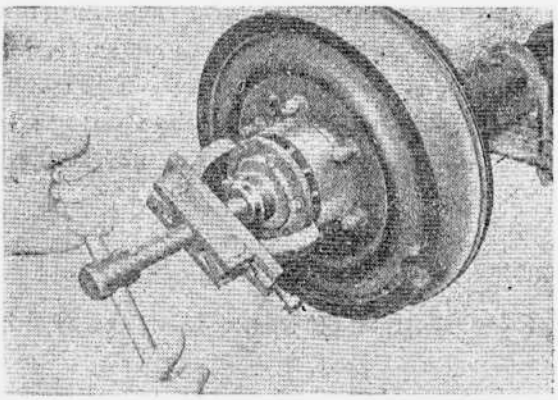
1. Remove flange cap and take off snap ring on end of drive shaft with snap ring expander.

2. Remove drive shaft flange.

To remove flange, unscrew all mounting bolts and screw bolts into service holes to force out the flange.

3. Jack up the vehicle and remove adjusting nuts and lock washers holding the outer bearing. Then shake the wheel to remove the outer bearing and the wheel





If the outer bearing is frozen making it difficult to remove, use special tool BX SST—2034 Universal Puller and utilizing drive shaft flange, remove outer bearing together with brake drum.

4. Remove knuckle spindle lock wire and take off spindle. This will allow the drive shaft, ball joint, and axle shaft to be pulled out.

5. Remove knuckle oil retainer and by removing the 4 bolts on each of the knuckle arm and knuckle shaft, the knuckle can be removed from the ball joint case.

ASSEMBLING FRONT AXLE

The front axle is reassembled by following the above procedure in reverse order.

- *NOTE* -

a. On the adjusting shims in the knuckle bearings, the same number of shims as was formally used must be replaced at the lower and upper parts unless there is exceedingly large play present between the knuckle and knuckle arm, and knuckle shaft. Failure to observe this will cause misalignment in the ball joint.

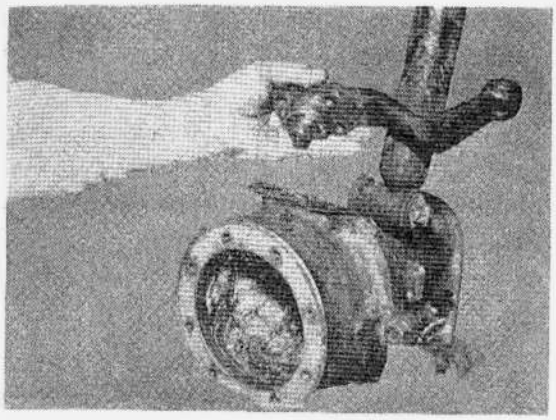
To make a simple check for misalignment, jack up the vehicle and without filling grease and having shift lever in neutral, turn the drive shaft from the outside while turning the steering slowly. If the shaft fails to turn smoothly, the center is misaligned.

b. Use thin gaskets between the knuckle and spindle, just enough to prevent grease from leaking out.

c. Apply grease to the inner and outer bearings before installing. Do not allow grease to enter the space between these bearings since there is danger of grease running into the brake drum.

ADJUSTING FRONT AXLE

1. To adjust knuckle bearing, first check for play by securely tightening knuckle arm and knuckle shaft, and then turning lightly while holding one end of knuckle arm. If play is present, adjust by removing the thinnest shims from the upper and lower adjusting shims.



Adjusting shims are available in 0.5 mm and 0.2 mm sizes.

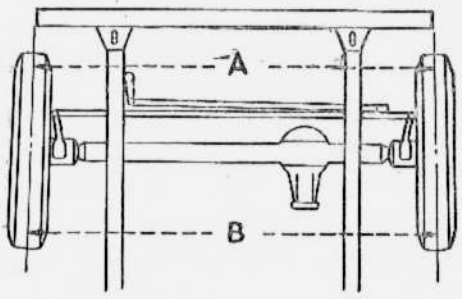
The knuckle bearings are tapered roller bearings so that care should be taken not to tighten these bearing too much as they may become damaged.

2. The wheel bearings are adjusted by screwing the adjusting nuts until tight and then unscrewing about 1/4 turn. The wheels are then checked to see if they turn lightly before tightening the lock nut.

FRONT WHEEL ALIGNMENT

It is necessary that the correct alignment be maintained in the front wheels at all times in order to provide easy and steady steering, and insure long life in the tires. The front wheel alignment for the Land Cruiser are as follows.

Toe-in	3—5 mm
Camber Angle	2°
Caster Angle	1.5°
King Pin Angle	9.5°
Steering Angle Inner	33°
" Outer	26°

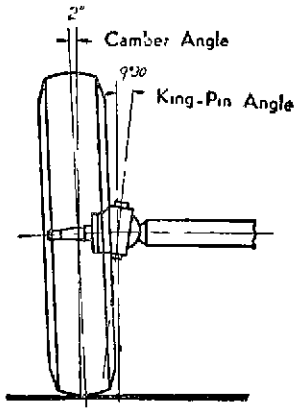


Toe-in

1. Toe-in

Toe-in is the amount which the rear part (B) is made larger than the front part (A). The purpose of providing toe-in is due to the fact that when the vehicle is running, the front wheels tend to spread out because of the effects of camber. By placing the front parts of the wheels slightly inwards, easier running is obtained and the wear in the tires are prevented. To adjust toe-in, use toe-in gauge and vary the length of the tie rod. This should be checked every 2,000 to 3,000 kms.

2. Camber and King Pin Angle

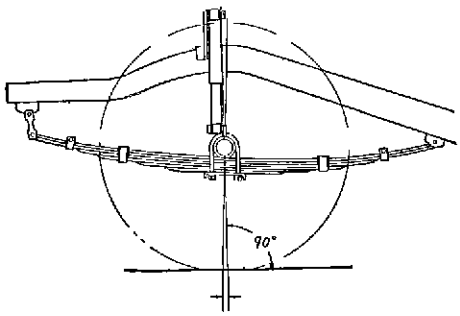


Camber

When the front wheels are viewed from the front, it will be seen that the wheels are installed such that the upper parts of the wheels are spaced farther apart than the lower parts. The angle at which the wheel is declined inwards is known as camber. The reason for providing camber is that steering will become easier if the point at where the tire contacts the ground coincides approximately with the extended center line of the king pin. The reason for placing the king pin at an angle is to not only aid the purpose of camber but is necessary in order to change the horizontal movement of the spindle to that of circular movement for providing returnability to the wheels and giving steering stability when running. Consequently, care should be taken to see that there is no looseness in the bearings and bushings

3. Caster

When front wheels are viewed from the side, it will be seen that the center line through the upper and lower knuckle shaft bearing which serve as king pin is not perpendicular to the surface of the ground but is declined slightly backwards This declining angle is known as camber The purpose of providing caster is because when the vehicle is running, the road resistance is received at the point where the front wheels contact the ground. By tilting the king pin backwards, the road resistance point will be moved back of the king pin center line Thus, the forward motion of the vehicle will become stabilized regardless of road conditions and make steering easier



Caster

4. Turning Angle

The turning angle is adjusted to the specified value through the knuckle stop adjusting bolt installed on the steering knuckle.

MEASURING FRONT WHEEL ALINEMENT

As previously mentioned, toe-in is measured by using toe in gauge The camber, caster, and king pin angle are measured by using the turning radius gauge together with the universal camber caster gauge, the methods being as outlined below.

—NOTE—

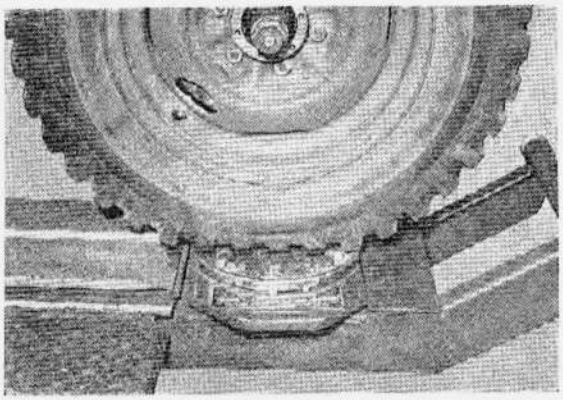
Before using these gauges, it is necessary that a careful check be made for looseness in wheel bearings, tire inflation, wear in king pins and their bushings, condition of springs, and other factors which may affect wheel alinement. All necessary repairs must be made before taking measurements.

1. Method of Measuring Camber

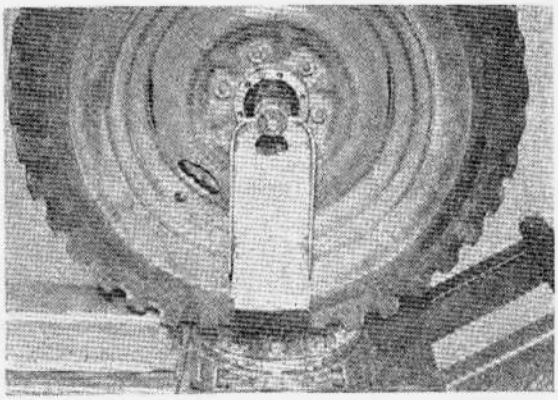
(1) Set front wheels in correct straight ahead position and place on turning radius gauges so that the pointer on these gauges register zero.

(2) Remove front wheel cap and axle hub cover and attach universal camber caster on the knuckle spindle.

(3) The reading shown on the camber graduation of this gauge is the camber angle of the wheel at this condition. This value should be 2°.



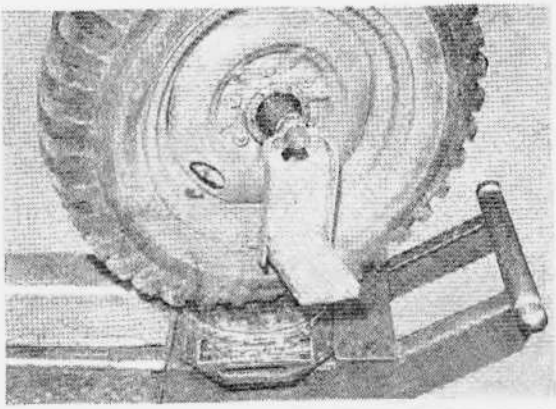
Turning Radius Gauge

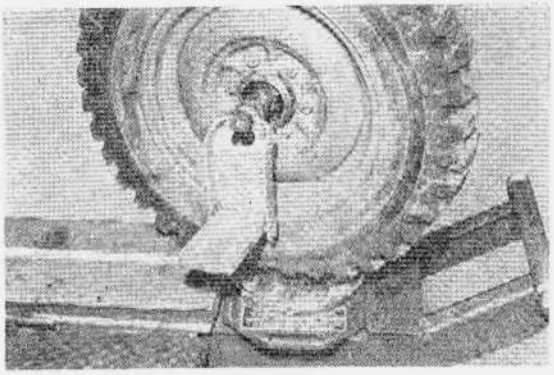


Measuring Camber

2. Measuring King Pin Angle

(1) Set front wheels in correct straight ahead position with the turning radius reading zero.





Measuring King Pin Angle

(2) Turn wheel slowly outwards until the pointer on the turning radius gauge registers 20°. At this position, set king pin angle gauge graduation to zero.

(3) Return wheel back to its original position of zero reading on the turning radius gauge. Then turn wheel inwards until the turning radius gauge registers 20°. The reading shown on the king pin angle graduations at this condition is the king pin angle of the wheel. This value should be 9.5°.

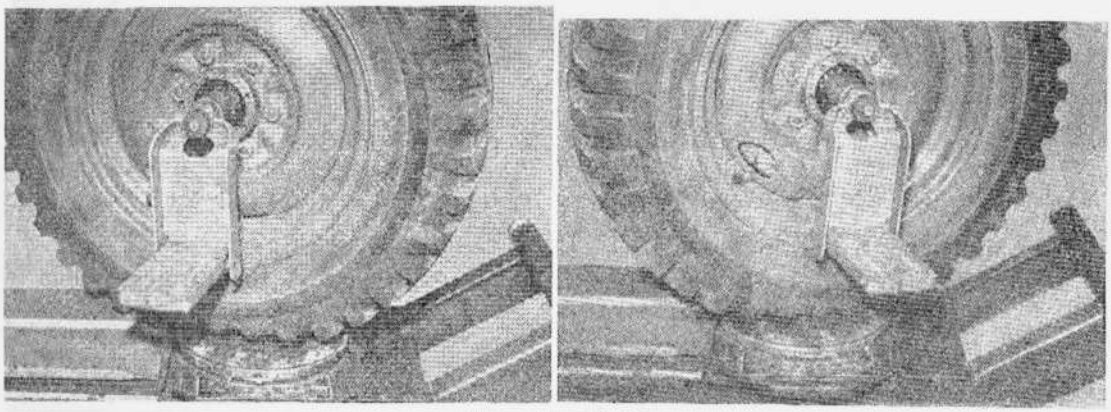
3. Measuring Caster Angle

The caster is measured in similar manner to the king pin angle.

(1) Set front wheels in correct straight ahead position with the turning radius gauge reading zero.

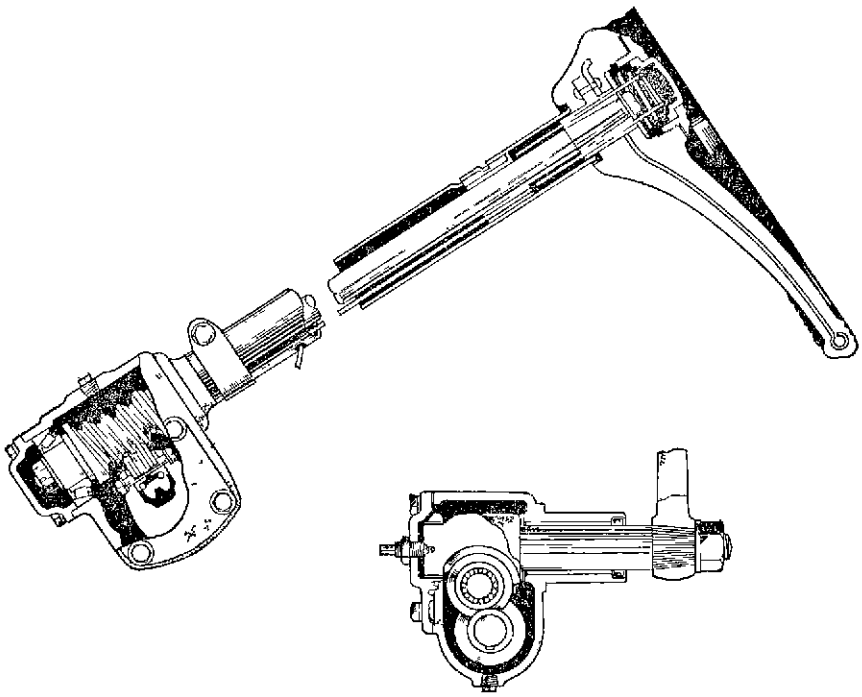
(2) Turn wheel slowly outwards until the pointer on the turning radius gauge registers 20°. At this position, set caster gauge gpaduation to zero.

(3) Return wheel back to its original position of zero reading on the turning radius gauge. Then turn wheel slowly inwards until the turning radius gauge registers 20° in the opposite direction. The reading shown on the caster gauge graduations is the caster angle of the wheel at this condition. This value should be 1.5°.



Measuring Caster

STEERING



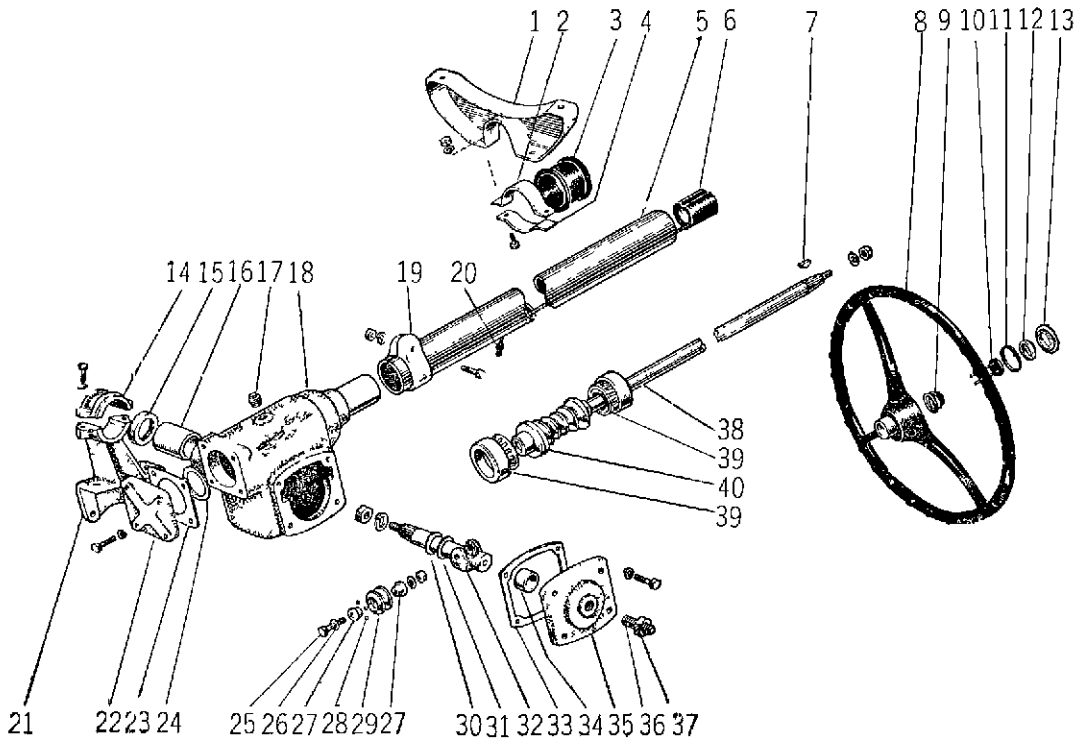
Steering System Specifications

Type	Worm and roller semi-reversible type
Steering Gear Ratio	23 . 1
Worm Gear Upper Bearing	Tapered roller bearing
Worm Gear Lower Bearing	Tapered roller bearing
Steering Wheel Diameter	432 mm
Steering Wheel Material	Hard rubber, steel rim core
Gear Box Oil Capacity	0.47 liter
Minimum Turning Radius	5300 mm
Turning Angle	Inner wheel 33° Outer wheel 26°

CONSTRUCTION AND OPERATION

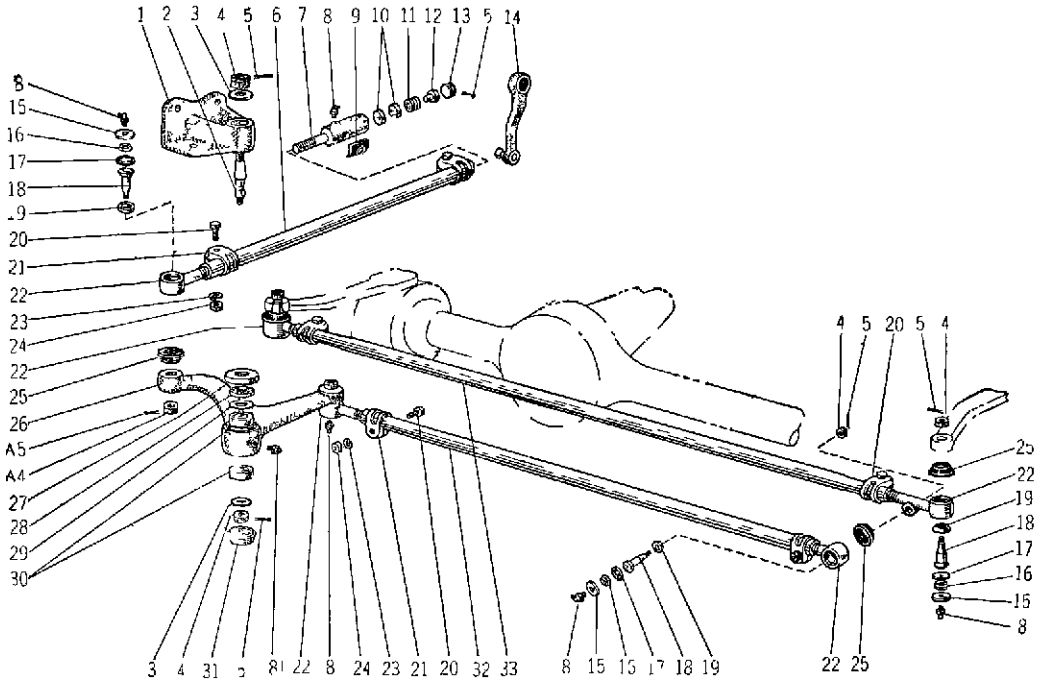
The steering system on the Toyota Land Cruiser is of the semi-reversible type. An hour glass shaped worm gear keyed on to the lower end of the steering main shaft is operated by the steering wheel on the top end of the shaft, and the sector roller which meshes with the worm gear transmits the rotating motion to the steering sector shaft The gear parts are housed inside the steering gear box filled with

Steering Gear Box & Wheel



① *Clamp Stay*
② *Upper Clamp*
③ *Clamp Grommet*
④ *Lower Clamp*
⑤ *Mast Jacket*
⑥ *Bushing*
⑦ *Key*
⑧ *Steering Wheel*
⑨ *Horn Button Spring*
⑩ *Needle Wire*
⑪ *Packing*
⑫ *Horn Button*
⑬ *Horn Button Stop*
⑭ *Gear Box Bracket Cap*
⑮ *Oil Retainer*
⑯ *Sector Shaft Bushing*
⑰ *Oil Plug*
⑱ *Gear Box*
⑲ *Mast Jacket Lower Clamp*
⑳ *Wire Cushion Grommet*
㉑ *Gear Box Bracket*
㉒ *Worm Bearing Cap*
㉓ *Cap Packing*
㉔ *Adjusting Shim*
㉕ *Sector Roller Shaft*
㉖ *Roller Adjusting Shim*
㉗ *Bearing Inner Race*
㉘ *Roller Ball*
㉙ *Sector Roller*
㉚ *Sector Adjusting Shim*
㉛ *Sector Adjusting Plate*
㉜ *Sector Shaft*
㉝ *Gear Box Packing*
㉞ *End Cover Bushing*
㉟ *End Cover*
㊱ *Sector Thrust Screw*
㊲ *Nut*
㊳ *Steering Main Shaft*
㊴ *Worm Bearing*
㊵ *Steering Worm*

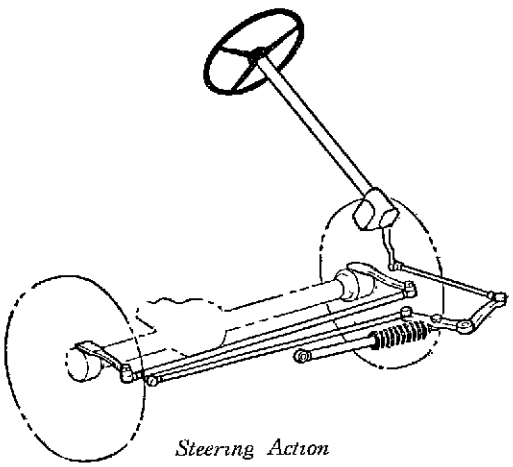
Tie Rod and Drag Link



① *Center Arm Bracket*
② *Center Arm Shaft*
③ *Plate Washer*
④ *Castle Nut*
⑤ *Cotter Pin*
⑥ *Drag Link*
⑦ *Drag Link End*
⑧ *Grease Nipple*
⑨ *Dust Cover*
⑩ *Ball Seat*
⑪ *Seat Spring*
⑫ *Seat Spacer*
⑬ *End Plug*
⑭ *Pitman Arm*
⑮ *End Plug*
⑯ *End Spring*
⑰ *Ball Seat*
⑱ *End Knob*
⑲ *End Ball*
⑳ *Bolt*
㉑ *Tube Clamp*
㉒ *Tie Rod End*
㉓ *Spring Washer*
㉔ *Nut*
㉕ *Dust Seal*
㉖ *Center Arm*
㉗ *Dust Cover Outer*
㉘ *Dust Cover Felt*
㉙ *Inner Plate*
㉚ *Bearing*
㉛ *Center Arm Cap*
㉜ *Relay Rod*
㉝ *Tie Rod*

gear oil so that the gears operate in the oil

The worm gear is supported at front and rear with tapered roller bearings and is made such that its axial play can be adjusted through the nut at the front end of the housing. The sector roller is supported by the sector roller shaft pin with ball bearings and fits on to the forked part of the steering sector shaft This sector shaft is supported on the housing with bushings This gear part is very well constructed from standpoint of large contacting surface, power transmission, frictional losses, heating, and wear. All shaft supporting parts of the housing are provided with oil retainers to prevent leakage of oil



Steering Action

The steering main shaft to which the worm gear is attached, is installed inside the mast jacket The steering wheel is keyed on to the top end of this shaft and fixed with a nut.

The end of the sector shaft is provided with tapered serrations One end of the Pitman arm fits on to this part and is fixed with a nut, and the other end provided with Pitman arm knob, connects on to one end of the forked part of the center arm through the drag link. This steering center arm is installed on the center arm shaft through a bearing and the arm shaft is fixed with a nut to the center arm bracket riveted on to the frame.

The other end of the center arm is connected to the steering relay rod. This relay rod connects on to the tie rod, and this tie rod connects to the steering knuckle arms through the tie rod ends.

The drag link is provided with a ball seat to receive the ball part of the Pitman arm knob with spring and drag link end plug to hold it in place The relay rod to center arm connection and tie rod end connections are also made so that the ball part of the end knob is received in a seat and provided with a spring to hold the ball against the seat. Thus, even when these knob connections on the Pitman arm and knuckle arms are subjected to considerable distortion from wheel vibration, they are unaffected and are able to operate smoothly.

The knuckle arm is attached with 4 bolts to the upper surface of the steering knuckle The other end is linked with the tie rod to the knuckle arm attached to the steering knuckle on the other side Thus, when the steering wheel is turned in the driver's cab, this motion is reduced by the worm and sector roller inside the gear box and transmitted through the Pitman arm, drag link, sector arm, relay rod, tie rod, and knuckle arms to turn the left and right steering knuckles about the

steering knuckle bearings as centers.

The various links and main parts of the steering system are of forged steel properly heat treated to provide ample durability and strength.

DISASSEMBLING AND REPAIRING STEERING SYSTEM

When the steering gear, that is, the gear tooth on the worm and roller, tapered roller bearings, roller shaft bushings and other parts become worn or damaged requiring replacement, the disassembly and repairs should be made in accordance with the procedures outlined below.

1. Removing Steering Assembly

a. Remove horn button

By unscrewing the horn button stop on the center of the steering wheel, the horn button together with its spring can be taken out

b Remove steering wheel

Unscrew nut on end of shaft, and using steering wheel puller (SST—2081), pull out steering wheel from main shaft as shown in the illustration.

c Remove Pitman arm from sector shaft.

Unscrew nut holding Pitman arm, and using puller (SST—2082) pull out Pitman arm from serrated part of sector shaft.

d. Remove steering gear box support upper.

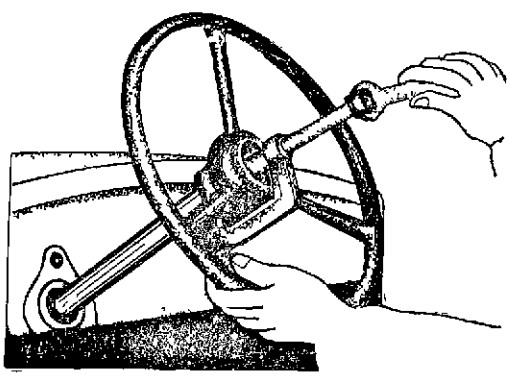
To remove, unscrew 2 bolts attaching gear box support upper.

e By pulling the steering shaft together with the gear housing assembly to the front, these can be removed from the vehicle as an assembly.

2. Disassembling Steering Assembly

After removing steering assembly from the vehicle, remove filler cap from steering gear box and drain out gear oil. Then hold in a vise and proceed as follows.

a. Unloosen bolts holding lower clamp on steering mast jacket and pull out mast jacket from steering main shaft



Removing Steering Wheel

b Unscrew 4 bolts holding flange cover on steering roller gear and remove flange cover. The sector shaft assembly can then be removed

c. Unscrew 4 bolts holding worm rear bearing cap and remove cap and rear tapered roller bearing cone The steering main shaft worm gear assembly together with front tapered roller bearing cone can then be taken out from the case

d To remove the worm gear from the main shaft, a press is used to force out the gear.

This completes the disassembly of the steering gear assembly All disassembled parts are thoroughly washed with kerosene and blown dry with compressed air The parts are carefully inspected and any part found worn or damaged should be replaced with new parts. When reassembling, follow the above procedure in reverse order and make the correct adjustments by the following methods

3. Adjusting Steering Gear

End Play on Steering Main Shaft

(Adjusting axial play in worm gear)

When installing worm gear inside the steering gear box, the center of this hour glass shaped worm gear must position correctly with the turning axis of the roller shaft. When installing, the number of adjusting shims on the outer side of the bearing are increased or decreased to suit.

The bearing and its cup are assembled, the adjusting rear plate packing is placed against this and the cap attached with 4 bolts tightened uniformally The housing is then held in a vise and the main shaft turned to check for tightness and axial play

In this adjustment, a small number of packing should be used at first to make the main shaft turn rather tight. The number is then increased one at a time, the cap being attached and the bolts tightened uniformally each time a packing is added, until correct adjustment is made when the main shaft turns easily without axial play

—NOTE—

The standard number of adjusting shims and packings are as follows

Steering worm front bearing adjusting shims

Thickness 0 5 mm . . . . 1 pc., 0 1 mm . . 1 pc,
and 0 2 mm . . . 1 pc

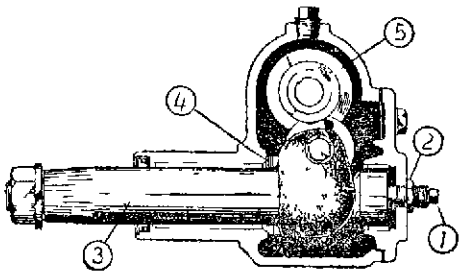
Steering worm bearing cap packing

Thickness 0.5 mm . . 4 pcs, 0.2 mm . . . 1 pc

Axial Play On Roller Shaft

Adjustment for axial play on the roller shaft is made through the adjusting thrust screw provided on the sector bearing plate. However, this adjustment can only be made when the sector roller and worm gear are meshing at the proper position. The roller can be positioned correctly by increasing or decreasing the number of sector adjusting shims between the forked part of the sector shaft and housing.

Adjusting Axial Play in Sector Shaft



① *Adjusting Screw*
② *Locknut*
③ *Sector Shaft*
④ *Adjusting Shim*
⑤ *Steering Worm*

The correct meshing position of the roller a d worm is when the roller is slightly off to one side of the center line of the worm as shown in the figure By decreasing the number of the above adjusting shims, the roller will come closer to the worm so that decreasing shims will make the mesh tighter and increasing shims will make the mesh looser To adjust, install steering wheel on end of main shaft and while holding the sector roller shaft with hand, turn the steering wheel in both directions The point on the steering wheel where the roller shaft is felt to begin turning is made the starting point and adjustments made by increasing or decreasing the number of shims until there is about 1 inch (25 4 mm) play in the steering wheel

—NOTE—

The standard number of steering sector adjusting shims are as follows

Thickness 0 31 mm . . . 6 pcs 0 61 mm . . . . 5 pcs

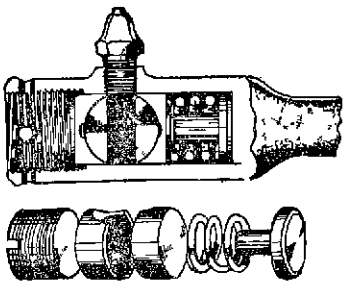
When the steering system is properly assembled from the steering wheel to the front wheels, the correct play on the steering wheel will be about 2 inches (50mm) measured on the circumference of the steering wheel.

After the mesh between the roller and worm is properly adjusted, the 4 bolts attaching sector bearing plate are securely tightened and through the adjusting thrust screw provided on this plate, the axial play in the roller shaft is adjusted. The adjustment is made by loosening the locknut and tightening thrust screw until the steering shaft feels heavy to turn Then the screw is loosened 1/4 to 1/2 turn and the locknut tightened to complete the adjustment.

Finally, the steering wheel is turned in both directions to check if all parts operate smooth without looseness

4. Disassembling and Adjusting Drag Link Ends

The part of the drag link connecting on to the Pitman arm receives the Pitman arm knob ball in the ball seat The seat is pressed down by a spring through the ball seat spacer and this spring is fixed by the drag link end plug To disassemble, the cotter pin provided on the end plug is pulled out and by prying out the plug with a screwdriver, the parts inside can be taken out easily.



Drag Link End Detail

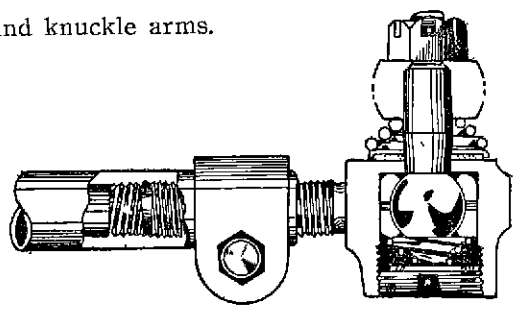
Before reassembling, carefully check all parts for wear and the spring for lost tension All defective parts found should be replaced All sliding parts especially the ball seat are amply greased and inserted in the proper order after which the knob part is inserted and the plug on the link end is screwed in tight. The plug is then loosened about 1/2 turn and final adjustment made so that connecting part slides easily with no looseness When this is completed, the cotter pin for the plug is inserted and locked This operation is performed on both ends of the link

5. Disassembling and Reconnecting Tie Rod End

The tie rod ends are provided with knobs to form ball joints as shown in the illustration. This type of connection are used at the following parts with minor differences depending on the part.

1. Connection between steering relay rod and center arm.
2. Connection between drag link and center arm
3. Connection between relay rod and tie rod
4. Connection between tie rod ends and knuckle arms.

To disassemble, pull out cotter pin from tie rod end plug and remove plug This will allow the spring and ball seat to be taken out Next pull out cotter pin from nut on knob end and unscrew this nut After this, hold the tie rod with hand and lightly hit the other connecting part to disconnect the knob from the arm end to pull the knob out from the tie rod end.



Tie Rod End Detail

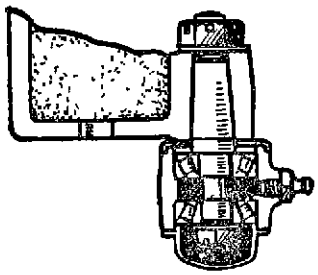
The relative position of the parts are as shown in the figure but before assembling, carefully check all parts and apply liberal grease to the parts The knob nut is tightened securely and locked with cotter pin Finally, the end plug is properly tightened and the cotter pin inserted to fix the plug

—NOTE—

When knocking out the knob from the knuckle arm, care should be taken not to hit the screw threads The knob can be removed easily by lightly tapping the knuckle arm end.

6. Removing and Installing Steering Center Arm.

The steering center arm is attached through 2 bearings to the center arm bracket installed on the frame The center arm shaft is tapered and this tapered part fits into the center arm bracket The shaft hole in this bracket into which



the shaft fits into has the same taper as the shaft The castle nut through a plate washer holds the end of the shaft down, the nut being prevented from turning with a cotter pin Between the center arm and arm shaft are the two upper and lower tapered roller bearings to permit free rotation of the shaft.

To remove center shaft.

1. Pry off steering center arm cap with screwdriver.

2. By pulling out cotter pin and unscrewing castle nut, the plate washer together with the tapered roller bearings can be removed

3. By taking out tapered roller bearings, the center arm can be removed.

To reassemble, follow the reverse order for disassembling.

However, when screwing on castle nut, take care not to screw on too tight but just enough to allow the center arm to turn freely and then lock with cotter pin

7. Assembling Steering Link Mechanism

When the steering link mechanism is disassembled, the reassembly is made by the following procedure

a. Match the mating marks on the steering sector shaft and Pitman arm and assemble these parts.

b. Turn the streering wheel fully to the left and right and count the number of turns required to determine the center position.

c. Connect drag link end to Pitman arm.

d. Connect other end of drag link to steering center arm.

In this case, adjust the length of the drag link so that the other arm of the steering arm is parallel to the frame.

e. Adjust front wheel toe-in correctly.

f. With the wheels positioned at correct toe-in, adjust the length of the relay rod and install tie rod.

MAIN TROUBLES IN STEERING SYSTEM

1. Steering Wheel Becomes Hard To Operate

When this case arises, jack up the front axle at the center part to lift up the front wheels from the ground, and try turning the steering wheel If it turns exceedingly easy, the main cause can be assumed to be due to defects in king pin part Hard steering can also be caused by low inflation in tires If the steering wheel is still hard to turn after jacking up, the cause will be due to some trouble within the steering system so that in this case, the drag link is disconnected from the Pitman arm and the operation of the steering system up to the steering gear is checked.

If in this case, the steering becomes easy, the trouble will be in the system after the drag link, and reversely, if the steering remains hard the trouble will be in the mechanism up to the sector shaft

a For cause of trouble in the mechanism up to the sector shaft.

1 Steering gear damaged or improperly adjusted.

2. Steering main shaft or mast jacket is bent.

3. Lack of oil in steering gear box.

b For cause of trouble in the mechanism after the drag link

1 Ball joint in drag link end or tie rod end is improperly adjusted (Over tightened)

2 Lack of oil in above ball joint.

3. Steering knuckle bearing (thrust bearing) damaged

4 Incorrect camber due to defective front wheel bearing.

5. Front axle deformed or front spring broken.

The cause for steering wheel being hard to operate can be traced to one of the above causes so that careful check should be made on these items and parts found defective should be repaired immediately and adjustments made before major trouble develops.

2. Steering Wheel Shakes

The above trouble develops when the play in the steering wheel becomes excessive or is caused by improper alignment of front wheels shaking the front wheels and transmitting this motion to the steering wheel.

This shaking action becomes greater as the road conditions become worse and as the running speed increases. When checking, the vehicle should be run at least up to 50 kms per hour and at the same time checks should be made while running on bad roads

Check for play in steering wheel is made by jacking up the vehicle and turning the steering wheel in both directions and determining the positions where the front wheels just begin to turn The distance between these points measured on the circumference of the steering wheel should be about 2 inches (50 mm) If the play is greater than this, it is due to the following causes and these causes are the principal reasons for the steering wheel to shake

a Steering gear worn.

b Ball joints on both ends of drag link have excessive play

c Tie rod ends on tie rod and relay rod worn worn excessively.

d. Front wheel bearing worn

e Steering knuckle bearing worn.

f Backlash between steering worm and sector roller too great.

g. Too many adjusting shims in steering knuckle resulting in excessive play in bearings

h Front wheel not balanced properly

In addition to the items listed above, the following causes can also result in the front wheel shaking so that these should also be carefully checked.

a When the connection between the steering gear box and frame is loose and when the sector shaft adjusting screw is loose.

b. Looseness in connection between steering knuckle and knuckle arm.

c. Looseness in tie rod end

d Looseness in front axle U-bolt

e Front spring shackle bolt or its bushing excssively worn.

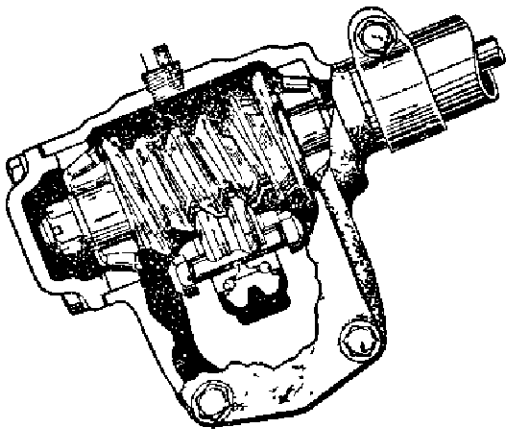
f. Front axle deformed or installed out of alignment.

g. Improper thickness of caster wedge

3. Steering Wheel Turns to One Side

While running, the steering wheel tends to turn to one side and obstructs the self righting action of the vehicle. This symptom may appear as a natural tendency of the vehicle itself after being used for a long period of time but generally it appears after an accident such as collision, big side slip, and running into a large hole in which the front axle system became abnormal due to receiving a large shock. In above case, inspection and repairs should be made at once before the trouble develops into a major breakdown or becomes a regular tendency of the vehicle.

The following are the list of causes which may result in the steering wheel to turn to one side.



Steering Gear Box Detail

a Front spring broken or badly deformed on one side.

b. Front wheels out of alignment or tire inflation not uniform.

c. Frame deformed so that the relative position of the front or rear axle to the frame is not at right angles.

d. Rear axle housing deformed

LUBRICATION OF STEERING SYSTEM

The steering system is an important unit in the operation of the vehicle so that in order to make its action smooth and prevent wear in its mechanism, lubricating points have been provided on its moving parts for replenishing recommended lubricants at periodical intervals

The Toyota Land Cruiser is provided with the following lubricating points.

1. Steering gear housing.
2 Ball joint on both end of drag link
3. Tie rod sockets on ends of tie rod and relay rod.
4 Steering sector arm

For steering gear lubrication, remove filler plug and check and replenish oil every 5,000 kms After every 15,000 kms, replace with new oil

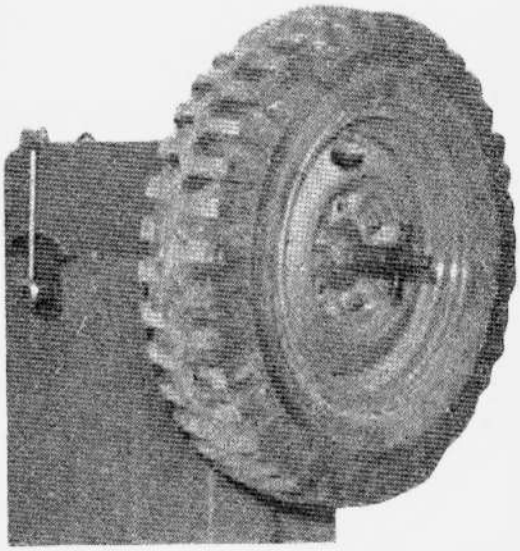
Outside of steering gear, the other parts are provided with grease nipples. On these parts, use grease gun and replenish with new grease every 2,000 kms.

Steering Gear Oil

Oil Recommended	{Summer SAE No. 140 {Winter SAE No. 90
Gear Box Capacity	0.47 liter
Replenish Gear Oil	Every 5,000 kms
Change Gear Oil	Every 15,000 kms

SIMPLE METHOD OF BALANCING TIRES

If a wheel balancer is available, a perfect balance can be made both statically and dynamically. If not available, a static balance can be made easily by the following method.



1. Jack up front wheel and arrange tire vertically.
2. Remove flange cap, snap ring, and flange from front drive shaft.
3. Loosen adjusting nut on front wheel outer bearing and adjust so that the wheel turns lightly and smoothly. Also adjust brakes if they are scraping.
4. Turn the wheel lightly by hand and make a chalk mark at the bottom part when it stops. Turn the wheel again to check and if it stops again at the same position, place the two lightest balance weights on the opposite position. (The two balance weights must be of the same weight).

If this still results in the wheel stopping at the same position, replace with heavier weights until the side with the balance weights becomes slightly heavier. Then move the weights apart until the wheel will stop at any position to complete balancing.

For convenience, the balance can sometimes be made by placing a single weight on the side opposite to the heavier side.

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