

STEERING

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GENERAL

The steering system allows the driver to freely change the traveling direction of the vehicle. The steering force of the steering wheel is transmitted through the steering shaft, power steering booster, pitman arm and drag link to the knuckle arm to steer the vehicle.

The system has an integral type power steering booster installed in the gear box to reduce the steering effort.

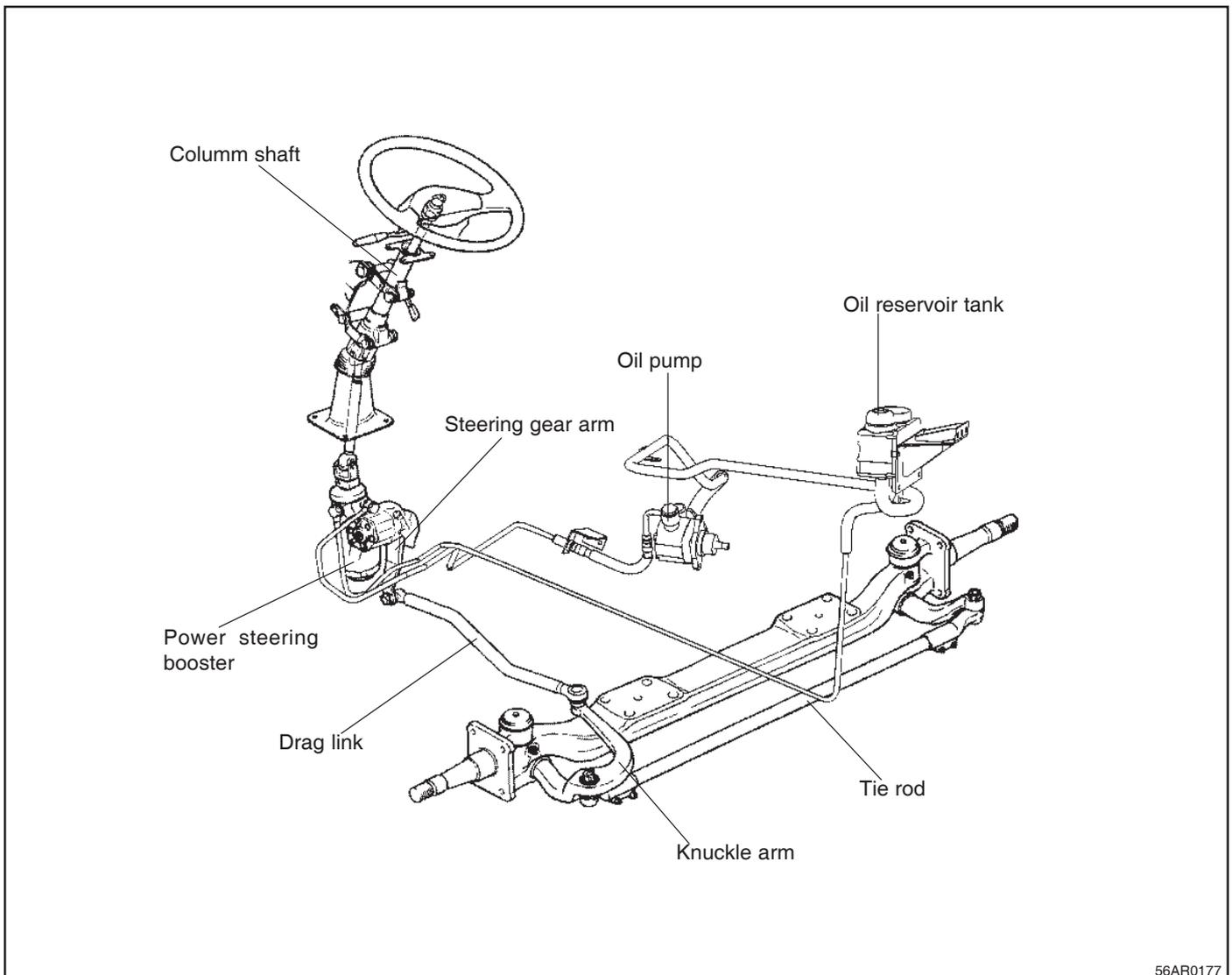
The power steering system hydraulic pressure circuits are as shown below.

Oil tank → Oil pump → Power steering booster



Integral power steering booster

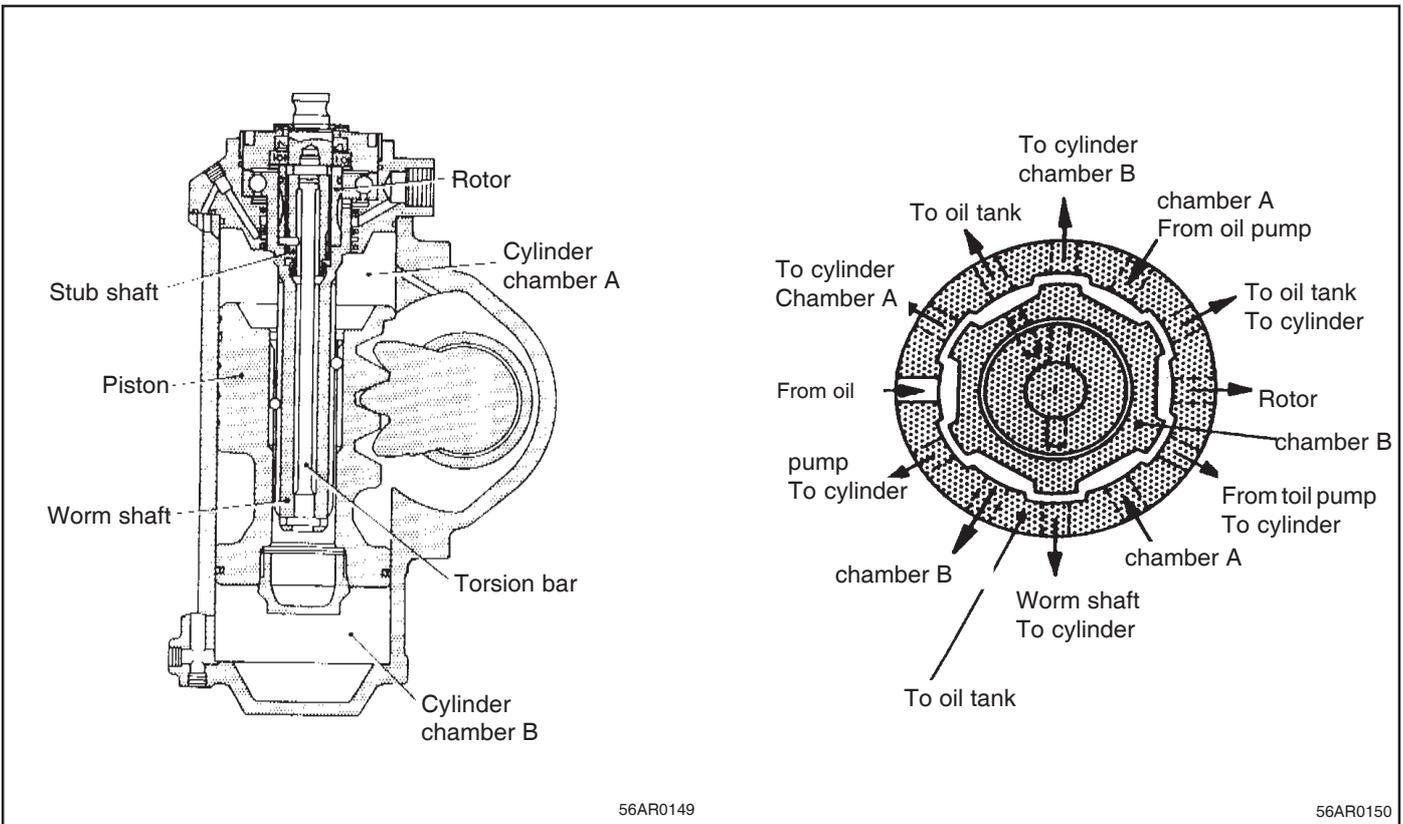
The integral power steering booster to reduce the steering effort consists of the power cylinder section (output section) serving also as the steering gear and the control valve section (control section).



(1) When traveling straight ahead

Operation of integral power steering booster
(when traveling straight ahead)

When there is no steering torque from the steering wheel, no relative displacement occurs between the stub shaft and worm shaft, so that the rotor remains in the neutral position of the worm shaft. Therefore, the hydraulic fluid delivered from the oil pump directly passes through the worm shaft groove to return to the oil tank. In other words, no operating pressure difference is produced between the cylinder chambers A and B and as a result, the piston remains in the neutral position and does not move.

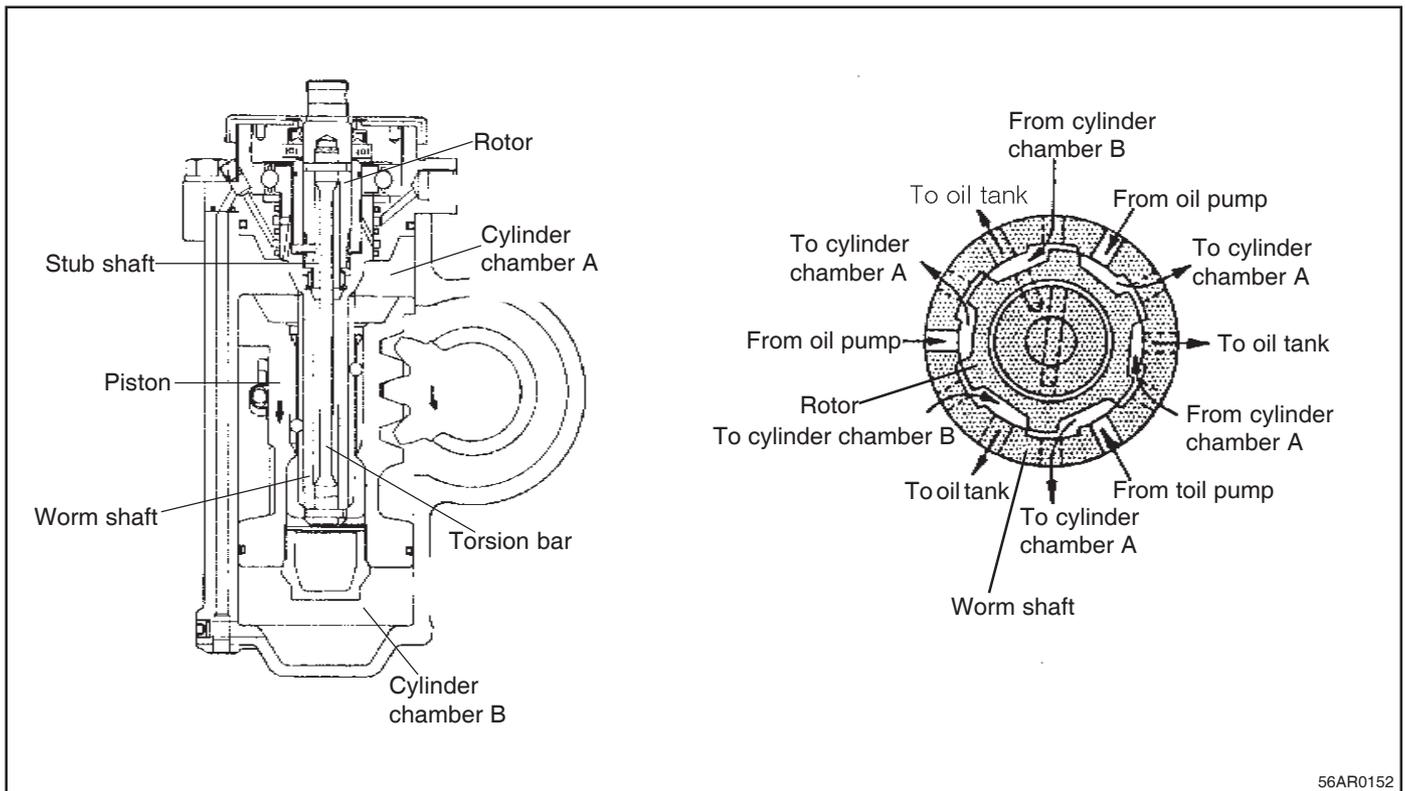


(2) Right turn

Operation of integral power steering booster
(when right turn is made)

When the steering wheel is turned clockwise, the load from the tires acts on the worm shaft to twist the torsion bar. As a result, the rotor turns clockwise with respect to the worm shaft, decreasing the axial direction groove clearance. This limits flow of the hydraulic oil to the oil tank and now the hydraulic oil from the oil pump enters the cylinder chamber A to cause the piston to move to the cylinder chamber B. The hydraulic oil in the cylinder chamber moves, the torsion bar that has been twisted returns to the neutral position. The force that has caused twisting of the torsion bar during steering is transmitted to the steering wheel as a steering reaction force which gives the driver a sense of steering response.

A left turn is also made on the same operating principles as the right turn but in opposite direction.



(3) Manual steering

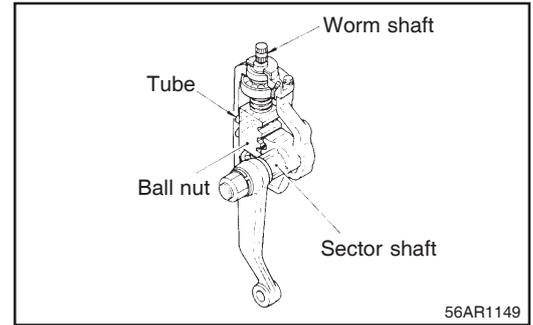
Even if the hydraulic pressure ceases to act on the power steering booster due to a stalled engine, defective oil pump, oil leaks or other causes, the mechanical power is directly transmitted from the stub shaft to the worm shaft by the stopper mechanism provided between the stub shaft and worm, allowing manual steering.

Steering gear assembly (recirculating ball type)

In this steering gear assembly, many balls are interposed between the worm shaft screw and the ball nut to transmit the turning effort of the worm shaft through the ball nut to the sector shaft.

The ball nut is fitted with a pair of tubes. Each end of the tube is tongue-shaped and is connected to the end of ball passage to recirculate the balls.

Sliding friction is replaced by rolling friction by interposing the balls between the worm shaft and the ball nut, allowing the driver to operate the steering gear with a light steering effort.



SPECIFICATIONS

| Item | Vehicle model | HD120 |
|-------------------------|---------------|--|
| Steering wheel | | |
| Type | | 2-spoke type |
| Steering shaft | | Universal joint type(Telescopic-Tilt type) |
| Power steering booster | | |
| Type | | Integral type |
| Cylinder inner diameter | | ∅90 |
| Piston operating area | | 63.6cm ² |
| Regulsated pressure | | 105kg/cm ² |
| Oil capacity | | 1ℓ |
| Power steering oil pump | | |
| Type | | Vane type |
| Delivery rate | | 15cc/rev. |
| Fluid flow rate | | 12ℓ /min. |
| Relief set pressure | | 105 kg/cm ² |
| Allowable rpm range | | 500~6000 rpm |
| Power steering oil tank | | |
| Type | | Oil pump separating type |
| Capacity | | 1.4ℓ |

SERVICE STANDARDS

SERVICE STANDARDS TABLE

Unit:mm

| Maintenance item | | Nominal Value (Basic diameter) | Limit | Remedy | |
|--|---|------------------------------------|---------------------|-----------------------------|---|
| Steering wheel and shaft | Steering wheel play | | 20-40 | Adjust | |
| | Steering upper shaft | Play in axial direction (vertical) | 0.2 or less | Correct or replace assembly | |
| | Play of joint in turning direction (play of needle bearing and spider) | | 1.5' or less | Replace assembly | |
| | Play of yoke spline tube and steering lower shaft (spline shaft) in turning direction | | 30' or less | Replace assembly | |
| Steering linkage | Sleeve lever shaft and bushing to clearance (Brg type) | | 0.015 to 0.111 | 0.4 [38] | Replace |
| | Connecting link pin and bushing to clearance | | 0.045 to 0.175 [42] | 0.4 | Replace |
| Steering gear sector | Sector shaft O.D. | Pitman arm side | 38 | 37.9 | Replace |
| | | Side cover side | | | |
| | Ball nut rack spline and sector shaft to clearance | | | 0.2 to 0.5 | |
| | Worn shaft starting torque kg·cm | After sector shaft installation | 4 to 8 | | Lower cover Bending adjusting |
| Before sector shaft installation | | 4 to 7 | | Adjust of Adjustment screw | |
| Integral power steering booster | Play of ball nut assembly in axial direction | | | 0.04 | Replace |
| | Body to ball nut clearance | | 0.11 [90] | 0.16 | Replace |
| | Rotor to worm shaft clearance | | 0.01 to 0.03 [35.5] | 0.03 more than | Replace |
| | Sector shaft O.D. | Pitman arm side | 57.975 | 57.875 | Replace |
| | | Side cover side | 47.975 | 47.875 | Replace |
| Backlash between ball nut rack and sector shaft gear | | 0.1 to 0.35 | | Adjust | |
| Power steering | Ridge wear on pressure plate and side plate surfaces in friction with rotor and vane | | | 0.01 | No sticking wear and streaks Replace |

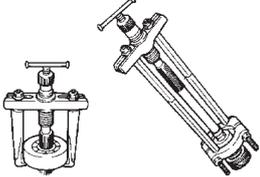
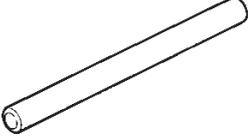
Unit:mm

| Maintenance item | | Nominal Value (Basic diameterine) | Limit | Remedy |
|------------------|---|--------------------------------------|-------|--|
| Power steering | Flow control valve to rear body clearance | | 0.03 | No sticking wear and streaks Replace as flow control valve assembly or rear body assembly |
| | Pump relief set pressure Mpa (kg/cm ²) at 1,800 rpm | 105 | | Replace as flow control valve assembly or rear body assembly |

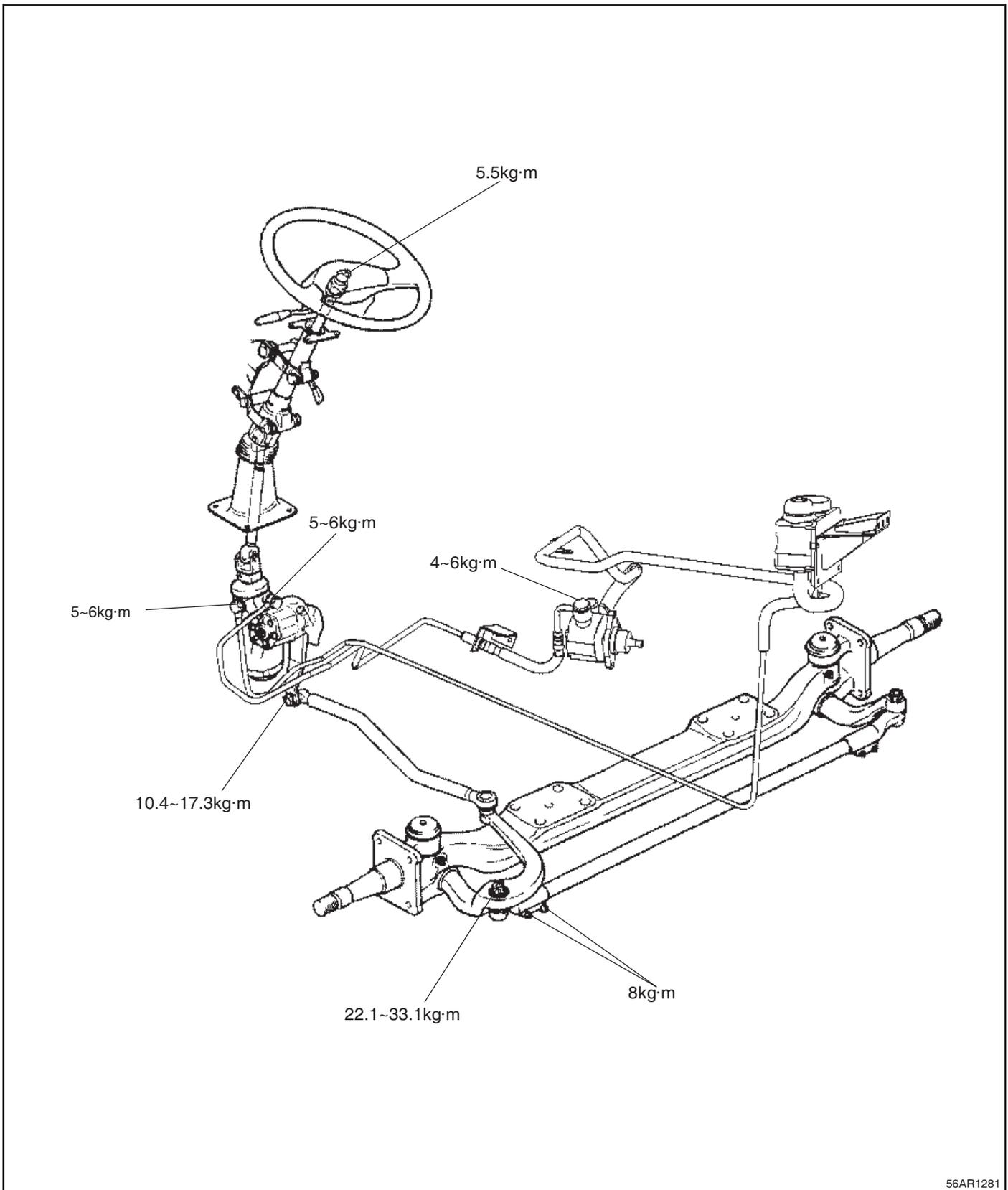
Tightening Torque Table

| Location tightened | | Screw size O.D. x pitch (mm) | Tightening torque (kg.m) |
|---------------------------------|-----------------------------------|---------------------------------|---|
| Steering shaft | Steering wheel nut | M20 x 1.5 | 5.5 |
| | Worm shaft and yoke mounting bolt | M10 x 1.25 | 5 to 5.5 |
| | Lock plate bolt | M5 x 0.8 | 0.4 to 6.0 |
| | Grease nipple | M6 x 0.75 | 0.3 to 0.5 |
| Link and bracket | Steering shaft | M12 x 1.25 | 3.7 |
| | Lock lever bolt | M18 x 1.25 | 1 |
| | Steering lever | M12 x 1.25 | 2 |
| Linkage | Ball stud castle nut | M20 x 1.5 | 20.7 to 34.5 |
| Integral power steering booster | Pitman arm nut | M36 x 1.5 | 40 to 45 |
| | Ball tube screw | M6 x 1.0 | 0.45 to 0.55 |
| | Taper plug | PT 1/8 | 0.9 to 1.3 |
| | Retainer | M32 x 1.5 | Tighten fully, turn back by 180°, tighten again to 39 (4), then turn back by 20° and stake. |
| | Adjusting screw lock nut | M14 x 1.5 | 12 to 13 |
| | Side cover bolt | M12 x 1.25 | 5.5 to 6.5 |
| | Adjusting plug | M80 x 1.5 | 23 to 25 |
| | Valve housing bolt | M16 x 1.5 | 12 to 13 |
| | Lock ring | M80 x 1.5 | Tighten lock ring with 12kg·m, and secure 2 points not to be removed. |
| Power steering oil pump | Plug | M48 x 1.5 | 30 to 40 |
| | Cartridge assembly screw | - | 0.6 to 0.9 |
| | Rear body bolt | | 5 to 6 |
| | Flow control valve plug | | 5 to 6 |
| | Hose connector bolt | | 1.8 to 2.5 |
| Power steering oil tank | Oil pump gear tighten nut | | 9 |
| | Plate screw | M6 x 1.0 | 0.4 to 0.5 |

SPECIAL TOOLS

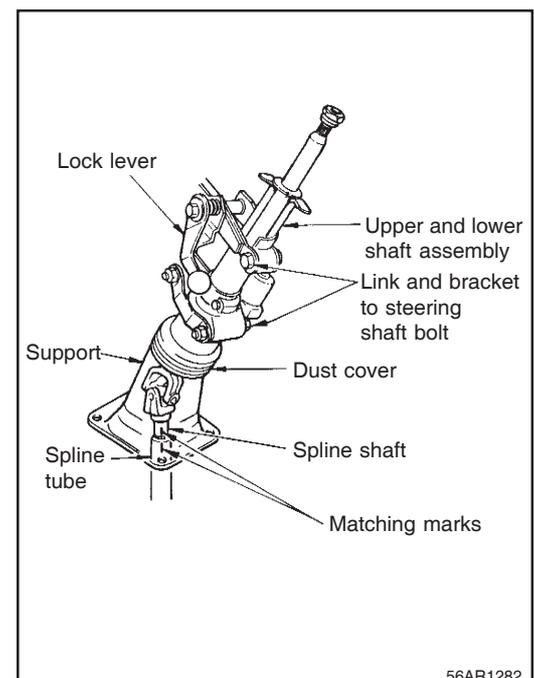
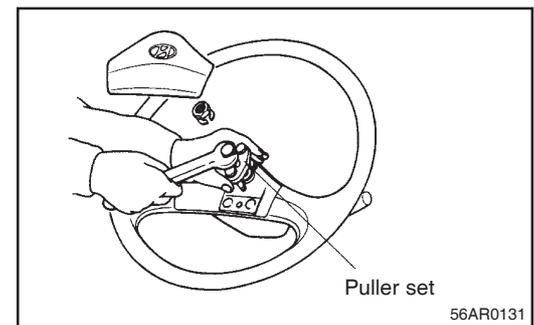
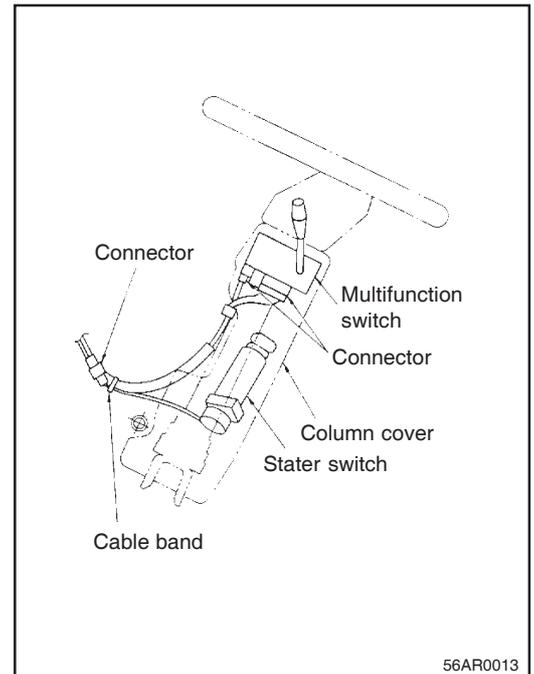
| Tool (Number and name) | Illustration | Use |
|---------------------------|--|---------------------------------|
| Puller set 09431-83100 |  ASST0030 | Removal of gear and bearing |
| Drift 09517-83300 |  ASST0020 | Removal of oil seal and bearing |

SERVICE PROCEDURE REMOVED AND INSTALLATION

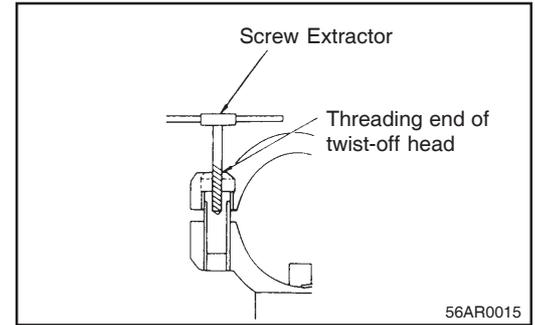


STEERING SHAFT**Removal**

- (1) Remove the negative terminal of the battery.
- (2) Remove the column cover.
- (3) Remove the cable band and remove all starter switch connectors.
- (4) Remove the multifunction switch connector.
- (5) Insert the key and turn to the ON position.
Remove the engine stop cable from the starter switch.
- (6) Remove the steering wheel using the special tool, puller set.
- (7) Remove the multifunction switch.
- (8) Fix the steering using lock lever and put matching marks to the spline shaft and spline tube.
- (9) Remove the dust cover from the column end and remove the support attaching bolts.
- (10) Remove the link and bracket to steering shaft bolts.

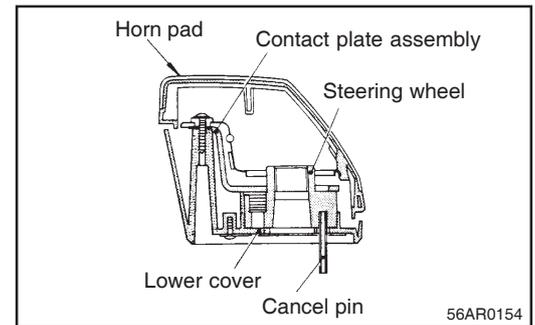
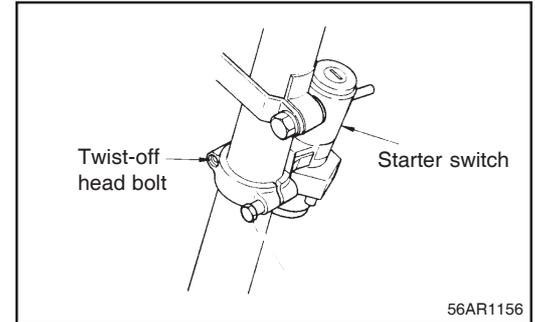


- (11) Remove the steering upper shaft assembly and spline shaft assembly together with the starter switch.
- (12) Hold the column end in a vise and drill a 5.5 to 6.0 mm diameter, 10 to 15 mm deep hole in the end of the twist-off head bolt from which the head has been removed.
- (13) Turn the special tool, Screw Extractor, counterclockwise to thread it into the hole until the bolt is removed.
- (14) Remove the starter switch from the steering column.

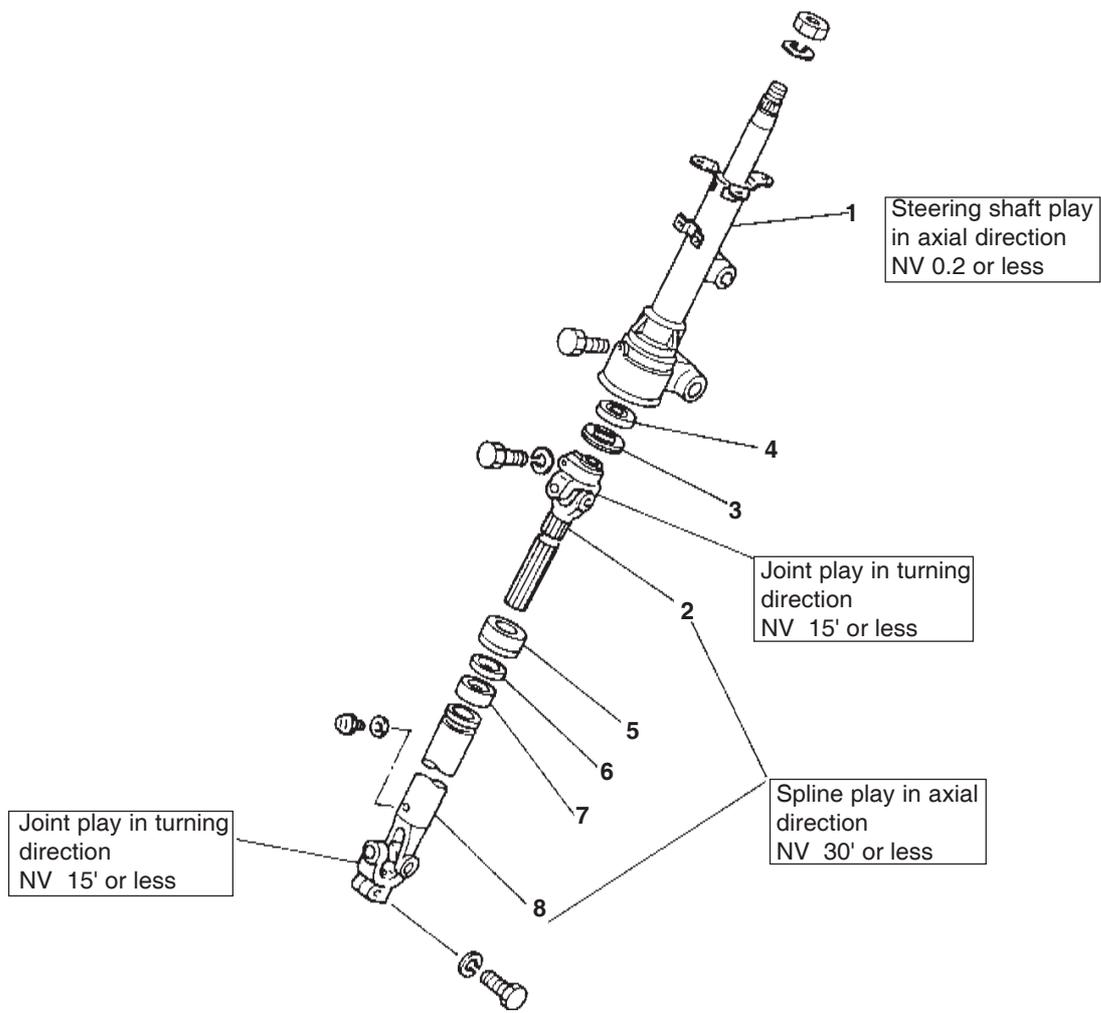


Installation

- (1) Install a new twist off head bolt and tighten it to 13 to 15 Nm (1.3 to 1.5 kgfm) to twist off the bolt head.
 - (2) After installation, make sure that the steering lock functions properly.
 - (3) If no abnormality is found, reverse the removal procedure to make installation.
- (4) Install the steering wheel as shown in the illustration.



Disassembly, inspection and correction

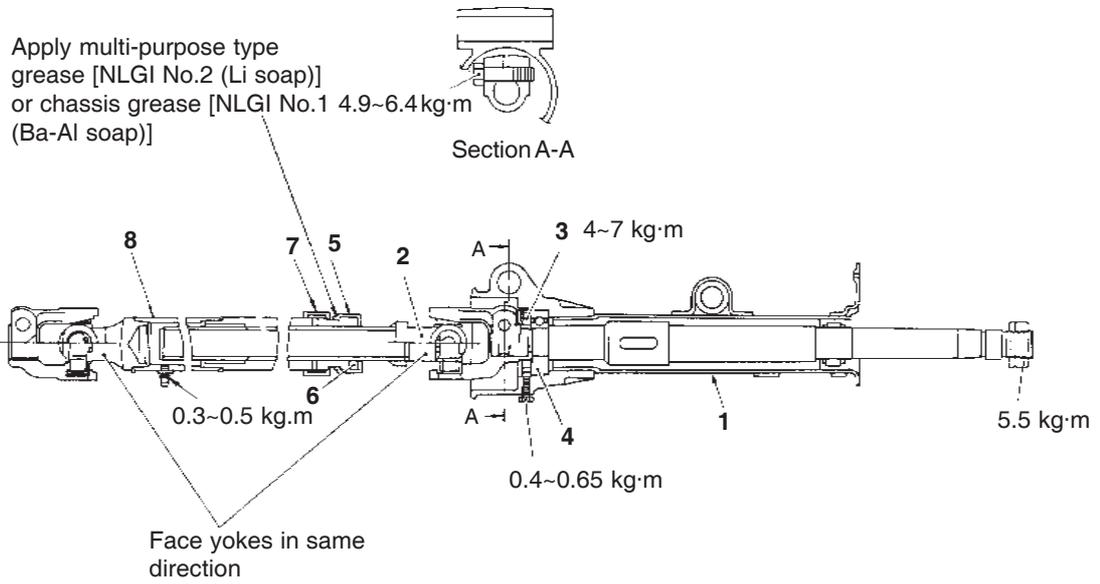


NV ... Nominal Value

Disassembly sequence

1. Steering upper shaft assembly
2. Spline shaft assembly
3. Lock plate
4. Bearing
5. Dust cover
6. Dust seal
7. Rubber cover
8. Spline tube assembly

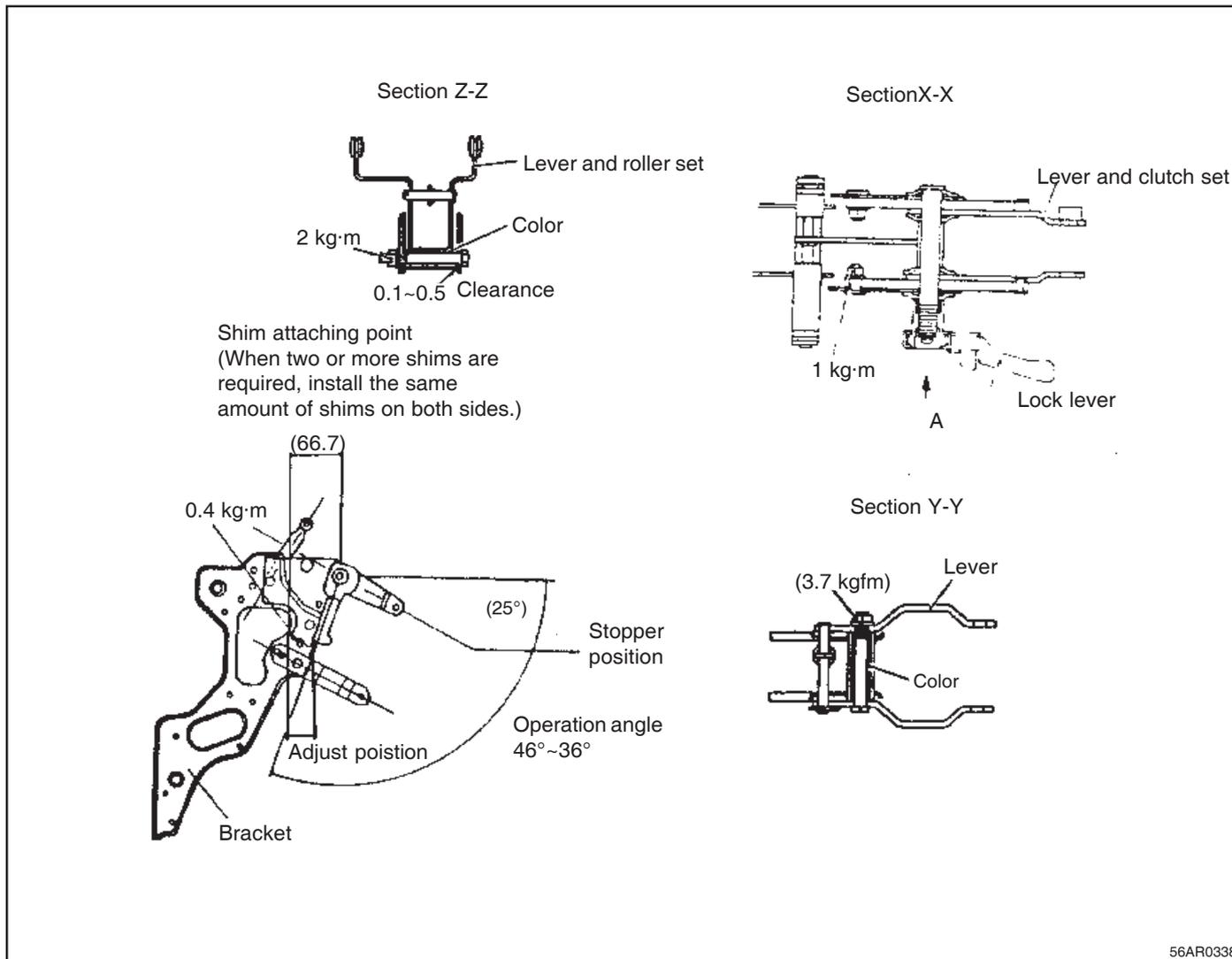
Reassembly



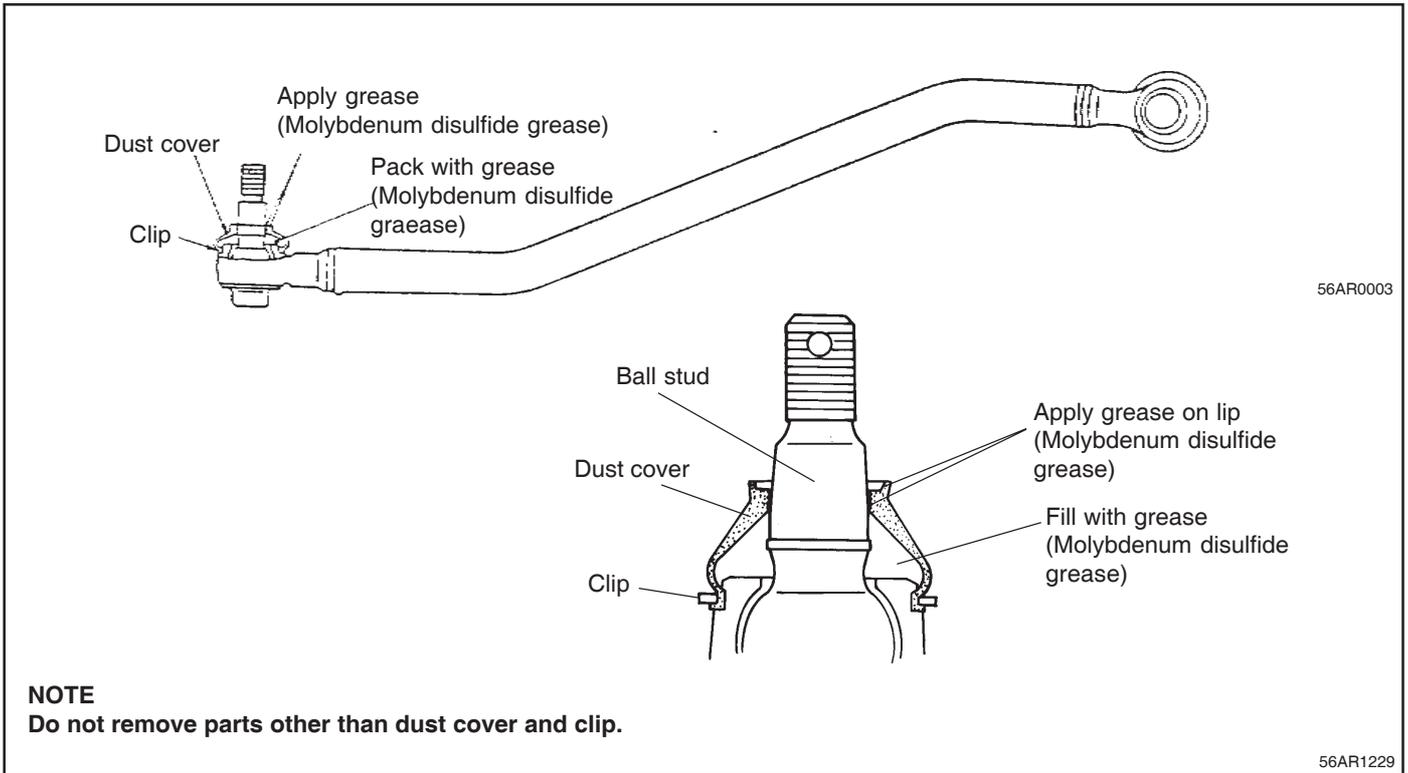
Assembly sequence

- 8→7→6→5→2
- 1→4→3↑

Link and Bracket Section



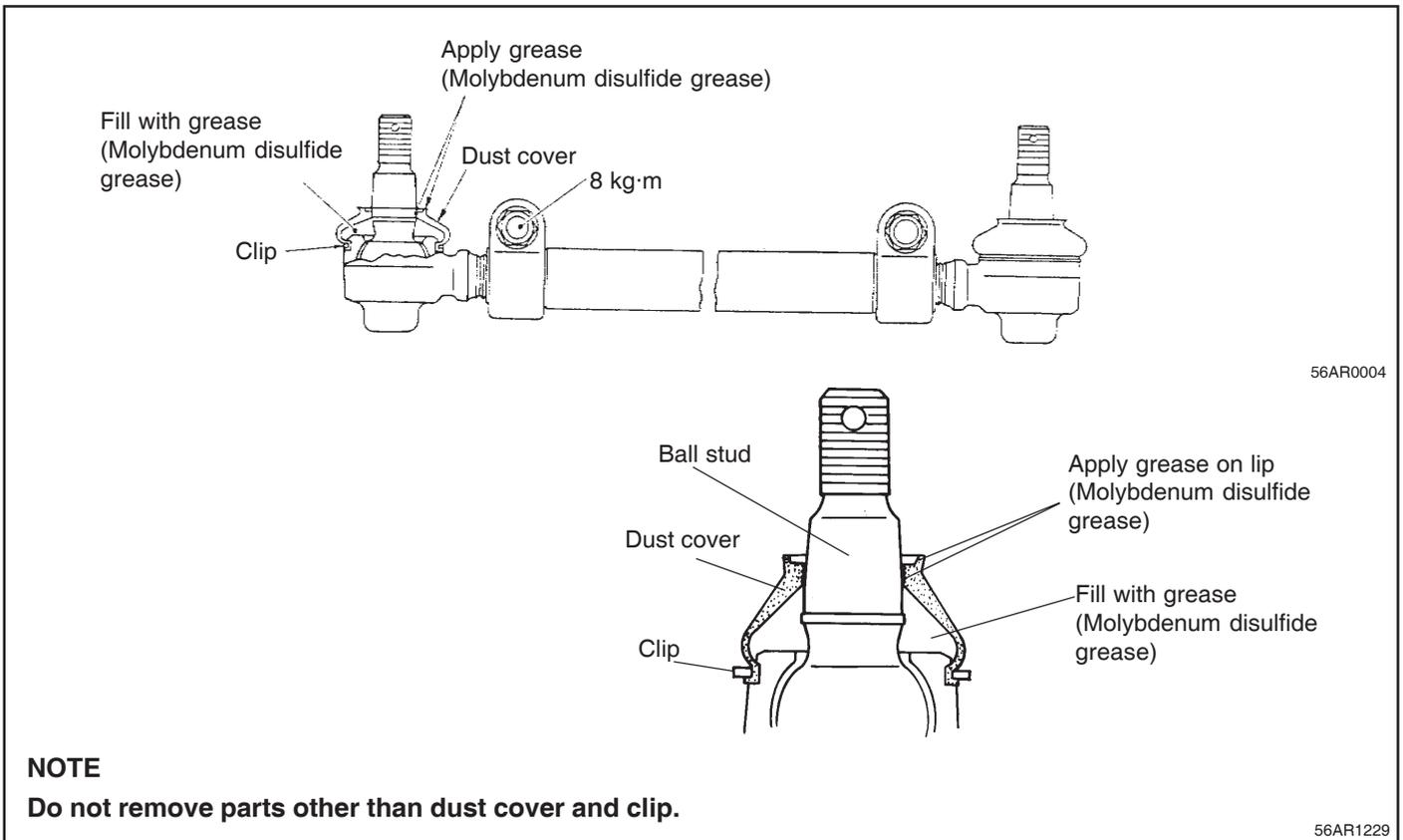
DRAG LINK



NOTE
Do not remove parts other than dust cover and clip.

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TIE ROD



NOTE
Do not remove parts other than dust cover and clip.

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ADJUSTMENT AFTER INSTALLATION**Steering wheel play**

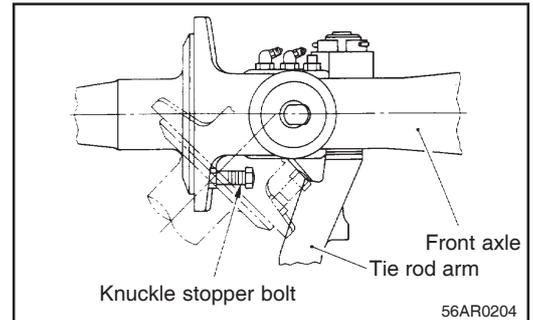
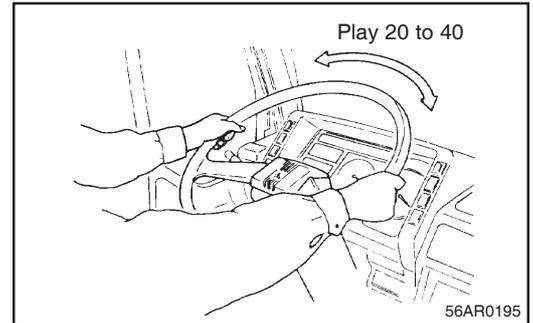
Place the vehicle in straight ahead position and start the engine. Lightly turn the steering wheel clockwise and counter-clockwise and check that the outside circumference play does not exceed the nominal value range.

NOTE

If the steering wheel play is out of the range, adjust installation of parts and backlash.

Adjustment of steering angle

Set the front wheels on the turning radius gauges and adjust the steering angle to the specified value by knuckle stopper bolt.



Integral power steering booster

Disassembly, inspection and correction

Ball nut assembly
axial play
L 0.04

Body (cylinder) to ball nut (piston) clearance
BD 0.11
NV 0.11
L 0.16

Sector gear backlash
NV 0.10-0.35
L 0.6 or less

Turning condition

Turning condition

Deterioration damage

Turning condition

Rotor (outside) to worm shaft clearance
NV 0.01 to 0.03
L More than 0.03

BD ... Basic Diameter
NV ... Nominal Value
L ... Limit

Sector shaft O.D.

| Item | Nominal diameter | Limit |
|-----------------|------------------|--------|
| Packing section | 47.975 | 47.875 |
| Bearing section | 47.975 | 47.875 |

Disassembly sequence

| | | |
|--------------------|-------------------------|--------------------|
| 1. Taper plug | 13. Piston (Ball nut) | 25. Seal ring |
| 2. Pitman arm | 14. Adjusting plug | 26. Plug |
| 3. Lock nut | 15. Ball bearing | 27. Oil seal |
| 4. Side cover | 16. Y-packing | 28. Y-packing |
| 5. Sector shaft | 17. Side rail | 29. Backup ring |
| 6. Retainer | 18. Steel ball | 30. Needle bearing |
| 7. Adjusting screw | 19. Bearing cage | 31. Body |
| 8. Y-packing | 20. Worm shaft | |
| 9. Backup ring | 21. Rotor | |
| 10. Needle bearing | 22. Seal ring | |
| 11. Dust cover | 23. Stub shaft assembly | |
| 12. Valve housing | 24. Seal ring | |

For parts with an encircled number, refer to Disassembly Procedure that follows.

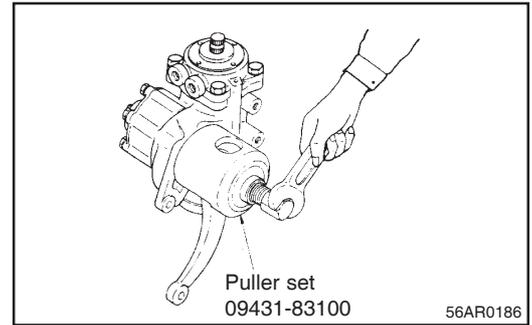
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NOTE

1. Align the stamped mark on the sector shaft end with the body center mark to place the sector shaft in the neutral position.
2. Loosen the lock nut of the adjusting screw beforehand.
3. Do not disassembly the ball nut assembly, adjusting screw, needle nut bearing, etc. except when necessary.

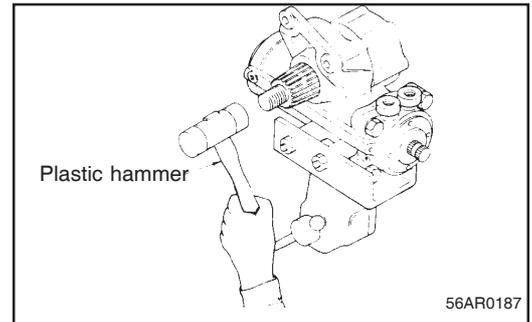
(1) Removal of pitman arm

Remove the pitman arm from the steering gear using the special tool, puller set.



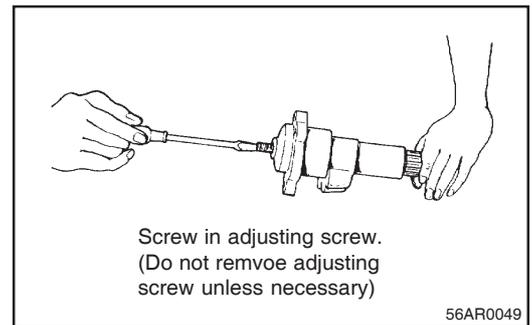
(2) Removal of side cover and sector shaft

Drive out the sector shaft and side cover as a unit from the body, lightly striking with a plastic hammer.



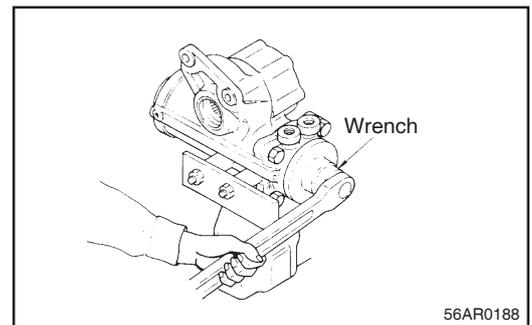
(3) Separation of sector shaft from side cover

Screw in the adjusting screw to remove the side cover from the sector shaft.



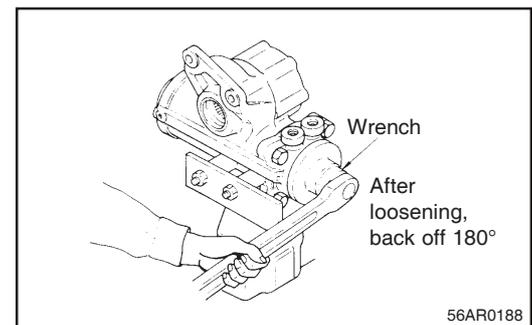
(4) Removal of ring nut

Remove the lock ring, using the wrench.



(5) Removal of adjusting plug

Remove the adjusting plug, using the Wrench.

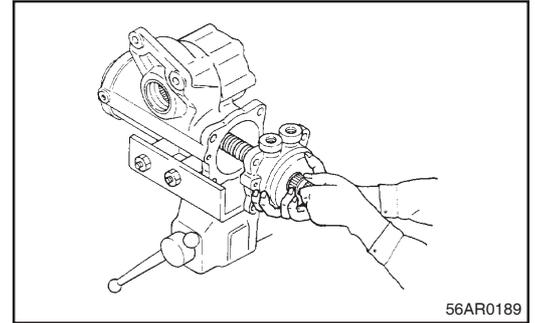


(6) Removal of ball nut assembly

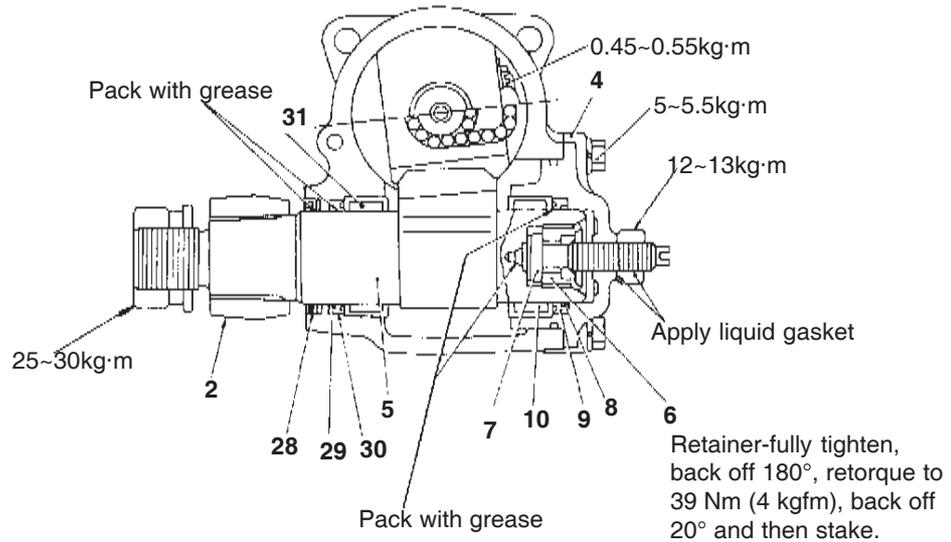
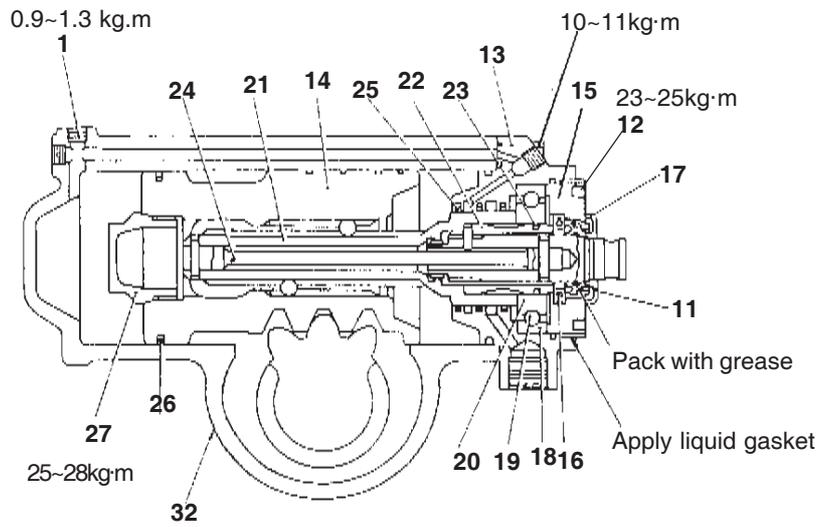
Remove the ball nut assembly as a unit from the body. When removing, make sure that the assembly is slowly removed to prevent the piston from turning to cause damage to the inside surface of the body.

NOTE

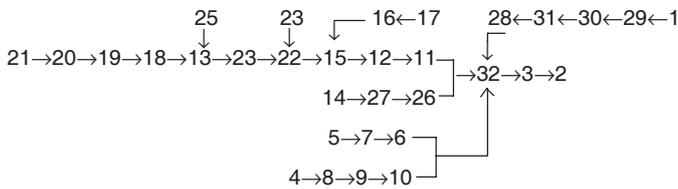
1. **Thoroughly clean the disassembled metallic parts in a cleaning oil. Handle carefully the piston section to prevent damage.**
2. **To remove the adjusting screw, loosen the staken retainer and remove the screw.**



Reassembly and Adjustment



Assembly sequence



For parts with encircled number, refer to Reassembly Procedure that follows.

NOTE

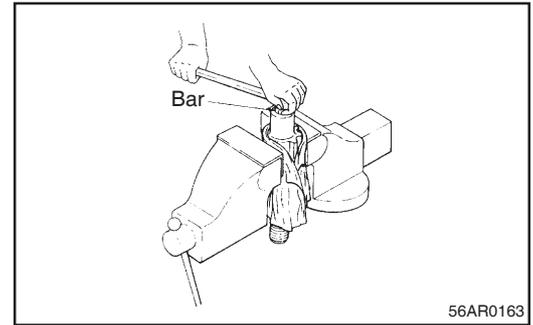
1. Replace the packings, O-rings, seal rings, etc. with new ones.
2. As a sealant, use the THREEBOND No.1102, and as a grease, use the Limax No.2 or equivalents.

(1) Tightening of retainer

Fully tighten and then back off 180°.

Retorque to 39 Nm (4kgfm).

Back off 20° and make sure that the adjusting screw turns smoothly.



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(2) Staking of retainer end portion (2 places)

To press-fit the Y-packing to the adjusting plug, use the Bar.



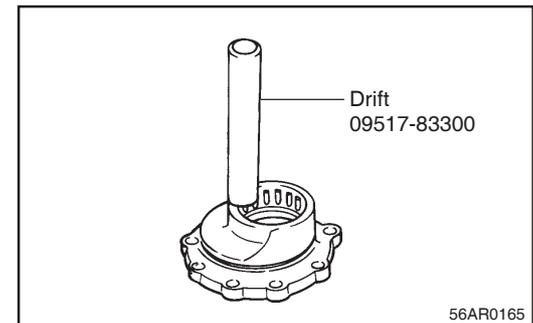
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(3) Installation of Y-packing and backup ring

Insert the Y-packing and backup ring and then insert the special tool, Drift, to correct the bend of the backup ring.

NOTE

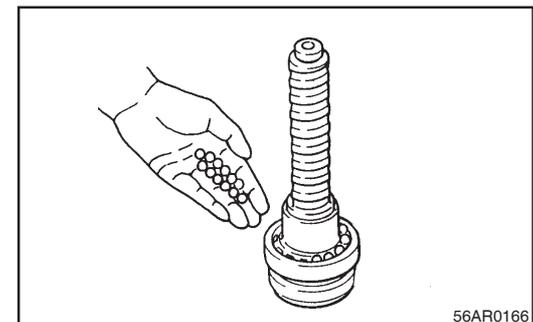
When the body section is installed, use the special tool, Drift for correction.



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(4) Assembly of thrust bearing

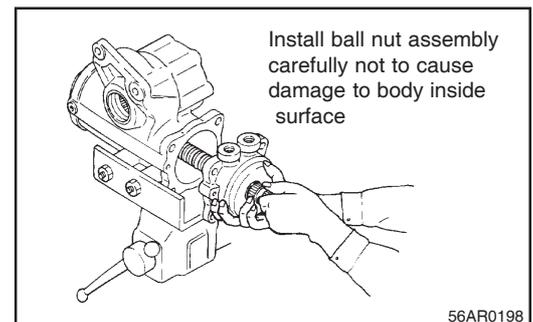
Insert the side race, bearing cage and steel balls.



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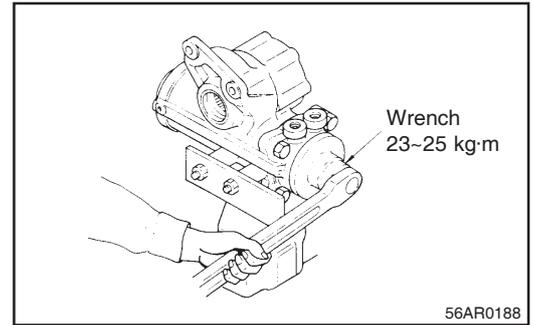
(5) Installation of O-ring and seal ring.

(6) Installation of ball nut assembly

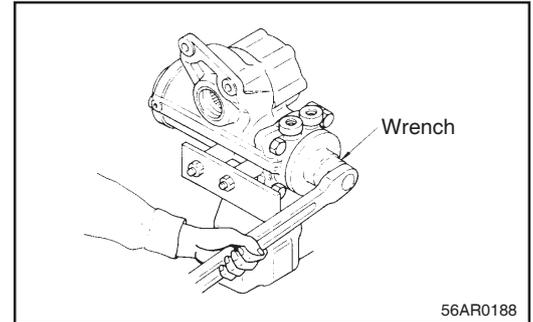


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(7) Tightening of adjusting plug

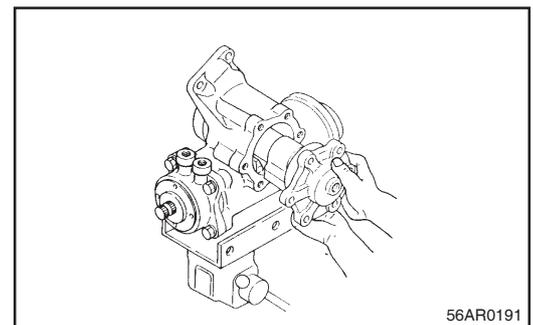


(8) Tightening of ring nut.



(9) Installation of sector shaft.

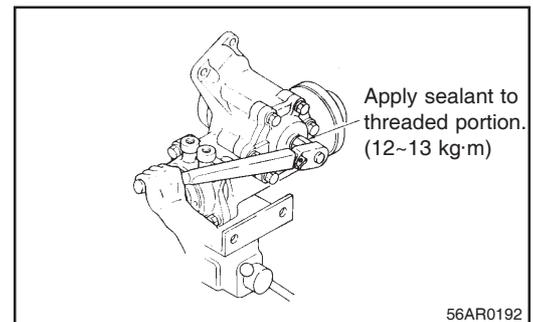
Put the rack (ball nut) and gear (sector shaft) in mesh in the neutral position.



(10) Tightening of lock nut

NOTE

Apply grease to the Y-packing and backup ring at installation.

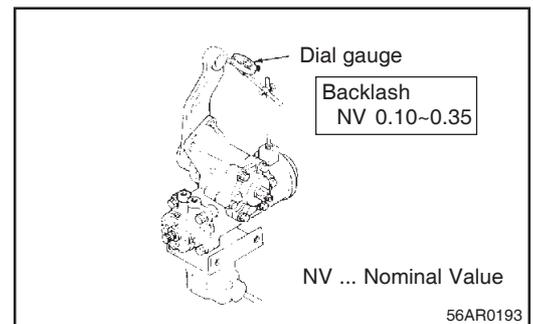


(11) Adjustment of sector gear backlash

Place the gears in the neutral meshing position and measure the backlash at the pitman arm end (L=250 mm). If necessary, adjust by the adjusting screw.

NOTE

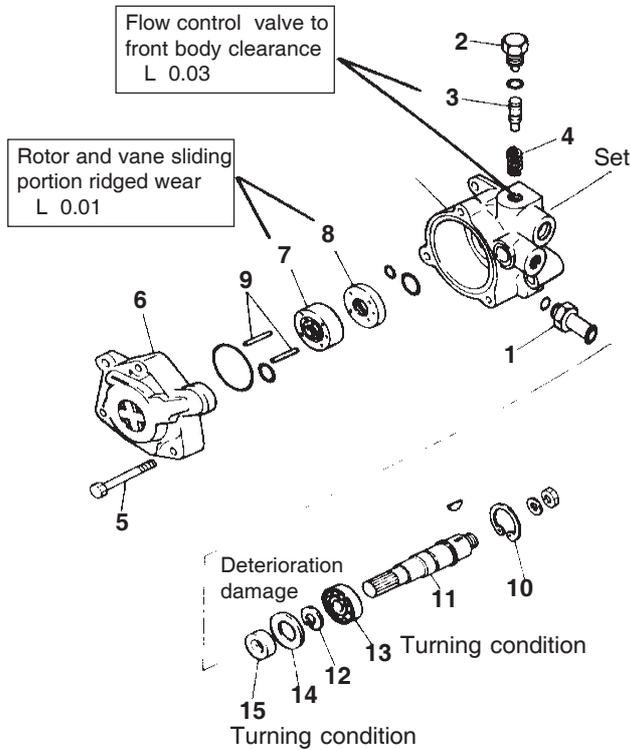
1. After adjustment, move the pitman arm again to make sure that the piston (ball nut) moves smoothly over the entire operating angle range (pitman arm).
2. The starting torque of the sector gear is less than 145 Ncm (15 kg·m) when the pump delivery rate is 12 lit./min, (Adjust by the adjusting plug.)



POWER STEERING OIL PUMP

Disassembly, inspection and correctin

L ...Limit



Disassembly sequence

1. Hose connector
2. Plug
3. Flow control valve assembly
4. Flow control spring
5. Bolt
6. Rear body
7. Cartridge assembly
8. Pressure plate
9. Straight pin
10. Retaining ring (snap ring)
11. Drive shaft
12. Retaining rind (snap ring)
13. Ball bearing
14. Retaining ring (snap ring)
15. Oil seal
16. Front

For parts with an encircled number, refer to Disassembly Procedure that follows.

NOTE

1. Do not disassemble the flow control vlve but reuse unless defective.
2. Do not remove the oil seal except for replacement. If removed, repalce with a new one.

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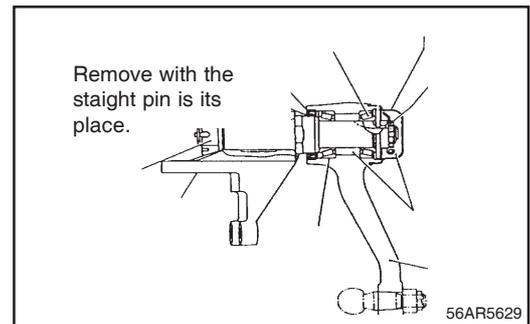
Disassembly procedure

Removal of cartridge assembly

- (1) Before disassembly, put matching marks on the periphery.
- (2) Remove the cartridge assembly, pressure plate and straight pin and put matching marks on the periphery of the cartridge assembly.

NOTE

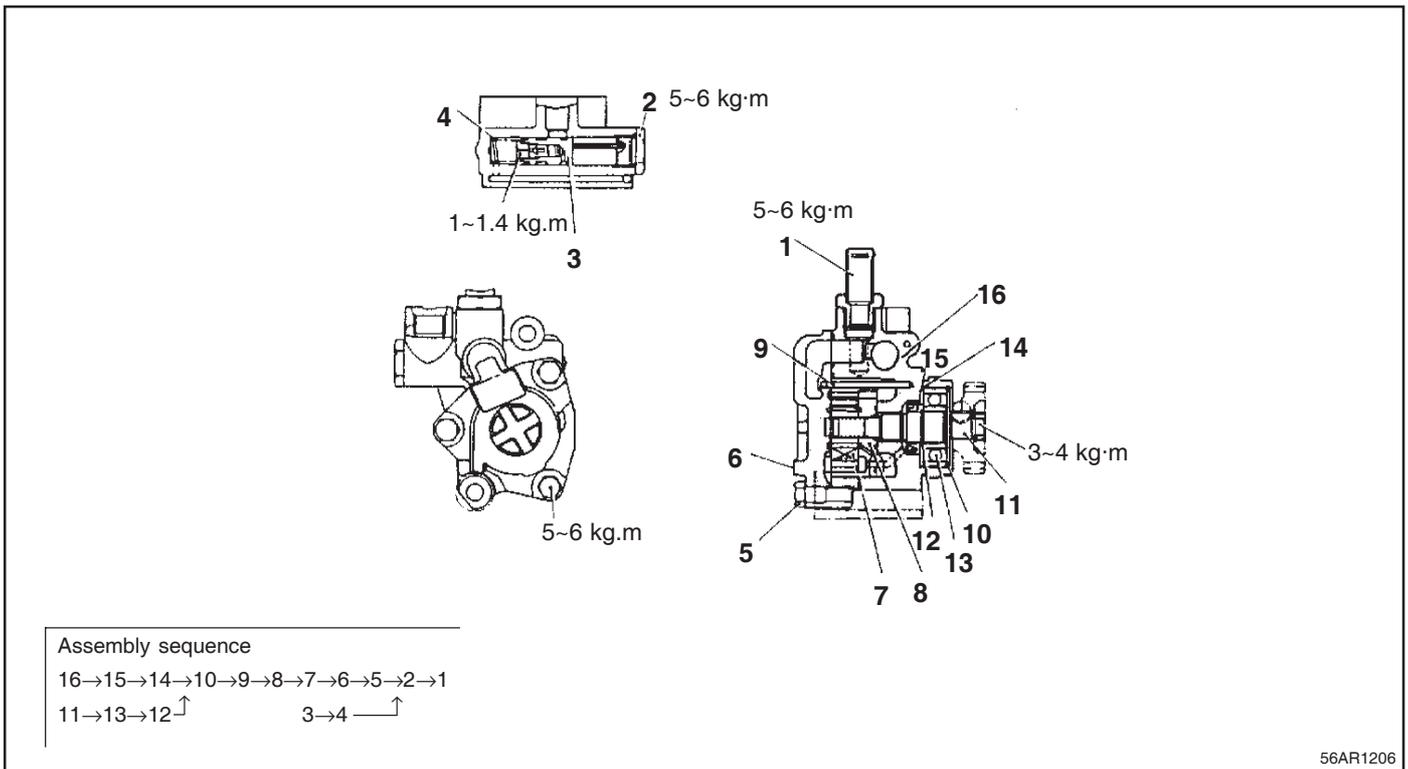
The rotor, vane and cam ring have been precision machined as a unit. Take care not to damage them. If replacement is necessary, replace as a cartridge assembly.



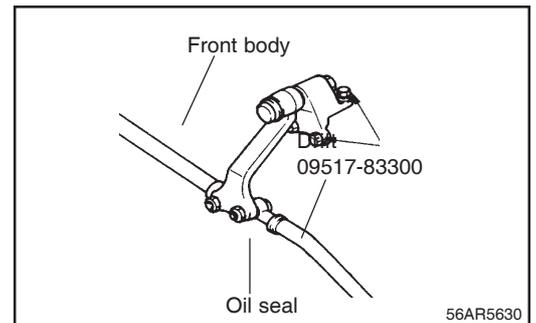
56AR5629

Reassembly

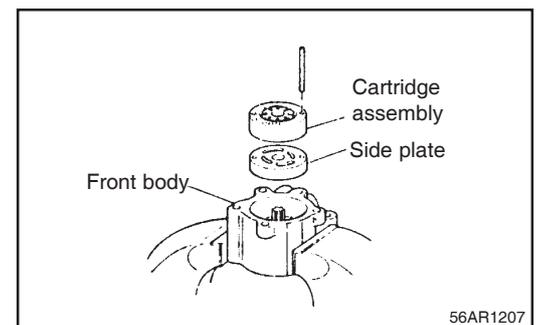
- (1) On occasion of periodic maintenance, replace the oil seals.
O-rings and other rubber parts, using a repair kit.
- (2) Install parts, aligning the alignment marks put at disassembly and noting the rotor direction and vane turning direction.
Check to see that the rotor and vane slide smoothly without excessive play



Pressing of oil seal



Installation of cartridge



NOTE

1. When installing the parts. Check correct matching of pin holes.

| |
|--|
| Pressure change by shims |
| Approx. 605 kPa (6.2 kg/cm ²) per 0.5 mm thick shim |
| Approx. 245 kPa (2.5 kg/cm ²) per 0.2 mm thick shim |

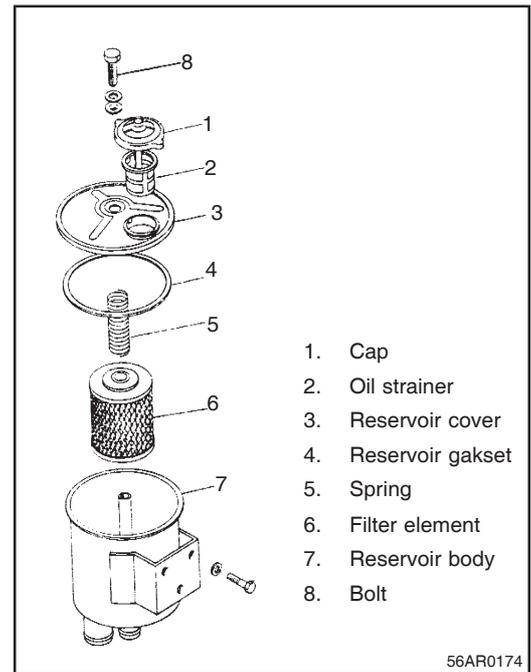
Adjustment

Adjustment of Relief Set Pressure of Flow Control Valve Assembly.
When the valve assembly was disassembled, be sure to adjust the relief pressure by the following procedures after reassembly.
Adjust by adding or removing shims. Addition of shims will lower the pressure.

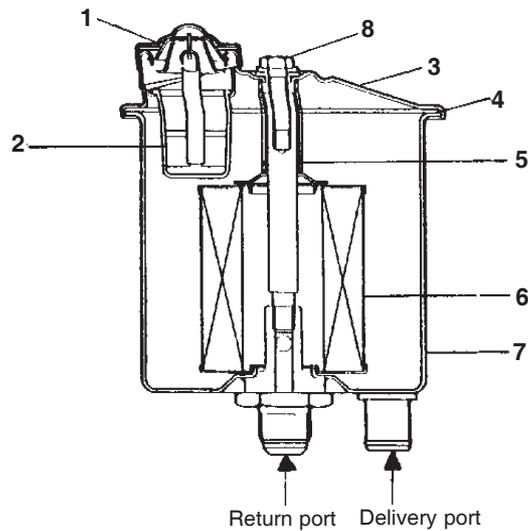
| |
|---|
| Standard value of valve assembly relief pressure |
| 9.3~11.3 Mpa (95~115 kg/cm ²) (pump speed 1,800 rpm) |

POWER STEERING OIL TANK

Disassembly



Reassembly



Assembly sequence

8→7→6→5→4→3→2→1

56AR0139

Adjustment after Installation

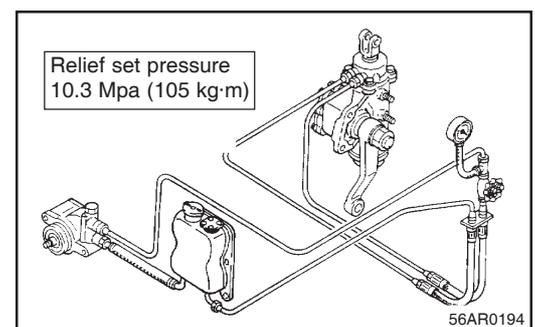
Bleeding

- (1) Fill the oil tank with hydraulic fluid to the brim of the filler cap.
- (2) With the front wheels reised on jacks and the engine running at idle, turn the steering wheel clockwise and counterclockwise and add the fluid if the level is low.
- (3) After the tank fluid level established, increase the engine speed and repeatedly turn the steering wheel until no more air bubbles come out in the tank.
- (4) After bleeding, check each section for leaks and check that the oil tank is filled up to the level mark.

Peformance Verification tests

To make sure that the power steering booster and oil pump are working well, perform tests on the floolwing.

- (1) If the fluid pressure when the steering wheel is released with the engine running at idle is (5 kg.cm²) or more, check the power steering booster, oil pump and oil circuit for clogging.
- (2) If the relief pressure readings are beyond the values given below, the relief valve is in faulty operation. If the reading is below the assembly standard value, the relief valve or spring is defective.



56AR0194

| Test item | Test procedure | Assembly standard |
|------------------------------|---|--|
| Checking smooth operation | Raise front wheels and turns steering wheel fully clockwise and counterclockwise several times. | Steering wheel to operate smoothly on entire stroke. |
| Measuring hydraulic pressure | <ol style="list-style-type: none">1) Mount combination of an oil pressure gauge capable of measuring more than (135 kg/cm²) and a stop valve between the pump delivery port and booster inlet and bleed the system.2) With the engine running at idle, turn the steering wheel clockwise and counterclockwise to raise the fluid temperature to 50~60°C.3) With the engine running at idle, fully open the stop valve.4) Release the steering wheel and measure the fluid pressure. | 5 kg/cm ² or less |
| Measuring relief pressure | <ol style="list-style-type: none">1) Slowly increase the engine speed to 1000 to 1200 rpm, close the stop valve and measure the maximum fluid pressure.2) Do not keep the stop valve fully closed for more than 15 seconds. | Relief set pressure 105 kg/cm ² |

TROUBLESHOOTING

| Symptom | Probable cause | Remdy |
|--|---|---|
| Hard steering | Steering ger mechanism defective | |
| | o Angular contact bearing damaged | Replace |
| | o Worm and ball nut worn | Replace |
| | o Insufficient oil quantity | Add oil |
| | o Improper oil viscosity | Replace oil |
| | o Incorrect rear cover hsim adjustment | Adjust rear cover shim |
| | o Incorrect rack starting torque adjustment | Adjust worm and ball nut starting torque |
| | Powser steering booster gear mechanism defective | |
| | o Thrust bearing damaged | Replace screw and housing assembly |
| | o Ball of ball scre worn | Replace screw and housing assembly |
| | o Low fluid level in oil tank | Add fluid |
| | o Air not compeletely bled | Bleed air |
| | o Improper fluid viscosity | Replace fluid |
| | o Trouble in power steering booster system | Repair or repalce |
| | o Incorrect pipe connections | Correct |
| | o Defective oil pump | Repair or replace |
| | o Flow control valve in faulty operation | Correct |
| | o Oil pump malfunctioning | Correct or replace |
| | Steering linkage defective | |
| | o Universal joint abnormally worn, damaged or poorly lubricated | Replace steering shaft assembly or apply grease |
| | o Deformed link | Replace link |
| | Front axle defective | |
| | o King pin poorly lubricated | Apply grese |
| o Poor front wheel alignments (toe-in, camber, caster) | Correct wheel alignments | |
| o Front wheel tires underinflated | Adjust | |
| o Thrust bearings damaged | Replace | |
| Other troubles | | |
| o Cargo one-sided toward the front of the bed | Distribute cargo evenly throughout the bed | |
| Unstable steering because of excessive free play of steering wheel | Steering gear mechanism defective | |
| | o Worn rack and gear unit of worm and ball nut | Replace |
| | o Sector shaft worn | Replace sector shaft |
| | o Worm and ball nut worn | Replace |
| | o Loosen steering gear mounting bolts | Tighten to the specified torue |

| Symptom | Probable cause | Remdy |
|--|---|---|
| Unstable steering because of excessive free play of steering wheel | Power steering booster gear mechanism defective | Replace screw and housing sector shaft |
| | o Worn rack and rear in ball screw unit | Replace bearing |
| | o Worn bearing in sector shaft | Replace screw and housing assembly |
| | o Worn ball in ball screw | Tighten to the specified torque |
| | o Loose power steering booster mounting bolts | Add fluid, retighten all parts, and bleed air |
| | o Air trapped and air not completely bled | |
| | Steering linkage defective | Pack with grease if the problem still persists, replace steering shaft assembly |
| | o Looseness in universal joint | |
| | o Looseness in drag link ball stud | Replace knuckle arm, pitman arm or drag link |
| | o Looseness in tie rod end ball stud | Replace tie rod end |
| | Front axle defective | Replace |
| | o Worn wheel hub bearing | Replace king pin or bushing |
| | o Worn king pin or bushing | |
| | Other troubles | Readjust or replace lining |
| | o Uneven brake application | Distribute cargo evenly throughout the bed |
| o Cargo one-sided toward the front of the bed | | |
| Vehicle pulls to one side | Front axle steering system defective | Correct |
| | o Improper wheel alignment | Replace |
| | o Deformed front axle | Replace |
| | o Worn or damaged wheel hub bearing | Replace king pin or bushing |
| | o Worn or damaged king pin | Correct |
| | o Steering wheel is off-center | Repair or replace |
| | o Steering gear defective | Correct or replace |
| | o Power steering booster defective | |
| | Other troubles | Distribute cargo evenly |
| | o Cargo one-sided | Replace |
| | o Sagging or broken leaf spring | Correct |
| o Uneven brake application | Adjust | |
| o Right and left tires unevenly inflated | | |

| Symptom | Probable cause | Remdy |
|---------------------------|---|--|
| Vehicle pulls to one side | o Right and left tires greatly different in the degree of wear | Replace tires |
| | o Right and left tires different in outer diameter | Replace with equal diameter tires |
| | o Right and left wheel bases greatly different | Correct wheel base |
| | o Bent rear axle housing | Replace axle housing |
| Steering wheel jerks | Front axle assembly defective | |
| | o Excessive clearance between king pin and bushing | Replace king pin or bushing |
| | o Worn or deteriorated wheel hub bearing | Replace |
| | o Improper wheel alignment (particularly camber and caster) | Correct wheel alingment |
| | o Looseness in knuckle arm or tie rod ball stud | Replace knuckle arm or tie rod end |
| | o Excessively uneven tire pressure | Adjsut tire pressure |
| | o Knuckle arm, tie rod arm, backing plate and knuckle, etc. improperly tightened | Tighten to specified torque |
| | o U-bolt, nut, etc. of front spring loose | Tighten to specified torue |
| | o Lateral and radial runouts of front tires, and incorrect static and dynamic balance | Correct wheel balance |
| | Steering gear steering system defective | |
| | o Improper play in worm and ball nut and sector shaft | Adjust |
| | o Angular contact bearing worn | Replace |
| | o Loosen drag link ball stud | Replace knuckle arm, pitman arm or drag link |
| | o Sector shaft worn | Replace sector shaft |
| | o Worm and ball nut worn | Replace |
| | Power steering booster steering system defective | |
| | o Improper play in ball screw unit and sector shaft | Adjust |
| | o Worn thrust bearing | Replace |
| | o Defective power steering booster | Correct or replace |
| | o Looseness in ball stud of drag link | Replace knuckle arm, pitman arm or drag link |
| | o Worn sector shaft and bearing | Replace sector shaft and bearing |
| | o Worn ball and groove in ball screw | Replace screw and housing assembly |

| Symptom | Probable cause | Remdy |
|---|---|---|
| Steering wheel jerks | Other troubles | |
| | o Excessive runout of propeller shaft | Correct or replace |
| | o Reduction pinion and gear damaged and in poor tooth contact | Replace pinion and gear or corect tooth contact |
| | o Excessive tire runout | Correct or replace |
| Power steering booster system defective | | |
| Hard steering in both clockwise and counter-clockwise directions | Low pressure due to fluid leaks | Retighten leaky parts or replace seal ring, O-ring, etc. |
| | Valve malfunctioning | Check and correct valve or repalce screw and housing assembly |
| | Piston damaged or foreign substance trapped | Check for foreign substance in hydraulic fluid, and check and correct inside surface of body and sliding surface of piston, or replace screw and housing assembly |
| Hard steering particularly in middle | Rack mesh torque out of adjustment | Adjust stub shaft rotating torque |
| Great difference in steering effort between clockwise and counter-clockwise rotations | Clogged hydraulic circuit | Check and correct hydraulic circuit or repalce screw and housing assembly |
| Hard steering particularly during idling | Air trapped due to low fluid level | Bleed air and then add fluid |
| Hard steering particularly at beginning | Valve malfunctioning | Check and correct valve or replace screw and hosuing assembly |
| Hard steering due to problems not in power steering booster | Defective oil pump | Correct or replace oil pump |
| | Clogged hydraulic piping | Correct or replace piping |
| | Insufficient grease in steering linkage joints | Pack joints with grease |
| | Insufficient front tire inflation pressure | Adjust to the specified air pressure |
| | Incorrect front wheel alignments | Measure wheel alignments if incorrect, adjust to the specified values |

| Symptom | Probable cause | Remdy |
|--|---|---|
| Hard steering due to problems not in power steering booster | King pin thrust bearing damaged | Correct or replace |
| | King pin short of grease | Apply grease to king pin |
| | Cargo one-sided toward front | Distribute cargo evenly |
| Steering wheel oscillations | Power steering booster defective <ul style="list-style-type: none"> o Valve and roll edge damaged or control seal ring or O-ring damaged | Replace screw and housing assembly |
| | <ul style="list-style-type: none"> o Improper fluid in power steering system | Replace with the specified hydraulic fluid |
| | Problems not in power steering booster <ul style="list-style-type: none"> o Uneven tire pressure | Adjust to specified pressure |
| | <ul style="list-style-type: none"> o Incorrect front wheel alignment | Measure wheel alignment If incorrect, adjust to specified values |
| | <ul style="list-style-type: none"> o Front wheels out of balance | Replace with wheel balancer or replace tires or wheels |
| | <ul style="list-style-type: none"> o Worn drag link or tie rod end ball joint | Replace drag link assembly or tie rod end |
| | <ul style="list-style-type: none"> o Worn king pin and king pin bushing | Disassembly and replace If defective |
| Poor returnability of steering wheel | Incorrect steering gear rack starting torque adjustment | Adjust main shaft starting torque |
| | Power steering booster defective <ul style="list-style-type: none"> o Rack torque out of adjustment | Adjust stub shaft torque |
| | <ul style="list-style-type: none"> o Clogged hydraulic circuit | Check and correct circuit or replace screw and housing assembly |
| | <ul style="list-style-type: none"> o Clogged hydraulic piping | Correct or replace piping |
| | Front wheel alignment off | Measure wheel alignment If incorrect, adjust to specified values |
| Vehicle wanders due to excessive free play of steering wheel | Steering gear defective <ul style="list-style-type: none"> o Sector shaft gear worn | Adjust steering wheel free play with adjusting screw or replace cross shaft |
| | <ul style="list-style-type: none"> o Damaged or worn worm and ball nut serrating | Replace worm and ball nut |

| Symptom | Probable cause | Remdy |
|--|--|---|
| Vehicle wanders due to excessive free play of steering wheel | Problems in power steering booster <ul style="list-style-type: none"> o Worm sector shaft gear | Adjust with adjusting screw or replace sector shaft |
| | <ul style="list-style-type: none"> o Damaged or worn stub shaft serrations | Replace screw and housing assembly |
| | Other problems <ul style="list-style-type: none"> o Worn front wheel bearings | Replace |
| | <ul style="list-style-type: none"> o Mounted or joined parts loose | Retighten to specified torque or replace detective parts |
| Insufficient steering angle or clockwise and counterclockwise steering angles differ | Incorrect pitman arm mounting angle | Mount at correct position |
| | Knuckle stopper bolt out of adjustment | Using tuning radius gauge, adjust clockwise and counterclockwise steering angles with knuckle stopper bolts |
| Fluid leaks | Fluid leaks from steering gear | Retighten leaky parts to specified torque, or replace oil seal and apply liquid packing |
| | Fluid leaks from power steering booster | Retighten leaky parts to specified toque or replace O-ring, seals, etc. |
| | Fluid leaks from oil pump <ul style="list-style-type: none"> o Defective oil pump housing | Disassemble, check and replace if defective |
| | <ul style="list-style-type: none"> o Defective gasket, oil seal | Disassemble, check and replace if defective |
| | <ul style="list-style-type: none"> o Loose bolts | Retighten to specified torque |
| | Fluid leaks from oil tank <ul style="list-style-type: none"> o Fluid leaks from oil tank due to overfilling | Adjust to specified level |
| | <ul style="list-style-type: none"> o Fluid leaks from oil tank due to trapped air | Bleed air and adjust to specified level |
| | <ul style="list-style-type: none"> o Improperly welded pipes | Braze or replace |
| | Loose hydraulic piping and connections | Retighten to specified torque or replace |

| Symptom | Probable cause | Remdy |
|--|---|---|
| Abnormal hydraulic pressure in oil pump | Maximum generated hydraulic pressure insufficient due to defective oil pump | Disassemble, check, correct, or replace defective parts |
| | Excessively high generated pressure at engine idling due to crushed or clogged hydraulic line | Correct o replace hose or pipe |
| Strange sound, vibration or noise from oil pump * The oil pump poduces some howling sound which is not an indication of any functional problem (particularly when turning the steering wheel while the vehicle in standstill) | | |
| Grinding noise | Air in oil pump | Check fluid level and hose clip, bleed air, or replace oil pump |
| | Seizure of parts in oil pump | Replace oil pump |
| Squeaking noise | Seizure of parts in oil pump | Replace oil pump |
| Low whirring noise | Loose pump bracket and mounting bolts and nuts | Retighten to specified torque |
| | Defective pump | Replace oil pump |