WORKSHOP MANUAL

KB

SECTION 09

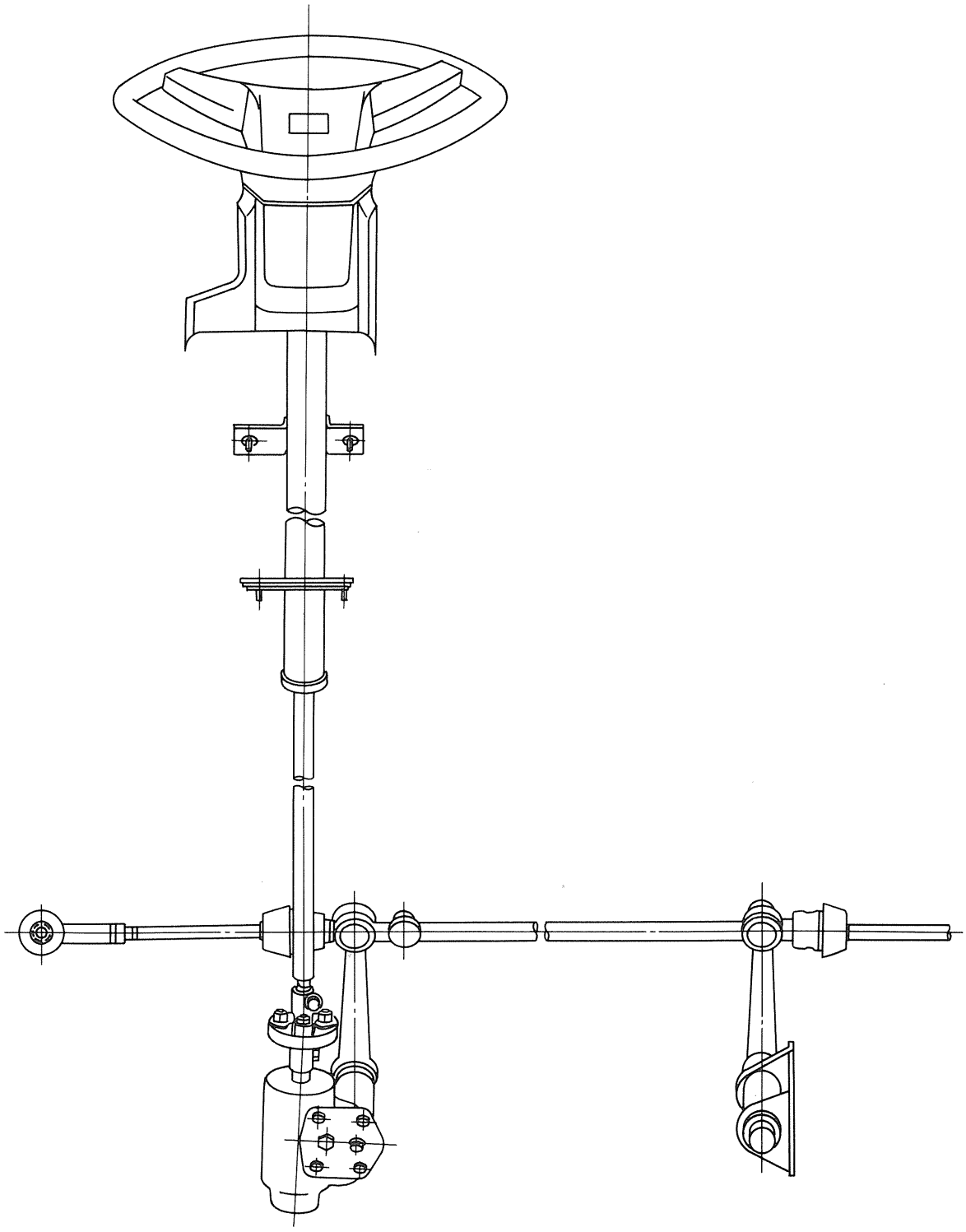
STEERING

ISUZU MOTORS LIMITED

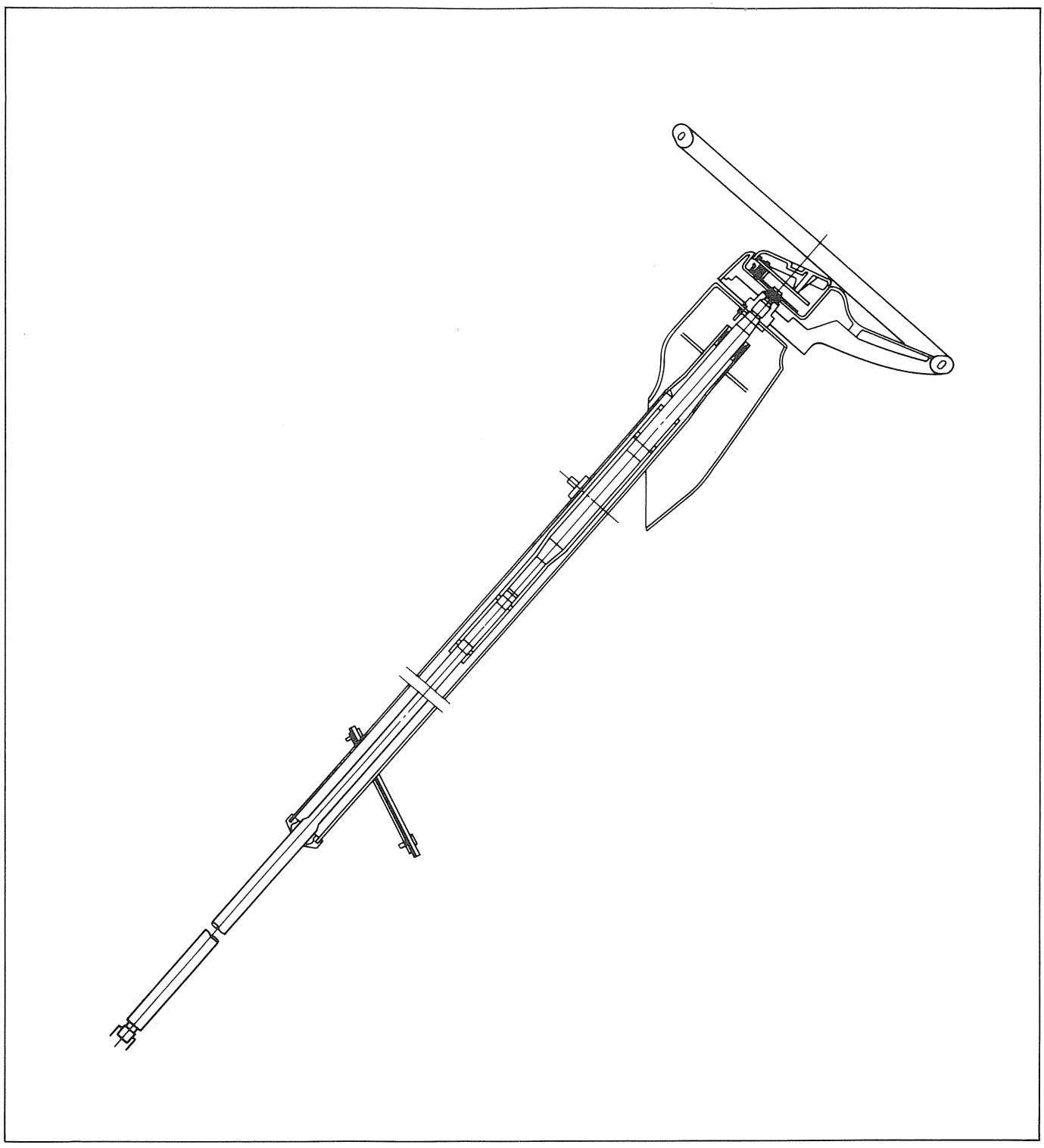
CONTENTS PAGE

GENERAL DESCRIPTION

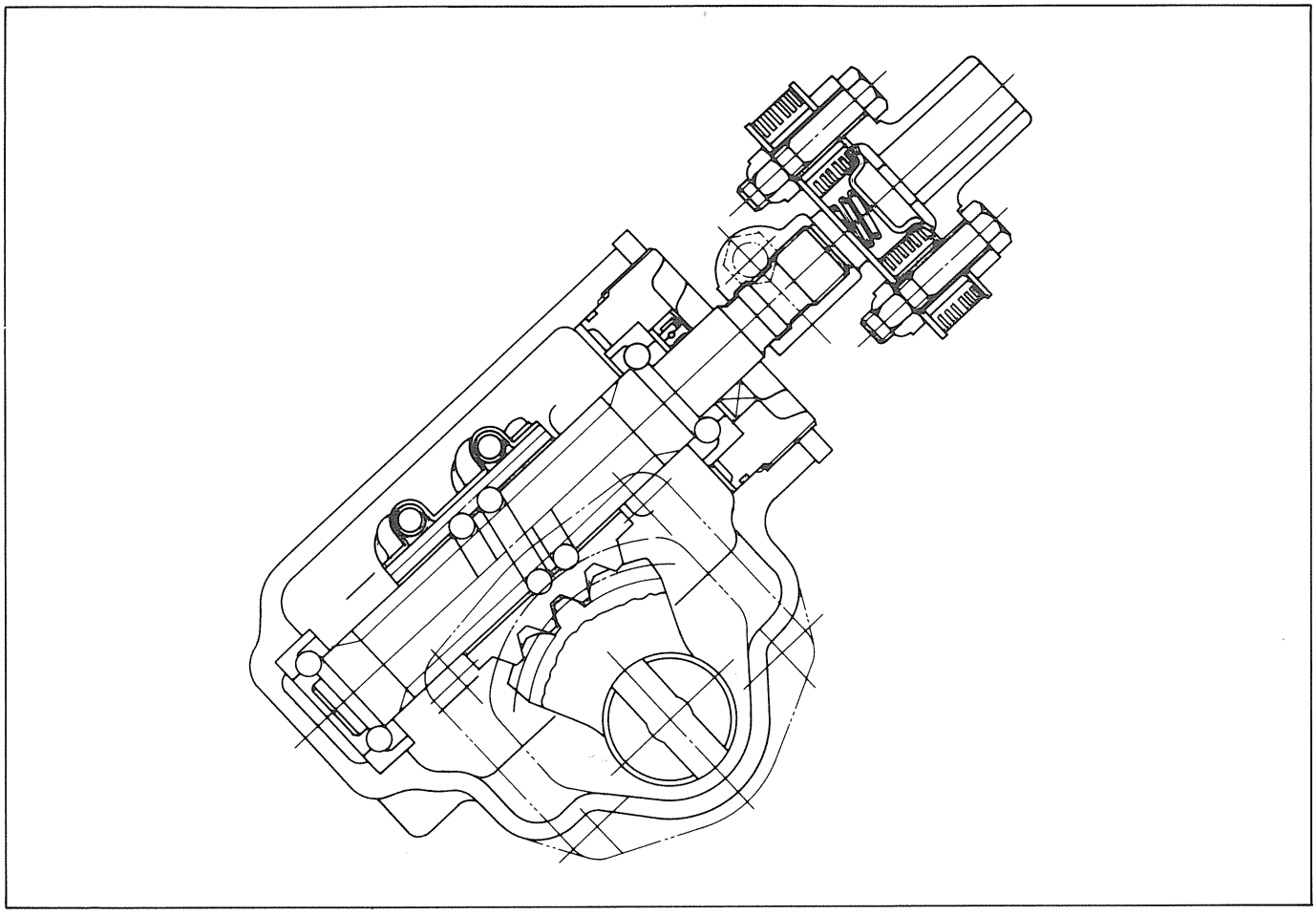
STEERING MECHANISM



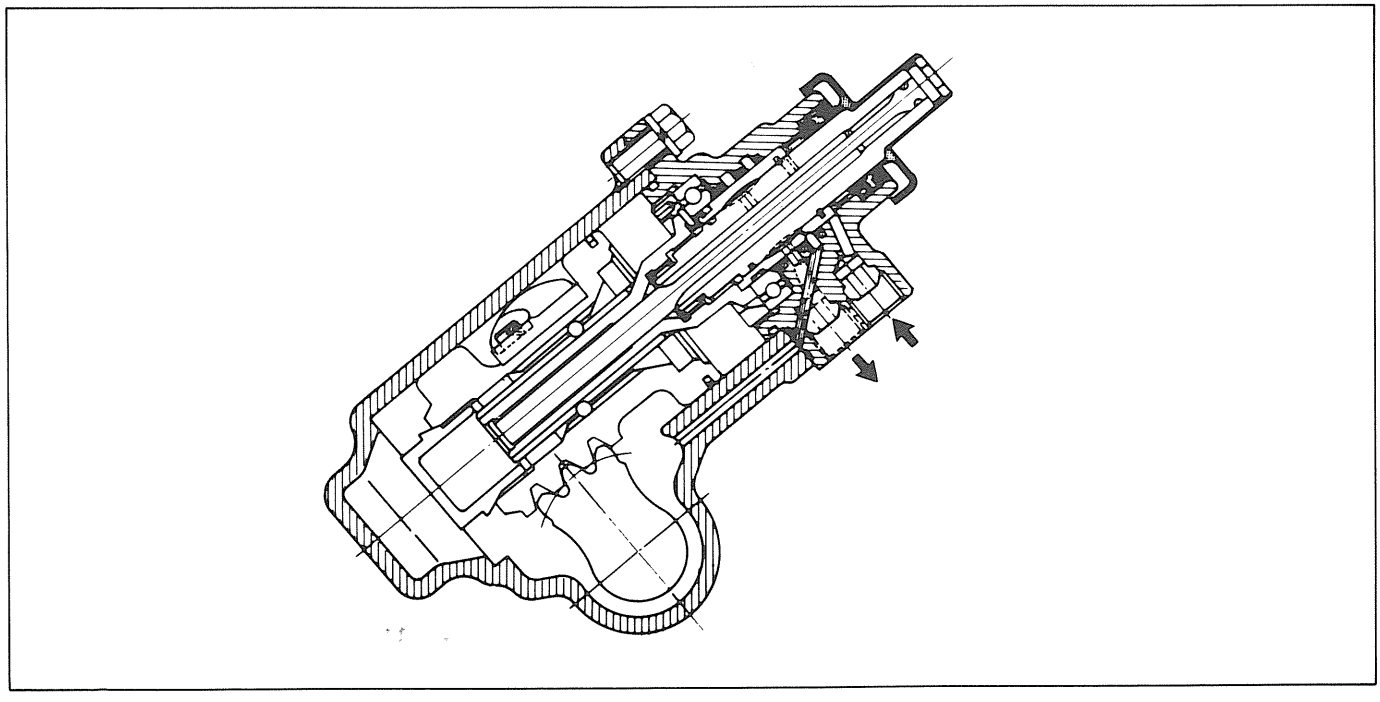
STEERING COLUMN



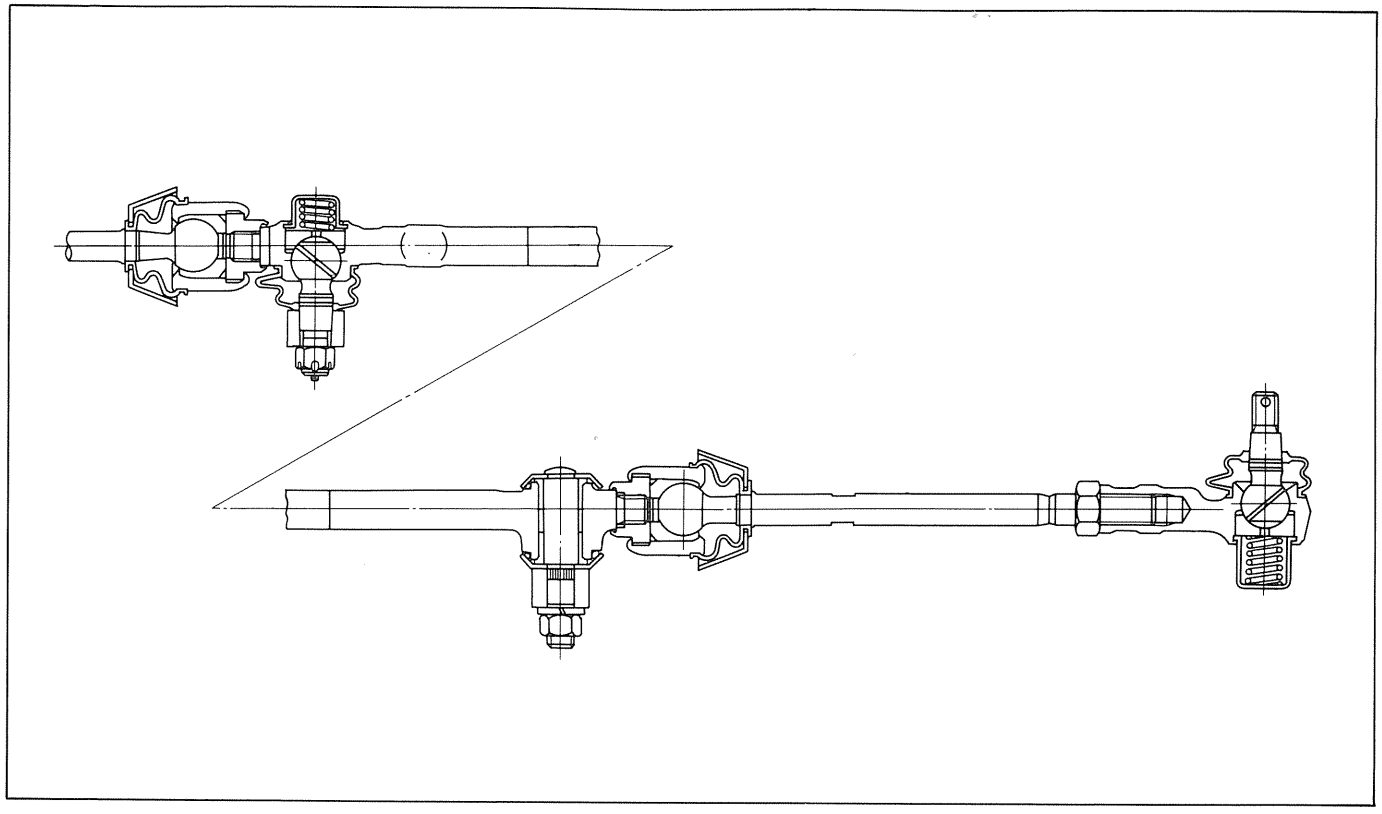
STEERING UNIT



POWER STEERING UNIT (OPTIONAL EQUIPMENT)



STEERING LINKAGE

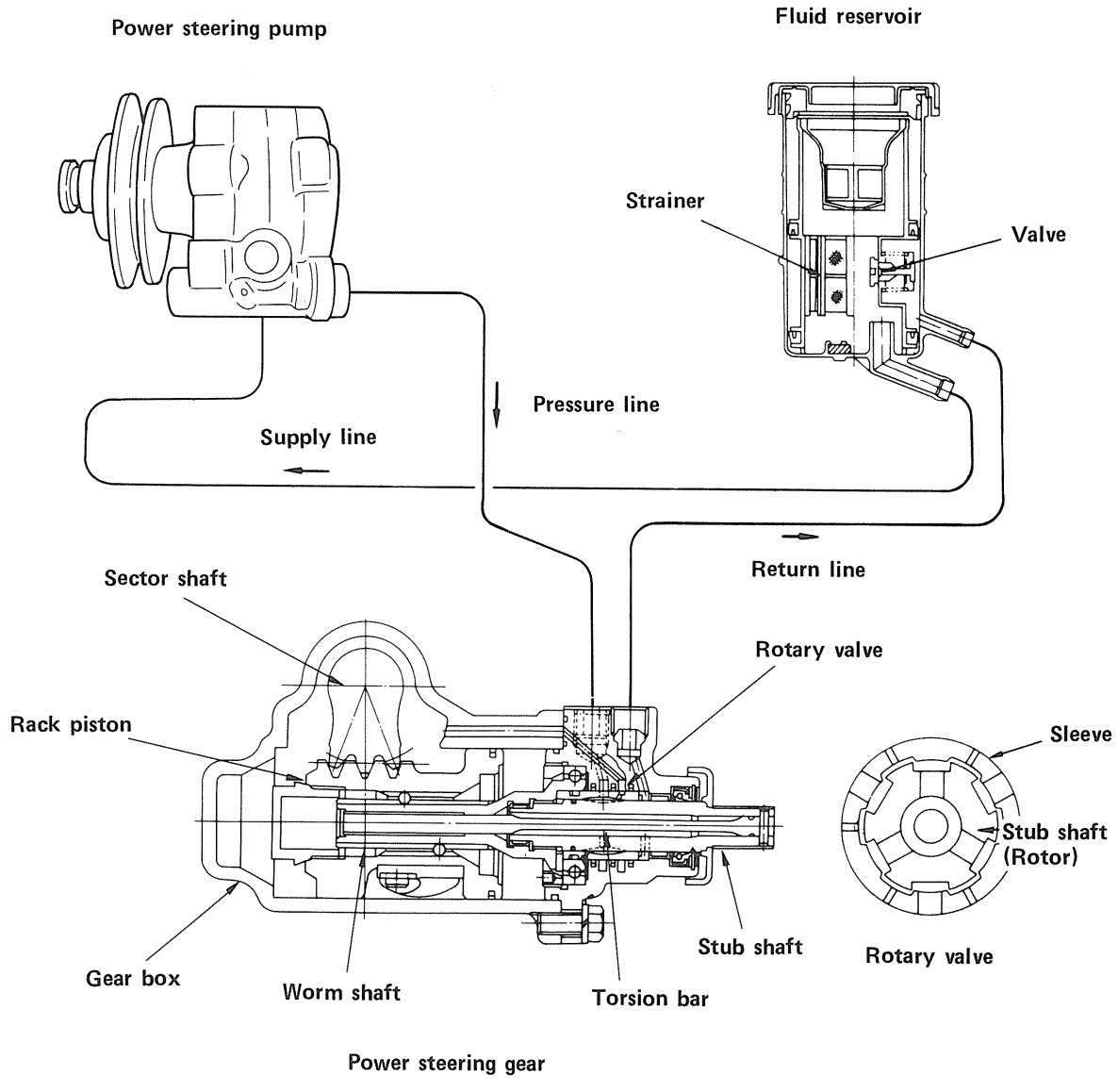


SPECIFICATIONS

		Manual steering	Power steering
Unit type		Recirculating ball	
Gear ratio		26 — 30	22.4
Sector shaft operating angle	Degree	64	60
Sector shaft backlash (Preload)	kg·m(ft.lbs.)	0.05—0.1 (0.36—0.72)	—
Maximum oil pressure	kg/cm^2(Psi)	—	80 (1138)
Oil pump type		—	Vane
Steering wheel — Diameter	mm(in.)	400(15.76)/380(14.97)	400(15.76)/380(14.97)
— Free play	mm(in.)	10—30 (0.394—1.181)	10 (0.394)
Oil capacity	liters(US gal.)	0.2 (0.757) SAE90 or equivalent	1 (3.785) ATF

POWER STEERING SYSTEM

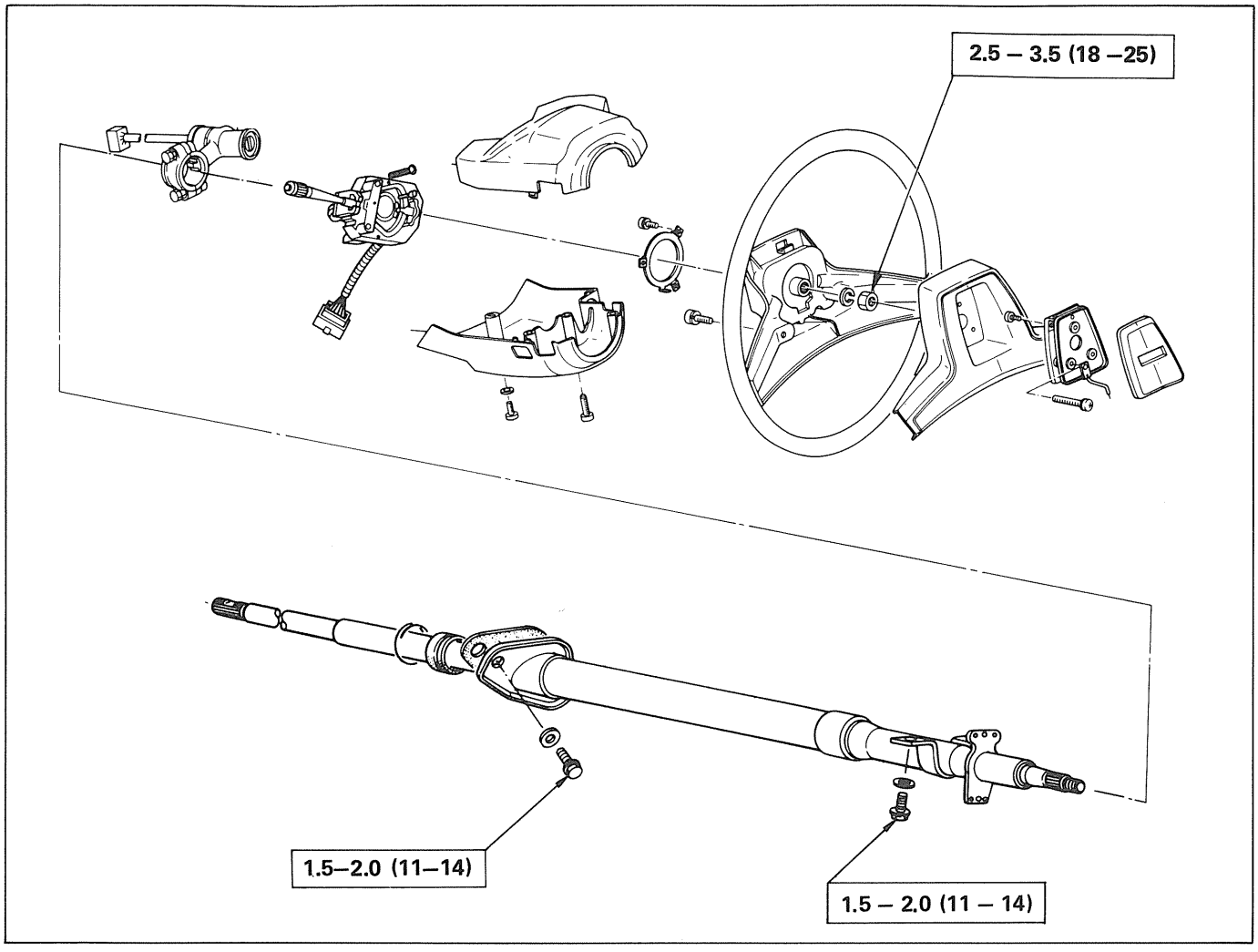
The power steering system consists of the five major groups of parts; the power steering gear assembly, oil pump hydraulic line, steering column assembly and steering linkage.
The steering column assembly and steering linkage are identical to those of the manual steering system in construction.
The power steering gear assembly is an integral type consisting of the conventional ball-screw type steering gear combined with a rotary and torsion bar type control valve and power cylinder.
The oil pump is a constant delivery vane type and is V-belt driven.
On model with the power steering system, the steering wheel turns 3.7 turns from lock to lock as the power steering system adopts a gear ratio which differs from that of the manual steering system.



FIXING TORQUE

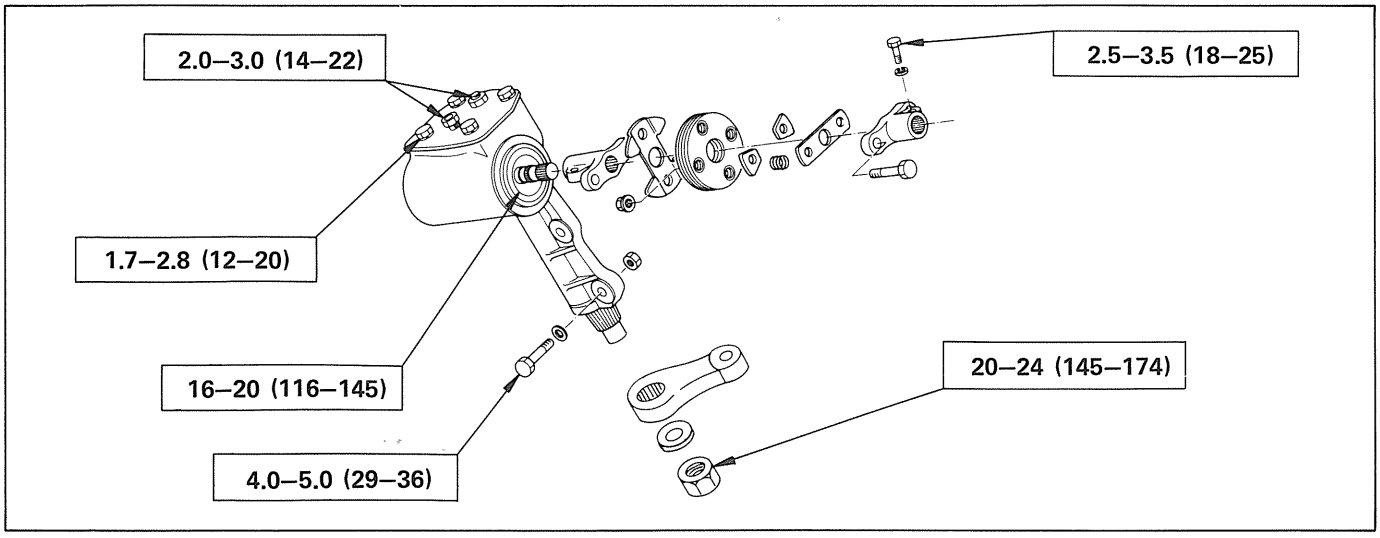
STEERING COLUMN

kg·m(ft.lbs.)



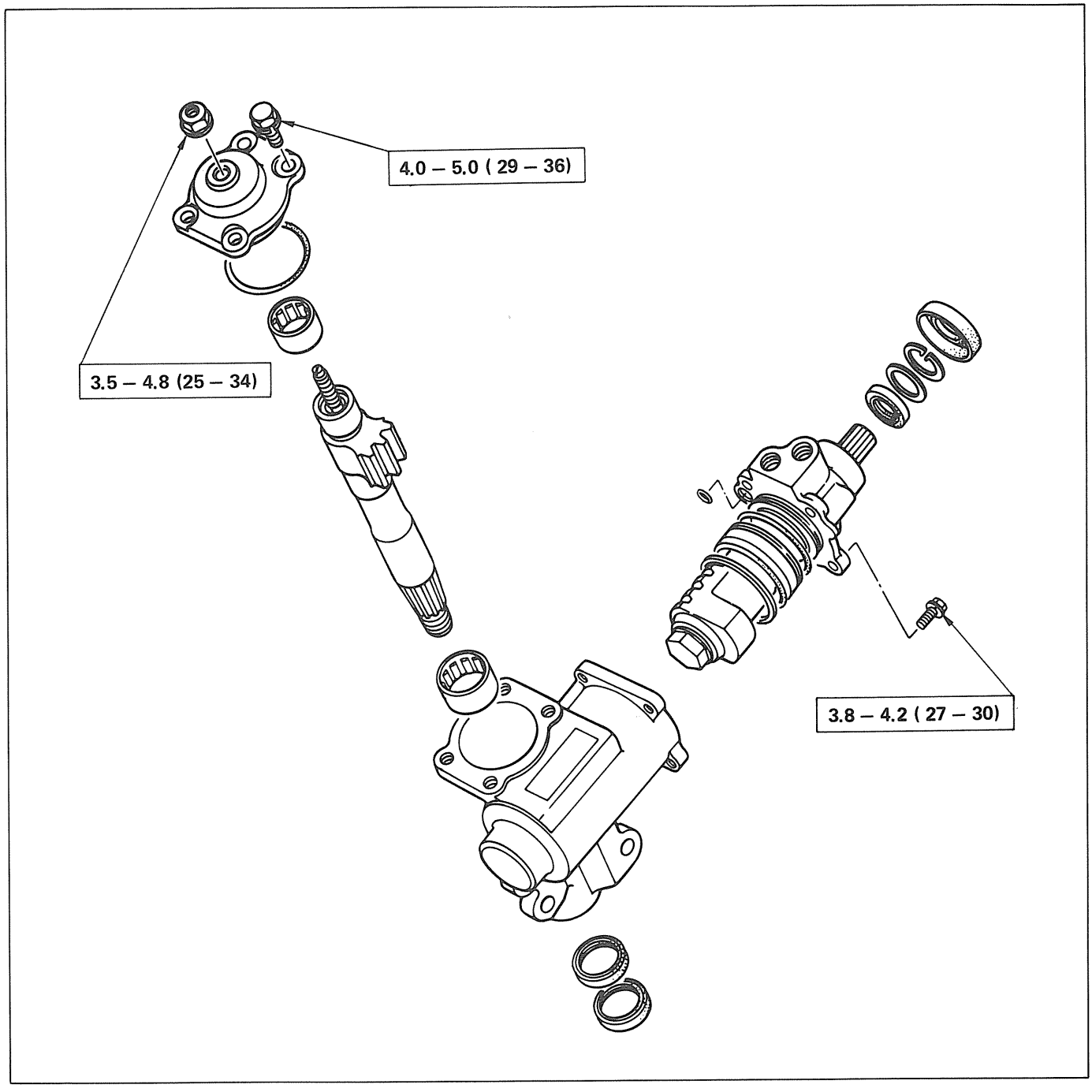
STEERING UNIT

kg·m(ft.lbs.)



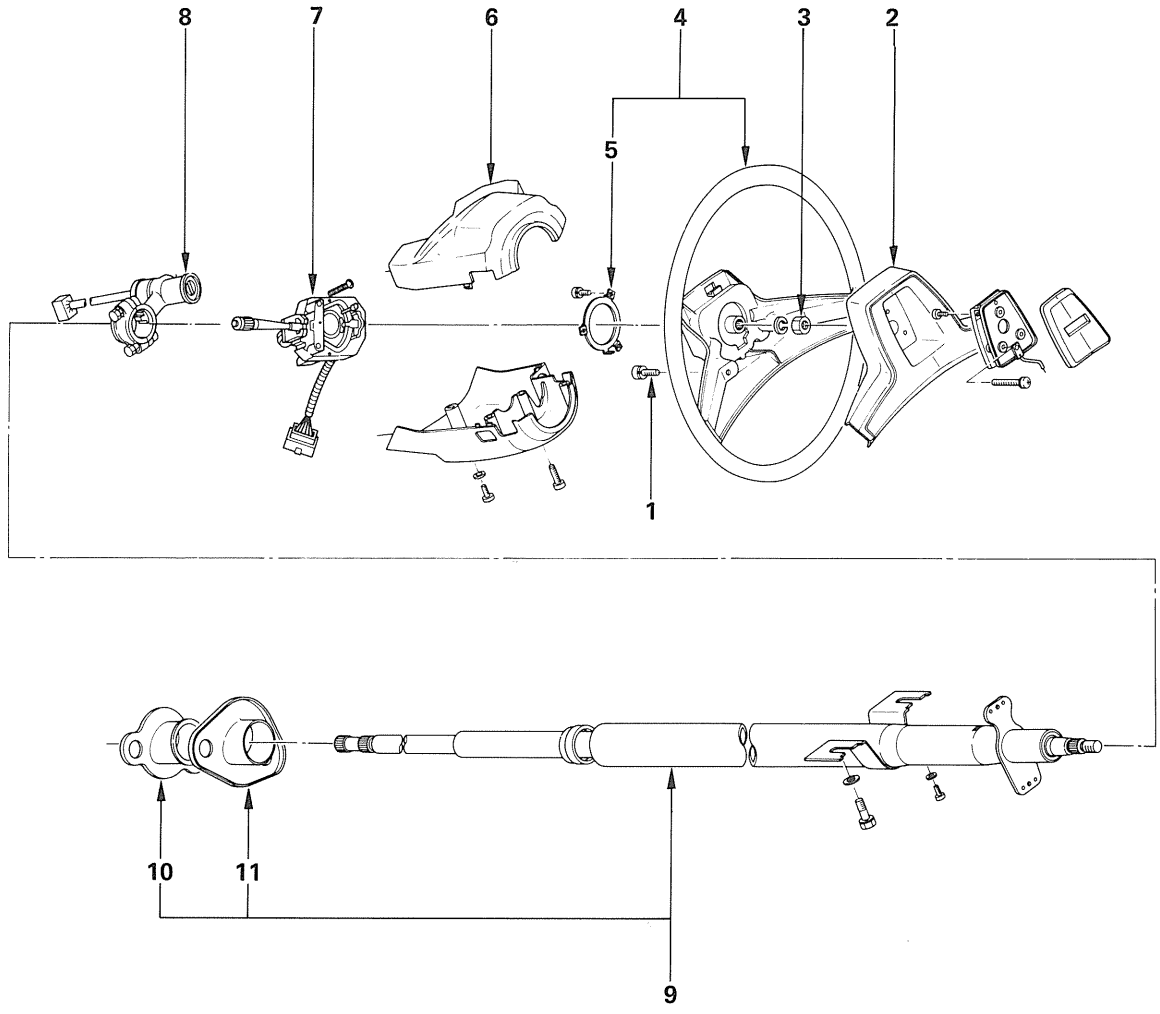
POWER STEERING UNIT

kg·m(ft.lbs.)



STEERING COLUMN

REMOVAL AND INSTALLATION

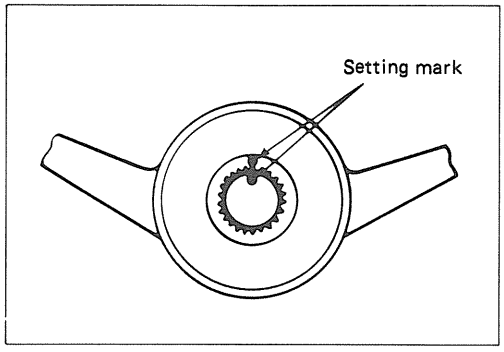


Removal steps

1. Screw
2. Horn shroud
3. Nut
▲ 4. Steering wheel
▲ 5. Contact ring
6. Steering cowl
7. Combination switch
8. Steering lock
▲ 9. Steering column assembly
10. Packing
11. Bracket

Installation steps

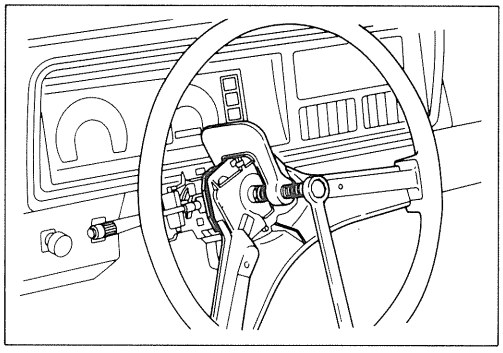
11. Bracket
10. Packing
▲ 9. Steering column assembly
8. Steering lock
7. Combination switch
6. Steering column
5. Steering cowl
▲ 4. Steering wheel
▲ 3. Nut
2. Horn shroud
1. Screw



Important operations — Removal

4. Steering wheel

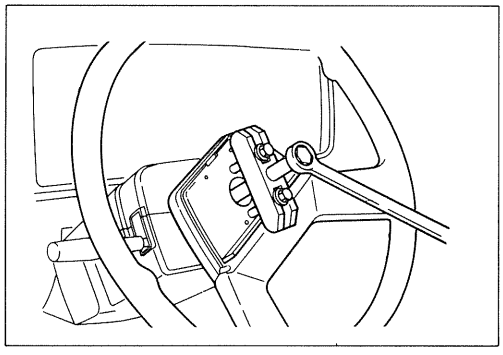
Mark the position of the steering wheel to the steering shaft to ensure correct reassembly.



- Except LS model

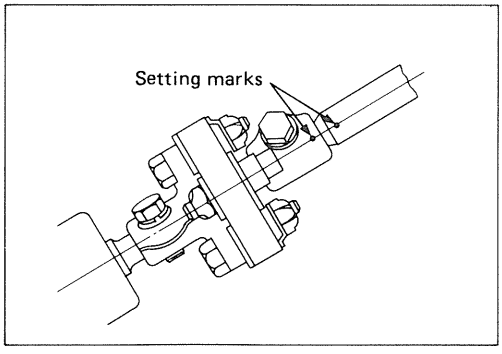
  Puller : 8-9425-7887-0
  (J-24292-B)

Note: Never apply a blow to the steering wheel shaft with a hammer or other impact tool in an attempt to remove the steering wheel.



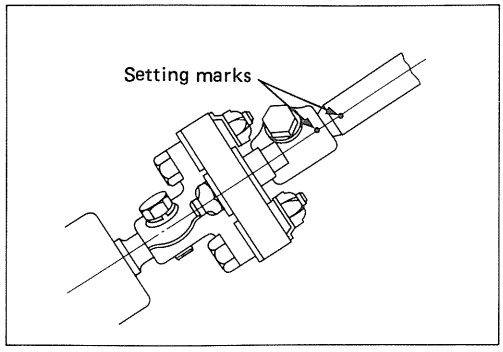
- LS model only

  Puller : 5-8521-0016-0
  (J-29752)



9. Steering column assembly

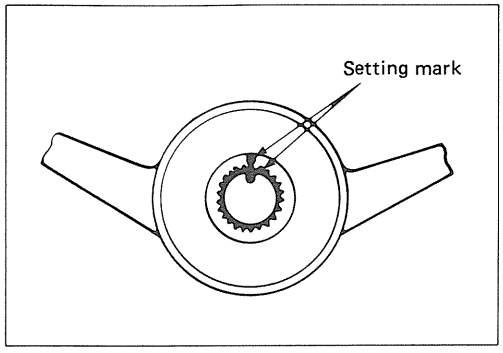
Apply a setting mark across the coupling flange and steering shaft to ensure reassembly of the parts in the original position.



Important operations — Installation

9. Steering column assembly

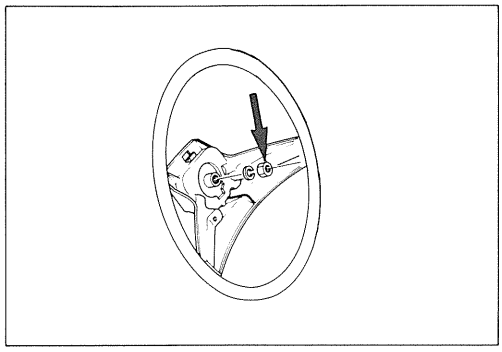
Align the setting marks applied at removal.



4. Steering wheel

(1) Align the setting marks applied at removal
(2) Apply grease to contact ring.

Note: Never apply a shock to the steering wheel in direction of the shaft by using a hammer or other impact tools in an attempt to remove the steering wheel.
Because, the steering shaft is designed as energy absorbing unit.

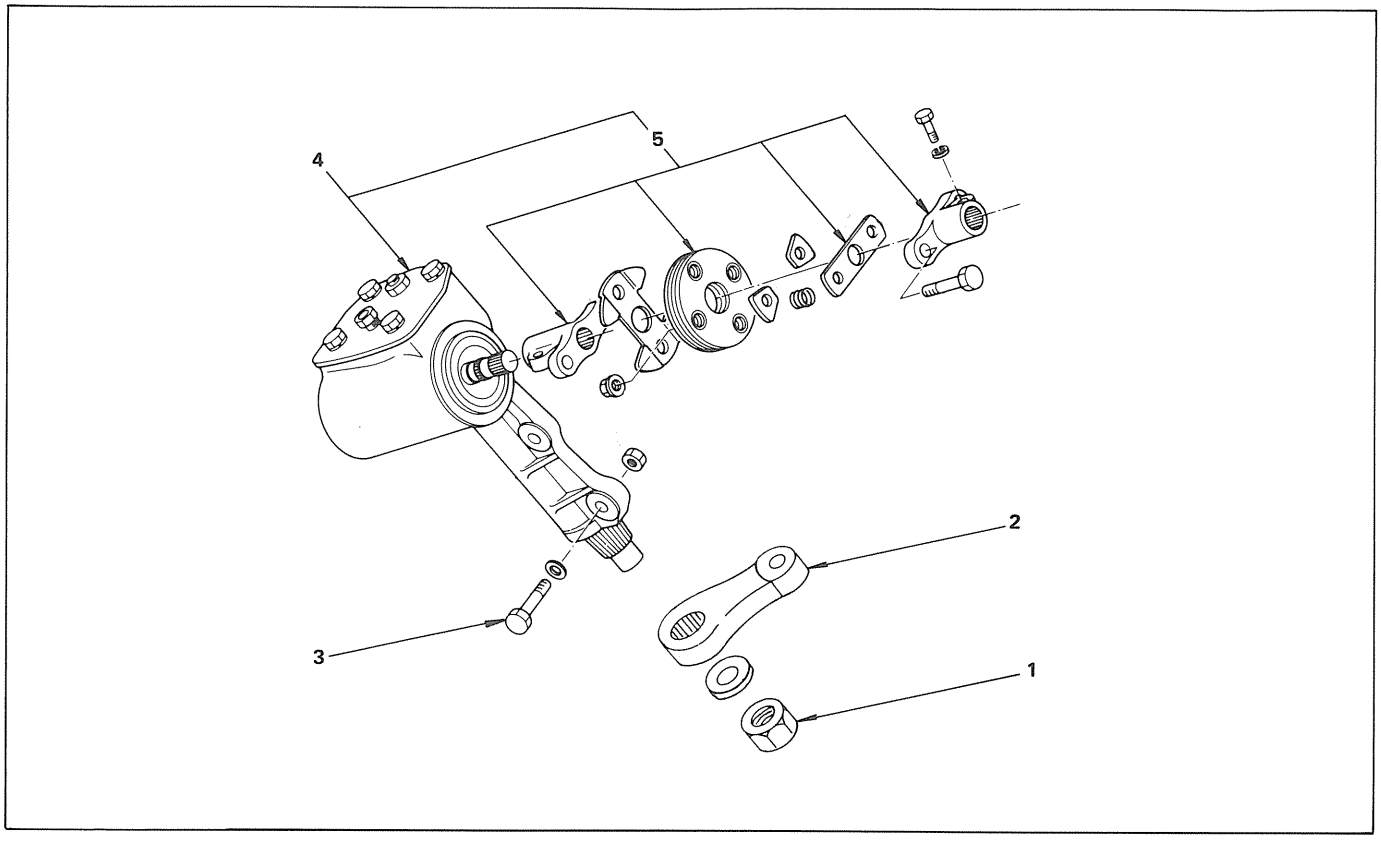


3. Nut

Torque	kg·m(ft.lbs.)	2.5—4.0 (18—29)

STEERING UNIT

REMOVAL AND INSTALLATION

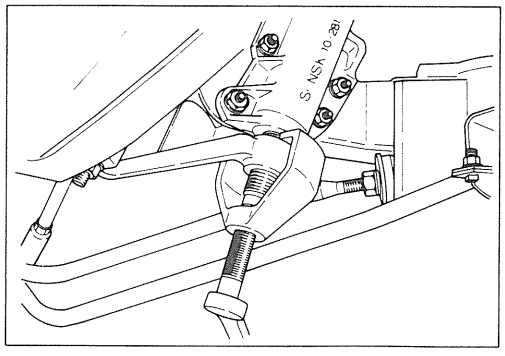


Removal steps

1. Nut
▲ 2. Pitman arm
3. Bolt
4. Unit assembly
▲ 5. Coupling assembly

Installation steps

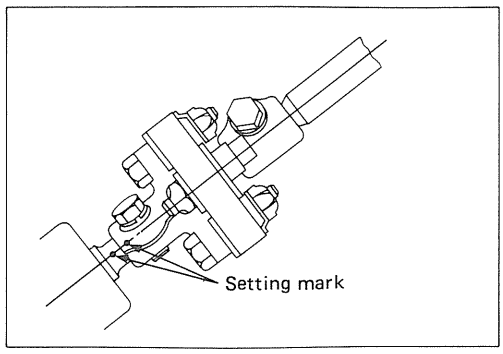
▲ 5. Coupling assembly
4. Unit assembly
▲ 3. Bolt
▲ 2. Pitman arm
▲ 1. Nut



Important operations — Removal

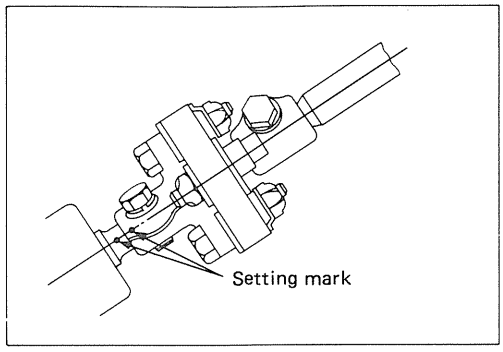
2. Pitman arm

Remover : 5-8840-2005-0
(J-29107)



5. Coupling assembly

Apply a setting mark across the flange and worm shaft to ensure reassembly of the parts in the original position.



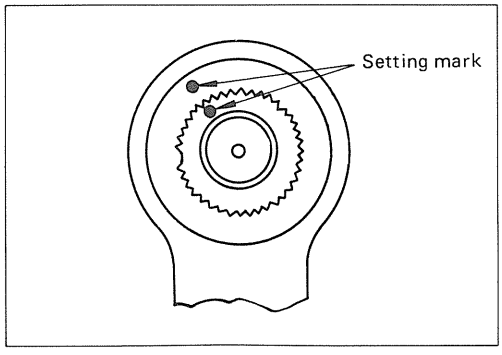
Important operations — Installations

5. Coupling assembly

Align the setting mark applied at removal.

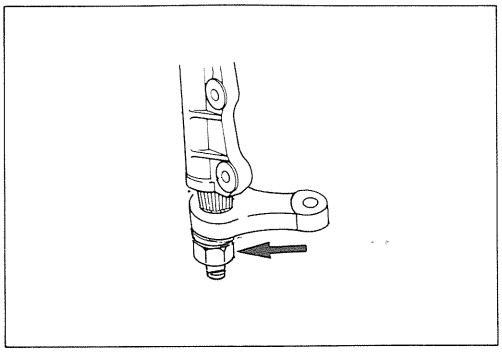
3. Bolt

Torque	kg·m(ft.lbs.)	4.0—5.5 (29—40)



2. Pitman arm

Align the notched tooth

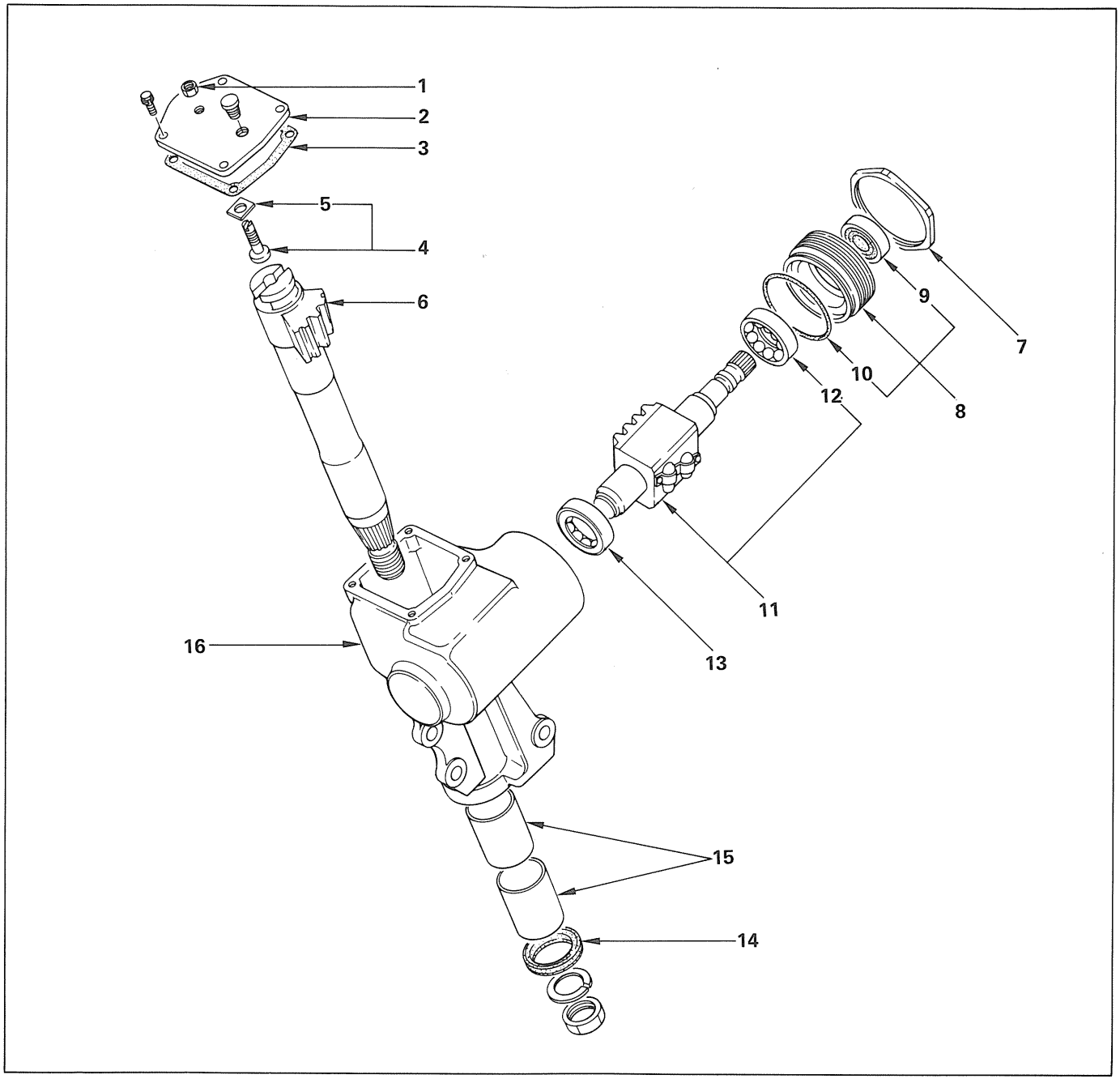


1. Nut

Torque	kg·m(ft.lbs.)	20—24 (145—174)

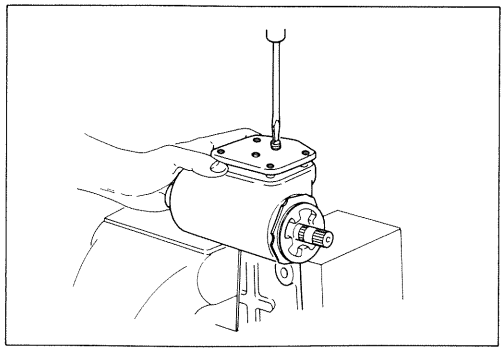
DISASSEMBLY

MANUAL STEERING UNIT



Disassembly steps

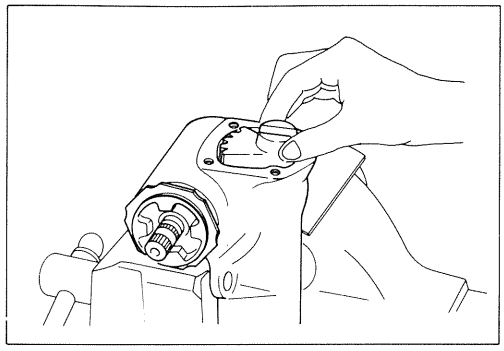
1. Lock nut
▲ 2. Side cover
3. Gasket
4. Adjust screw
5. Adjust shim
▲ 6. Sector shaft
▲ 7. Lock nut
▲ 8. End cover
9. Oil seal
10. O-ring
▲ 11. Ball nut and worm shaft
12. Bearing
13. Bearing
14. Oil seal
15. Bushing
16. Gear box



Important operations

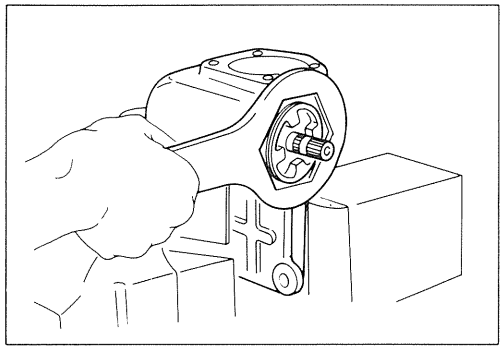
2. Side cover

(1) Turn the adjust screw counter-clockwise slightly, then remove the side cover fixing bolt.
(2) Turn the adjust screw clockwise with the side cover held from turning.



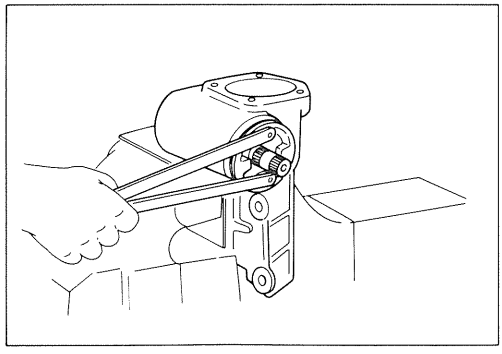
6. Sector shaft

Hold the sector shaft in straight-ahead position when removing it from the gear box. Avoid driving the sector shaft off the gear box with a hammer or other impact tools.



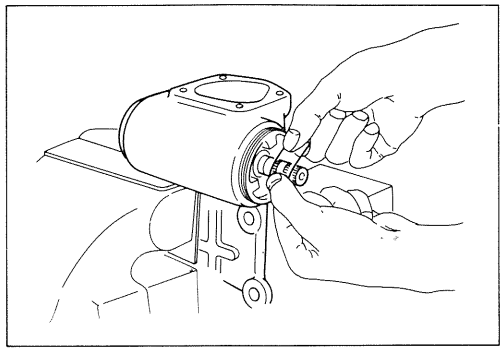
7. Lock nut

Wrench : 5-8840-2006-0
(J-29753)

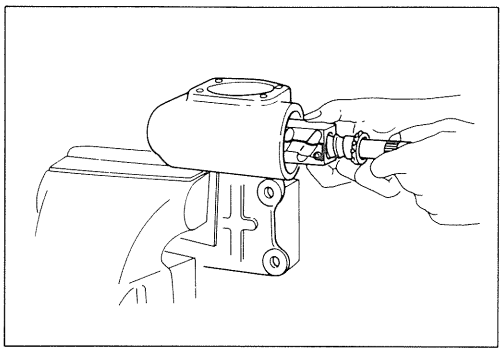


8. End cover

Remover : 5-8840-2007-0
(J-7624)



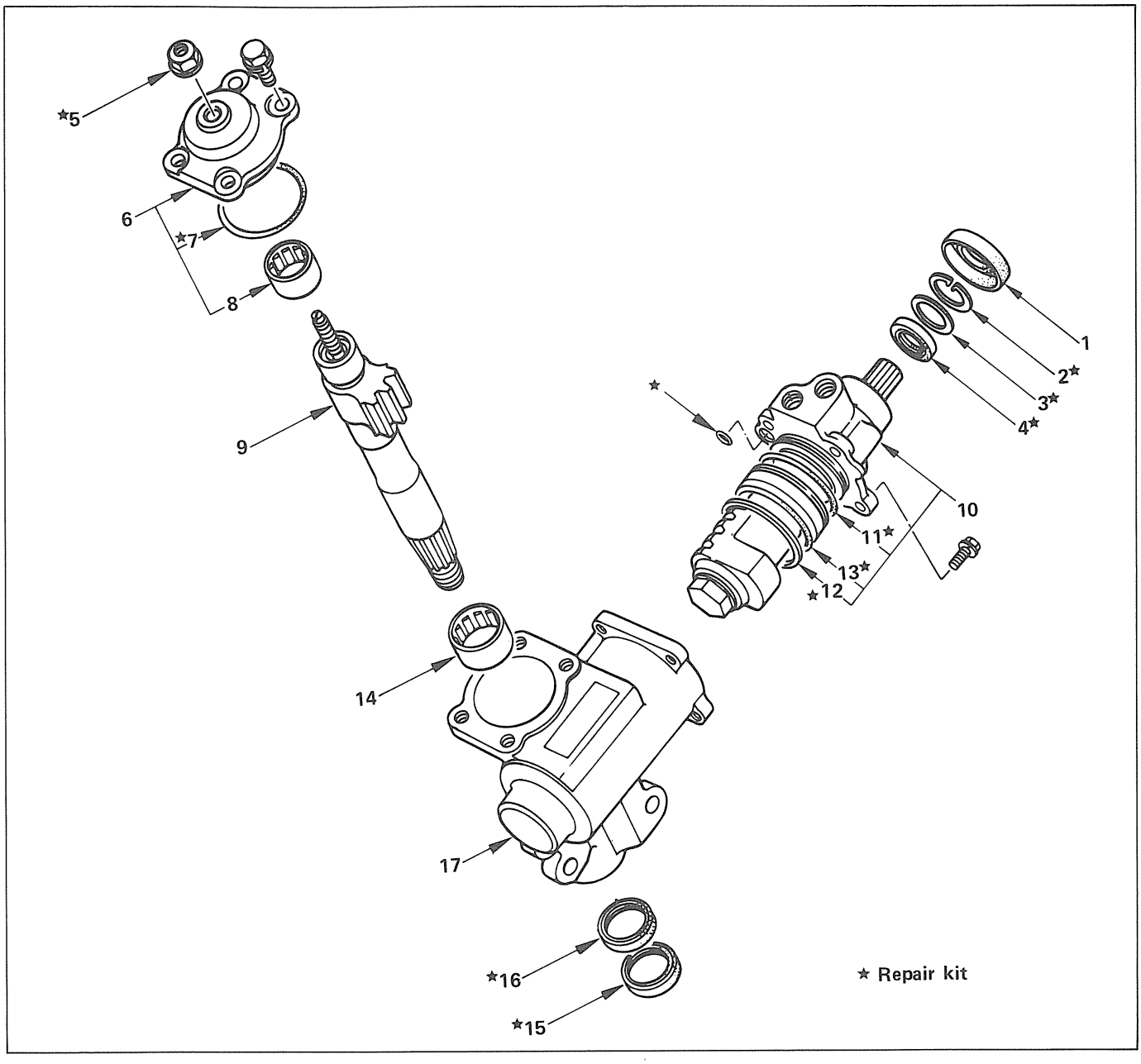
When removing, use care so as not to cause damage to the oil seal.
Taping the splines will provided some protection.



11. Ball-nut and worm shaft

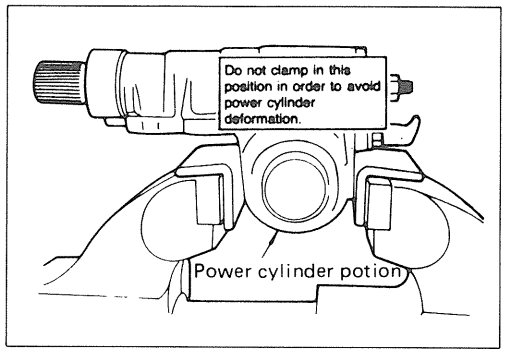
Always keep ball-nut assembly in a horizontal position and avoid holding it vertically, or ball-nut will slide out.

POWER STEERING UNIT



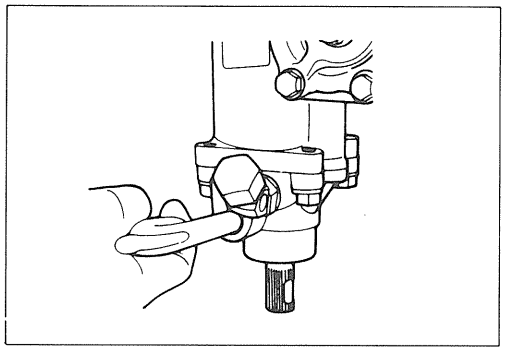
Disassembly steps

1. Dust cover
2. Retaining ring
3. Buck up ring
▲ 4. Oil seal
▲ 5. Lock nut
▲ 6. Top cover assembly
7. O-ring
8. Needle bearing
▲ 9. Sector shaft
▲ 10. Ball nut and valve housing assembly
11. O-ring
12. Seal ring
13. O-ring
14. Needle bearing
15. Dust seal
16. Seal ring
17. Gear box



Important operations

Avoid clamping the steering gear assembly in a vise at the power cylinder portion.

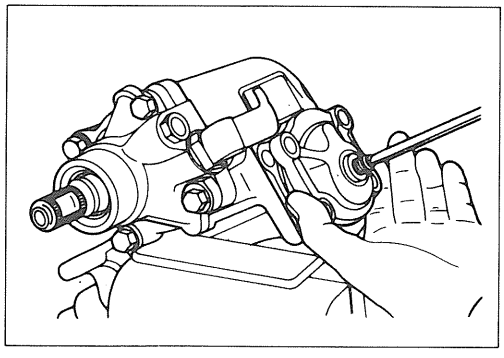


4. Oil seal

(1) Clean faces of the stub shaft extended outward.
(2) Plug hose fitting on the inlet side.
(3) Remove the oil seal by applying compressed air through hole in the outlet side.

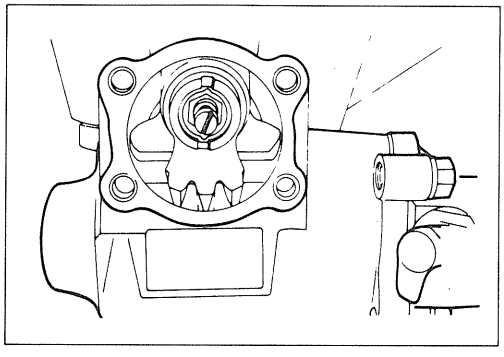
5. Lock nut

Remove adjusting screw lock nut and turn adjusting screw counter-clockwise to remove the preload between sector gear and rack piston, then remove the top cover bolts.



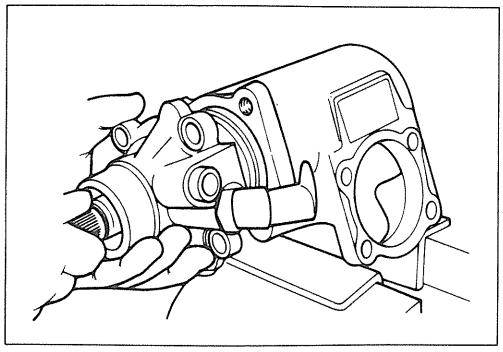
6. Top cover

Hold the top cover stationary, turn the adjust screw clockwise to raise and free the cover, then remove the cover.



9. Sector shaft

Bring the stub shaft into straight-ahead position. Avoid driving the sector shaft off the gear box with a hammer or other impact tools.



10. Ball screw and valve housing assembly

It is strongly advisable to keep the ball nut and valve housing assembly always in horizontal position and avoid holding it vertically, or the rack piston will fall off onto the end of the worm, causing rack piston to slip out of the worm shaft and balls to fall apart.

INSPECTION AND REPAIR

MANUAL STEERING UNIT

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.

- Bearing
- Oil seal, bushing
- Ball nut and worm shaft
- Sector shaft
- Gear box

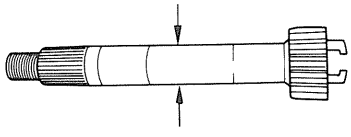
Visual check

Inspect the following parts for wear, damage or other abnormal conditions.

Ball-nut rotation

Hold the worm shaft vertically and see if the ball-nut lowers with turning motion smoothly. If lowering of the ball-nut with its own weight is unsmooth, check the worm shaft for bending and ball-groove for burns, dents and presence of foreign matter.

Note: When making a test on the ball nut assembly, exercise care so as not to strike ball nut against end of worm shaft, or damage to the ball tubes will result.



Sector shaft outside diameter

mm(in.)

Standard	Limit
28.6 (1.13)	28.3 (1.12)

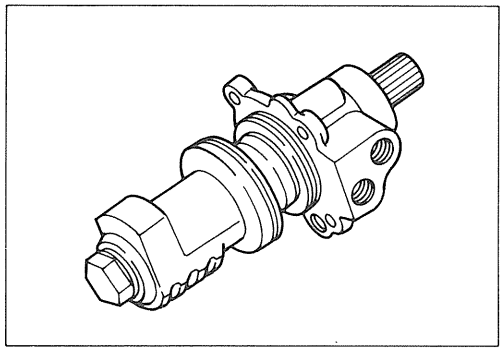
POWER STEERING UNIT

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.

- Bearing
- Oil seal, Dust seal, Dust cover
- O-ring, seal ring
- Ball nut and valve housing
- Sector shaft
- Gear box

Visual check

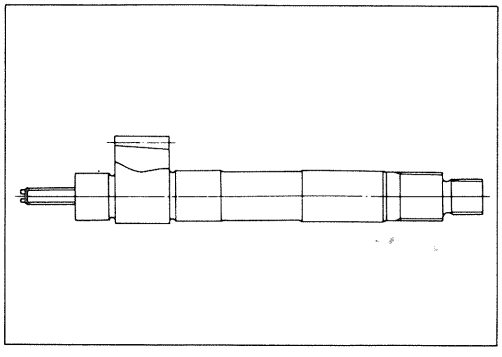
Inspect the following parts for wear, damage or other abnormal conditions.



Ball-nut rotation

Hold the ball nut and valve housing assembly vertically and see if the ball-nut lowers with turning motion smoothly. If lowering of the ball-nut with its own weight is unsmooth, check the worm shaft for bending and ball-groove for burns, dents and presence of foreign matter.

Note: When making a test on the ball nut and valve housing assembly, exercise care so as not to strike ball nut against end of worm shaft, or damage to the ball tubes will result.



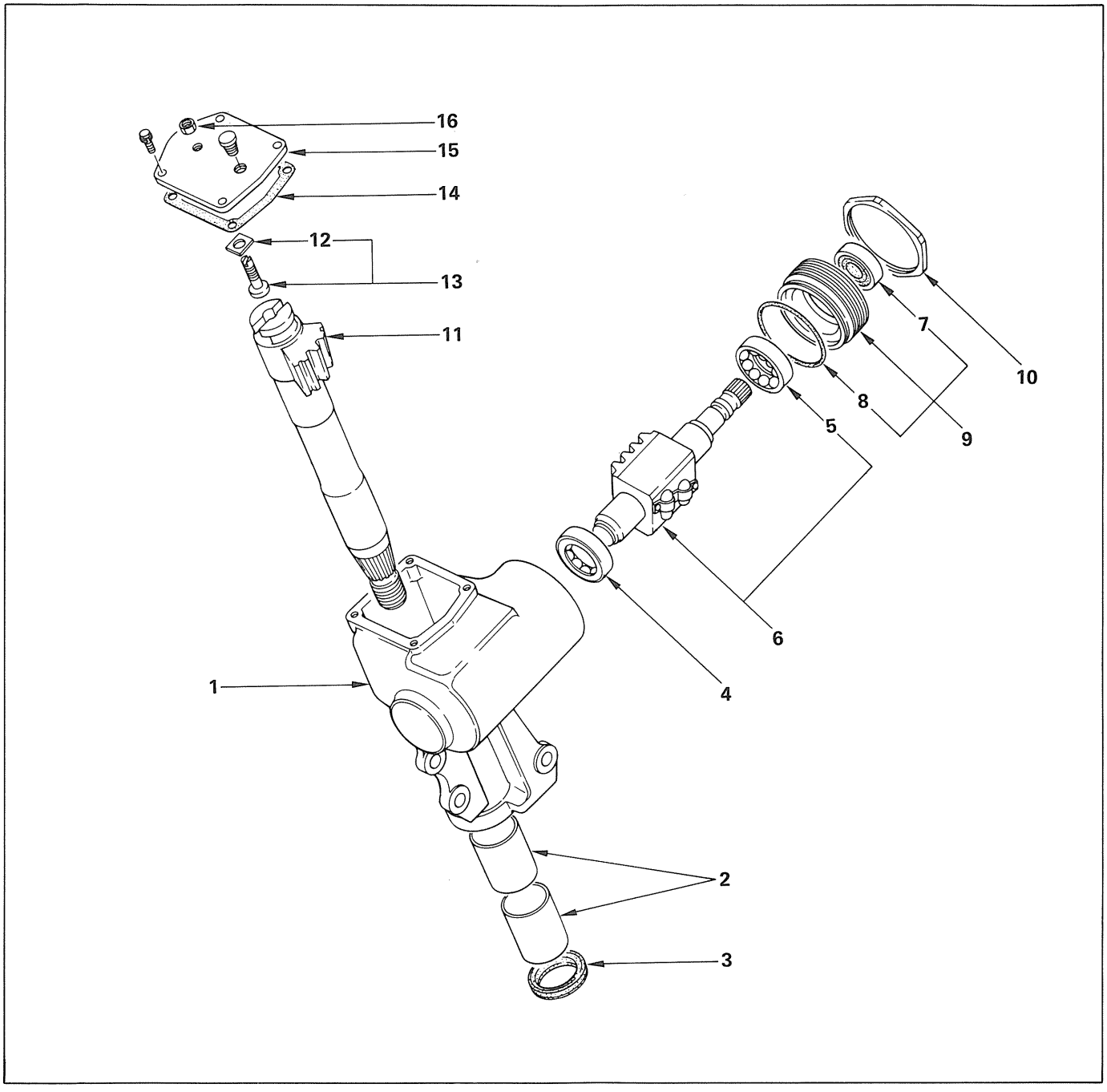
Sector shaft outside diameter

mm(in.)

Standard	Limit
32.0 (1.260)	31.7 (1.248)

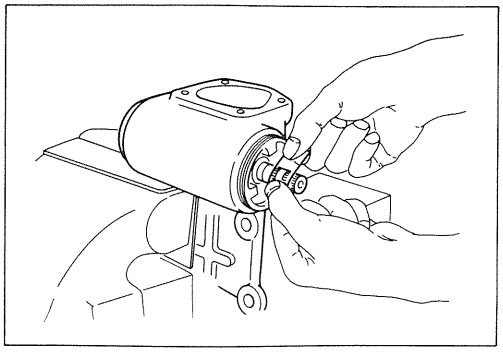
REASSEMBLY

MANUAL STEERING UNIT



Reassembly steps

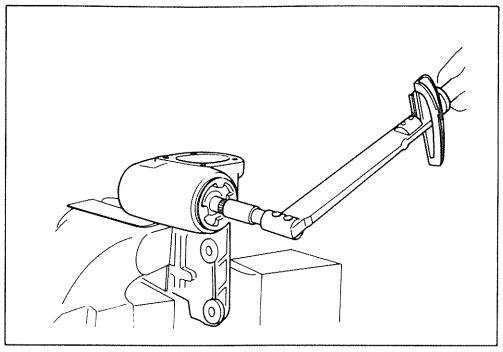
1. Gear box
2. Bushing
3. Oil seal
4. Bearing
5. Bearing
6. Ball nut and worm shaft
7. Oil seal
8. O-ring
▲ 9. End cover
▲ 10. Lock nut
▲ 11. Sector shaft
▲ 12. Adjust shim
13. Adjust screw
▲ 14. Gasket
▲ 15. Side cover
▲ 16. Lock nut



Important operations

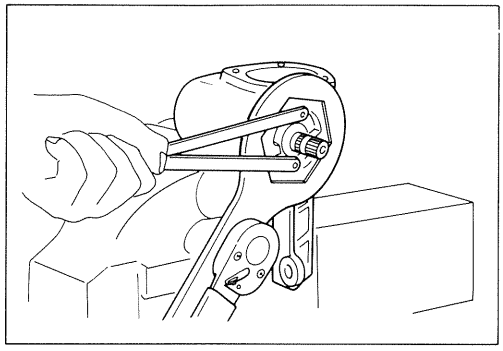
9. End cover

(1) When installing, use care so as not to cause damage to the oil seal.
Taping the splines will provide some protection.



(2) Adjust the bearing preload.

Preload kg·m(ft.lbs.)	0.03—0.06 (0.22—0.43)

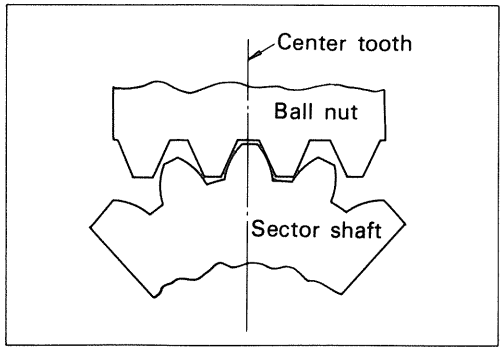


10. Lock nut

Torque kg·m(ft.lbs.)	16—20 (116—145)

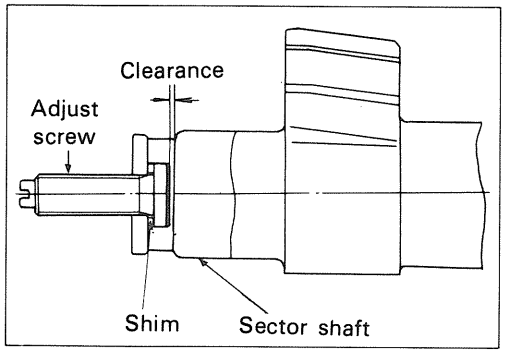
Note: After tightening, check the bearing preload.

Preload kg·m(ft.lbs.)	0.03—0.06 (0.22—0.43)



11. Sector shaft

Align the center tooth of ball-nut with that of the sector shaft.



12. Adjust shim

Adjust the clearance and check that the adjust screw slides freely.

Clearance mm(in.)	0.1 (0.0039)

Adjust shims available

mm(in.)
1.53, 1.56, 1.59, 1.62, 1.65 (0.060, 0.061, 0.063, 0.064, 0.065)

14. Gasket

15. Side cover

Apply liquid gasket to the jointing face of each parts.

16. Lock nut

Adjust the backlash between the sector gear and ball-nut.

(1) Set the sector shaft in a straight ahead position.

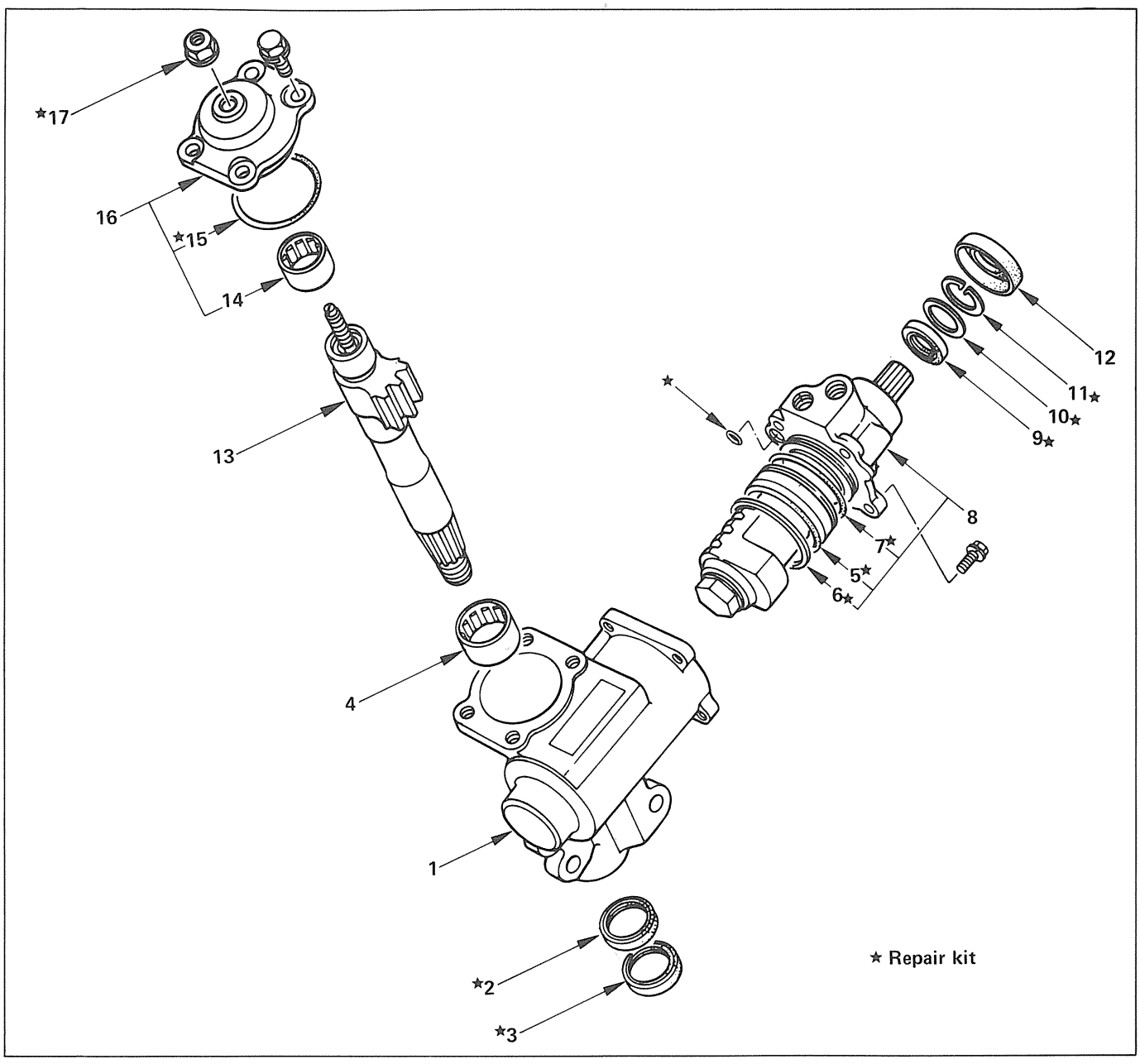
(2) With the adjust screw, adjust the backlash to the specification

Backlash (Preload) kg·m(ft.lbs.)	0.05—0.1 (0.36—0.72)

(3) Lock adjust screw with lock nut.

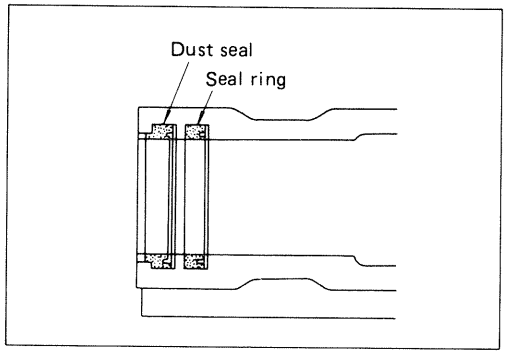
Torque kg·m(ft.lbs.)	2.0—3.0 (14—22)

POWER STEERING UNIT



Reassembly steps

1. Gear box
▲ 2. Seal ring
▲ 3. Dust seal
4. Needle bearing
▲ 5. O-ring
▲ 6. Seal ring
▲ 7. O-ring
▲ 8. Ball nut and valve housing assembly
▲ 9. Oil seal
▲ 10. Buck up ring
▲ 11. Retaining ring
12. Dust cover
▲ 13. Sector shaft
14. Needle bearing
15. O-ring
▲ 16. Top cover assembly
▲ 17. Lock nut

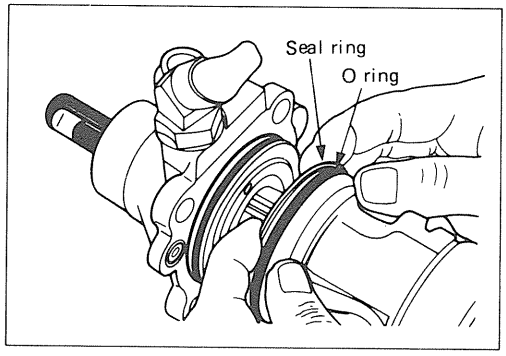


Important operation

2. Seal ring

3. Dust seal

Note the setting direction.
Apply a thin coat of grease to lip of the each parts.

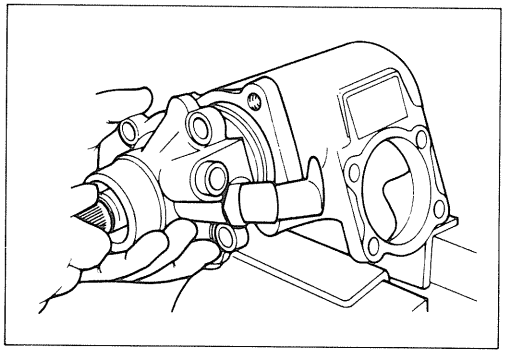


5. O-ring

6. Seal ring

7. O-ring

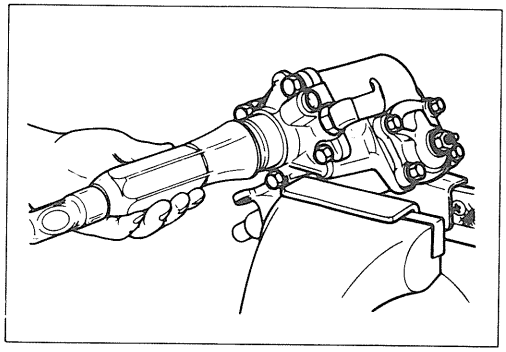
Apply a thin coat of grease.



8. Ball nut and valve housing assembly

(1) It is strongly advisable to keep the ball screw and valve housing assembly always in horizontal position and avoid holding it vertically, or the rack piston will fall off onto the end of the worm, causing rack piston to slip out of the worm shaft and balls to fall apart.
(2) Be carefully so as not to drop O-ring fitted to oil passage in the valve housing.
(3) Tighten the valve housing retaining bolts to the specified torque.

Torque	kg·m(ft.lbs.)	4.0—5.5 (29—40)



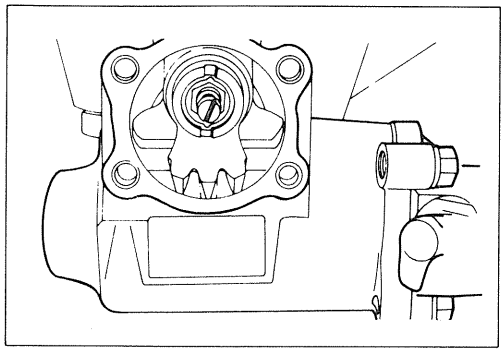
9. Oil seal

Oil seal installer : 5-8522-0026-0
(J-26508)

10. Back up ring

11. Retaining ring

Turn the face with rounded edge (outer circumference) to the oil seal.



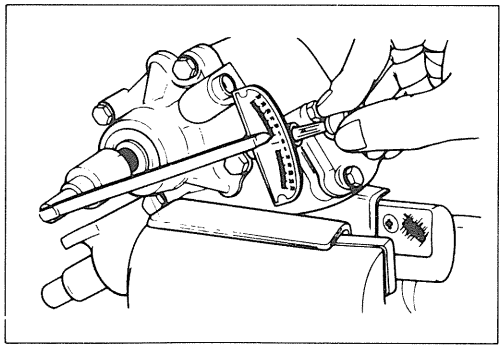
13. Sector shaft

(1) Tape the sector shaft serration to protect the seal ring from damage.

(2) Align the center tooth of ball nut with that of the sector shaft.

16. Top cover assembly

Bolt torque kg·m(ft.lbs.)	4.0—5.5 (29—40)



17. Lock nut

Adjust the backlash between the worm gear and the ball nut.

(1) With the worm gear rotating, set it to the straight ahead position.

(2) Set the worm shaft backlash to below 10 kg·cm (0.71 ft.lbs.) with the sector shaft adjusting screw.

(3) Measure the worm shaft backlash with the worm gear turned 450° both to the right and to the left. The worm gear backlash in these positions should be 2 — 4 kg·cm (0.14 — 0.29 ft.lbs.) lower than in the straight ahead position.

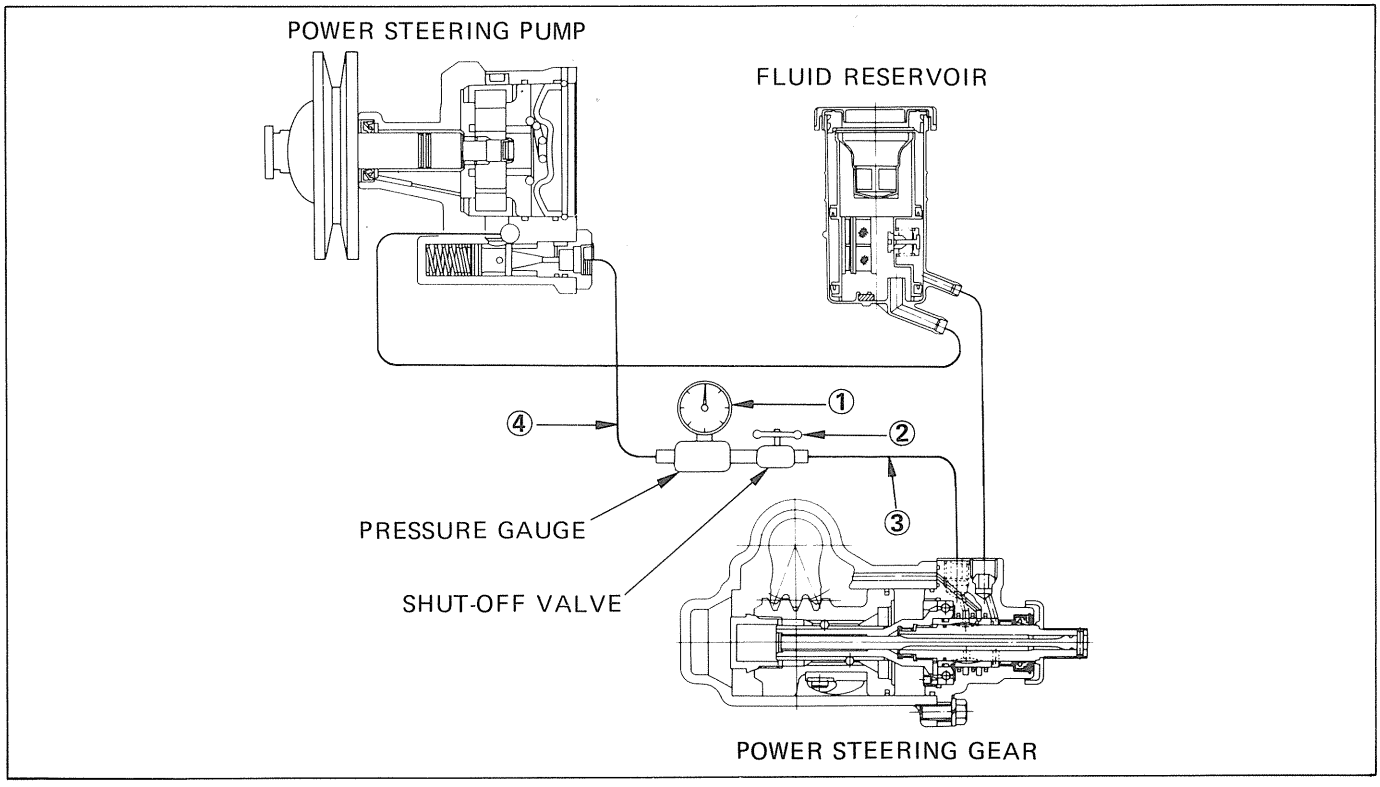
(4) Lock the sector shaft adjusting screw with the lock nut.

Torque kg·m(ft.lbs.)	3.5—4.8 (25—35)

INSPECTION OF POWER STEERING SYSTEM

MEASUREMENT OF FLUID PRESSURE

Measurement of fluid pressure in the power steering system is performed to determine whether or not the oil pump and power steering unit are functioning normally.



1. Installation of tester

- Power steering tester : 5-8840-0135-0 (J-29877-A)
  Adapter ; power steering tester : 5-8840-0136-0 (J-33996)

  1 Oil pressure gauge with shut off valve
  2 Shut off valve
  3 Adapter (to oil pump)
  4 Adapter (to steering unit)

- Installation procedure ;

  Disconnect the hose on the outlet side of the pump at the back of the pump. Connect the gauge hose closest to the power steering gauge shut off valve to the hose on the vehicle. Connect the gauge hose furthest from the shut off valve to the back of the power steering pump.

2. Bleeding

- Open stop valve fully.
- Fill fluid reservoir with specified automatic transmission fluid (DEXRON®) and turn the steering wheel to lock in both directions repeatedly, so that level of fluid in the reservoir lowers.
- Fill to bring the level of fluid in the reservoir to the specified level and start the engine.
- Perform the following check with the engine running at idle.
  Bleeding is considered to be completed if the following conditions apply ;

(1) Turn the steering wheel to lock in both directions 3 or 4 times.
A buzz is not produced in the hydraulic line.

(2) Stop the engine with steering wheel in a straight-ahead position.
Level of fluid in reservoir does not increase.

Note: Do not hold the steering wheel in position of lock for more than 5 seconds, or temperature of fluid increases sharply.

3. Measurement of fluid pressure

- Open stop valve fully.
- Increase engine speed to 1500 rpm.
- Measure the fluid pressure when the steering wheel is turned to lock in both directions.

Fluid pressure kg-cm^2(psi)	77—85 (1,085—1,210)

Diagnosis :

(1) When pressure is higher than 85 kg/cm^2 (1,210 psi), the valve within the oil pump is defective.

(2) When the pressure is lower than 77 kg/cm^2 (1,085 psi).

- Return steering wheel to straight-ahead position.
- Close stop valve completely.
- Hold engine running at 1500 rpm, and take reading of the pressure gauge.

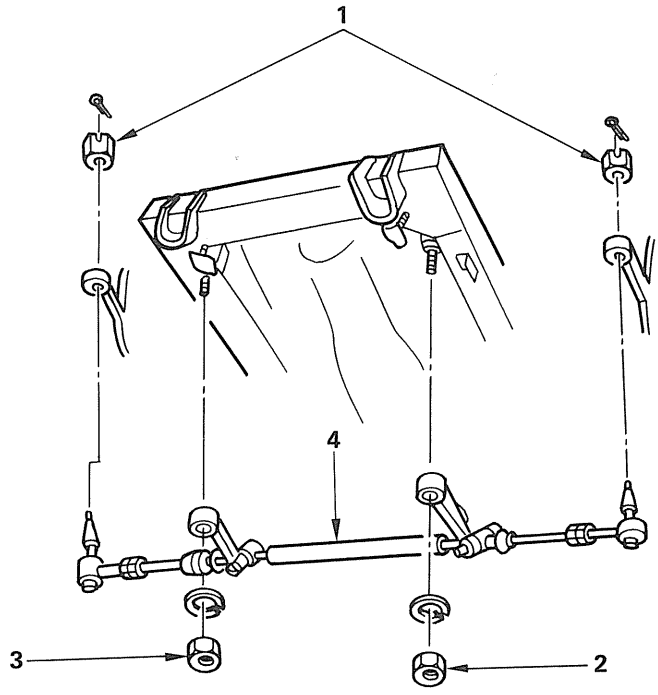
Diagnosis :

kg/cm^2(psi)

Fluid pressure	Possible trouble
77—85 (1,085—1,210)	Steering unit
Lower than 77 (1,085)	Oil pump

STEERING LINKAGE

REMOVAL AND INSTALLATION

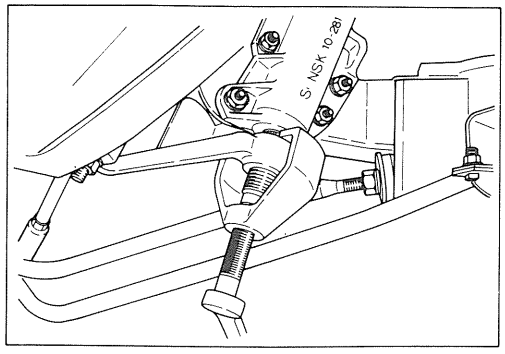


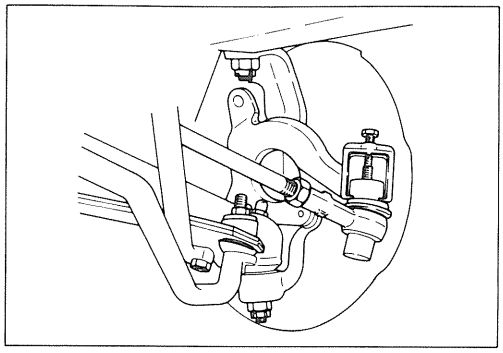
Removal steps

1. Nut
2. Nut ; pitman arm
3. Nut ; relay lever
▲ 4. Linkage assembly

Installation steps

4. Linkage assembly
▲ 3. Nut ; relay lever
▲ 2. Nut ; pitman arm
▲ 1. Nut





Important operations — Removal

4. Linkage assembly

Pitman arm and relay lever remover :
5-8840-2005-0
(J-29107)

Tie rod remover : 5-8840-0011-0
(J-21687-02)

Important operations — Installation

3. Nut ; relay lever

Torque	kg·m(ft.lbs.)	12 (87)

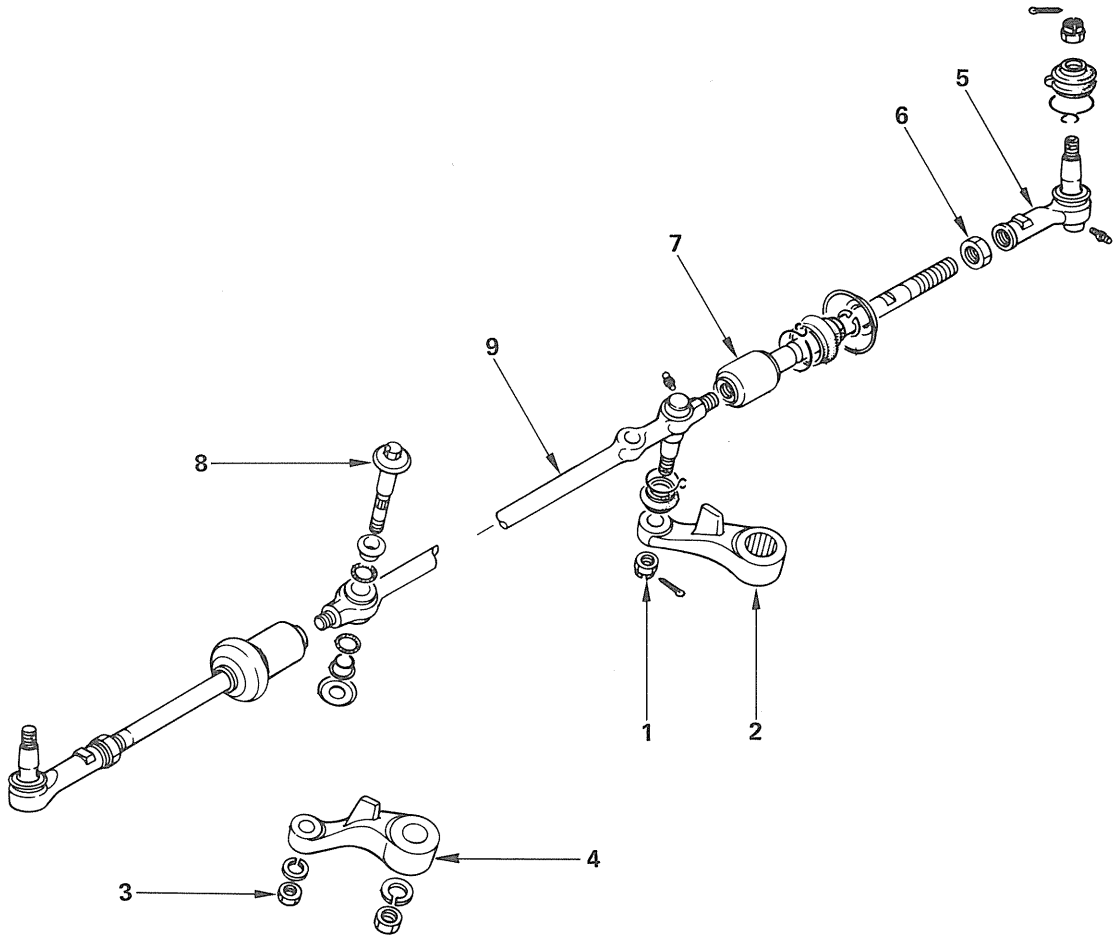
2. Nut ; pitman arm

Torque	kg·m(ft.lbs.)	20—24 (145—174)

1. Nut

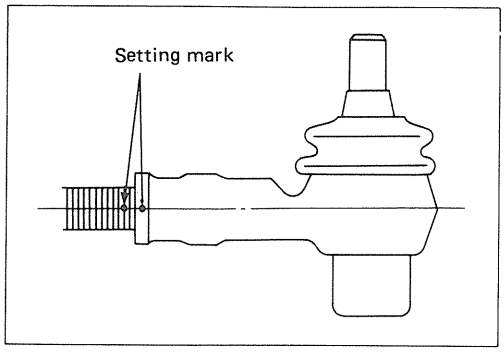
Torque	kg·m(ft.lbs.)	7 (51)

DISASSEMBLY



Disassembly steps

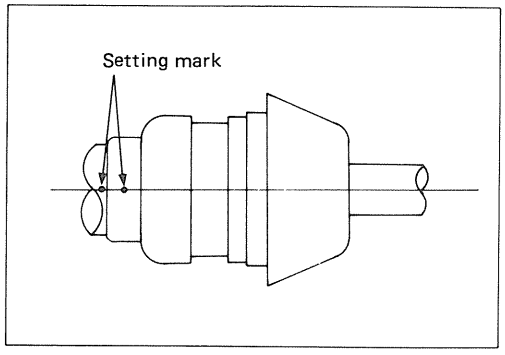
1. Nut
2. Pitman arm
3. Nut
4. Relay lever
5. ▲ End assembly (outer)
6. Nut
7. ▲ End assembly (inner)
8. Pin assembly
9. Center track rod assembly



Important operations

5. End assembly (outer)

Apply the setting mark to ensure reassembly of the parts in the original position



7. End assembly (inner)

Apply the setting mark to ensure reassembly of the parts in the original position

INSPECTION AND REPAIR

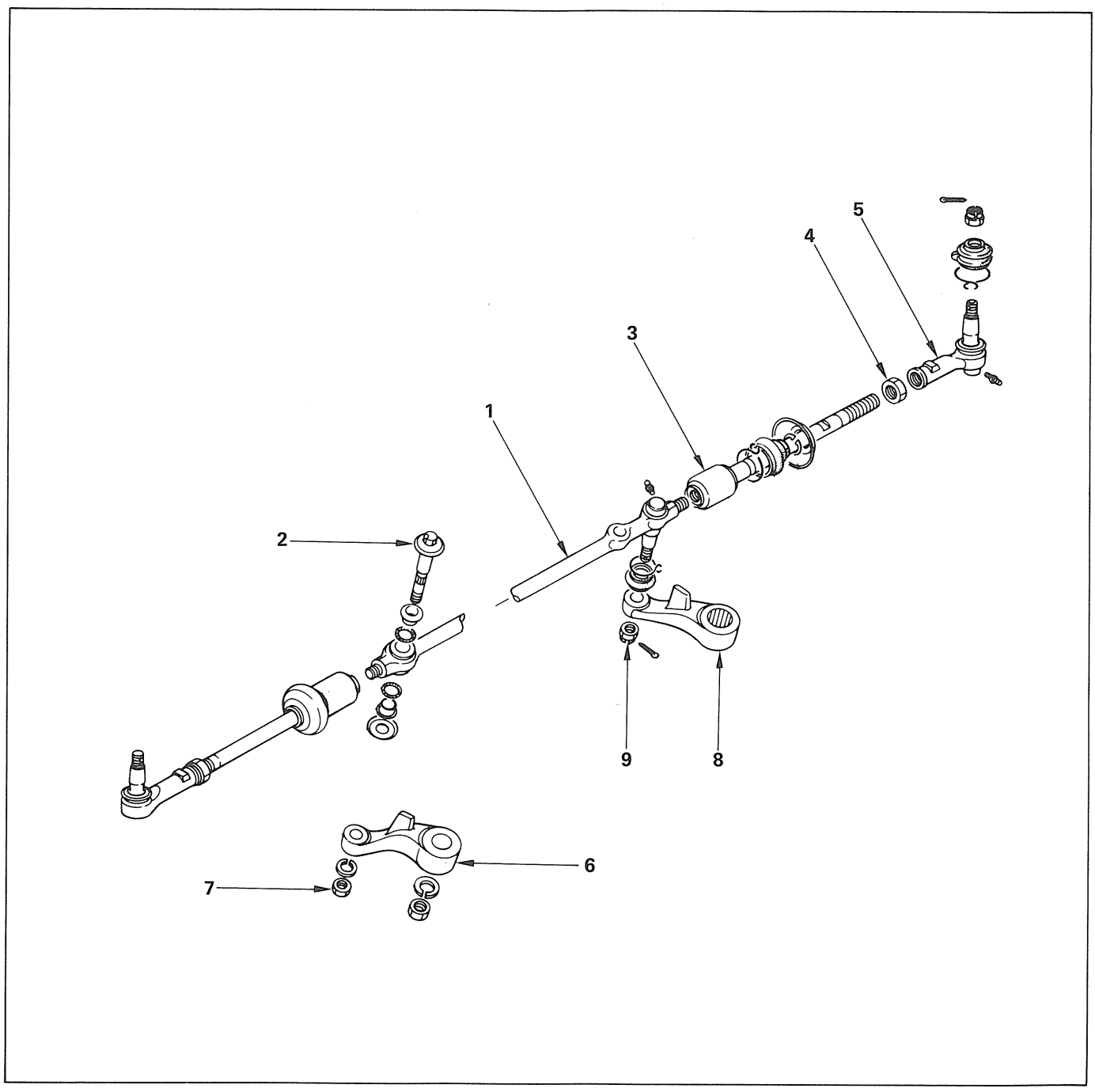
Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.

- Pitman arm, relay lever
- End assembly, pin assembly
- Center track rod assembly
- Cover, boot

Visual check

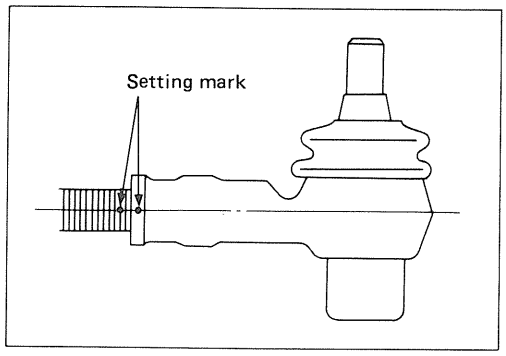
Inspect the following parts for wear, damage or other abnormal conditions.

REASSEMBLY



Reassembly steps

1. Center track rod assembly
2. Pin assembly
▲ 3. End assembly (inner)
▲ 4. Nut
▲ 5. End assembly (outer)
6. Relay lever
▲ 7. Nut
8. Pitman arm
▲ 9. Nut



Important operations

3. End assembly (inner)

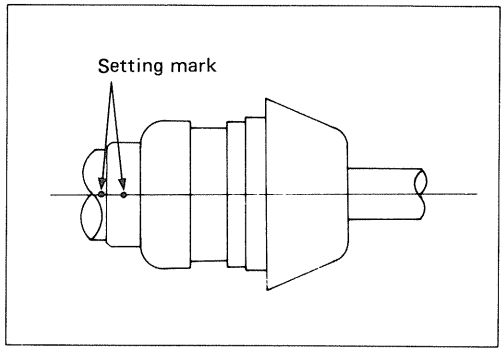
Align the setting marks applied at the disassembly.

Torque	kg·m(ft.lbs.)	8—10 (58—72)

After tightening, coulk the two portions securely.

4. Nut

Torque	kg·m(ft.lbs.)	12 (87)



5. End assembly (outer)

Align the setting marks applied at the disassembly.

7. Nut

Torque	kg·m(ft.lbs.)	6 (43)

9. Nut

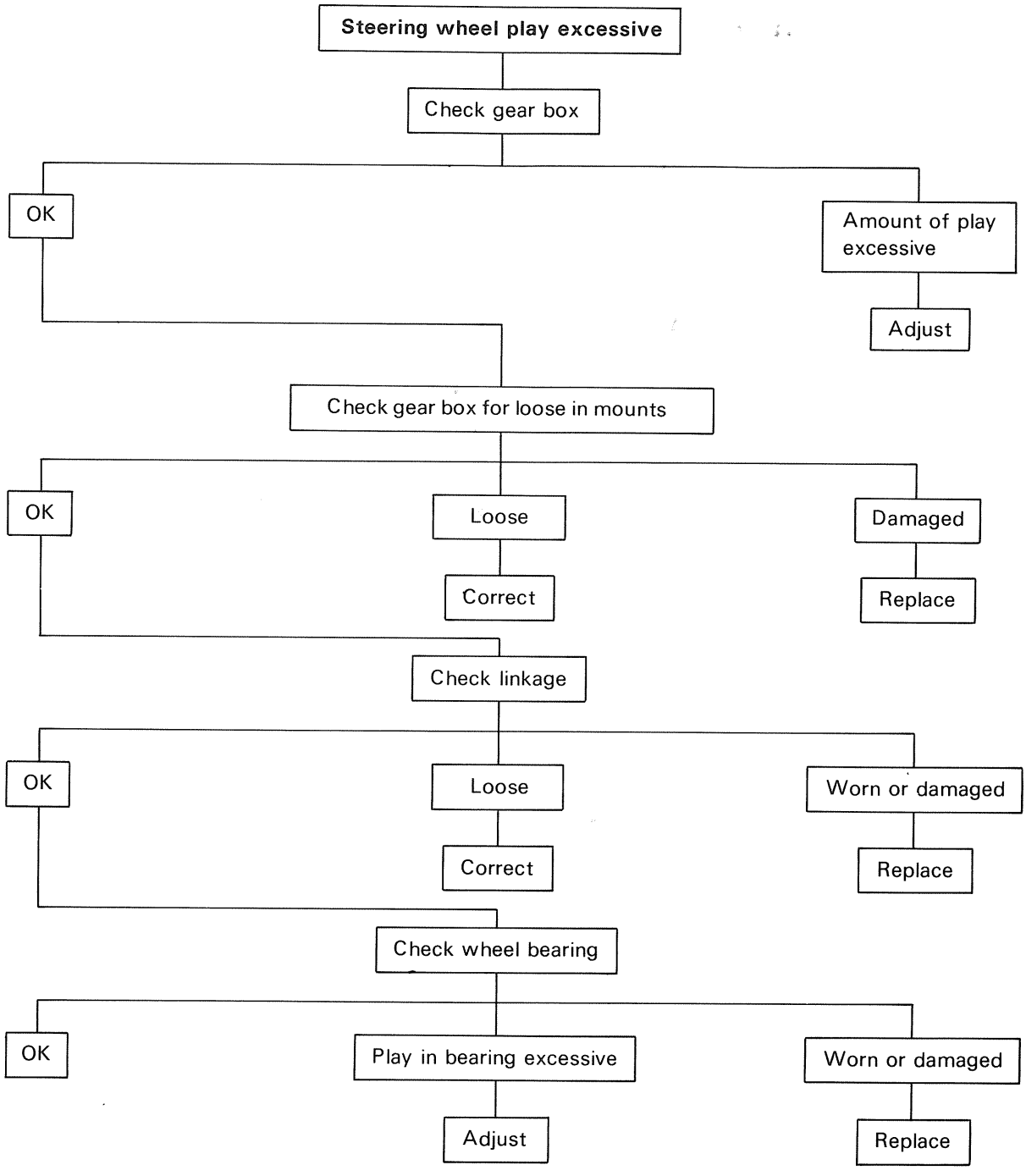
Torque	kg·m(ft.lbs.)	7 (51)

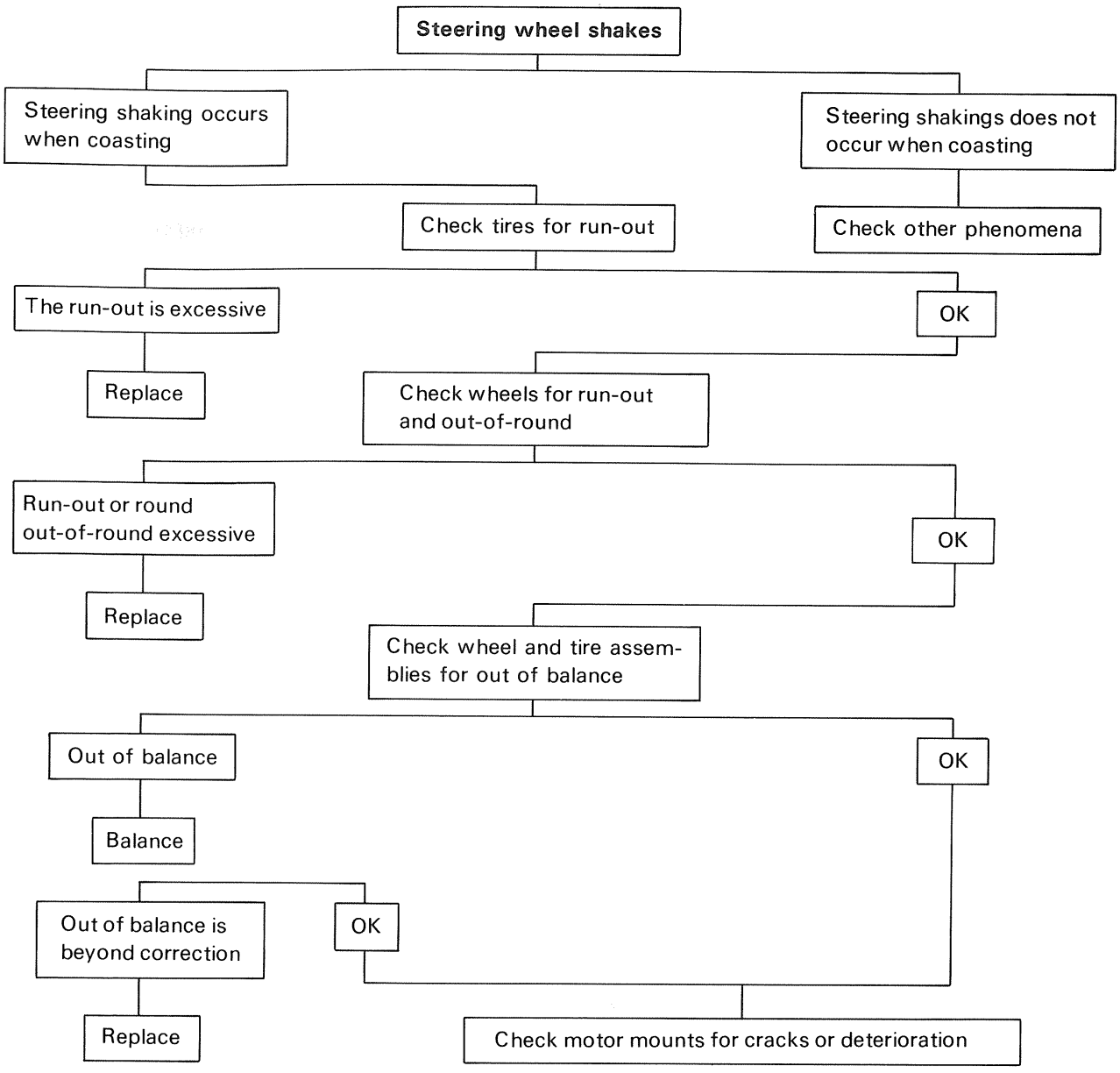
TROUBLE SHOOTING

INSPECTION PROCEDURES FOR STEERING SYSTEM

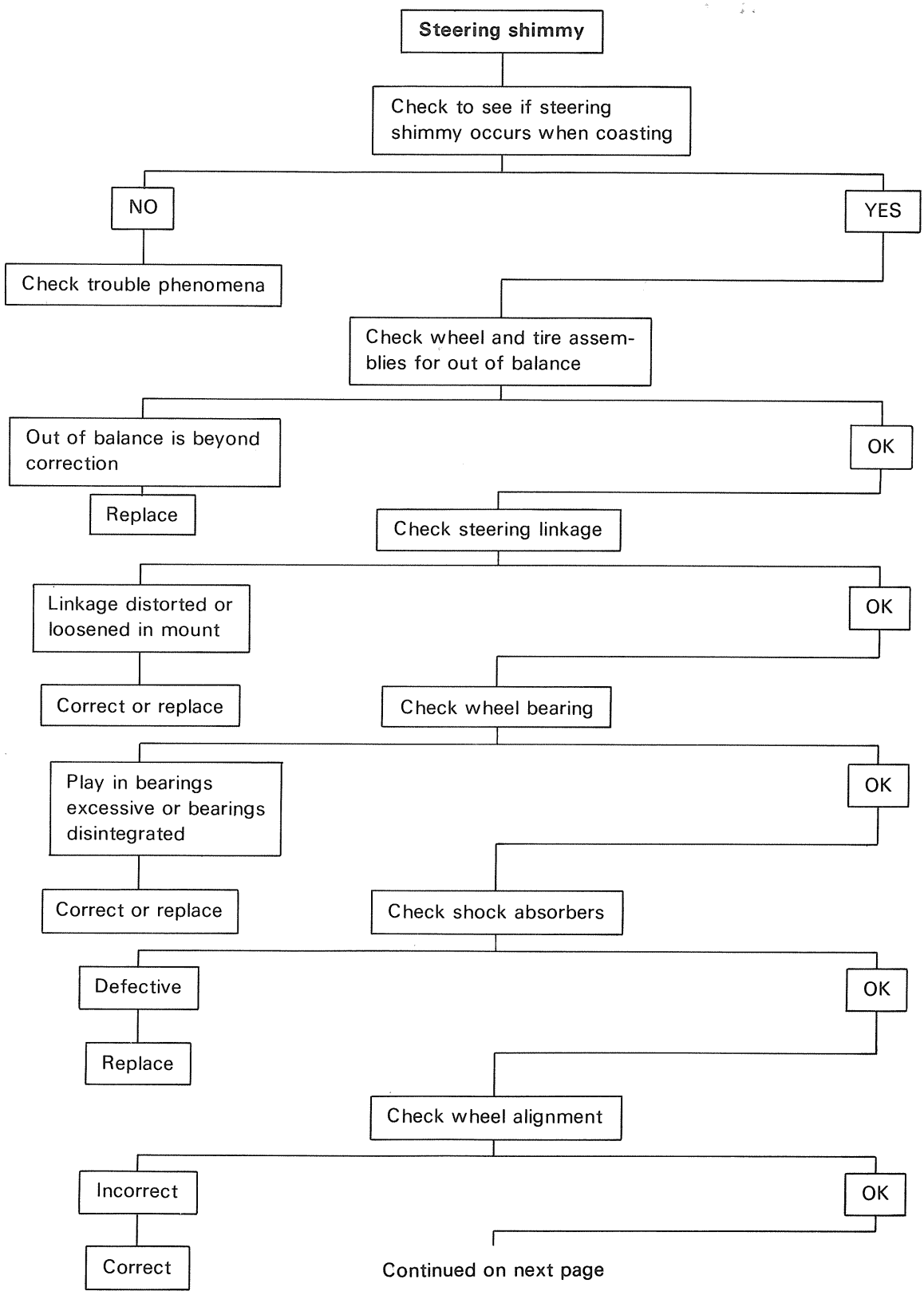
COMPONENT AND TEST		PROCEDURE
HANDLE	Check for play and slack	1. Place the steering wheel in the straight forward position. Gently move the wheel to the right and to the left. About ten millimeters of play in either direction should be present before the front tires begin to move. If the vehicle is equiped with power steering, the engine should be running when these tests are made. 2. Grasp the steering wheel firmly with both hands. Exert force in an up and down direction on the steering column. There should be no play. 3. Move the steering wheel to the right and to the left. Check to see that there or the steering shaft. Make sure that there is no slack in those areas where parts are joined together.
	Check the operating condition of the system	1. Make the following checks while actually driving the vehicle. a. Check the position of the steering wheel when the vehicle is traveling straight ahead. b. Make sure that the vehicle does not have a tendency to steer to the right or the left. c. There should be no excessive vibration present at the steering wheel. d. Turn the vehicle as sharply as possible to both the right and the left. When the steering wheel is turned fully in either direction, check for abnormal noise. Neither should the wheel feel overly heavy when it is fully turned to either the left or the right. Loosen your grip on the steering wheel. It should return to its center position.
GEAR BOX	Check for oil leakage	1. Check all parts of the steering unit (the oil seals of the front cover, side cover, sector shaft, etc.) to make sure that there is no oil leakage.
	Check for looseness in the assembly	1. With the wheels of the vehicle on the ground (the vehicle should not be jacked up), have an assistant or helper turn the steering wheel to the right and to the left. As he does this, you should carefully check all areas where the steering unit is attached to the frame for looseness and other possible problems.
	Check for bearing backlash	1. Check the condition of the connections between the steering shaft and the bearings. Move the steering shaft in the direction of the axle and make sure that there is no backlash present. 2. Rotate the steering shaft. There should be no abnormal noise. It should rotate smoothly and there should be no feeling of roughness. Check to make sure that there is no abnormal or excessive bearing wear.
	Check for gear backlash	1. The front wheels should be facing straight ahead. Have an assistant or helper grasp the drop arm so as to immobilize it. Now try to turn the steering wheel. Backlash should not exceed one millimeter.
	Inspect the sector shaft for cracks	1. Remove the steering unit from the vehicle and break it down into its component parts. Carefully inspect the sector shaft for cracks or other damage.

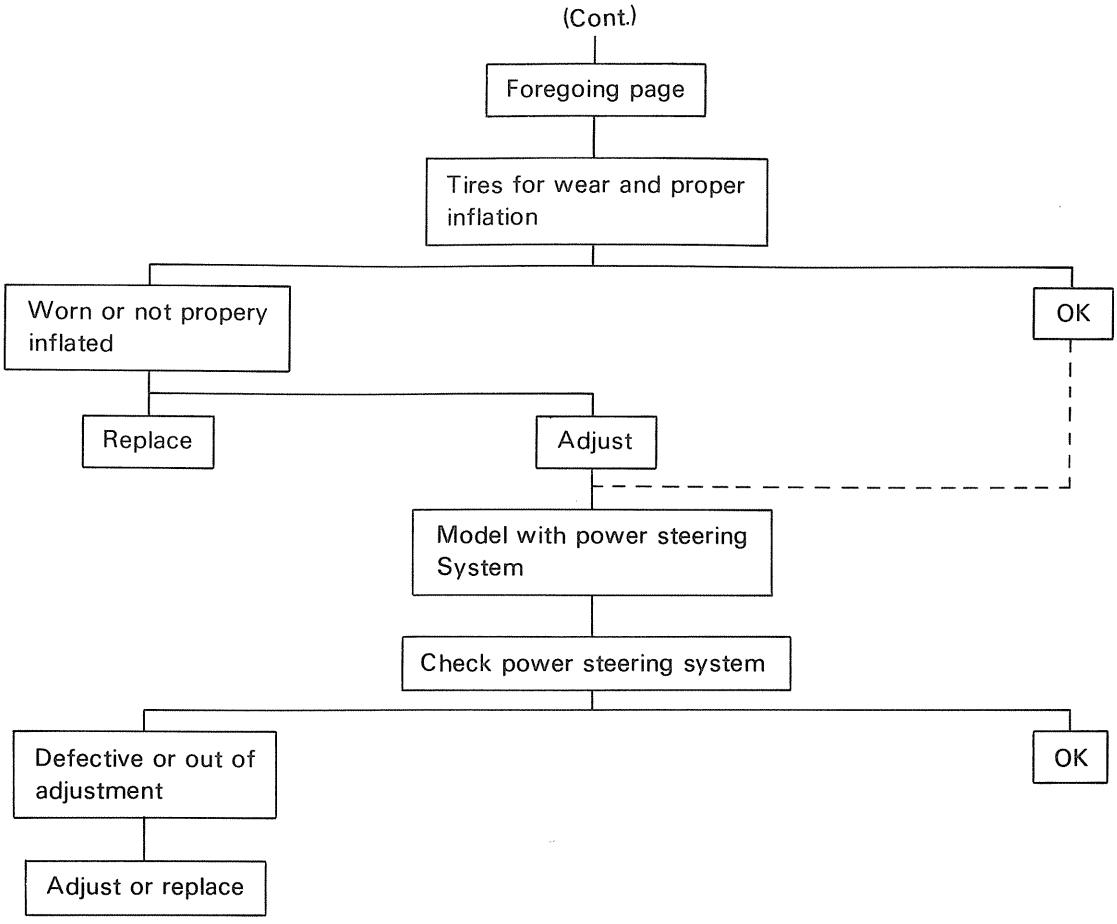
COMPONENT AND TEST		PROCEDURE
RODS AND ARMS	Check for play, backlash, and damage	1. With the wheels of the vehicle on the ground (the vehicle should not be jacked up), have an assistant or helper turn the steering wheel to the right and to the left. As he does this, you should carefully check the connecting points of all the parts for looseness, slack, or damage. a. Specifically check the droparms, the draglings, the tie rods, the tie rod ends, the knuckle arms, and the tie rod arms. 2. Carefully check all of the pins for cracks and other damage. 3. Make sure that the rod end boots and related areas are not cracked or otherwise damaged.
	Check the coupling parts for abrasion and other abnormal conditions	1. The ball joints and the rubber bushings should be free from abrasion or any other damage. 2. Pay careful attention to the coupling areas. Make sure that everything is properly connected.
	Check for cracks in the knuckle arms and also for poor knuckle attachment	1. Make sure that both the knuckle arms and the tie rod arms are free from cracks. The fit between the knuckles and the tapers should be secure. Look for any abnormal coloring which may indicate trouble.
KNUCK-LES	Check for loose and damaged joints	1. Jack up the front axle and the front crosspiece. By hand, rotate the two front tires in either direction. Check that the king pins and the ball joints are free of play or slack. If play or slack is present, have an assistant or helper, hold down the brake pedal. Using a dial gauge, once again check the wheels for play and vibration. It is possible that the problem lies not with the steering system but with the wheel bearings.
	Check the gap between the steering knuckles and the front axle	1. Use a thickness gauge or other appropriate tool to measure the width of the gap between the steering knuckles and the front axle. Measure in the direction of the king pin. After measurement, thrust washers may be inserted to alter the gap.


Steering wheel play excessive
Check gear box
OK
Amount of play excessive
Adjust
Check gear box for loose in mounts
OK
Loose
Damaged
Correct
Replace
Check linkage
OK
Loose
Worn or damaged
Correct
Replace
Check wheel bearing
OK
Play in bearing excessive
Worn or damaged
Adjust
Replace



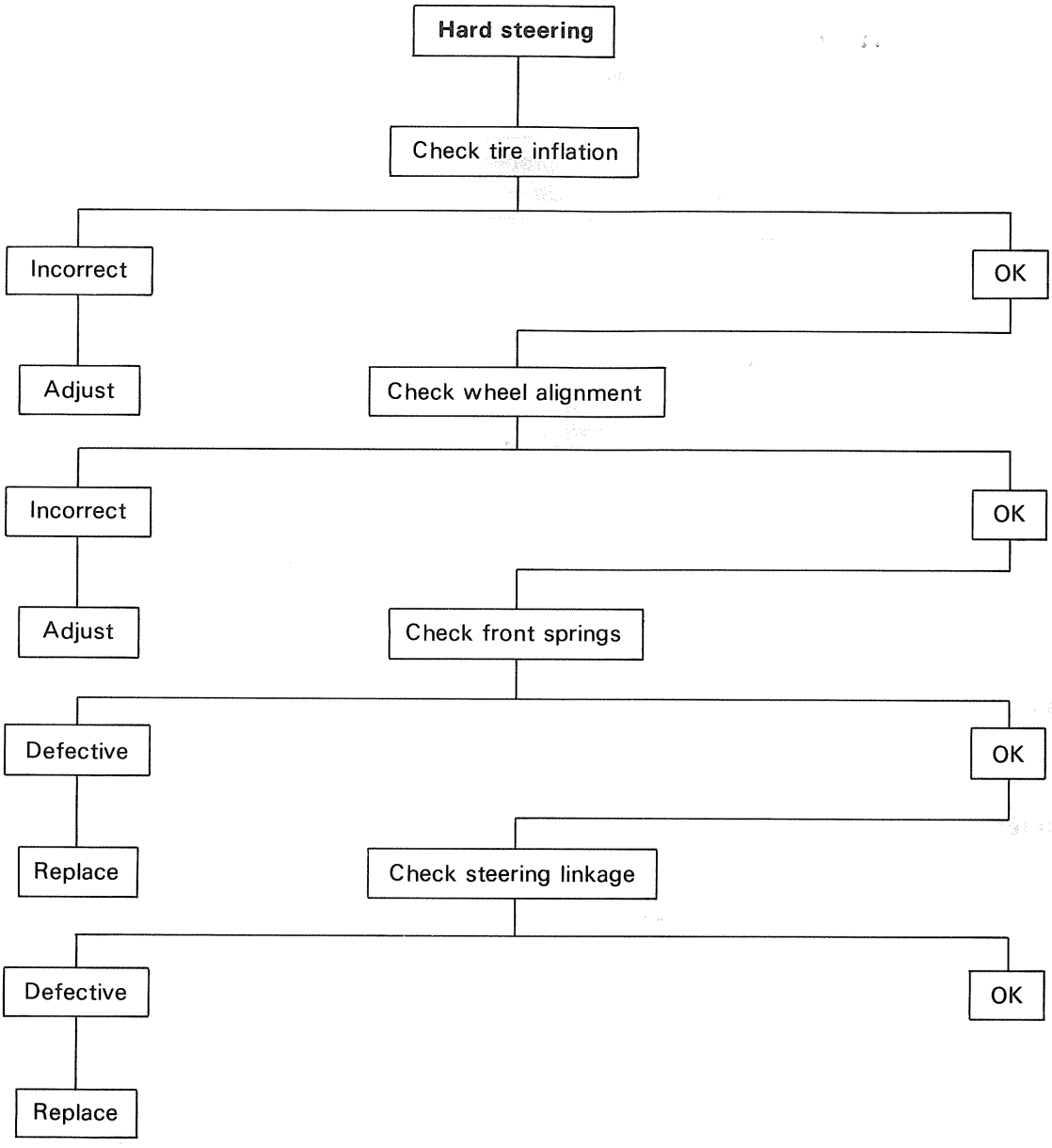
Notice:
1. In most case, the problem of steering shaking can be removed by checking and correcting wheel and tire assemblies. Wheel and tire runout requires careful adjustment.
2. Clutch chatter when starting the vehicle should not be misjudged as steering shaking.
3. Steering shaking is liable to occur when driving at a high speed.
4. If the steering shaking occurs at speed range of from 40 to 60 km/h, the trouble is most likely due to tire runout or use of tires that are unequal in tread patterns.

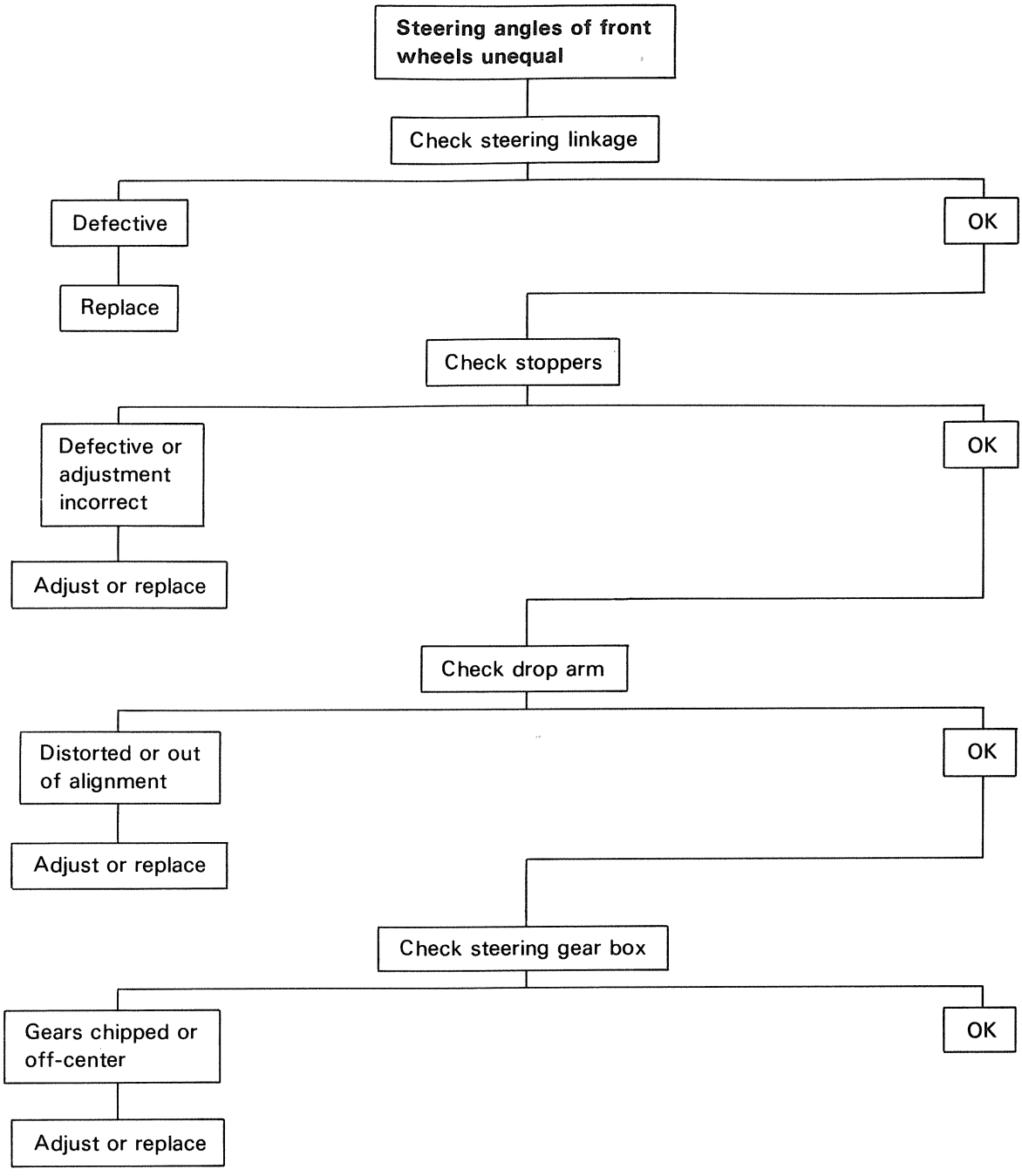

Steering shimmy
Check to see if steering shimmy occurs when coasting
NO
YES
Check trouble phenomena
Check wheel and tire assemblies for out of balance
Out of balance is beyond correction
OK
Replace
Check steering linkage
Linkage distorted or loosened in mount
OK
Correct or replace
Check wheel bearing
Play in bearings excessive or bearings disintegrated
OK
Correct or replace
Check shock absorbers
Defective
OK
Replace
Check wheel alignment
Incorrect
OK
Correct
Continued on next page

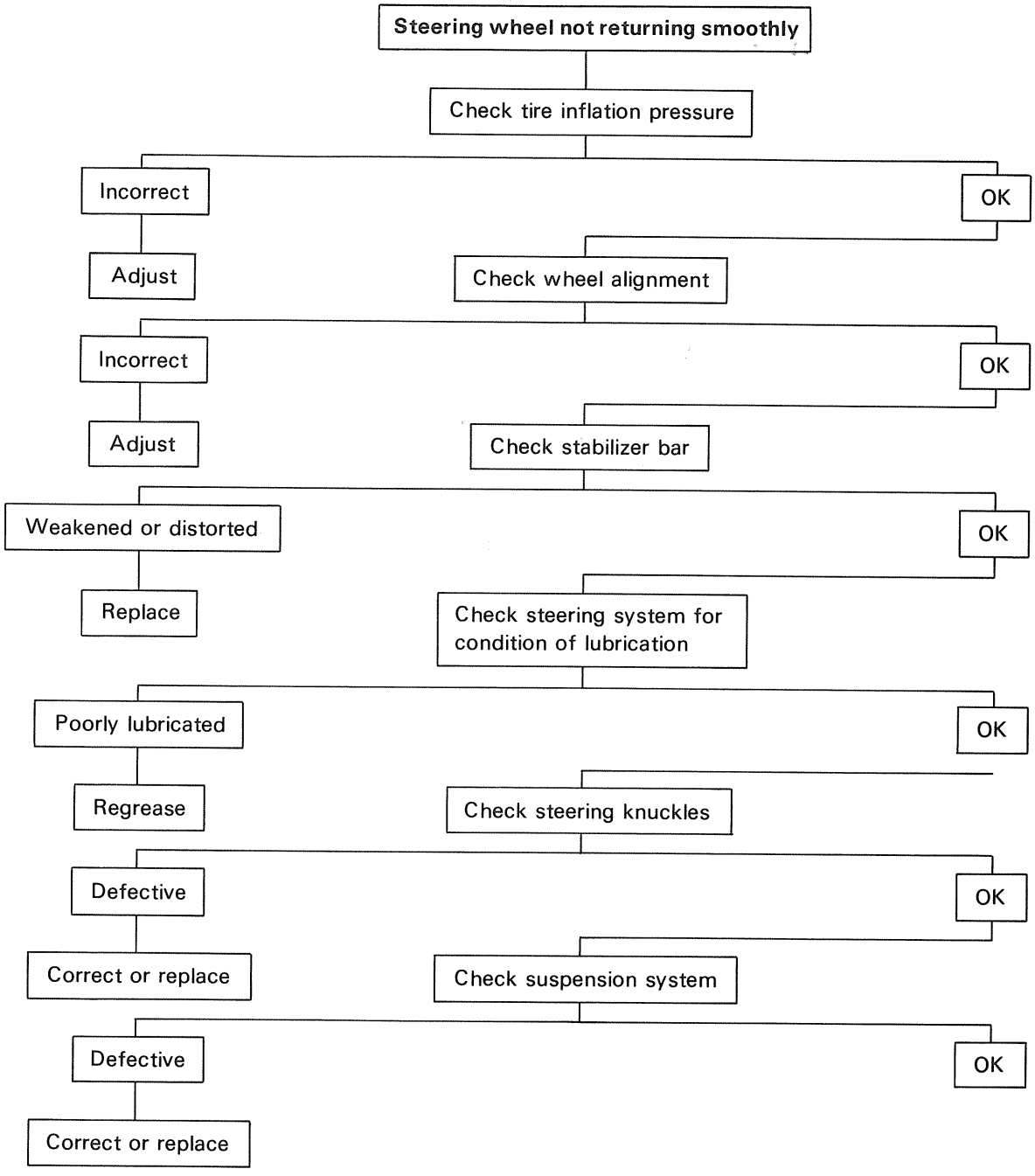


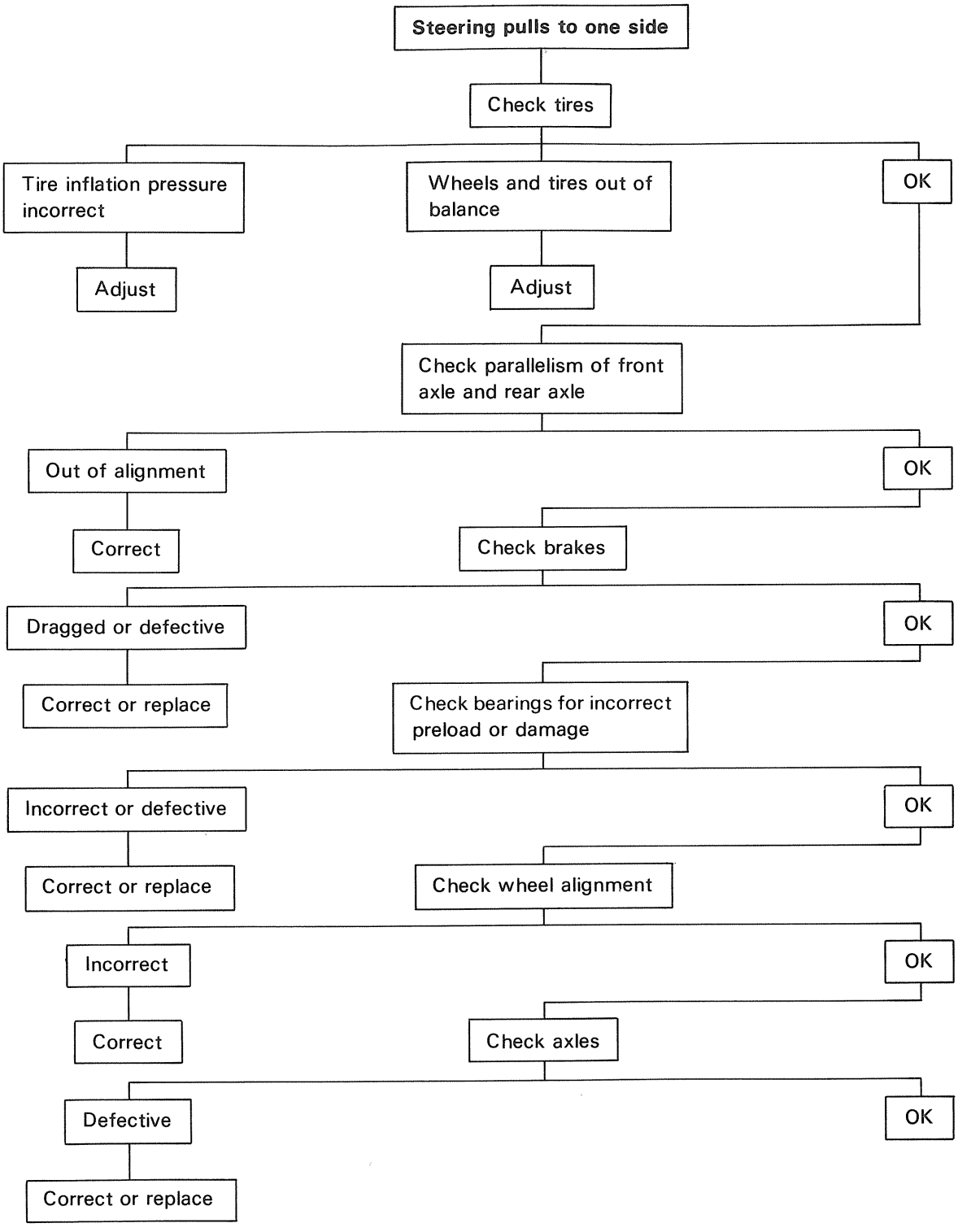
Notice:

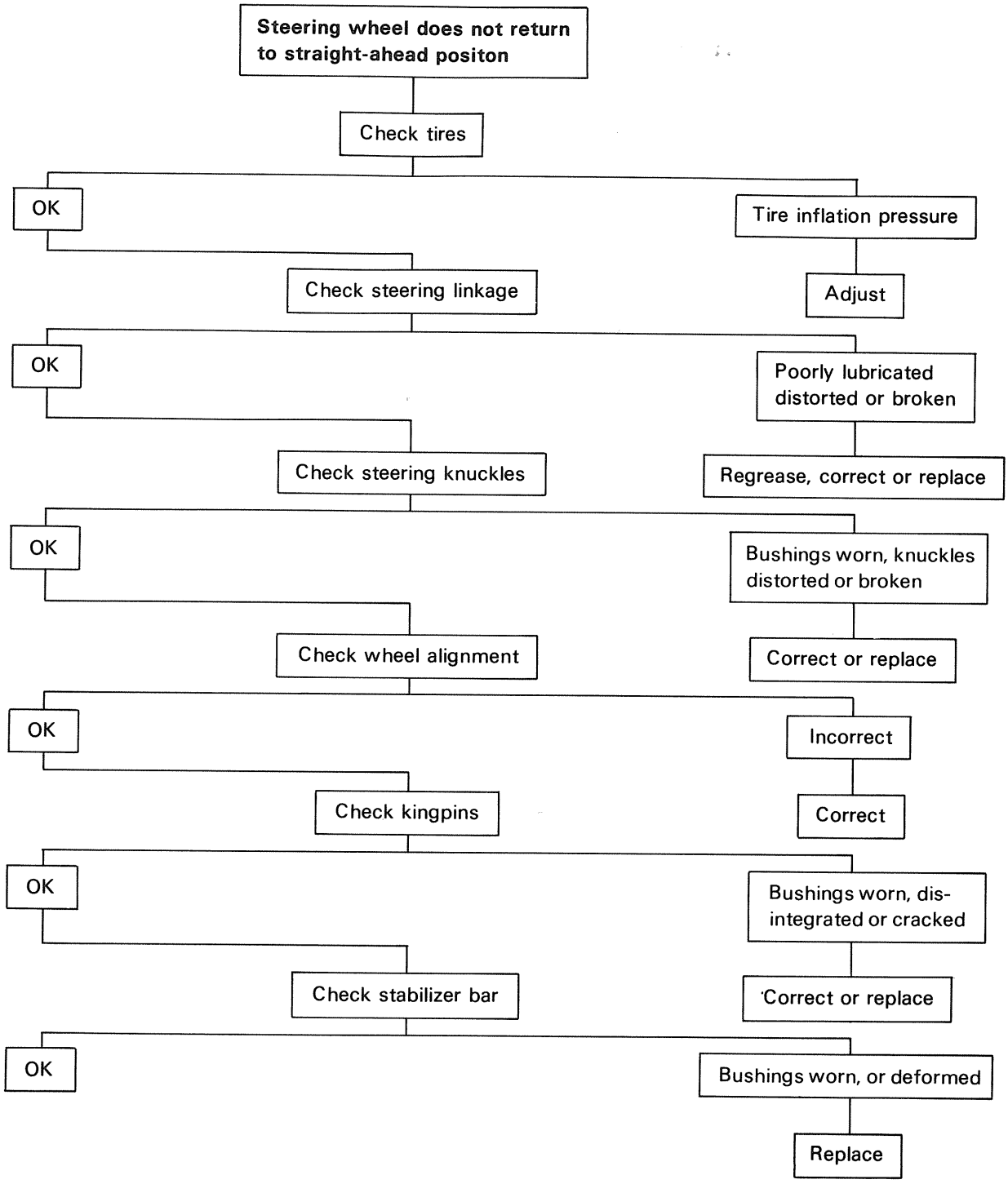
1. So-called "Steering shimmy" is a type of phenomenon which can be eliminated through balancing of wheel and tire assemblies.
   Note following if the cause of steering shimmy can not be removed through correction of run-out and out of balance:
   (1) Wheels are still out of balance or out of round.
   (2) Play in joints or linkage excessive, wheel alignment incorrect or linkage lacks rigidity.
2. The steering shimmy is also related to designs of the steering linkage, suspension system, etc. which may not be adjusted or corrected in some cases.
3. The following are often mistaken for steering shimmy:
   (1) Steering shaking
   (2) Booming noise at low speed accompanying vibrations.


Hard steering
Check tire inflation
Incorrect
OK
Adjust
Check wheel alignment
Incorrect
OK
Adjust
Check front springs
Defective
OK
Replace
Check steering linkage
Defective
OK
Replace

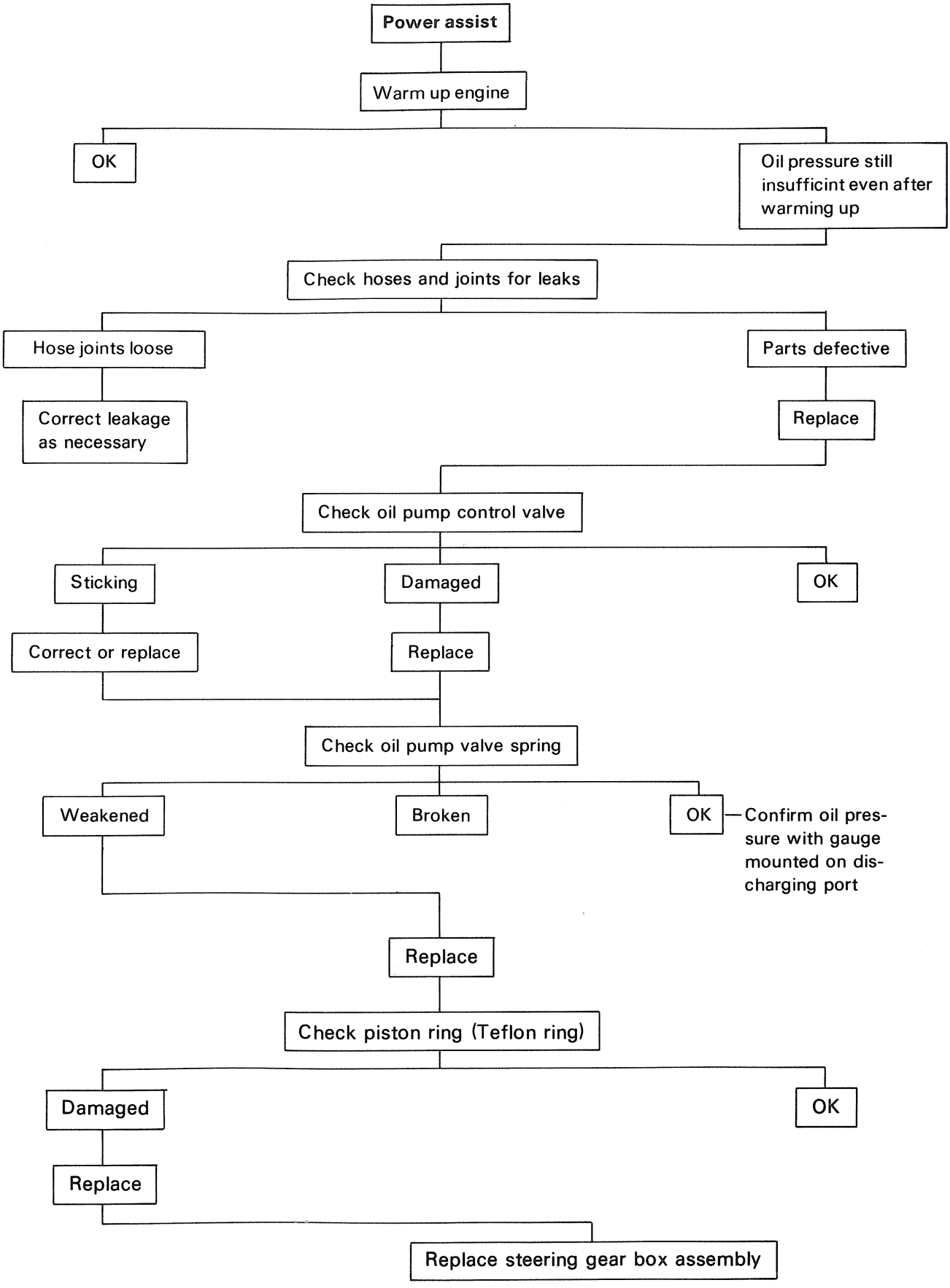

Steering angles of front wheels unequal
Check steering linkage
Defective
Replace
OK
Check stoppers
Defective or adjustment incorrect
Adjust or replace
OK
Check drop arm
Distorted or out of alignment
Adjust or replace
OK
Check steering gear box
Gears chipped or off-center
Adjust or replace
OK

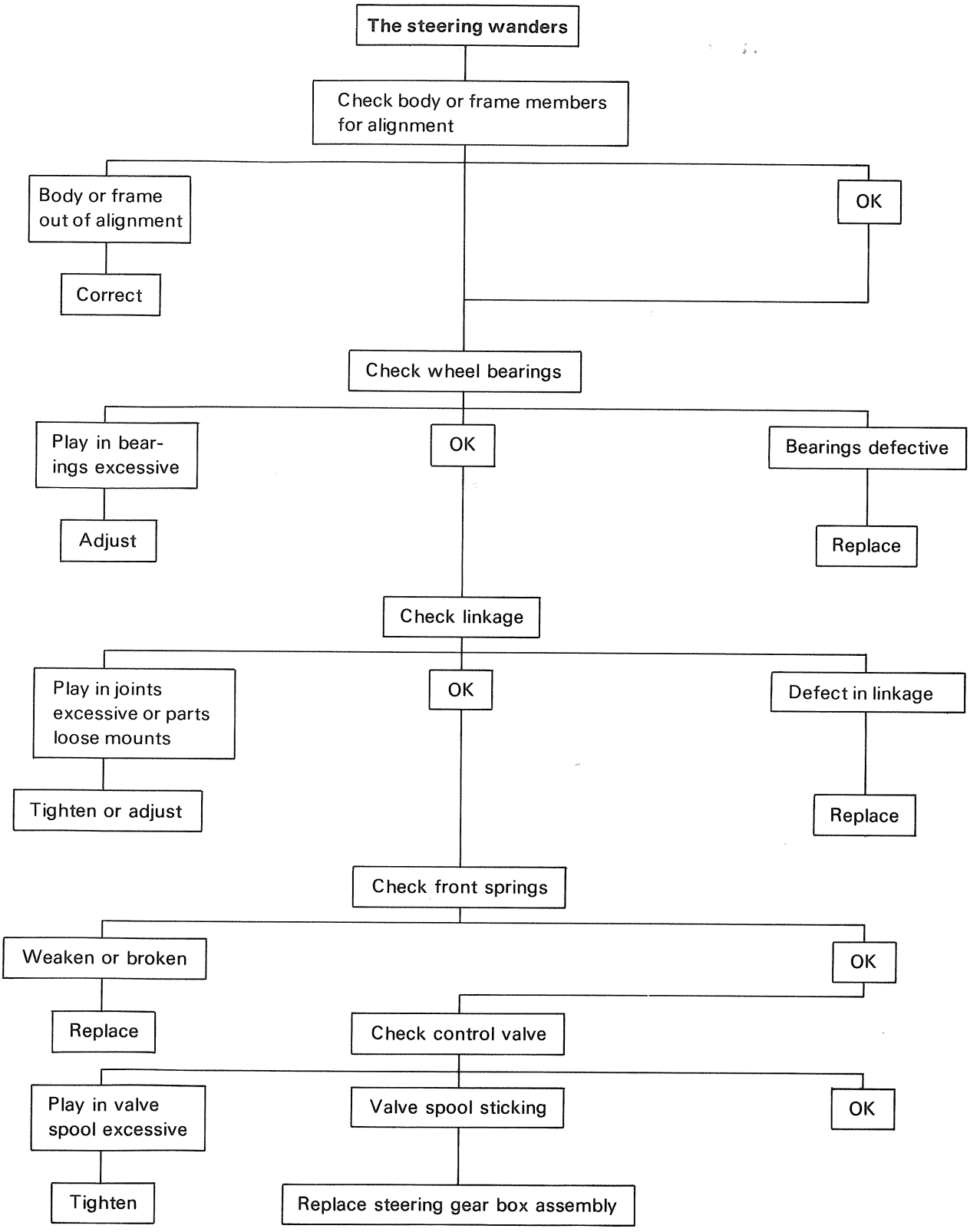

Steering wheel not returning smoothly
Check tire inflation pressure
Incorrect
Adjust
OK
Check wheel alignment
Incorrect
Adjust
OK
Check stabilizer bar
Weakened or distorted
Replace
OK
Check steering system for condition of lubrication
Poorly lubricated
Regrease
OK
Check steering knuckles
Defective
Correct or replace
OK
Check suspension system
Defective
Correct or replace
OK

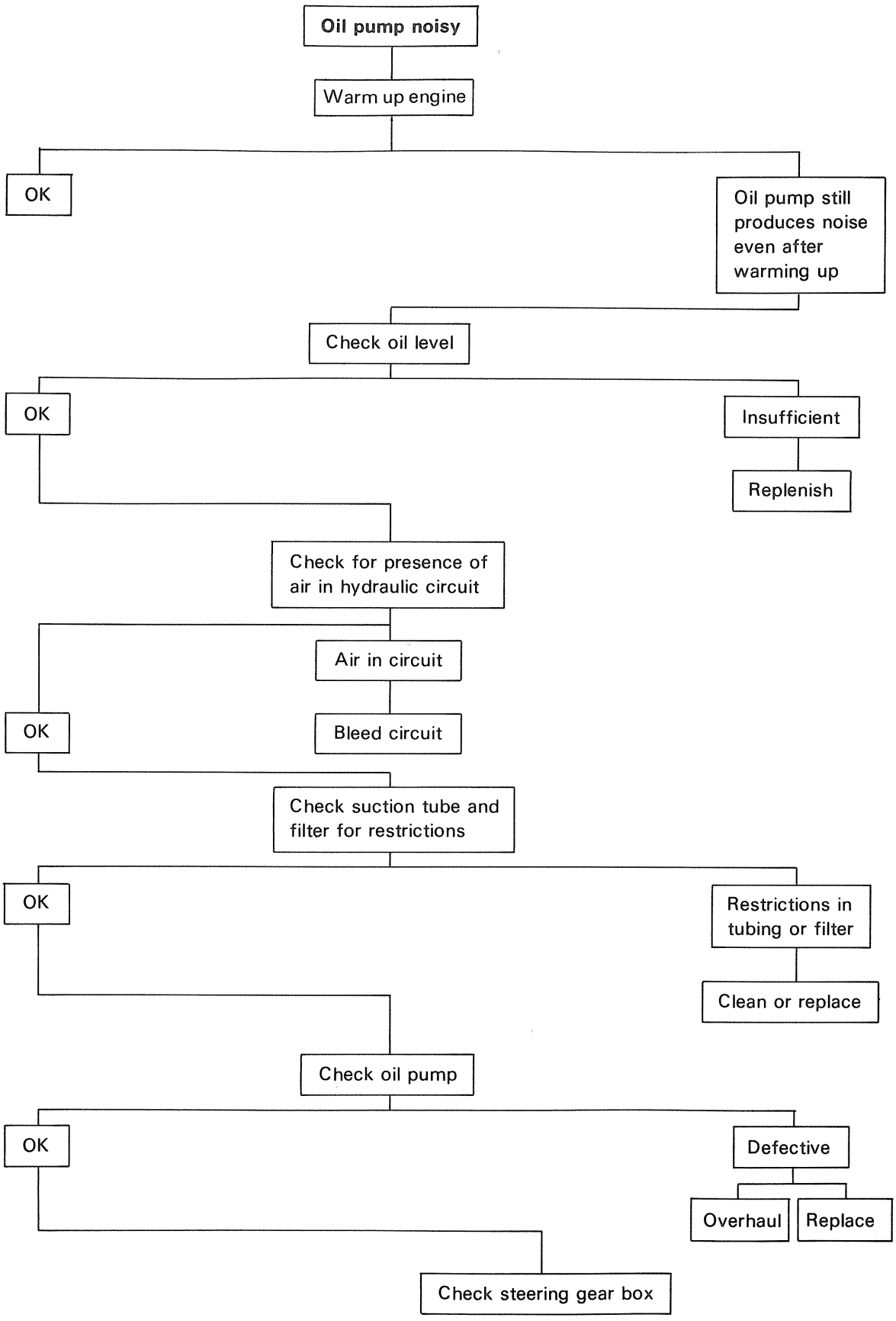

Steering pulls to one side
Check tires
Tire inflation pressure incorrect
Wheels and tires out of balance
OK
Adjust
Adjust
Check parallelism of front axle and rear axle
Out of alignment
OK
Correct
Check brakes
Dragged or defective
OK
Correct or replace
Check bearings for incorrect preload or damage
Incorrect or defective
OK
Correct or replace
Check wheel alignment
Incorrect
OK
Correct
Check axles
Defective
OK
Correct or replace


Steering wheel does not return to straight-ahead positon
Check tires
OK
Tire inflation pressure
Adjust
Check steering linkage
OK
Poorly lubricated distorted or broken
Regrease, correct or replace
Check steering knuckles
OK
Bushings worn, knuckles distorted or broken
Correct or replace
Check wheel alignment
OK
Incorrect
Correct
Check kingpins
OK
Bushings worn, dis-integrated or cracked
Correct or replace
Check stabilizer bar
OK
Bushings worn, or deformed
Replace

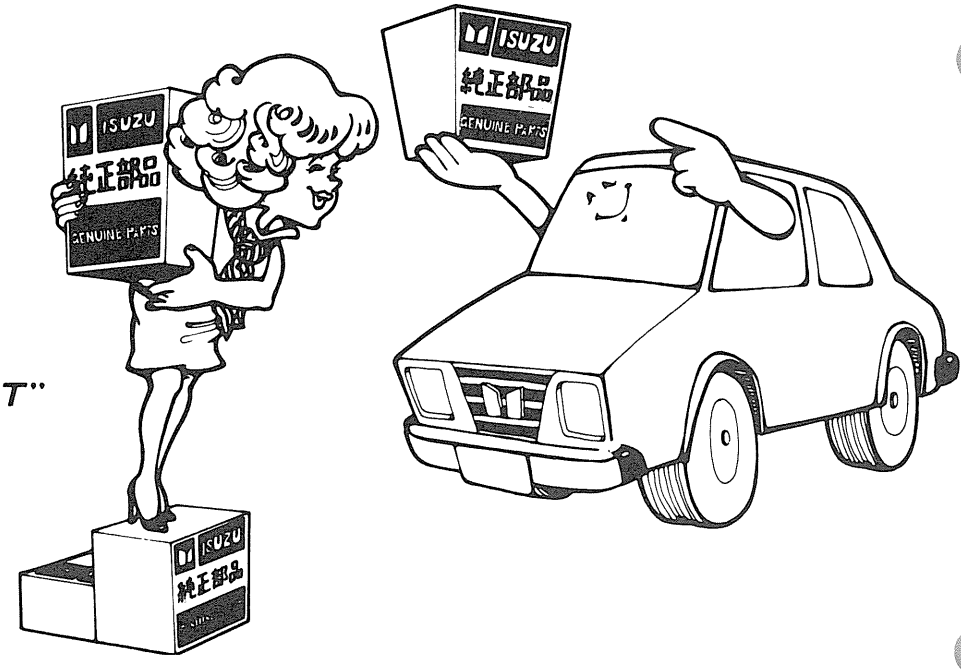
POWER-STEERING




The steering wanders
Check body or frame members for alignment
Body or frame out of alignment
Correct
OK
Check wheel bearings
Play in bearings excessive
Adjust
OK
Bearings defective
Replace
Check linkage
Play in joints excessive or parts loose mounts
Tighten or adjust
OK
Defect in linkage
Replace
Check front springs
Weaken or broken
Replace
OK
Check control valve
Play in valve spool excessive
Tighten
Valve spool sticking
Replace steering gear box assembly
OK
Correct or replace


Oil pump noisy
Warm up engine
OK
Oil pump still produces noise even after warming up
Check oil level
OK
Insufficient
Replenish
Check for presence of air in hydraulic circuit
Air in circuit
OK
Bleed circuit
Check suction tube and filter for restrictions
OK
Restrictions in tubing or filter
Clean or replace
Check oil pump
OK
Defective
Overhaul
Replace
Check steering gear box

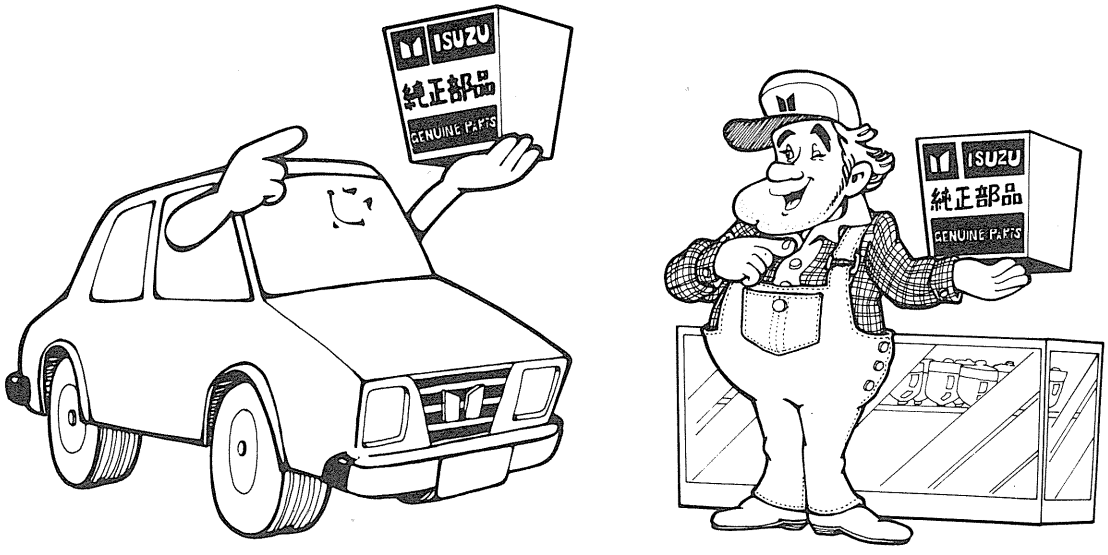
MEMO



"QUALITY PARTS YOU CAN TRUST"

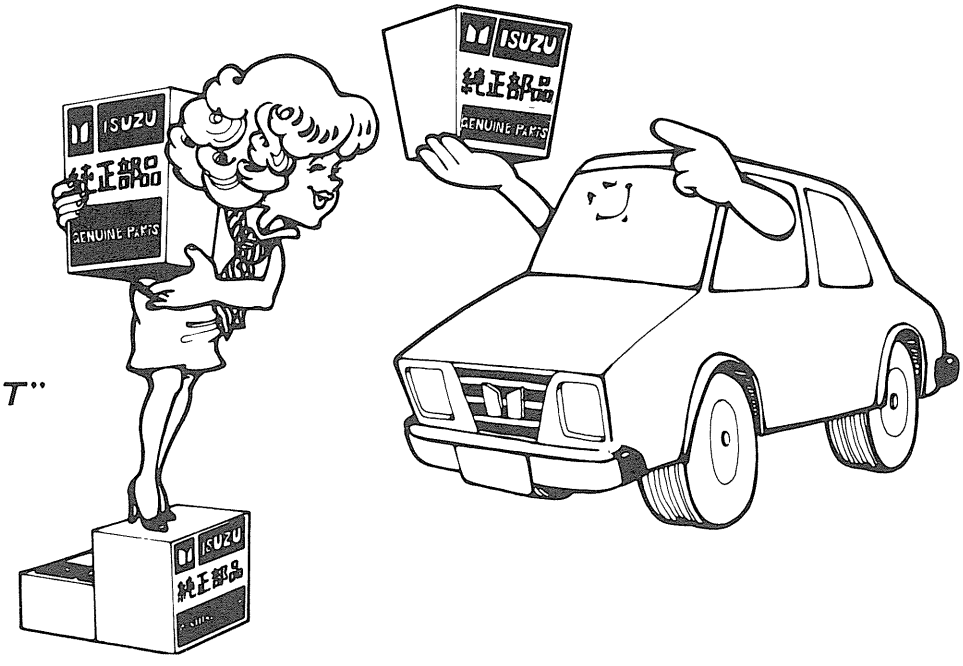
MEMO

"QUALITY PARTS YOU CAN TRUST"



MEMO

"QUALITY PARTS
YOU CAN TRUST"



KBSTR-WE-65G

You are requested to order this manual using the manual number that is shown above.

This manual is applicable for vehicles in all countries except USA and Canada.

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