

## 5-6. Steering System

### 1. General

A rack and pinion steering system is employed. The steering shaft has a built-in shock-absorbing mechanism to reduce shock should the vehicle be involved in a collision. In addition, a steering lock is provided to counter theft.

The steering shaft is joined to the gear box with a universal joint and rubber coupling, on the right-hand drive vehicle, and with two universal joints on the left-hand drive vehicle.

### 2. Specifications

		Right-hand drive vehicle	Left-hand drive vehicle
Steering wheel	Outer diameter	370 mm (14.57 in)	
	Shape	Large horn cover 2-spoke	
	No. of turns	3.7	3.6
Shock-absorbing shaft		Yes	
Steering lock		Yes	
Minimum turning radius		4.4 m (14.4 ft)	4.5 m (14.8 ft)
Steering angle	Inner wheel	$37.5^{\circ} +1 -2$	$37.0^{\circ} +1 -2$
	Outer wheel	$34.5^{\circ} +1 -2$	$34.0^{\circ} +1 -2$
Type of gear box		Rack & pinion type	
Total gear ratio		18.4	
Toe-in		0 mm — IN 2 mm (0 in — IN 0.08 in)	

### 3. Component Parts and Service Data

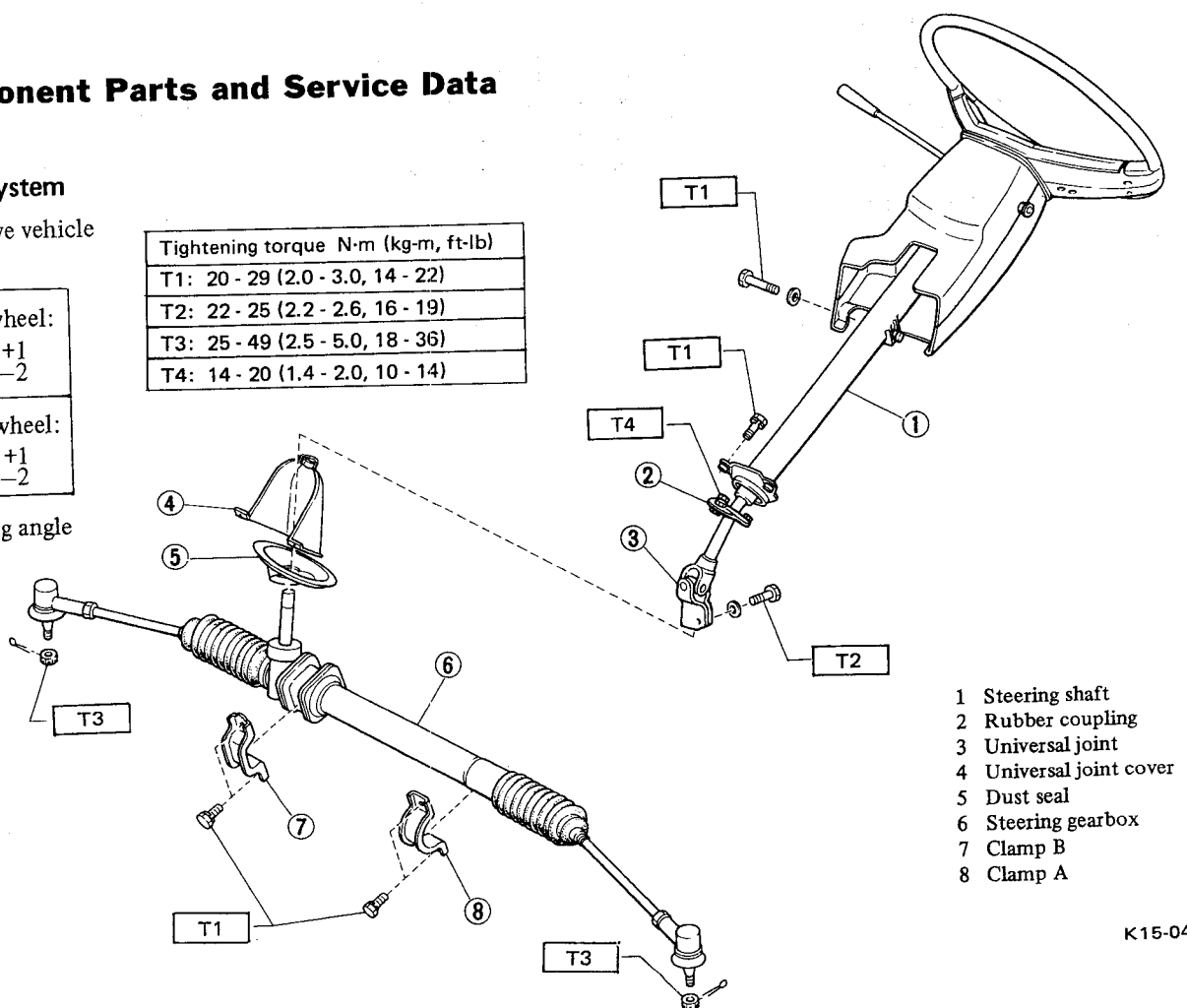
#### 1. Steering System

Right-hand drive vehicle

Inner wheel:
$37.5^{\circ} +1 -2$
Outer wheel:
$34.5^{\circ} +1 -2$

● Steering angle

Tightening torque N·m (kg·m, ft·lb)
T1: 20 - 29 (2.0 - 3.0, 14 - 22)
T2: 22 - 25 (2.2 - 2.6, 16 - 19)
T3: 25 - 49 (2.5 - 5.0, 18 - 36)
T4: 14 - 20 (1.4 - 2.0, 10 - 14)



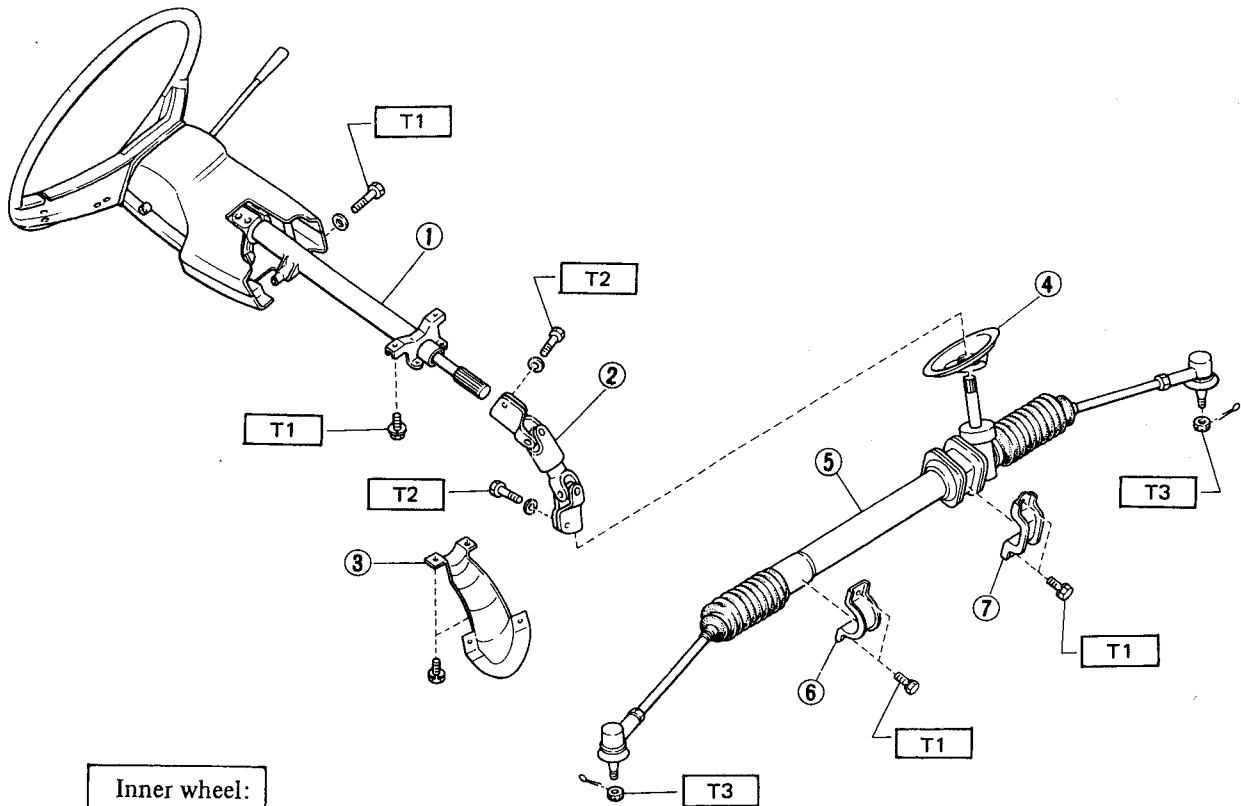
- 1 Steering shaft
- 2 Rubber coupling
- 3 Universal joint
- 4 Universal joint cover
- 5 Dust seal
- 6 Steering gearbox
- 7 Clamp B
- 8 Clamp A

K15-047

Fig. 5-6-1

# Steering system

Left-hand drive vehicle



Inner wheel:
$37.0^{\circ} +1$ $-2$
Outer wheel:
$34.0^{\circ} +1$ $-2$

● Steering angle

Tightening torque N·m (kg·m, ft·lb)
T1: 20 - 29 (2.0 - 3.0, 14 - 22)
T2: 22 - 25 (2.2 - 2.6, 16 - 19)
T3: 25 - 49 (2.5 - 5.0, 18 - 36)

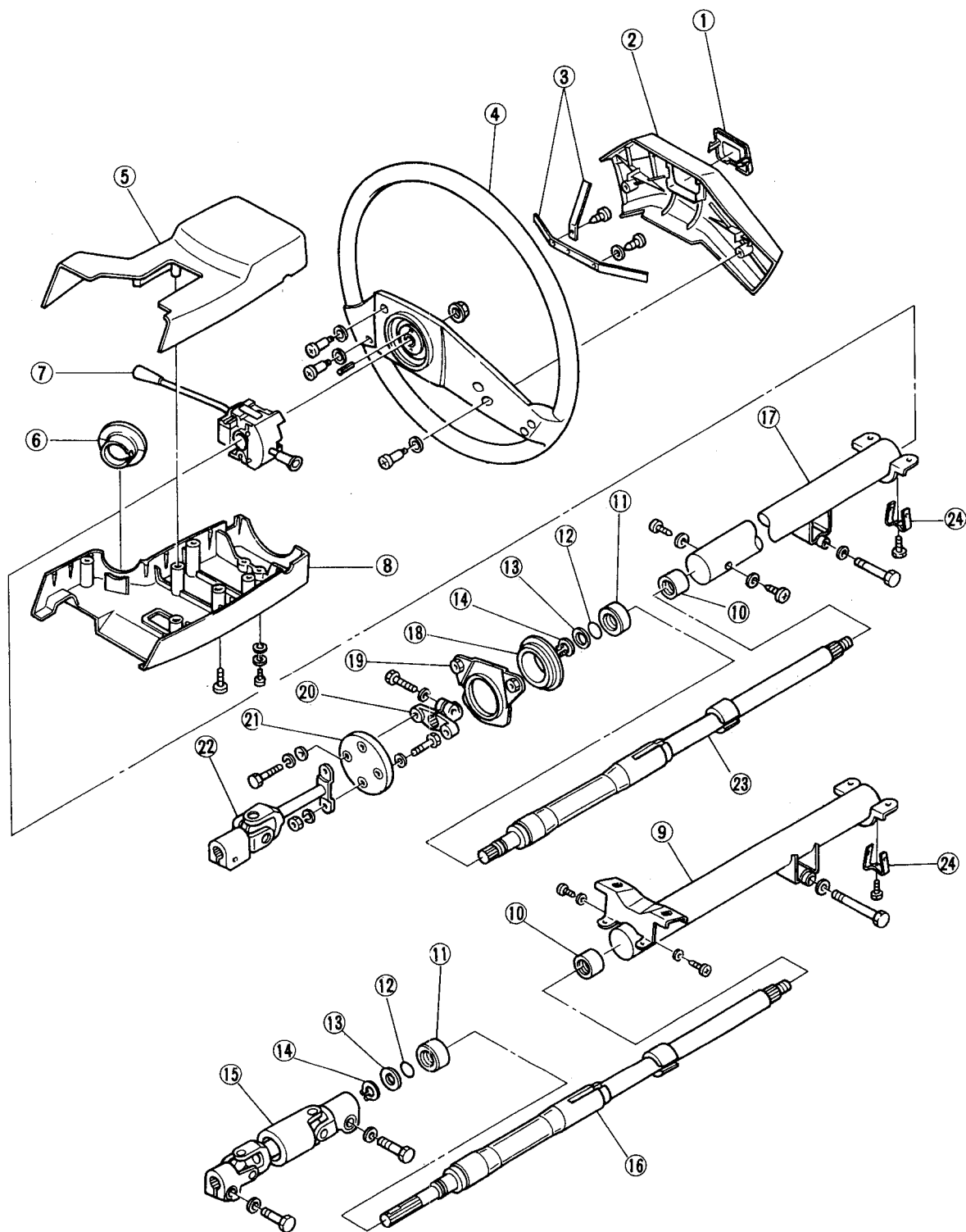
- 1 Steering shaft
- 2 Universal joint
- 3 Universal joint cover
- 4 Dust seal
- 5 Steering gearbox
- 6 Clamp B
- 7 Clamp A

Fig. 5-6-2

K15-048

# Steering system

## 2. Steering Shaft



- 1 Steering ornament
- 2 Horn cover
- 3 Horn spring
- 4 Steering wheel
- 5 Column cover upper
- 6 Grommet
- 7 Combination switch
- 8 Column cover

- 9 Column pipe (Left-hand)
- 10 Bearing upper
- 11 Bearing lower
- 12 O-ring
- 13 Washer
- 14 Snap ring
- 15 Universal joint
- 16 Steering shaft (Left-hand)

- 17 Column pipe (Right-hand)
- 18 Bush
- 19 Bracket
- 20 Joint
- 21 Rubber coupling
- 22 Universal joint
- 23 Steering shaft (Right-hand)
- 24 Brush

Fig. 5-6-3

K15-049

## Steering system

### 3. Steering Gear Box

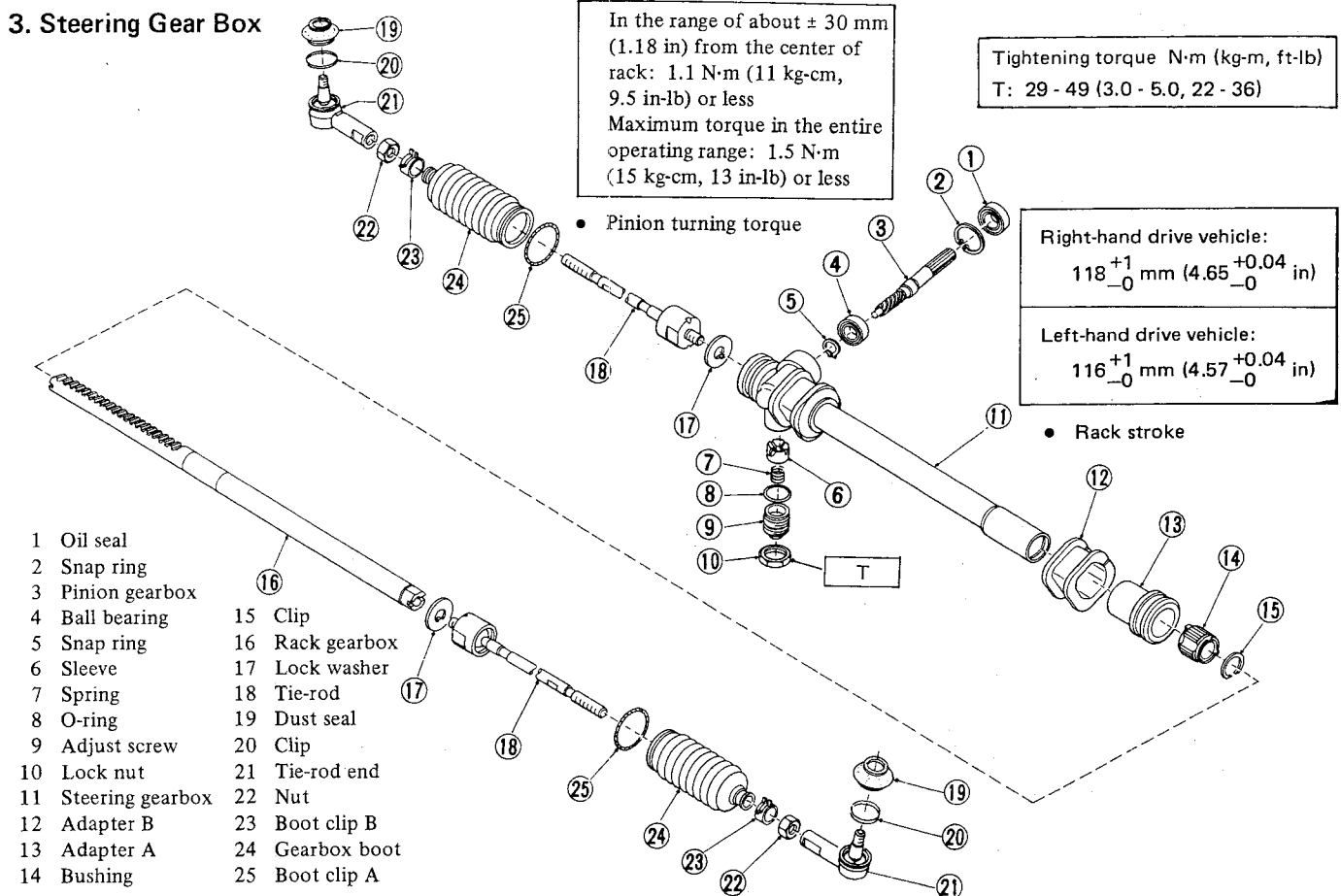


Fig. 5-6-4

K15-050

### 4. Service Precautions for Major Components

#### 1. Steering Shaft

- 1) Remove the components of the steering shaft in the following order.
  - (1) The battery minus terminal.
  - (2) The universal joint.
  - (3) The wiring harness connectors (for the ignition switch and combination switch) under the instrument panel.

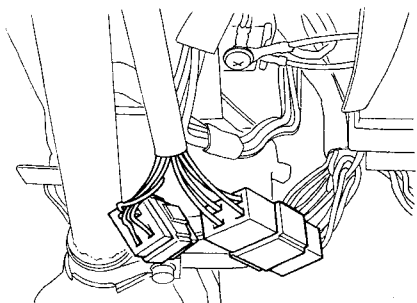


Fig. 5-6-5

K16-015

- (4) The bracket under the instrument panel.

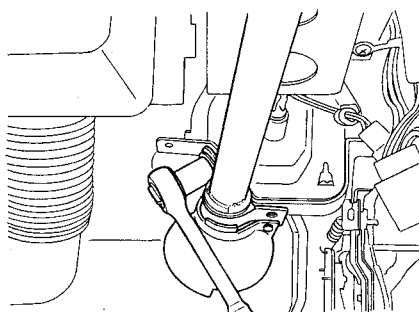


Fig. 5-6-6

K15-016

- (5) The steering shaft.

From the pinion of the gear box, remove the steering shaft and the universal joint.

#### NOTE:

Be careful not to damage the steering shaft during removal.

- (6) The steering wheel ornament (horn cover type steering wheel) or

steering wheel cover (horn button type steering wheel).

#### NOTE:

When removing the steering wheel ornament, insert a 0.5 mm (0.020 in) thick, 15 mm (0.59 in) wide piece of spring steel sheet into the gap between the underside of the ornament and the horn cover. Then remove the ornament by pulling upward.

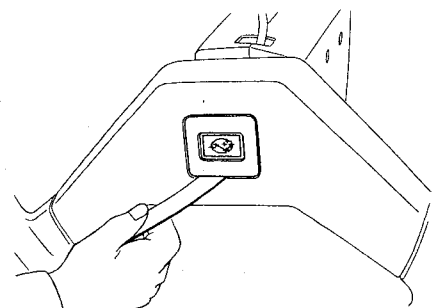


Fig. 5-6-7

K15-017

- (7) The steering wheel.
- (8) The steering column cover.
- (9) Bracket assembly.

## Steering system

2) Check the removed steering shaft for wear, alignment, damage, etc. Replace it if found defective.

(A) Steering shaft for right-hand drive vehicle

(1) Length of shaft L

Standard value:  
557 ± 1 mm (21.93 ± 0.04 in)

(2) Alignment of shaft

(1) Run-out at lower end of shaft	0.6 mm (0.024 in), max.
(2) Rotary O.D. at elliptic pressed area	32.6 mm (1.283 in) dia., max.
(3) Run-out at steering lock collar	0.6 mm (0.024 in), max.
(4) Run-out at upper end of shaft	1.2 mm (0.047 in), max.

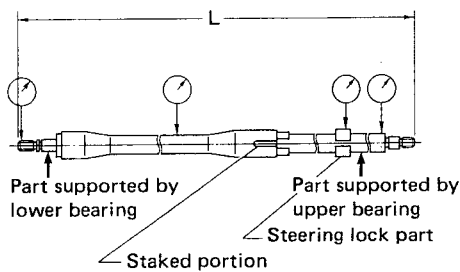


Fig. 5-6-8

(B) Steering shaft for left-hand drive vehicle

(1) Length of shaft L

Standard value:  
617.3 ± 1 mm (24.30 ± 0.04 in)

(2) Alignment of shaft

(1) Run-out at lower end of shaft	0.6 mm (0.024 in), max.
(2) Rotary O.D. at elliptic pressed area	32.6 mm (1.283 in) dia., max.
(3) Run-out at steering lock collar	0.6 mm (0.024 in), max.
(4) Run-out at upper end of shaft	1.2 mm (0.047 in), max.

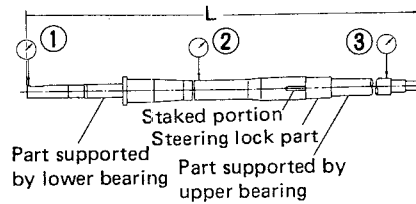


Fig. 5-6-9

3) Check the universal joint for the spider's endwise play and rocking torque. Replace the joint if found defective.

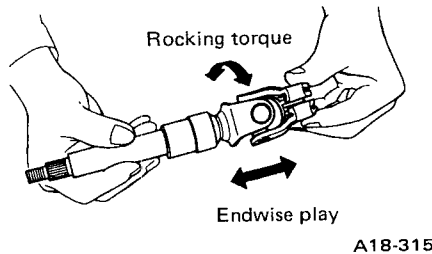


Fig. 5-6-10

Standard endwise play	0 mm (0 in)
Maximum rocking torque	0.4 N·m (4 kg-cm, 3.5 in-lb)

4) Assembly should be made in the reverse order of removal paying attention to the following points.

(1) Coat each sliding part of the steering shaft with grease.

(2) When placing the serrated part of the pinion in the universal joint, place the notched part of the pinion on the side of the through bolt. Install the through bolt from the spotface side of the universal joint.

Tighten the universal joint coupling bolts after installing the steering shaft to correct position firmly.

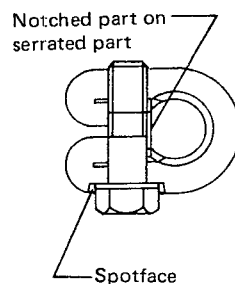
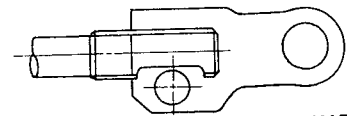


Fig. 5-6-11



K15-039

Fig. 5-6-12

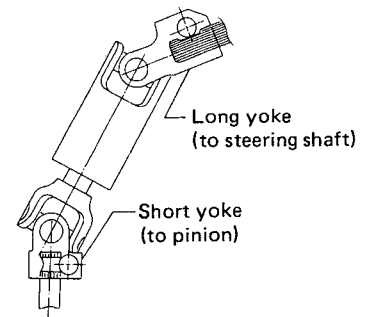
### NOTE:

If the steering shaft feels heavy, due to excessive rotational friction when turned, loosen each mounting bolt, turn the shaft left and right several times and retighten in the order of assembly.

(3) In the left-hand drive vehicle, the universal joint should be installed in the following manner: insert the serrated part of the steering shaft in the long yoke and temporarily tighten the bolt; put the serrated part of the gear box pinion in the short yoke and temporarily tighten the bolt.

### NOTE:

- Ensure that the bolt extends past the undercut on the serrated part.
- Regularly tighten the bolts on the gear box pinion side and the steering shaft side in that order.



K15-040

Fig. 5-6-13

## 2. Steering Gear Box

1) Remove the parts of the steering gear box in the following order.

- The universal joint coupling bolts.
- The dust seal.
- Front wheels.
- The tie-rod end.

Remove the tie-rod end from the knuckle arm with a puller.

(5) Gear box.

To remove the gear box, remove the mounting bolts, lower the gear box, and pull the point of the pinion out of the dust seal toward the engine compartment.

## Steering system

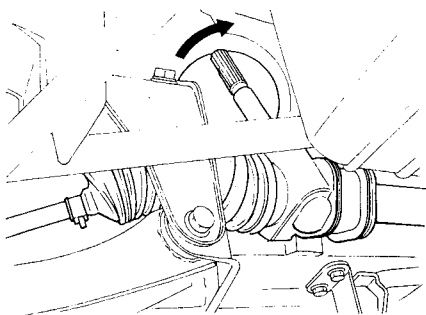


Fig. 5-6-14

K15-018

Then, remove the bolts mounting the bracket on the side of the driver's seat crossmember, loosen the transverse link bush and nut and turn the bracket downward. This will allow the gear box to be pulled out toward the driver's seat.

### NOTE:

Be careful not to damage the gear box boots during removal.

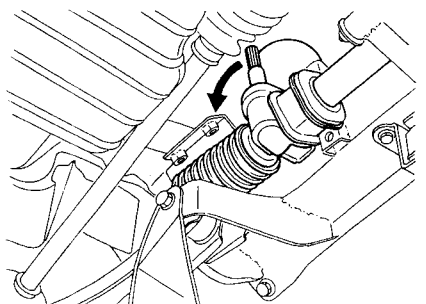


Fig. 5-6-15

K15-019

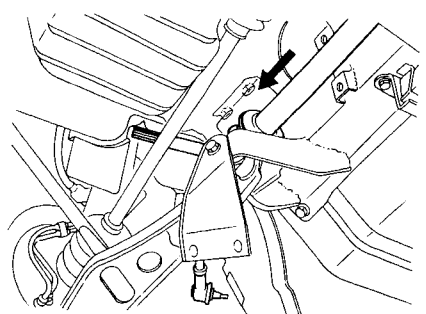


Fig. 5-6-16

K15-020

2) The gear box should be disassembled in the following manner.

### NOTE:

Before disassembly, measure the turning torque and the backlash (the angle to which the adjusting screw is tighten-

ed) in neutral and use the measured values for reference during reassembly.

(1) Hold the gear box assembly stationary with a vise and remove the tie-rod end and lock nut.

(2) Remove the clips from the boot and the boot from the gear box.

### NOTE:

Be careful not to damage the boot during removal.

(3) Firmly hold the rack stationary with a wrench to prevent it from turning and remove the tie-rod from the rack.

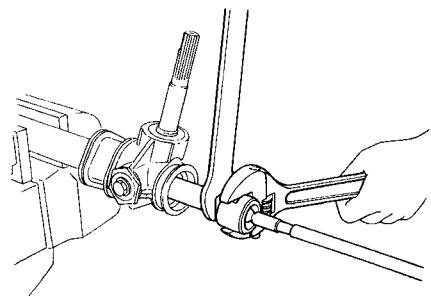


Fig. 5-6-17

K15-021

(4) Loosen the lock nut on the adjusting screw and remove the screw.

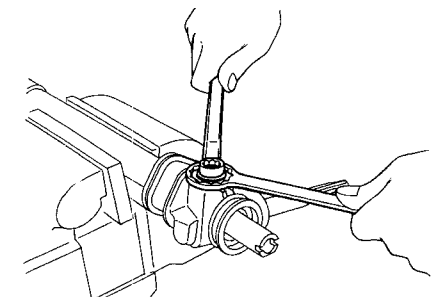


Fig. 5-6-18

K15-022

(5) After removing the spring and sleeve, remove the oil seal from the pinion with a flat-bladed screwdriver.

### NOTE:

The oil seal removed cannot be reused.

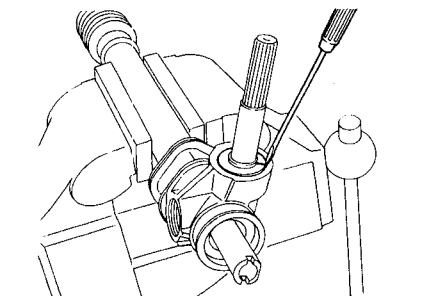


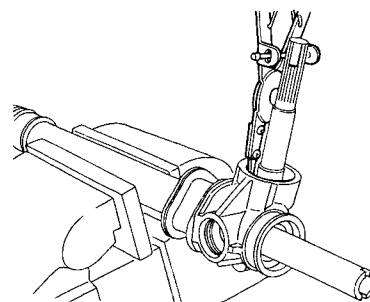
Fig. 5-6-19

K15-023

(6) First remove the snap ring, and then the pinion.

### NOTE:

Be careful not to damage the inside of the housing.



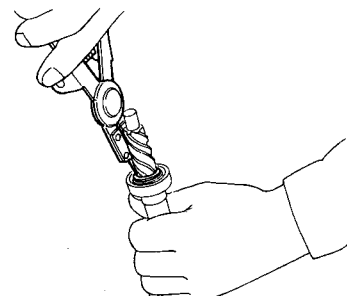
K15-024

Fig. 5-6-20

(7) Remove the snap ring from the pinion. Then, using a press, remove the ball bearing.

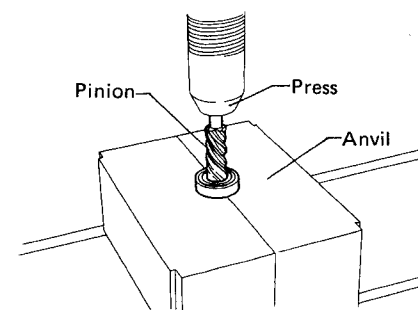
### NOTE:

When removing the bearing, the pressing load must always be borne by the inner race of the bearing.



K15-025

Fig. 5-6-21



K15-026

Fig. 5-6-22

(8) Remove the rack.

## Steering system

### NOTE:

To prevent the bush being damaged by the rack tooth surface, pull out the rack to the right, in the right-hand drive vehicle, and to the left, in the left-hand drive vehicle.

- 3) Check the parts removed for wear and damage and replace those if found defective.

### NOTE:

The oil seal and lock washer must always be replaced each disassembly.

- 4) The rack should be checked for eccentricity in the center.

When the bend exceeds the tolerance limit, replace the entire rack and pinion set.

### NOTE:

When the pinion assembly needs to be replaced, the set should be replaced.

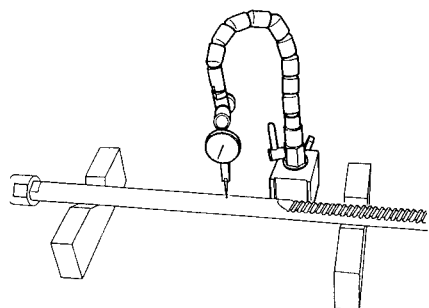


Fig. 5-6-23

K15-030

Tolerance limit of bending:  
0.2 mm (0.008 in) (run-out)

- 5) Assembly should be made in the reverse order of disassembly, paying attention to the following points:

- (1) Coat the sliding part of each component and the teeth of the rack and pinion with grease. Also apply grease to the area of the pinion where the ball bearing is installed.
- (2) For the right-hand drive vehicle, mesh the pinion with rack at  $86.5^\circ$  from the center line of the sleeve in the counterclockwise direction (as shown in figure) at the rack position for when the vehicle is driven straight-ahead, and then insert the pinion into the housing.

For the left-hand drive vehicle, the pinion may be installed in any position as it has an undercut on its entire circumference.

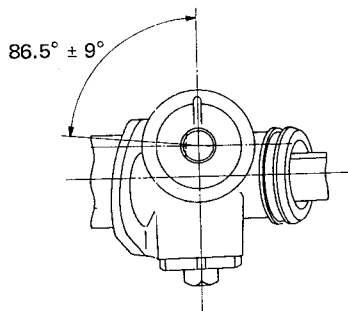
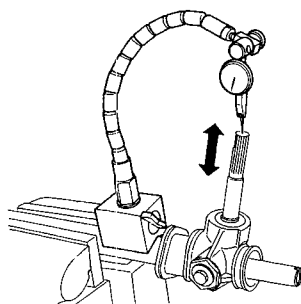


Fig. 5-6-24

K15-041

- (3) After securing the pinion with the snap ring, measure the axial play of the pinion with a dial gauge. To measure, move the pinion up and down by applying a force of approximately 98 N (10 kg, 22 lb).



Axial play limit:  
0.3 mm (0.012 in)

Fig. 5-6-25

K15-027

- (4) Coat the lip and inside of the oil seal with grease and press-fit it into the gear box.

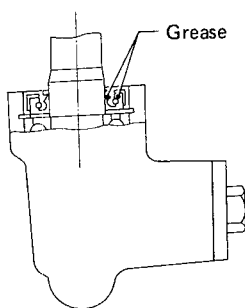


Fig. 5-6-26

K15-042

- (5) Coat the sleeve and O-ring with grease, then screw in the adjusting screw.

### NOTE:

Be careful not to forget to install the spring.

- (6) Adjust the backlash of the rack with the pinion in the following manner: completely turn in the adjusting screw until the tightening torque rapidly increases, then turn the adjusting screw back  $15^\circ$  from that position and lock it with the lock nut. The clearance between the adjusting screw and sleeve should be 0.063 mm (0.0025 in).

Lock nut tightening torque:  
29 – 49 N·m  
(3.0 – 5.0 kg-m, 22 – 36 ft-lb)

### NOTE:

When tightening the lock nut, prevent the adjusting screw from turning by holding it with a wrench.

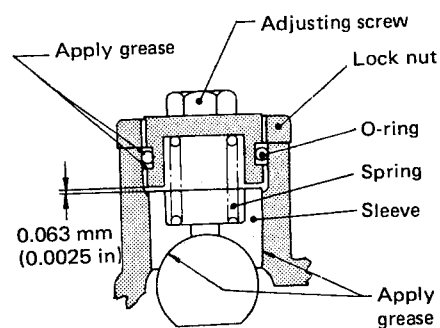


Fig. 5-6-27

K15-031

- (7) Put the lock washer pawl in line with the notch at the end of the rack before tightening the tie-rod.

After tightening the tie-rod to the specified torque, stake the lock washer with a punch in the two dents of the tie-rod socket.

### NOTE:

Be careful that the staked point neither has an acute-angled part nor sticks out of the periphery of the tie-rod socket.

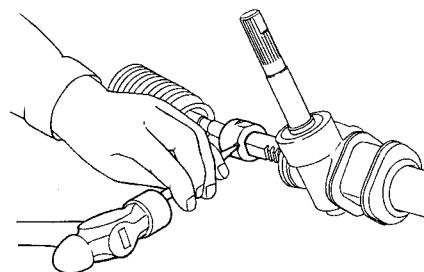


Fig. 5-6-28

K15-028

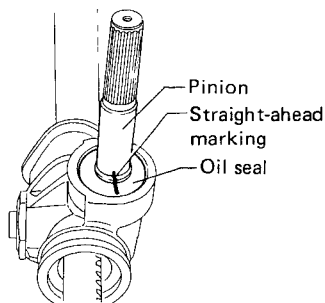
## Steering system

(8) Check the stroke of the rack by turning the pinion.

Rack stroke

Right-hand drive vehicle	118 $\begin{smallmatrix} +1 \\ -0 \end{smallmatrix}$ mm (4.65 $\begin{smallmatrix} +0.04 \\ -0 \end{smallmatrix}$ in)
Left-hand drive vehicle	116 $\begin{smallmatrix} +1 \\ -0 \end{smallmatrix}$ mm (4.57 $\begin{smallmatrix} +0.04 \\ -0 \end{smallmatrix}$ in)

Next, set the rack and pinion to the straight-ahead position and mark the pinion shaft and a side of the oil seal with white paint.



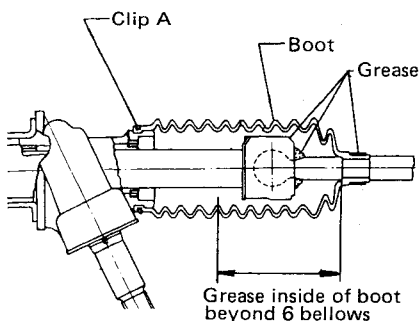
K15-029

Fig. 5-6-29

(9) Apply grease to the inside of the boots beyond 6 bellows on the small-end side and install it.

### NOTE:

Before installing the boot, again coat the teeth and sliding part of the rack with grease.



K15-032

Fig. 5-6-30

(10) After assembly, turn the pinion to see if it rotates smoothly.

### Pinion turning torque

In the range of about  $\pm 30$  mm (1.18 in) from the center of rack: 1.1 N·m (11 kg-cm, 9.5 in-lb) or less  
Maximum torque in the entire operating range: 1.5 N·m (15 kg-cm, 13 in-lb) or less

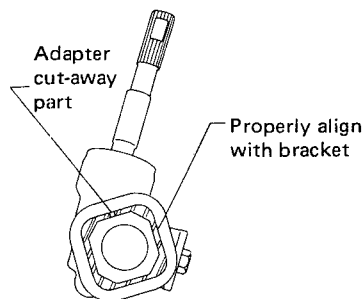
When the turning torque of the pinion exceeds the specified value, turn the adjusting screw back  $20^\circ$  from the completely tightened position and readjust the backlash.

### NOTE:

Check ventilation in the gear box by carefully observing how the boot behaves while the pinion is turning.

(6) When installing the gear box to the crossmember, pay attention to the position of the adapter cut-away part.

Tighten the clamp from the side of the pinion.



K15-043

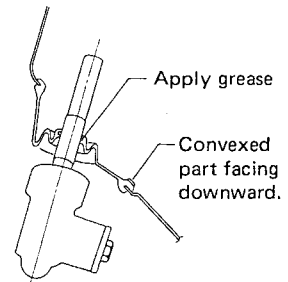
Fig. 5-6-31

(7) The tie-rod end should be linked to the knuckle arm by tightening the castle nut to 25 to 29 N·m (2.5 to 3.0 kg-m, 18 to 22 ft-lb) and then by turning not more than  $60^\circ$  until the cotter pin holes align.

### NOTE:

When installing the tie-rod end to the knuckle arm, do not hammer the cap on the bottom of the tie-rod end.

(8) Install the dust seal so that the convexed part on its periphery faces downward.



K15-044

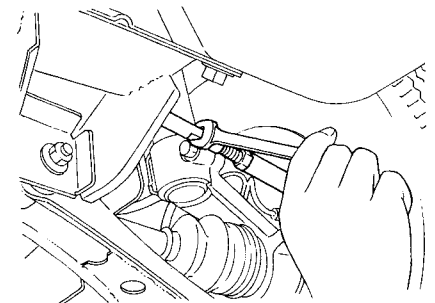
Fig. 5-6-32

(9) Align the white-painted mark on the pinion so that the rack of the gear box may be brought to the center. Then turn the tie-rod to adjust toe-in.

Amount of toe-in:  
0 mm – IN 2 mm  
(0 in – IN 0.08 in)

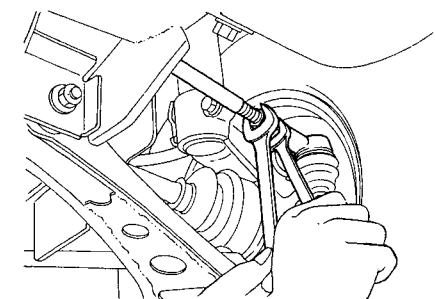
### NOTE:

- When adjusting toe-in, be careful that the boot is not twisted.
- After adjustment, be sure to firmly tighten the lock nut.



K15-035

Fig. 5-6-33



K15-033

Fig. 5-6-34



## Steering system

Inspection and adjustment of wheel steering angle

	Inner wheel	Outer wheel
Right-hand drive vehicle	$37.5^{\circ} +1$ $-2$	$34.5^{\circ} +1$ $-2$
Left-hand drive vehicle	$37.0^{\circ} +1$ $-2$	$34.0^{\circ} +1$ $-2$

10) After adjusting wheel alignment, check for the straight-ahead position of the steering wheel.

When correcting the position of the steering wheel by adjusting the length of the tie-rod, turn the left and right tie-rods equally in the same direction.

Turning the tie-rod  $1/5$  of a turn causes the steering wheel to rotate about 10 mm (0.39 in) on the circumference.

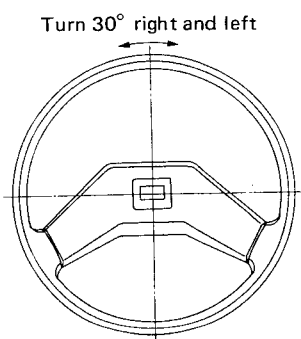
11) Inspection and adjustment of backlash.

Procedures for inspecting and adjusting rack-and-pinion backlash with the steering gear box mounted on a vehicle.

(1) Procedures for inspecting backlash

a. Get on the vehicle. The vehicle should be on the ground.

b. Quickly turn the steering wheel right and left.



K15-045

Fig. 5-6-35

c. Listen to the backlash noises that come from the rack and pinion in mesh at this time.

d. Jack up the vehicle and support it with safety stands.

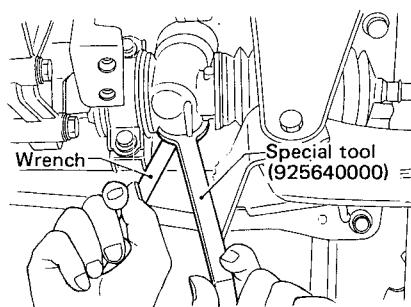
e. Hold the tie-rod on the side of the pinion from below the floor and move it up and down with force to see if it rattles. When the backlash noise is great or the tie-rod rattles too much, take the following steps to adjust the backlash.

(2) Procedures for adjusting backlash

a. Set the steering wheel to the straight-ahead position.

b. In left-hand drive vehicle, remove the exhaust pipe.

c. Loosen the lock nut with the lock nut wrench (special tool: 925640000).



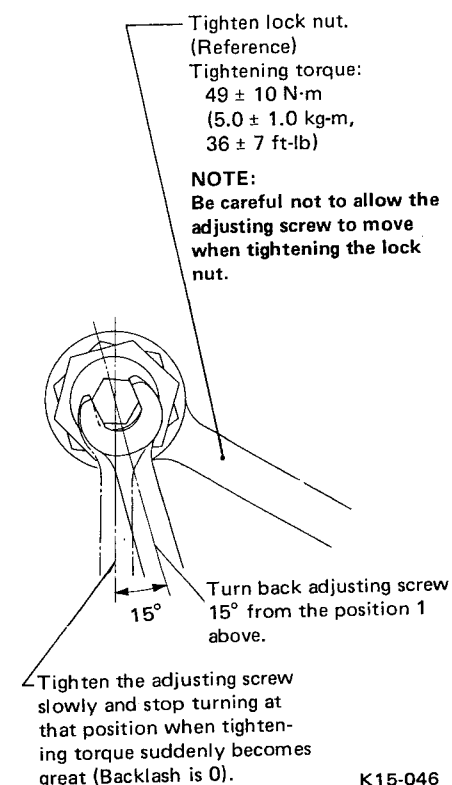
K15-034

Fig. 5-6-36

d. Adjust the backlash by turning the adjusting screw in and out.

e. Tighten the lock nut.

f. Carry out the inspections in item (1) above to ensure the adjustment is done properly.



K15-046

Fig. 5-6-37

### CAUTION:

After adjusting the backlash, check steering effort by turning the steering wheel right and left as far as possible while the vehicle is jacked up. When the steering wheel feels too tight or drags, the backlash is too small and must be readjusted.