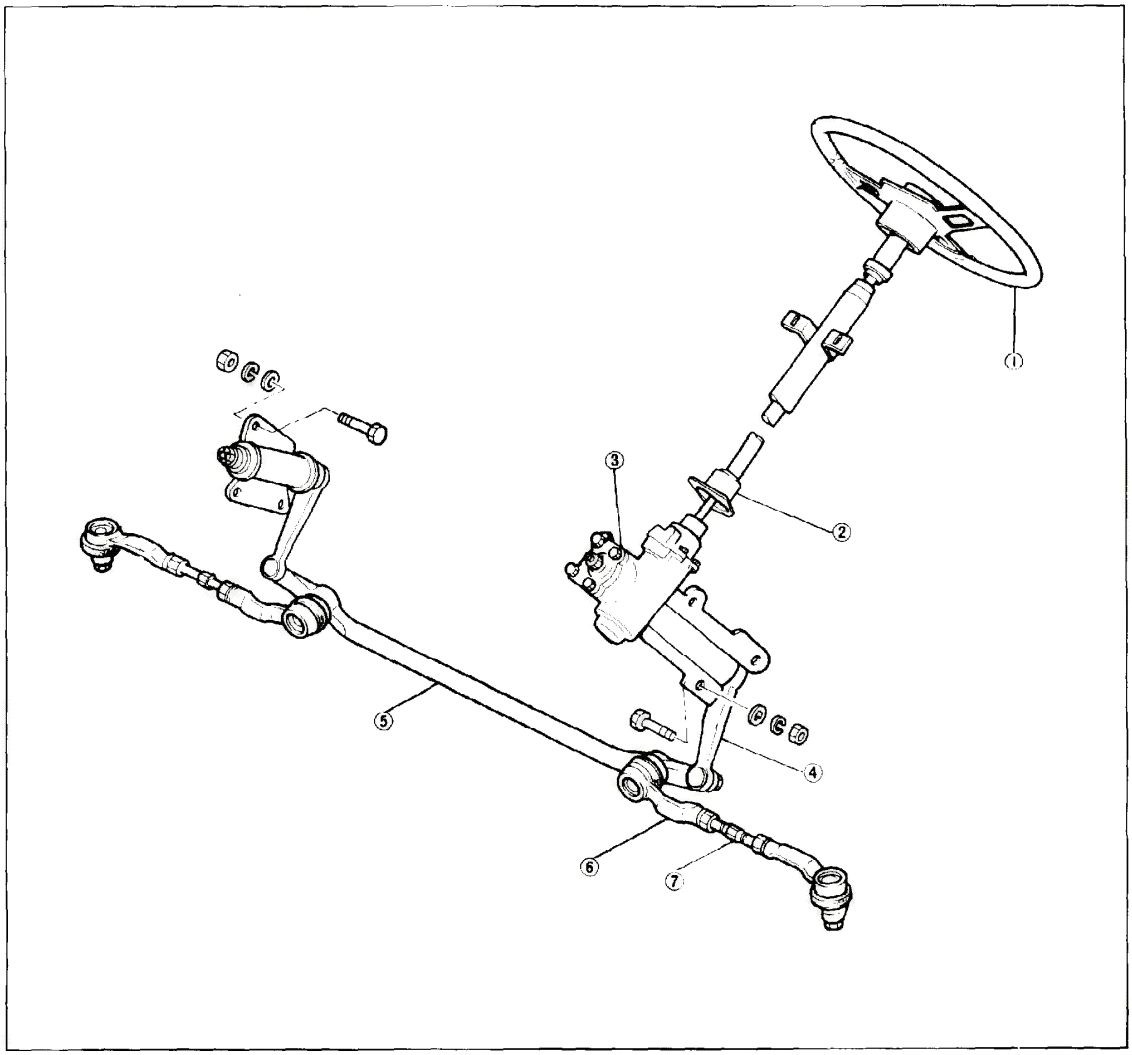
MANUAL STEERING SYSTEM

OUTLINE

STRUCTURAL VIEW



47U10A-043

1 Steering wheel
2 Steering column
3 Steering gear
4 Idler arm
5 Center link
6 Ball socket
7 Tie rod

SPECIFICATIONS

Gear type		Ball nut
Shaft type		Regular type
Shaft joint type		1 joint
Gear ratio		17.0 ~ 20.0 : 1
Steering wheel free play		5 ~ 20 mm (0.2 ~ 0.8 in)
Maximum steering	Inside	39°40' ± 2°
	Outside	32°14' ± 2°
Wheel alignment	Toe-in	3 ± 3 mm (0.12 ± 0.12 in)
	Camber angle	1°00 ± 30' * 0°35' ± 30'
	Caster angel	Right-hand side 4°10' ± 30' Left-hand side 3°40' ± 30'
	King-pin inclined angle	10°44' * 11°20'
	Trail	20 mm (0.79 in)
Oil used	Type	API service GL-4 SAE90
	Quantity	0.325 liters (19.83 cu. in)

* 14 inch tire vehicle

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TROUBLESHOOTING GUIDE

Problem	Possible Cause	Remedy	Page
Steering wheel is hard to turn. (Jack up the front end of vehicle, keeping both left and right tires off the ground and operate the steering wheel)	**Wheel turns to easy**		
	Insufficient tire air pressure	Adjust	
	Excessively uneven wear of tire	Replace	
	Excessive force required to turn wheel		
	Faulty lubrication, presence of foreign matter and abnormal wear of ball joints of steering system	Lubricate or replace	
	Stuck or damaged ball joint of steering system	Replace	
	Faulty adjustment of preload of steering worm shaft	Adjust	
	Damaged steering gear	Replace	10A–6
	Insufficient oil in gear box	Lubricate	
Steering wheel pulls	Deformed steering linkage	Replace	10A–10
	Faulty adjustment of preload of front wheel bearings	Adjust	
	Fatigued front springs	Replace	
	Deformed knuckle arm	Replace	
	Brakes are dragging	Adjust	
	Faulty wheel alignment (toe-in)	Adjust	10A–13
	Faulty tire air pressure	Adjust	
	Unevenly worn tire (Left and right tires are worn unevenly)	Replace	
Unstable driving	Deformed steering linkage	Replace	
	Worn or damaged joint of steering system	Replace	
	Faulty adjustment of preload of steering worm shaft	Adjust	
	Faulty adjustment of preload of front wheel bearing	Adjust	
	Fatigued front spring	Replace	
	Malfunctioning of shock absorber	Replace	
	Faulty wheel alignment (toe-in)	Adjust	10A–13
	Faulty adjustment of tire air pressure	Adjust	
	Wheels are deformed or out of balance	Repair or replace	
Steering wheel vibrates	Faulty adjustment of preload of wheel bearing or worn wheel bearing	Adjust or replace	
	Deformed steering linkage	Replace	
	Worn or damaged joint of steering system	Replace	10A–11
	Faulty adjustment of preload of steering worm shaft	Adjust	
	Loose gear box mounting bolts	Tighten	
	Faulty wheel alignment (toe-in)	Adjust	
	Tire air pressure is not adjusted	Adjust	
	Unevenly worn tires	Replace	
	Depth of tire tread is different between left and right tires	Replace	
	Wheels are deformed or out of balance	Repair or replace	
	Malfunctioning or loose shock absorbers	Replace or tighten	
Excessive play in steering	Faulty adjustment of gear box backlash	Adjust	
	Worn steering gear	Replace	
	Worn or damaged joint of steering system	Replace	
	Faulty adjustment of preload of front wheel bearing	Adjust	
Faulty stability of steering wheel	Stuck or damaged joint of steering system	Replace wheel	
	Faulty front wheel alignment (toe-in)	Adjust	
	Faulty adjustment of preload of steering worm shaft	Adjust	
	Faulty adjustment to tire air pressure	Adjust	
Noise from steering system	Loose or worn steering linkage	Tighten or replace	
	Worn joint of steering system	Replace	
	Faulty adjustment of gear box backlash	Adjust	

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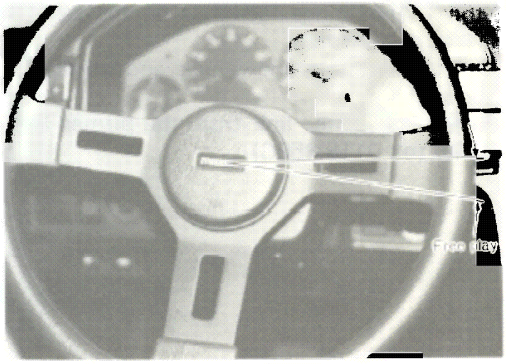

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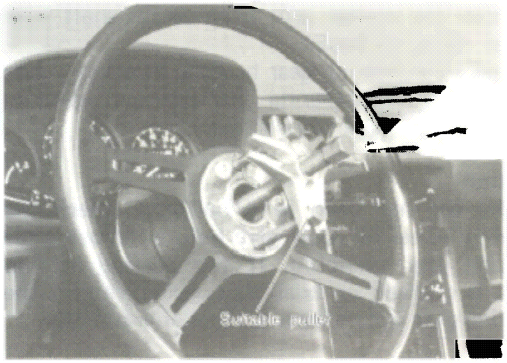

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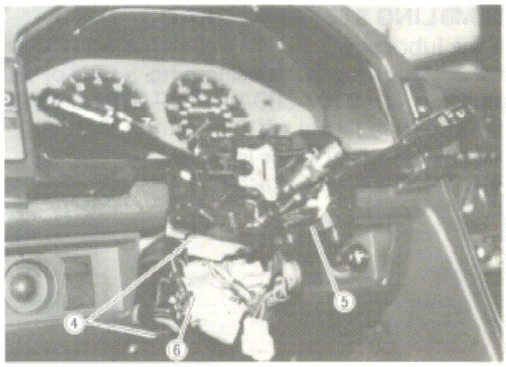
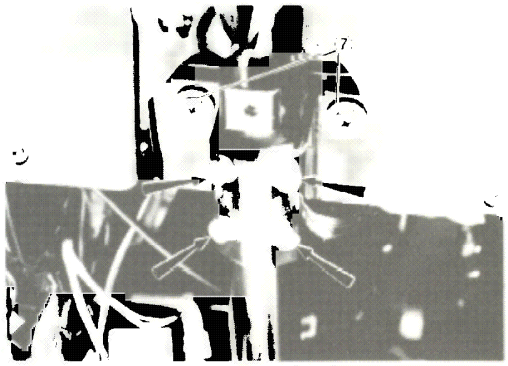




47U10A-003

STEERING WHEEL PLAY

Check the free play at the circumference of the steering wheel.

Standard free play: 5 ~ 20 mm (0.2 ~ 0.8 in)

To check the free play, place the front wheels straight ahead and turn the steering wheel slowly. The free play is taken when the front wheel begins to move.
If excessive play is found, the following points should be carefully checked.
1. Fitting condition of the center link ball joints
2. Looseness of the idler arm bushes
3. Looseness of the wheel bearing
4. Backlash between the sector shaft and ball nut

STEERING GEAR

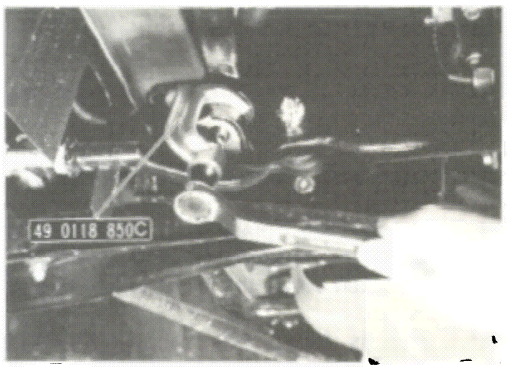
REMOVING STEERING GEAR

1. Disconnect the battery negative cable.
2. Remove the horn cap and steering wheel.

Cautions
a) Before removing the steering wheel, apply identification marks on the steering column shaft and steering wheel.
b) Do not strike the steering column shaft end with a hammer. Striking shaft will damage the bearing or collapsible shaft.
c) Use suitable puller to remove the steering wheel.

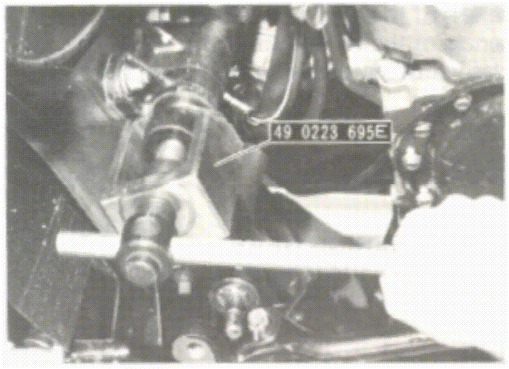
3. Remove the steering column covers.
4. Remove the air duct and disconnect the couplers of the combination switch.
5. Remove the combination switch assembly.
6. Remove the steering lock assembly referring to Page 10A–14.

7. Remove the column jacket fixing bracket.



47U10A-004

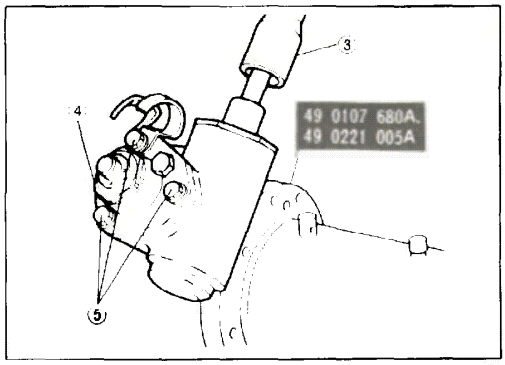
8. Mark the bonnet hinge locations on the bonnet and remove the bonnet.
9. Raise the front end of the vehicle and support it with stands.
10. Disconnect the center link from the pitman arm with **puller** (49 0118 850C).



47U10A-005

11. Remove the pitman arm from sector shaft with **puller** (49 0223 695E).
12. Remove the steering gear housing attaching bolts and remove the steering gear housing assembly through the engine compartment.

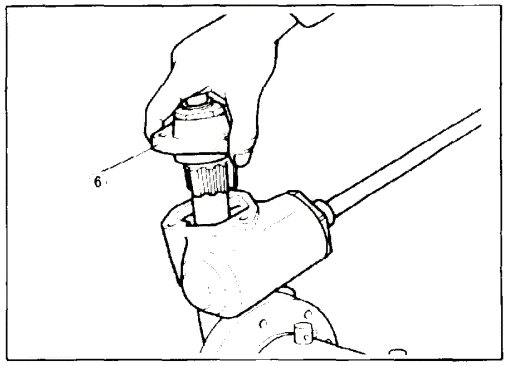
Caution
If the car has been in a collision, check the steering wheel for axial play before removing the steering gear assembly. If the steering column shaft is crushed or axial play occurs, replace the steering gear and column shaft as an assembly.



47U10A-006

DISASSEMBLING STEERING GEAR

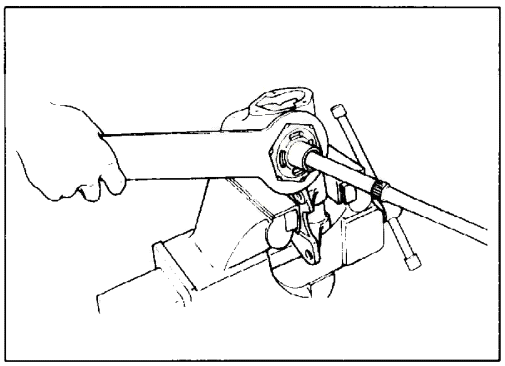
1. Drain the lubricant.
2. Hold the steering gear housing with a vice or an **engine stand** (49 0107 680A and 49 0221 005A).
3. Slide the column jacket off the column shaft.
4. Loosen the adjusting cover lock nut.
5. Remove the side cover attaching bolts.



47U10A-007

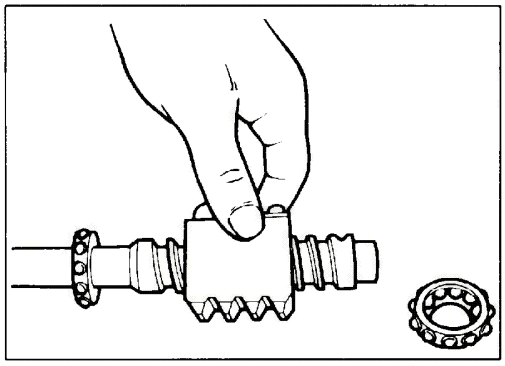
6. Remove the sector shaft assembly from the gear housing by tapping the sector shaft assembly with a plastic hammer.

Caution
Be careful not to damage the shaft.



47U10A-008

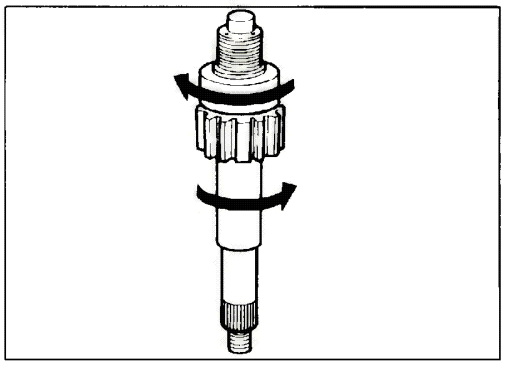
8. Unscrew the end cover lock nut with the suitable wrench.
9. Loosen the end cover.
10. Remove the worm shaft and ball nut assembly.
    Do not disassemble the worm shaft and ball nut assembly.
11. Remove the oil seal with suitable tool.
    Do not remove the oil seal unless it is necessary.



47U10A-009

INSPECTING STEERING GEAR

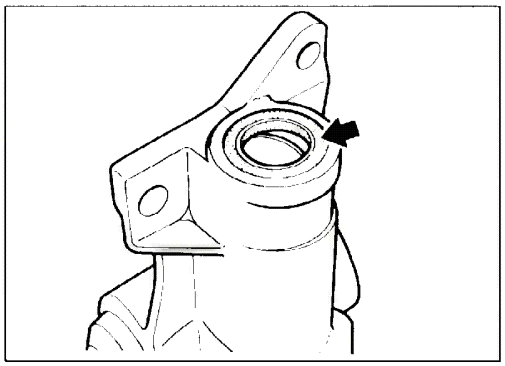
1. Check the operation of the ball nut assembly on the worm shaft. If the ball nut does not travel smoothly and freely on the worm shaft and there is roughness, replace the steering gear assembly.
2. Check the worm bearings and cups for wear or any damage. If defective, replace the steering gear assembly.



47U10A-010

3. Check the interrupted rotation and the abnormal noise of tapered roller baring.

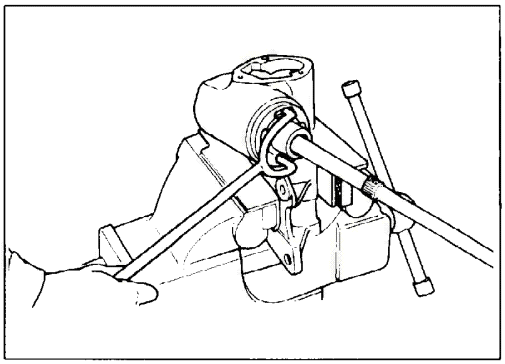
Caution
Twirl the bearing toward the thrust direction and check for any interrupted rotation (catching) and the abnormal sound.
If any of above conditions is found, replace the sector shaft assembly.



47U10A-011

4. Check the oil seal for wear, flaw or any damage. If there is any possibility of oil leakage, replace the oil seal.

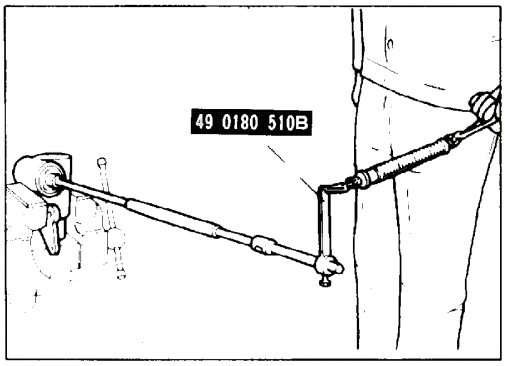
Caution
When installing, do not tap the oil seal directly with a hammer.



47U10A-012

ASSEMBLING STEERING GEAR

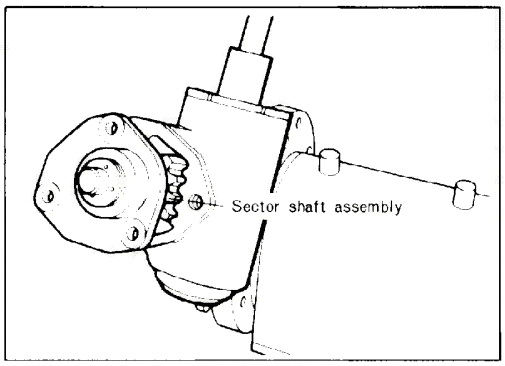
1. Install the oil seal with suitable tool (if removed). **When installing, do not tap the oil seal directly with a hammer.**
2. Install the worm shaft and ball nut assembly into the gear housing.
3. Screw in the end cover until the preload of the worm shaft becomes **0.2 ~ 0.5 kg (0.44 ~ 1.1 lb).**



47U10A-013

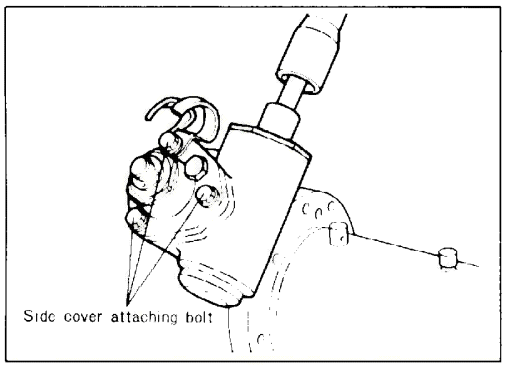
To measure the preload, attach the **attachment** (49 0180 510B) to the column shaft end and pull the spring scale squarely and then, take a reading of the scale when the shaft starts to turn.

4. After adjusting the preload, tighten the end cover lock nut with suitable wrench and recheck the preload.



47U10A-014

5. Trun the worm shaft and place the rack in the center position of the worm.
6. Install the sector shaft assembly into the gear housing, being careful not to damage the oil seal. Make sure the center of the sector gear is in alignment with the center of the worm shaft rack.



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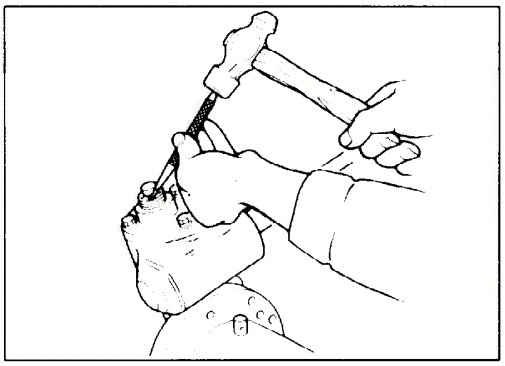
7. Apply sealing agent to side cover and place the side cover onto the sector shaft assembly, then turn the sector shaft assembly counter-clockwise until it is screwed into proper position.
8. Tighten the side cover attaching bolts.

Tightening torque: 45 ~ 55 N·m (33 ~ 40 ft·lb)

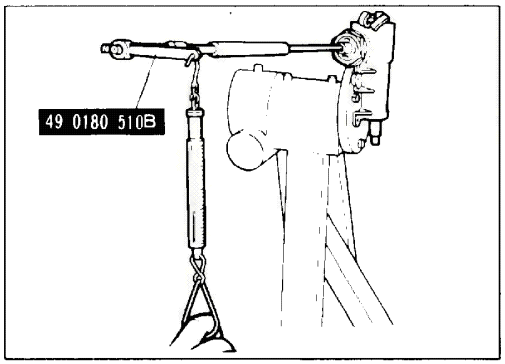
9. Temporarily tighten the adjusting cover lock nut.



47U10A 016

11. To adjust the steering gear preload, turn the adjusting cover clockwise with a punch and a hammer until the correct value is obtained.

Preload: 0.6 ~ 1.2 kg (1.3 ~ 2.6 lb)



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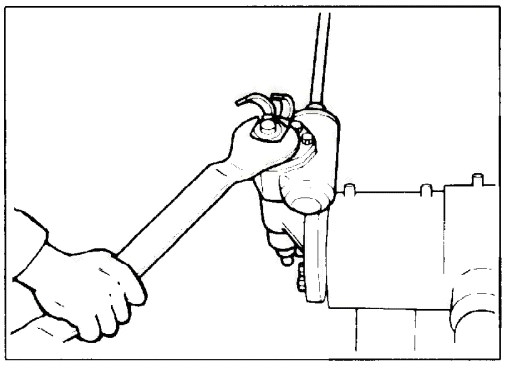
To measure the preload, attach the **attachment** (49 0180 510B) to the column shaft end and pull the spring scale squarely and then, take a reading of the scale when the shaft starts to turn.



47U10A-018

12. Tighten the adjusting cover lock nut.

Tightening torque: 70 ~ 100 N-m (51 ~ 72 ft-lb)

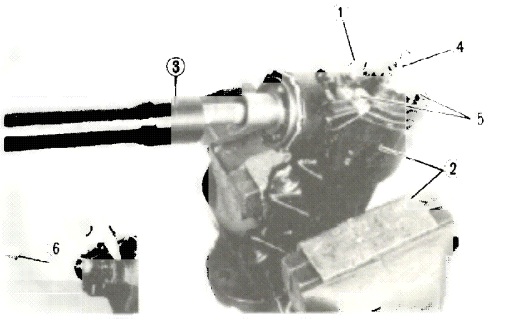
13. Install the column jacket onto the end cover.

INSTALLING STEERING GEAR

Install the steering gear in the reverse order of removal, **noting** the following points.

1. Place the shim in original position between the steering gear housing and the frame to obtain the proper column shaft alignment.
2. Install the pitman arm onto the sector shaft, aligning the identical serrations of the pitman arm and sector shaft.

Pitman arem tightening torque:
150 ~ 180 N-m (108 ~ 130 ft-lb)



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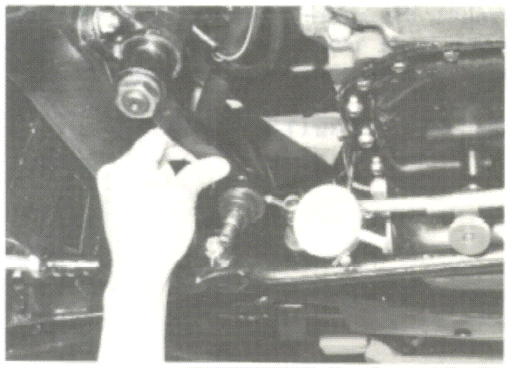
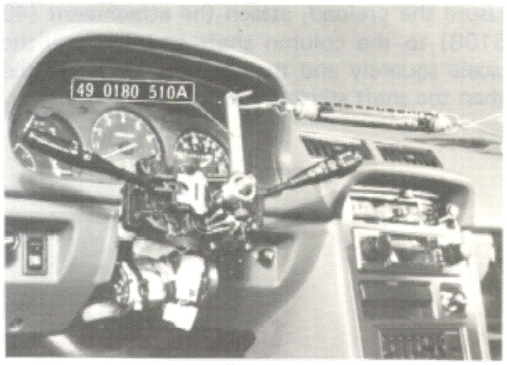


47U10A-020

3. Adjust the backlash between the sector gear and rack, proceed as follows.
1) Move the sector shaft several times from the side of pitman arm to see that it turns smoothly then stop the pitman arm in the center position of its travel range.
2) Mount a dial indicator and adjust the backlash at the neutral position (center position) of pitman arm by turning the adjusting screw in or out so that the movement of the pitman arm end becomes **0 mm.**
3) Tighten the adjusting screw lock nut securely.

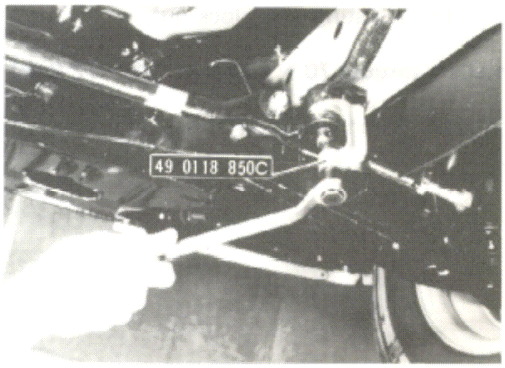


47U10A-021

4. Fit the **attachment** (49 0180 510A) to the column shaft end and measure the worm shaft preload at the center portion of shaft travel.
The preload should be checked when the center link is disconnected from the pitman arm.

Preload (with sector shaft):
0.6 ~ 1.2 kg (1.32 ~ 2.65 lb)

5. Align the identification marks on the steering wheel and column shaft.
6. Fill the gear housing with lubricant (A.P.I. Service GL-4, SAE 90).



47U10A 022

STEERING LINKAGE

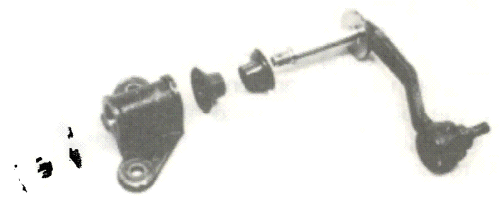
The ball joints are filled with lithium grease and are completed sealed therefore require no lubrication service.

REMOVING IDLER ARM

1. Raise the front end of the vehicle and support it with stands.
2. Disconnect the center link from the idler arm with **puller** (49 0118 850C).
3. Remove the idler arm assembly.

DISASSEMBLING IDLER ARM

1. Hold the idler arm assembly in a vise.
2. Remove the split pin, nut and washer.
3. Remove the idler arm and bushes from the bracket.
4. Check the bushes and replace if they are worn excessively.

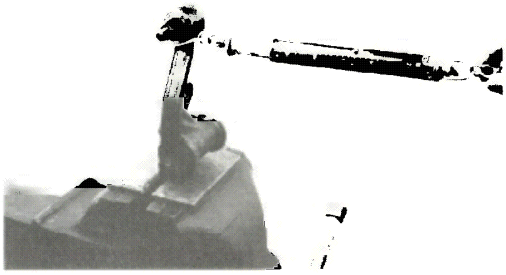


47U10A-023

47U10A-024

ASSEMBLING IDLER ARM

1. Position the bush on the idler arm spindle and fill with grease (Lithium base NLGL No. 2) to bush and spindle.
2. Install the idler arm to bracket and pack the grease into the bracket.
3. Position the bush and washer.
4. Tighten the spindle nut and install the new split pin.



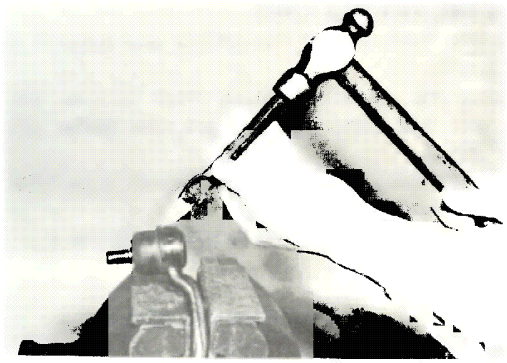
47U10A-025

5. Check the revolving torque of the idler arm by using a spring scale. The reading should be **within 2 ~ 6 kg (4.4 ~ 13.2 lb).**
   If the specified reading is not obtained, replace the idler arm bushes.

47U10A-026

INSTALLING IDLER ARM

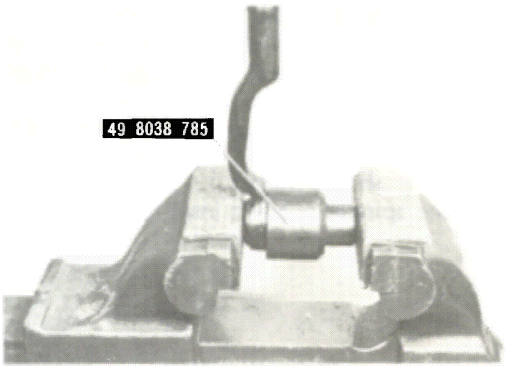
1. Install the idler arm assembly to the frame and tighten the attaching bolts to **44 ~ 55 N-m (32 ~ 40 ft-lb).**
2. Connect the center link to the idler arm.
   Tighten the nut to **25 ~ 35 N-m (18 ~ 25 ft-lb)** and install a new split pin.



47U10A-027

CHECKING BALL JOINT

1. Inspect the ball joint for wear. If defective, replace the whole ball joint.
2. Check the dust seal for wear, flaw or any damage. If the dust seal is defective, replace it with new one.
   To replace the dust seal, remove the ball joint and hold it in a vise.
   Remove the dust seal with suitable tool.



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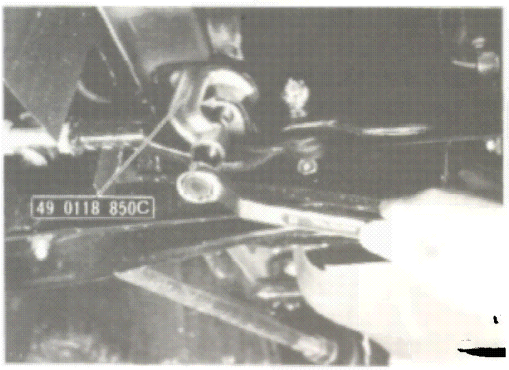
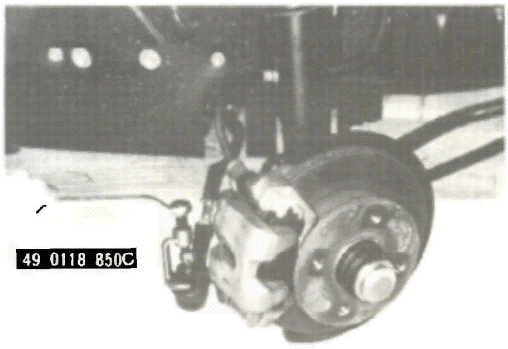
Pack a small amount of grease (Lithium base NLGI No. 2) into the dust seal and install the dust seal with the **boot installer** (49 8038 785).



47U10A-029

REPLACING PITMAN ARM

1. Raise the front end of the vehicle and support it with stands.
2. Disconnect the center link from the pitman arm with **puller** (49 0118 850C).
3. Loosen the nut and remove the pitman arm from the sector shaft with **puller** (49 0223 695E).
4. Install the pitman arm onto the sector shaft, aligning the identical serrations of the pitman arm and sector shaft. Tighten the nut to **150 ~ 180 N-m (108 ~ 130 ft-lb).**
5. Connect the center link to the pitman arm and tighten the nut to **30 ~ 45 N-m (22 ~ 33 ft-lb)** Install a new split pin.

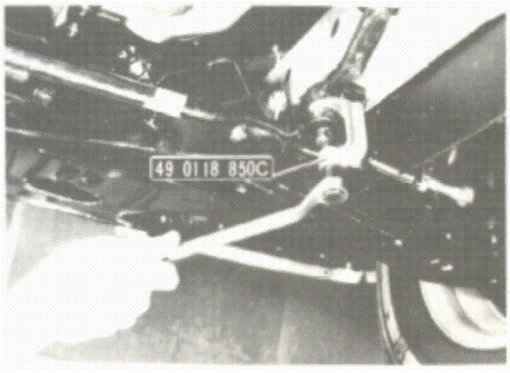


47U10A-030

REPLACING TIE-ROD

1. Raise the front end of the vehicle and support it with stands. Remove the front wheel.
2. Disconnect the tie-rod from the center link and knuckle arm by using the **puller** (49 0118 850C).
3. Install the tie-rod to the center link and knuckle arm.
4. Tighten the nuts to **30 ~ 45 N-m (22 ~ 33 ft-lb)** and install new split pins.

Caution
Whenever the tie-rod or ball joint is replaced, the toe-in must be reset.

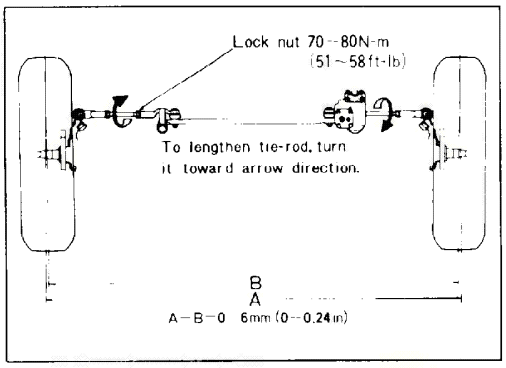


47U10A-031

REPLACING CENTER LINK

1. Raise the front end of the vehicle and support it with stands.
2. Remove the center link from both tie-rods, pitman arm and idler arm by using the **puller** (49 0118 850C).
3. Install the center link to the pitman arm, idler arm and tie-rods.
4. Install and tighten the nuts to specifications. Install new split pins.

Center link to idler arm tightening torque:
25 ~ 35 N-m (18 ~ 25 ft-lb)
Other ball joints tightening torque:
30 ~ 45 N-m (22 ~ 33 ft-lb)



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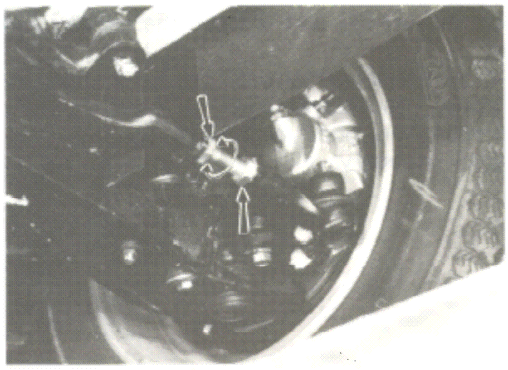
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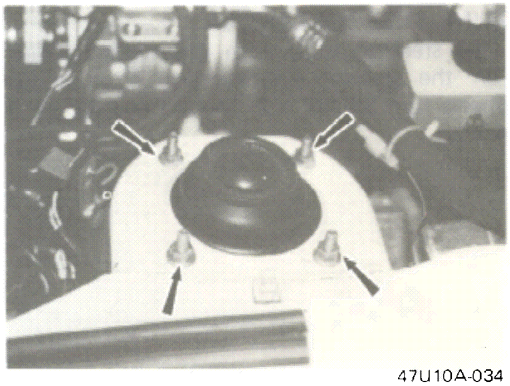
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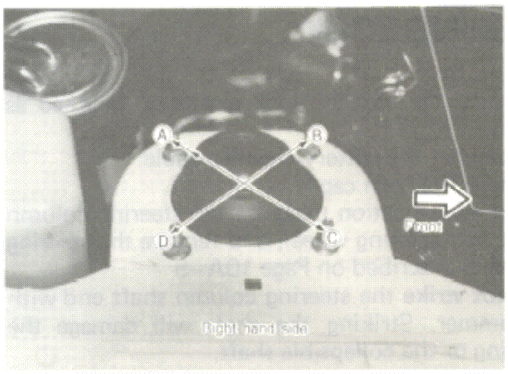

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FRONT WHEEL ALIGNMENT

INSPECTION BEFORE CHECKING FRONT WHEEL ALIGNMENT

1. Check the tire inflation and bring to recommended pressure.
2. Inspect the front wheel bearing play and correct if necessary.
3. Inspect the wheel and tire run-out and balance.
4. Inspect the ball joints of the front suspension and steering linkage for any excessive looseness.
5. The vehicle must be on level ground and has no luggage or passenger load.

CHECKING TOE-IN

1. Raise the front end of the vehicle until the wheels clear the ground.
2. Turning the wheels by hand, mark a line in the center of each tire tread by using a scribing block.
3. Lower the vehicle and place the front wheels in the straight-ahead position.
4. Measure the distance between the marked lines at the front and rear of the wheels.
   Both measurements must be taken at equal distances from the ground.
   If the distance between the wheels at the rear is greater than that at the front by **3 ± 3 mm (0.12 ± 0.12 in)**, it is correct.
   If it is found to be incorrect, adjust the toe-in by turning the tie-rods by equal amounts.

CHECKING CAMBER AND CASTER

To check the camber and caster, use a wheel aligning gauge following the manufacturer's instructions.

Camber:	**1°00′ ± 30′ (13 inch tire vehicle)**
	0°35′ ± 30′ (14 inch tire vehicle)
Caster:	**4°10′ ± 30′ (Right hand side)**
	3°40′ ± 30′ (Left hand side)

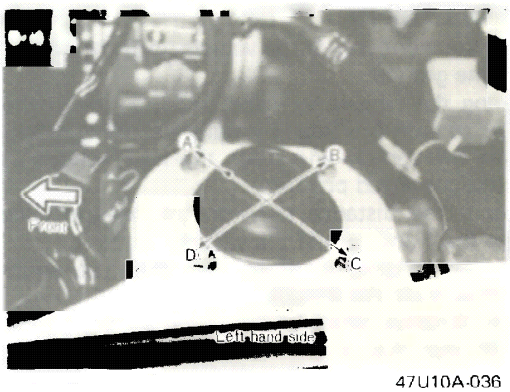
If it is found to be incorrect, adjust the camber and caster as follows:

1. Raise the front end of the vehicle and support it with stands.
2. Open the bonnet.
3. Remove the four nuts attaching the front suspension mounting block to the fender apron.
4. Press the front suspension downward and change the position of the mounting block according to the following table.

Position of front suspension mounting block	Variation	
	Camber	Caster
0° (A) "Original"	0	0
90° (B)	0	+28'
180° (C)	+28'	+28'
270° (D)	+28'	0

5. Tighten the nuts attaching the front suspension mounting block to the fender apron.

   Tightening torque: 23 ~ 30 N-m (17 ~ 22 ft-lb)



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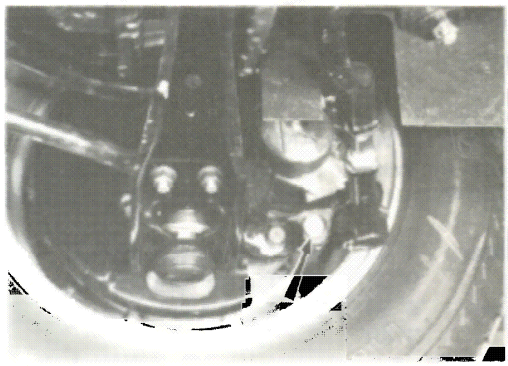
6. Lower the vehicle and recheck the camber and caster.
   If the correct adjustment can not be obtained by the above procedures, check all parts of front suspension and body alignment, and repair or replace if necessary.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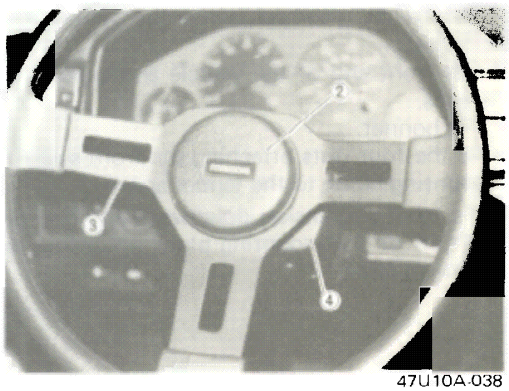
ADJUSTING STEERING ANGLE

Adjust the steering angle with the adjusting bolt fitted on the steering knuckle arm so that the front wheels turn **39°40'** ± **2°** inward and **32°14'** ± **2°** outward.



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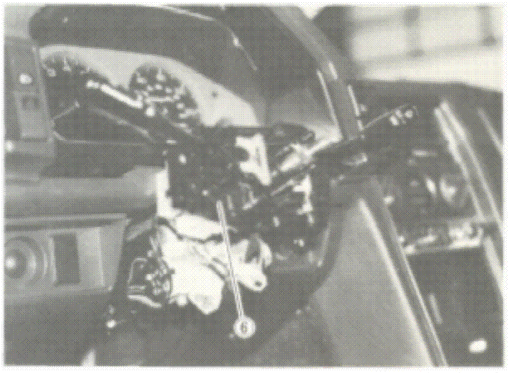
STEERING LOCK

To replace the steering lock assembly, proceed as follows.

1. Disconnect the battery negative cable.
2. Remove the horn cap.
3. Make identification maks on the steering column shaft and steering wheel, and remove the steering wheel as described on Page 10A–5
   Do not strike the steering column shaft end with a hammer. Striking the shaft will damage the bearing or the collapsible shaft.
4. Remove the steering column covers.



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5. Remove the air duct and disconnect the couplers of the combination switch.
6. Remove the combination switch assembly.

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7. Position the suitable protector under the steering lock assembly to protect the steering shaft from the shock of the hammer blows.
8. Loosen the bolts attaching the steering lock body to the column jacket by using a chisel.
9. Position a new steering lock assembly to the column jacket and tighten the bolts until the head of the bolts snap off.
10. Install the combination switch, column covers and steering wheel in the reverse order of removal.