

# **WORKSHOP MANUAL**

**NHR, NKR, NPR, NQR, NPS**

## **STEERING, SUSPENSION, WHEELS AND TIRES**

### **SECTION 3**

# **ISUZU**

**ISUZU**



International Service & Parts  
*Tokyo, Japan*



## NOTICE

Before using this Workshop Manual to assist you in performing vehicle service and maintenance operations, it is recommended that you carefully read and thoroughly understand the information contained in Section-0A under the headings "GENERAL REPAIR INSTRUCTIONS" and "HOW TO USE THIS MANUAL".

All material contained in this Manual is based on latest product information available at the time of publication.

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### Applicable Model

N Series		
NHR55	NPR58	NPS66
NHR69	NPR59	NPS71
NKR55	NPR65	NQR66
NKR58	NPR66	NQR70
NKR66	NPR69	NQR71
NKR69	NPR70	
NPR55	NPR71	

This manual is applicable to 1994 year model and later vehicles.



**THIS MANUAL INCLUDES THE FOLLOWING SECTIONS:**

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<b>00</b>	<b>Service Information</b>
<b>3A</b>	<b>Front End Alignment</b>
<b>3B1</b>	<b>Power Steering</b>
<b>3B2</b>	<b>Manual Steering</b>
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<b>3B4</b>	<b>Steering Column</b>
<b>3C</b>	<b>Front Suspension</b>
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# SECTION 00

## SERVICE INFORMATION

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# TROUBLESHOOTING

## STEERING SYSTEM

PROBLEM	POSSIBLE CAUSE	CORRECTION
<b>Objectionable "Hiss"</b>	Noisy relief valve. There is some noise in all power steering systems. One of the most common is a hissing sound most evident at standstill parking. Hiss is a high frequency noise similar to that experienced while slowly closing a water tap. The noise is present in every valve and results from high velocity fluid passing valve orifice edges. There is no relationship between this noise and performance of the steering. "Hiss" may be expected when the steering wheel is at end of travel or when slowly turning at standstill.	Do not replace the valve unless "hiss" is extremely objectionable. A replacement valve will also exhibit slight noise and is not always a cure.
<b>Rattle or Chuckle Noise in the Steering Gear</b>	<ol style="list-style-type: none"> <li>1. Gear housing loose on frame.</li> <li>2. Steering linkage looseness.</li> <li>3. Pressure house touching other parts of the truck.</li> <li>4. Loose pitman shaft over center adjustment. A slight rattle may occur on turns because of increased clearance off the "high point." This is normal and clearance must not be reduced below specified limits to eliminate this slight rattle.</li> <li>5. Loose pitman arm.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check gear mounting. Torque the bolts to specifications.</li> <li>2. Check linkage pivot points for wear. Replace if necessary.</li> <li>3. Adjust the hose position. Do not bend tubing by hand.</li> <li>4. Adjust.</li> <li>5. Torque the pitman arm nut.</li> </ol>
<b>Groan Noise in the Steering Pump</b>	<ol style="list-style-type: none"> <li>1. Low oil level.</li> <li>2. Air in the oil. Poor pressure house connection.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill the reservoir to the proper level.</li> <li>2. Torque the connector. Bleed the system.</li> </ol>
<b>Rattle or Knock Noise in the Steering Pump</b>	Loose pump gear nut.	Torque the nut.
<b>Rattle Noise in the Steering Pump</b>	<ol style="list-style-type: none"> <li>1. Vanes not installed properly</li> <li>2. Vanes sticking in the rotor slots.</li> </ol>	<ol style="list-style-type: none"> <li>1. Install properly</li> <li>2. Repair or replace.</li> </ol>
<b>Swish Noise in the Steering Pump</b>	Defective flow control valve.	Replace or repair.
<b>Whine Noise in the Steering Pump</b>	Pump shaft bearing scored.	Replace the housing and shaft. Flush and bleed the system.
<b>Growl Noise in the Steering Pump</b>	Excessive back pressure in houses or the steering gear caused by restriction.	Locate the restriction and correct. Replace the part if necessary.



## STEERING SYSTEM (CONT.)

PROBLEM	POSSIBLE CAUSE	CORRECTION
<b>Growl Noise in the Steering Pump (Particularly Noticeable at Standstill Parking)</b>	<ol style="list-style-type: none"> <li>1. Scored pressure plates, thrust plate or rotor.</li> <li>2. Extreme wear of the cam ring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the parts and flush the system.</li> <li>2. Replace the parts.</li> </ol>
<b>Excessive Play or Looseness in the Steering System (Steering Wanders)</b>	<ol style="list-style-type: none"> <li>1. Front wheel bearings loosely adjusted.</li> <li>2. Worn coupling or steering shaft joints.</li> <li>3. Worn steering linkage ball joints.</li> <li>4. Worn upper or lower ball joints.</li> <li>5. Steering wheel loose on the shaft, loose pitman arm, tie rods, steering arms, or steering linkage ball studs.</li> <li>6. Steering gear worm bearing loosely adjusted.</li> <li>7. Excessive pitman shaft to ball nut lash in the steering gear.</li> <li>8. Toe-in out of adjustment or worn drag link or tie rod sockets.</li> <li>9. Steering system out of alignment.</li> <li>10. Tires badly worn, edge of the tires are rounded off.</li> <li>11. Lack of lubrication in the linkage and kingpins.</li> <li>12. Air in the system.</li> <li>13. Steering gear mounting loose.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust the bearings or replace with new parts as necessary.</li> <li>2. Replace</li> <li>3. Replace steering linkage.</li> <li>4. Replace ball joints.</li> <li>5. Torque the fasteners.</li> <li>6. Adjust the preload.</li> <li>7. Adjust the preload.</li> <li>8. Replace the tie rod ends if worn, adjust to correct the toe-in, and inspect the steering arm and tie rod for bent condition.</li> <li>9. Align caster, camber, and toe-in. Inspect spring components for condition and wear. Repair or replace as required.</li> <li>10. Install new tires, and check alignment; abnormal tire wear indicates improper alignment.</li> <li>11. Lubricate. Free up any components which are frozen and will not take lubrication.</li> <li>12. Add oil to the pump reservoir and bleed the system. Check hose connectors for proper torque.</li> <li>13. Tighten attaching bolts to the specified torque.</li> </ol>
<b>Vibration and Shimmy</b>	<ol style="list-style-type: none"> <li>1. Seal damage and leakage resulting in loss of lubricant, corrosion and excessive wear.</li> <li>2. Tires, wheels, or brake drums out of balance.</li> <li>3. Bent wheel or out of bound tire. Wheel nuts torqued unevenly.</li> <li>4. Loose steering linkage components.</li> <li>5. Worn steering linkage ball joints.</li> <li>6. Worn upper or lower end ball joint.</li> <li>7. Wheel loose on the hub.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace damaged parts as necessary.</li> <li>2. Balance the tires and wheels, preferably with an on-vehicle type balancer, as this method balances the entire wheel and drum assembly.</li> <li>3. Replace the wheel and remount the tire, or replace the assembly.</li> <li>4. Adjust, torque, and repair the linkage as necessary.</li> <li>5. Replace steering linkage.</li> <li>6. Replace ball joints.</li> <li>7. Inspect the wheel bolt holes for damage, and replace the wheel or torque the nuts.</li> </ol>



## STEERING SYSTEM (CONT.)

PROBLEM	POSSIBLE CAUSE	CORRECTION
<b>Vibration and Shimmy (cont.)</b>	8. Drive line universal joints rough or defective. This condition may be confused with steering vibration. 9. Engine misses or is out of balance, this may also be confused with steering shimmy. 10. Faulty shock absorbers.	8. Repair the drive line. 9. Correct the miss in the engine, or repair the out of balance condition, clutch, pressure plate, or harmonic balancer, etc. 10. Replace the shock absorbers.
<b>Hard Steering or Excessive Effort Required at Steering Wheel</b>	1. Low or uneven tire pressure. 2. Steering linkage kingpins or ball joints need lubrications. 3. Tight or frozen intermediate rod, tie rod or idler socket. 4. Steering gear to column misalignment. 5. Steering gear adjusted too tightly. 6. Front wheel alignment incorrect. 7. Steering gear adjusted too tight. 8. Frozen or tight shaft bearings. 9. Lower the U-joint flange rubbing against the adjuster. 10. Tight or binding conditions in steering column. 11. Power cylinder rod nicked or marred.	1. Inflate to specified pressures. 2. Lubricate, and free up kingpins or ball joints. Make certain all fittings take lubricant properly. 3. Lube or replace as necessary. 4. Align the column. 5. Adjust preload. 6. Check alignment and correct as necessary. 7. Adjust the steering gear. 8. Replace the bearings. 9. Loosen the bolt, assemble and torque properly. 10. Adjust the steering column. 11. Replace the cylinder.
<b>Pump Inoperative, Poor, or No Assist (Hard Steering)</b>	1. Low oil level. 2. Air in the oil. 3. Defective hoses or steering gear. 4. Flow control valve stuck. 5. Loose nut in end of flow control valve. 6. Pressure plate not flat against ring. 7. Extreme wear of pump ring. 8. Scored pressure plate, thrust plate. 9. Vanes not installed properly. 10. Vanes sticking in rotor slots. 11. Faulty flow control valve assembly.	1. Fill the reservoir to the proper level. 2. Locate the source of the air leak and correct it. 3. Repair or replace. 4. Repair or replace. 5. Torque nut. 6. Repair or replace. 7. Repair or replace. 8. Repair or replace. 9. Repair or replace. 10. Repair or replace. 11. Repair or replace.
<b>Momentary Increase in Effort when Turning Wheel Fast to Right or Left</b>	1. Low oil level in pump. 2. High internal leakage in hydraulic pump. 3. High internal leakage in steering gear.	1. Add power steering fluid as required. 2. Check the pump pressure. (See the pump pressure test). 3. Repair.
<b>Steering Wheel Surges or Jerks when Turning with Engine Running Especially During Parking</b>	1. Low oil level. 2. Insufficient pump pressure. 3. Defective gear relief valve. 4. Sticky flow control valve.	1. Fill as required. 2. Check pump pressure. (See pump pressure test). Replace relief valve if defective. 3. Replace the gear relief valve. 4. Repair or replace.



## STEERING SYSTEM (CONT.)

PROBLEM	POSSIBLE CAUSE	CORRECTION
<b>Steering Pulls to Left or Right</b>	<ol style="list-style-type: none"> <li>1. Camber incorrectly adjusted. Steering will generally pull to the side of the axle having the greatest positive camber.</li> <li>2. Low air pressure in the right or left tire. Steering will pull to the side having the low air pressure.</li> <li>3. Axle loose and shifted at the spring U-bolts.</li> <li>4. Rear axle loose at the spring U-bolt. If shifted axle is shifted at one side, it will cause the steering to pull.</li> <li>5. Unbalanced steering gear valve. If this is the cause, steering effort will be very light in the direction of the lead and heavy in the opposite direction.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust camber.</li> <li>2. Inflate the tire to the correct pressure, check for air leak and repair as required.</li> <li>3. Align the axle, and torque the U-bolt nuts. Inspect for damaged parts. Replace if required.</li> <li>4. Align the rear axle and replace the defective parts, if any. Torque the U-bolt.</li> <li>5. Replace the valve.</li> </ol>
<b>Poor Return of the Steering Wheel</b>	<ol style="list-style-type: none"> <li>1. Lack of lubrication in the linkage.</li> <li>2. Steering gear to column misalignment.</li> <li>3. Tires not properly inflated.</li> <li>4. Improper front wheel alignment.</li> <li>5. Steering linkage binding.</li> <li>6. Steering wheel rubbing against the directional signal housing. (Turn the steering wheel and listen for internal rubbing in the column.)</li> <li>7. Tight steering shaft bearings.</li> <li>8. Sticky or plugged valve spool.</li> <li>9. Steering gear out of adjustment.</li> <li>10. Tight kingpin bushings.</li> <li>11. Lower U-joint flange rubbing against the steering gear adjust plug.</li> <li>12. Upper or lower end ball joint binding.</li> </ol>	<ol style="list-style-type: none"> <li>1. Lube the linkage.</li> <li>2. Align the steering column.</li> <li>3. Inflate to the specified pressure.</li> <li>4. Check and adjust as necessary.</li> <li>5. Replace the pivots.</li> <li>6. Adjust the steering jacket.</li> <li>7. Replace the bearings.</li> <li>8. Repair or replace valve.</li> <li>9. Check adjustment. Adjust as required.</li> <li>10. Lubricate or replace as required.</li> <li>11. Loosen the pinch bolt and assemble it properly.</li> <li>12. Replace ball joints.</li> </ol>
<b>Snapping or Chucking in the Steering Column or Wheel</b>	<ol style="list-style-type: none"> <li>1. Loose steering gear at the frame.</li> <li>2. Worn steering shaft universal joints.</li> <li>3. Worn steering linkage components. The effect of these components will telescope through the steering system and be felt in the steering wheel.</li> <li>4. Steering gear incorrectly adjusted.</li> </ol>	<ol style="list-style-type: none"> <li>1. Torque the mounting bolts.</li> <li>2. Replace and repair the joints as necessary.</li> <li>3. Adjust, torque, and repair the components.</li> <li>4. Adjust steering gear.</li> </ol>
<b>Excessive Road Shock</b>	<ol style="list-style-type: none"> <li>1. Tire air pressure too high.</li> <li>2. Wheel bearings adjusted too loose.</li> <li>3. Camber adjustment incorrect.</li> <li>4. Weak or broken front spring.</li> <li>5. Defective shock absorbers.</li> <li>6. Loose suspension components.</li> </ol>	<ol style="list-style-type: none"> <li>1. Deflate to the correct pressure.</li> <li>2. Adjust the bearings.</li> <li>3. Adjust the camber.</li> <li>4. Replace the spring.</li> <li>5. Replace the shock absorbers.</li> <li>6. Inspect, adjust or repair, and replace as necessary.</li> </ol>



## FRONT AND REAR SUSPENSION

PROBLEM	POSSIBLE CAUSE	CORRECTION
<b>Spring Noise</b>	<ol style="list-style-type: none"> <li>1. Loose U-bolts.</li> <li>2. Loose or worn eye bushings.</li> <li>3. Lack of lubrication.</li> <li>4. Defective shock absorber.</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten to recommended torque.</li> <li>2. Replace eye bushings.</li> <li>3. Lubricate as required.</li> <li>4. Replace shock absorber.</li> </ol>
<b>Spring Sag or Bottom</b>	<ol style="list-style-type: none"> <li>1. Inoperative shock absorber.</li> <li>2. Broken spring leaf.</li> <li>3. Severe operation or overloading.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace shock absorbers.</li> <li>2. Replace leaf or spring assembly.</li> <li>3. Check road capacity rating.</li> </ol>
<b>Spring Breakage</b>	<ol style="list-style-type: none"> <li>1. Loose U-bolts.</li> <li>2. Normal fatigue.</li> <li>3. Overloading.</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten to recommended torque.</li> <li>2. Replace springs.</li> <li>3. Do not overload vehicle.</li> </ol>
<b>Excessive Road Shock</b>	<ol style="list-style-type: none"> <li>1. Tire air pressure too high.</li> <li>2. Wheel bearings adjusted too loose.</li> <li>3. Camber adjustment incorrect (Negative camber contributes to road shock).</li> <li>4. Weak or broken spring.</li> <li>5. Defective shock absorbers.</li> <li>6. Loose suspension components.</li> </ol>	<ol style="list-style-type: none"> <li>1. Deflate to correct pressure.</li> <li>2. Adjust bearings.</li> <li>3. Adjust camber.</li> <li>4. Replace springs.</li> <li>5. Replace shock absorbers.</li> <li>6. Inspect, adjust or repair and replace as necessary.</li> </ol>

## WHEELS

PROBLEM	POSSIBLE CAUSE	CORRECTION
<b>Wheel Hop (Vehicle Vibration and Rough Steering)</b>	<p><b>Wheels</b></p> <ol style="list-style-type: none"> <li>1. Rocks and debris wedged between dual disc wheels.</li> <li>2. Out-of-balance tire and/or hub and drum/rotor assembly.</li> <li>3. Improper positioning of the side rings split.</li> </ol> <p><b>Vehicle</b> Loose or worn driveline or suspension.</p>	<ol style="list-style-type: none"> <li>1. Remove rocks and debris.</li> <li>2. Determine the out-of-balance component and balance or replace.</li> <li>3. Reassemble with ring split opposite (180 degrees) the valve opening to improve balance.</li> </ol> <p>Identify location of vibration carefully as it may be transmitted through the frame making a rear end vibration appear to come from the front. Then repair or replace loose or worn parts (Refer to PROPELLER SHAFT [SEC. 4B] for vehicle vibration.)</p>
<b>Stripped Threads</b>	Excessive clamp load.	Replace studs — follow proper torque procedure.
<b>Rust Streaks from Stud Holes Correction</b>	Loose cap nuts.	Check complete assembly, replace damaged parts and follow proper torque procedure.



## TIRES

PROBLEM	POSSIBLE CAUSE	CORRECTION
<b>Wobble (Vehicle Vibrations and Rough Steering)</b>	<b>Wheels</b> <ol style="list-style-type: none"> <li>1. Bent or distorted disc from overloading or improper handling.</li> <li>2. Loose mountings, damaged studs, cap nuts, enlarged stud holes, worn or broken hub face, or foreign material on mounting surfaces.</li> <li>3. Improper positioning of the side rings split.</li> </ol> <b>Vehicle</b> <ol style="list-style-type: none"> <li>1. Improper alignment.</li> <li>2. Loose, worn or broken suspension parts.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace wheel.</li> <li>2. Replace worn or damaged parts. Clean mounting surfaces.</li> <li>3. Reassemble with ring split opposite (180 degrees) the valve opening to improve balance.</li> </ol> <ol style="list-style-type: none"> <li>1. Have vehicle aligned.</li> <li>2. Repair or replace.</li> </ol>
<b>Cracked or Broken Wheel Discs (Cracks Develop in the Wheel Disc from Handhole to Rim, or from Handhole to Stud)</b>	Metal fatigue resulting from overloading.	Replace wheel. Check position of wheel on vehicle for working load specifications.
<b>Damaged Stud Holes (stud Holes Become Worn, Elongated or Deformed, Metal Builds up Around Stud Hole Edges, Cracks Develop from Stud Hole to Stud Hole)</b>	Loose wheel mounting.	Replace wheel and check for: <ul style="list-style-type: none"> <li>• Installation of correct studs and nuts.</li> <li>• Cracked or broken studs — replace.</li> <li>• Worn hub face — replace.</li> <li>• Broken or cracked hub barrel — replace.</li> <li>• Clean mounting surfaces and retorque cap nuts periodically.</li> <li>• Rust streaks fanning out from stud holes indicate that the cap nuts are or have been loose.</li> </ul>
<b>Damaged Stud Threads</b>	Sliding wheel across studs during assembly.	Replace stud following proper wheel installation.
<b>Loose Drum</b>	Improper drum bolt.	Replace with proper length bolt.
<b>Loose Inner Wheel</b>	<ol style="list-style-type: none"> <li>1. Excessive stud standout from mounting face of hub allowing wheel nut to bottom out.</li> <li>2. Improper torque.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace with proper length bolt.</li> <li>2. Use recommended torque procedure.</li> </ol>
<b>Broken Wheel Studs</b>	<ol style="list-style-type: none"> <li>1. Loose cap nuts.</li> <li>2. Overloading.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace stud and follow proper torque procedures.</li> <li>2. Replace stud.</li> </ol>



## TIRES (Cont.)

PROBLEM	POSSIBLE CAUSE	CORRECTION
<b>Tire Slippage on Rim</b>	<ol style="list-style-type: none"> <li>1. Improper storage or operating conditions.</li> <li>2. Poor maintenance.</li> <li>3. Rust, corrosion on bead seating.</li> <li>4. Loss of pressure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Correct as required.</li> <li>2. Follow proper maintenance procedures.</li> <li>3. Correct as required.</li> <li>4. Follow proper maintenance procedures.</li> </ol>
<b>Tire Mounting Difficulties</b>	<ol style="list-style-type: none"> <li>1. Mismatch tire and rim sizes.</li> <li>2. Defective or mismatched rings for rim use.</li> <li>3. Overinflation of tires.</li> <li>4. Corrosion and dirt.</li> </ol>	<ol style="list-style-type: none"> <li>1. Correct as required.</li> <li>2. Correct as required.</li> <li>3. Follow recommended tire pressure.</li> <li>4. Correct as required.</li> </ol>
<b>Tires Show Excessive Wear on Edges of Tread</b>	<ol style="list-style-type: none"> <li>1. Underinflated tires.</li> <li>2. Vehicle overloading.</li> <li>3. High speed cornering.</li> <li>4. Incorrect toe-in setting.</li> </ol>	<ol style="list-style-type: none"> <li>1. Properly inflate to recommended pressure.</li> <li>2. Correct as required.</li> <li>3. Correct as required.</li> <li>4. Set to correct specifications.</li> </ol>
<b>Tires Show Excessive Wear in Center of Tread</b>	Tires overinflated.	Properly inflate to recommended pressure.
<b>Excessive Tire Wear</b>	<ol style="list-style-type: none"> <li>1. Improper tire pressure.</li> <li>2. Incorrect tire/wheel usage.</li> <li>3. Defective shock absorbers.</li> <li>4. Front end out of alignment.</li> <li>5. Loose, worn or damaged steering linkage, joints, suspension components, bushings and ball joints.</li> </ol>	<ol style="list-style-type: none"> <li>1. Properly inflate to recommended pressure.</li> <li>2. Install correct tire/wheel combination.</li> <li>3. Repair or replace.</li> <li>4. Align front end.</li> <li>5. Inspect, repair or replace as required.</li> </ol>
<b>Dual Tires Rubbing</b>	Insufficient wheel spacing.	Check tire and wheel sizes.



# MAIN DATA AND SPECIFICATIONS

## Front End Alignment

### 1994 – 1997 Model

	Wishbone Suspension	NHR Rigid	NKR Rigid	NPR	NQR	NPS
Steering Angle						
Inner (Deg.)	38°	46°	38°	47°	42.5°	38°
Outer (Deg.)	35°	34°	30°	36°	34°	30°
Wheel alignment						
Toe-in Bias Tire mm(in.)	-2 – 2		3 – 7 (0.12 – 0.28)			-2 – 2
Radial Tire mm(in.)	(-0.08 – 0.08)		0 – 4 (0 – 0.16)			(-0.08 – 0.08)
Camber (Deg.)	0°15'±45'		1°15'±45'			0°15'±45'
Caster (Deg.)	1°00'±1°		1°30'±1°			2°00'±1°
King Pin Inclination (Deg.)	9°45'			7°15'		

### 1998~ Model

	Wishbone Suspension	NHR	NKR Rigid	NPR	NQR	NPS
Steering Angle						
Inner (Deg.)	38.5° (7.00-15 Tire)	37.5°	38.5° (7.00-15 Tire)	47.5° (7.00-16 Tire)		38°
	35.5° (7.00-16 Tire)		35.5° (7.00-16 Tire)	42.5° (7.50-16 Tire)	42.5° (7.50-16 Tire)	
	31.5° (7.50-16 Tire)		31.5° (7.50-16 Tire)		36.5° (8.25-16 Tire)	
Outer (Deg.)	29.5° (7.00-15 Tire)	33°	29.5° (7.00-15 Tire)	35° (7.00-16 Tire)		30°
	27.9° (7.00-16 Tire)		27.9° (7.00-16 Tire)	32.7° (7.50-16 Tire)	32.7° (7.50-16 Tire)	
	25.1° (7.50-16 Tire)		25.1° (7.50-16 Tire)		30.0° (8.25-16 Tire)	
Wheel alignment						
Toe-in mm(in.)			-2 – 2 (-0.08 – 0.08)			
Camber (Deg.)	0°15'±45'	1°15'±45'		0°15'±45'		0°15'±45'
Caster (Deg.)	1°00'±1°	1°30'±1°	3°±1°	2°45'±1°		2°00'±1°
King Pin Inclination (Deg.)	9°45'±30'	7°15'		12°00'		7°15'



## Power Steering Unit

	Right Hand Drive	Left Hand Drive
Type	Integral rotary valve type	
Numbers of Ball	28	30
Gear Ratio	22.6 NHR, NKR 20.9 NPR, NQR, NPS	21.9
Ball Screw Lead mm(in.)	9.912 (0.390) NHR, NKR 9.922 (0.391) NPR, NQR, NPS	10.319 (0.375)
Torsion Bar Spring Constant N-cm/deg (kg-cm/deg)	15.7 (16.0)	
Valve Operating Angle (Deg.)	±7°	±8.3°
Regulated Oil Pressure kPa (kg/cm <sup>2</sup> / psi)		
NHR, NKR	10,297 (105 / 1,493)	
NPR, NQR, NPS	10,787 (110 / 1,564)	
Regulated Oil Flow Volume liter/min (US gal/min / UK gal/min)	8 (2.11/1.76)	

## Power Steering Oil Pump Unit

	4J Series Engine	4B Series Engine	4H Series Engine
Type	Vane type		
Theoretical Delivery (cm <sup>3</sup> /rev)	7.2	12.2	9.6
Regulated Oil Flow Volume (liter/min)	8.5 – 6.5	8.0 – 6.5	8.0 – 6.5
Regulated Oil Pressure kPa(kg/cm <sup>2</sup> / psi)			
NHR, NKR	10,297 (105 / 1,493)	10,297 (105 / 1,493)	10,297 (105 / 1,493)
NPR, NPS			10,787 (110 / 1,564)
NQR			11,278 (115 / 1,635)
Maximum Allowable Speed (r.p.m.)	3,700	5,000	6,500



## Tandem Hydraulic Pump

		Hydraulic Booster Pump	Power Steering Pump
Type		Vane type	
Theoretical Delivery	cm <sup>3</sup> /rev	13	8.4
Regulated Oil Flow Volume	liter/min	8.0	8.0 – 6.5
Regulated Oil Pressure	kPa(kg/cm <sup>2</sup> /psi)	11,770 (120/1,706)	10,790 (110/1,564)
Maximum Allowable Speed	r.p.m.	6,500	

## Manual Steering Unit

		NHR, NKR	NPR, NQR
Type		Recirculating ball type	
Sector Shaft Outside Diameter	mm(inch)	34.295	38.1
Numbers of Ball		28 × 2	50 × 2
Gear Ratio		24.5 – 28.5	27.7 – 31.7



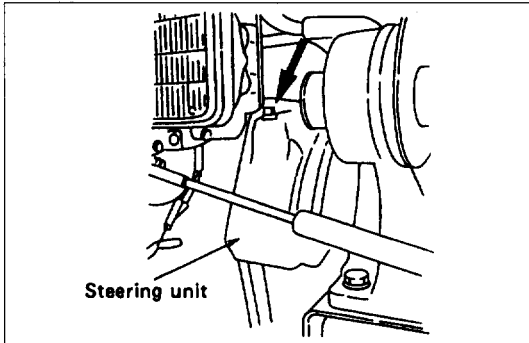
# SERVICE STANDARD

ITEMS	SERVICE STANDARD	SERVICE LIMIT
<b>Power Steering</b>		
Sector Shaft Outside Diameter mm(in)		
RHD	39.975 (1.574)	39.925 (1.572)
LHD	38.125 (1.501)	38.043 (1.498)
Play between Sector Shaft and Bearing mm(in)		
RHD	—	0.12 (0.0047)
LHD	—	0.20 (0.0080)
Backlash between Sector Shaft and Ball Nut mm(in)		
RHD	0.05 – 0.25 (0.0020 – 0.0098)	
LHD	0.33 (0.013) or less	
Steering Wheel Free Play mm(in)	10 – 50 (0.4 – 2.0)	
Power Steering Fluid Pressure (at idling engine speed) kPa(kg/cm <sup>2</sup> /psi)		
NPR66, NQR66, NPS66	10,787 (110 / 1,564)	
except Above Models	10,297 (105 / 1,493)	
<b>Manual Steering</b>		
Sector Shaft Outside Diameter mm(in)		
NHR, NKR	34.925 (1.375)	34.825 (1.371)
NPR, NQR	38.100 (1.500)	38.000 (1.496)
Play between Sector Shaft and Needle Bearing mm(in)	—	0.2 (0.008)
Ball Nut Axial Play mm(in)	—	0.1 (0.004)
Worm Shaft Starting Torque N•m(kg•m/lb•ft)		
(Without Sector Shaft)		
NHR, NKR	0.34 – 0.64 (0.035 – 0.065 / 0.25 – 0.47)	
NPR, NQR	0.29 – 0.69 (0.030 – 0.070 / 0.22 – 0.51)	
(With Sector Shaft)		
NHR, NKR	0.54 – 1.03 (0.055 – 0.105 / 0.40 – 0.76)	
NPR, NQR	0.98 (0.1 / 0.72) or less	
Backlash between Sector Shaft and Ball Nut mm(in)		
NHR, NKR	0.2 (0.0079) or less	
NPR, NQR	0.5 (0.0197) or less	
Steering Wheel Free Play mm(in)	10 – 30 (0.4 – 1.2)	
<b>Suspension</b>		
Spring Pin Outside Diameter mm(in)	25 (0.98)	24.7 (0.019)
Clearance between Shackle Pin and Bushing mm(in)	0.1 (0.0039)	0.5 (0.019)



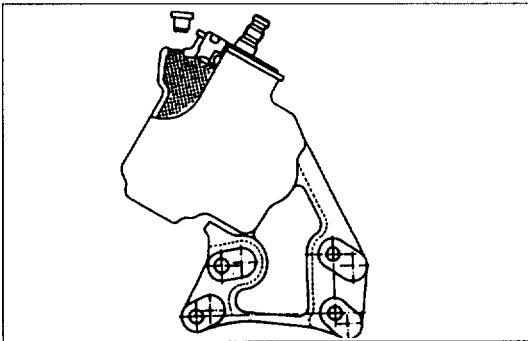
# SERVICING

## STEERING SYSTEM

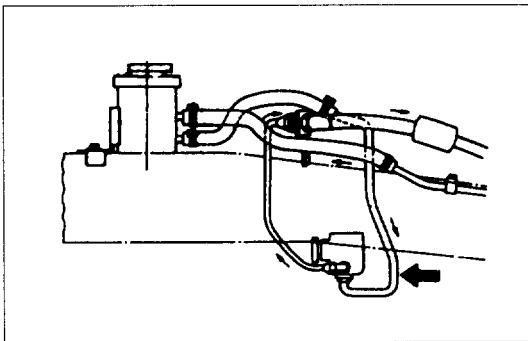


### Manual Steering Gear Oil

1. Remove the filler plug on the steering unit.



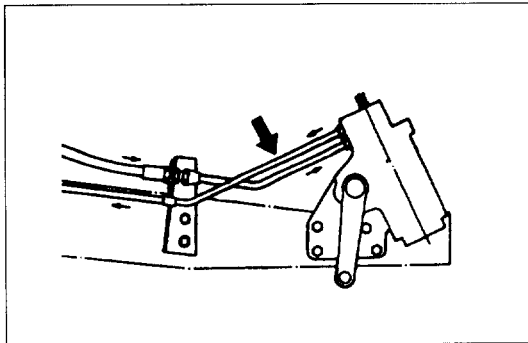
2. Fill the gear box to the level of filler plug with specified gear oil through the filler hole.
3. Install and tighten the filler plug.



### Power Steering Fluid

#### Draining

1. Jack up the front wheels until they are clear of the ground.
2. Disconnect the fluid pipes between the steering unit and fluid reservoir, and the fluid hose between the pump and the fluid reservoir.
3. When draining is completed, remove remaining fluid within hydraulic system by turning the steering wheel to stop in both directions several times.



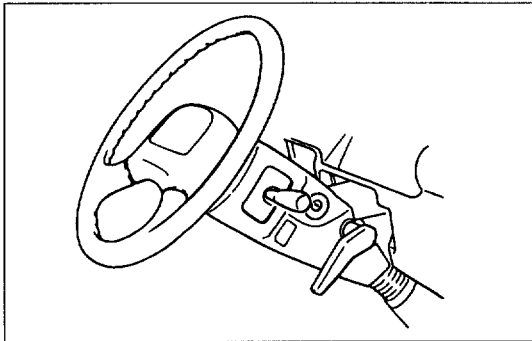
#### Hose Replacement

Replace the power steering hoses every second fluid change.



**Refilling**

1. Connect the fluid lines securely and fill the fluid reservoir with specified automatic transmission fluid.
2. When the fluid reservoir is filled to specified level, allow 2 or 3 minutes. While refilling, keep fluid reservoir replenished as necessary to prevent air from entering the hydraulic system.
3. Lower the front wheels to the ground. Start and let the engine idle for a few minutes.  
Recheck the fluid level and replenish if necessary.

**Steering Wheel Free Play****Inspection**

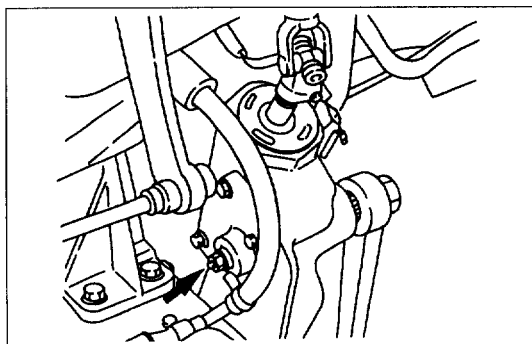
1. Check the amount of the steering wheel play by turning the wheel in both directions until the tires begin to move with the front wheels properly in the straight ahead position.

**NOTE:**

**If the vehicle is equipped with a power steering unit, the wheel free play should be checked with the engine running.**

Steering Wheel Free Play		mm(in)
Manual Steering	Power Steering	
10 – 30 (0.4 – 1.2)	10 – 50 (0.4 – 2.0)	

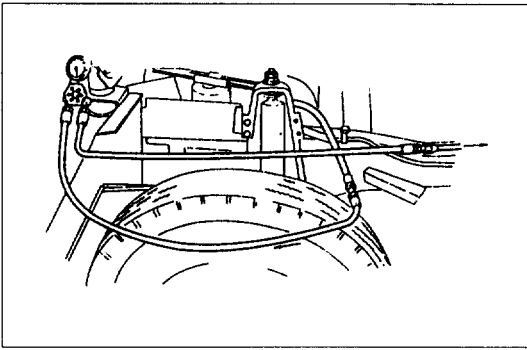
2. Also check the steering wheel for play and looseness in mount by moving it back and forth and sideways. While driving check for hard-steering, shimmy and tendency of steering to pull to one side.

**Adjustment**

1. Align the front wheels properly in the straight ahead position.
2. Loosen the lock nut on the adjusting screw of the steering unit.
3. Turn the adjust screw clockwise to decrease free play or counter-clockwise to increase.
4. After check of specified free play, tighten the lock nut to specified torque.

Lock Nut Torque		N·m (kg·m / lb·ft)
Manual Steering	Power Steering	
25 (2.5 / 18)	69 (7.0 / 51)	





## Power Steering Fluid Pressure



### Preparation

1. Install the power steering fluid pressure gauge between the pump and steering unit as figure.  
Gauge: 5-8840-0162-0
2. Start and let the engine idle until oil temperature reaches 50 – 60°C (122 – 140°F).
3. Take measurement of the pressure gauge when the steering wheel is turned clockwise or counterclockwise to lock.



Standard Pressure (at idle speed)	kPa (kg/cm <sup>2</sup> / psi)
NHR, NKR, NPR (except NPR66, 70, 71)	10,297 (105/1,493)
NPR66, 70, 71, NPS66, 71	10,787 (110/1,564)
NQR	11,278 (115/1,635)

Excess pressure means pump trouble.

Less pressure means steering unit trouble.

### NOTE:

**This test should be done within ten seconds.**

- Steering wheel shake
- Steering shimmy
- Hard steering
- Turning radius
- Steering wheel return
- Steering pull to one side



## Steering Function

Check the following items.

- Tire pressure and abnormal wear
- Front hub bearings for axial play
- Ball joints on steering linkage for play
- Operation of shock absorbers
- Tightness of suspension parts
- King pin bearings for play



## Inspection of Wheel Alignment

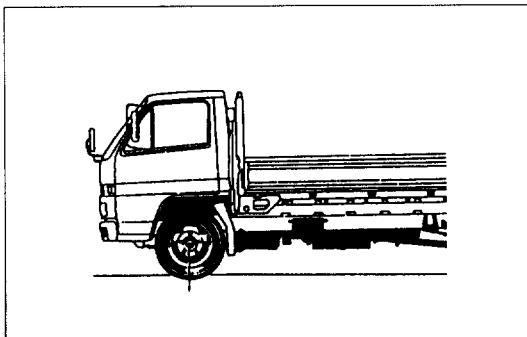
The points listed in table at left must be checked prior to inspecting front wheel alignment.



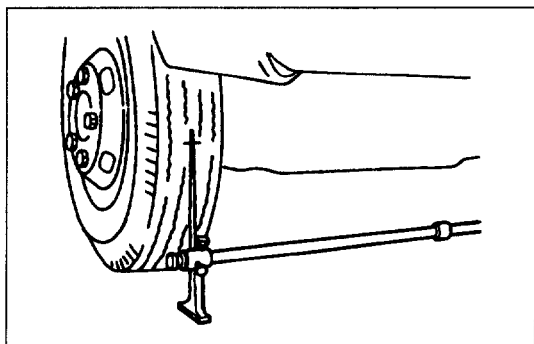
## Toe-In

Measurement should be taken with the vehicle on a surface plate.

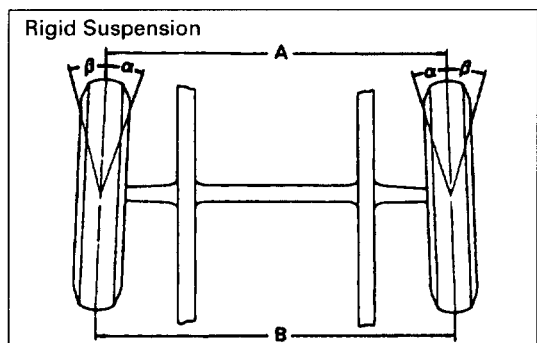
If a surface plate is not available, toe-in should be checked with the vehicle parked on a level floor.







1. Set front wheels to its straight ahead position.
2. Align the toe-in gauge with center height of each wheels at front end.
3. Apply center marks to each wheel, then take measurement of distance A between the center marks on each wheel.
4. Move slowly the vehicle rearward until center marks get its rear end position.
5. Take measurement of distance B between the center marks at rear end.



The toe-in can be calculated with next formula.

$$\text{Toe-in} = B - A$$

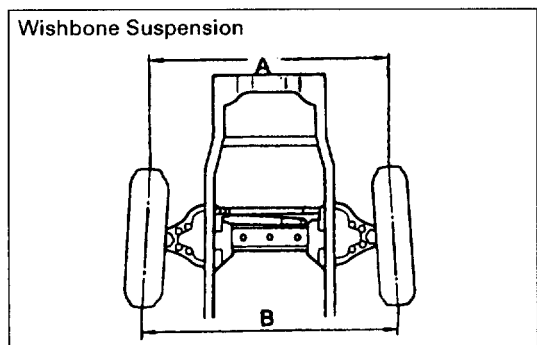
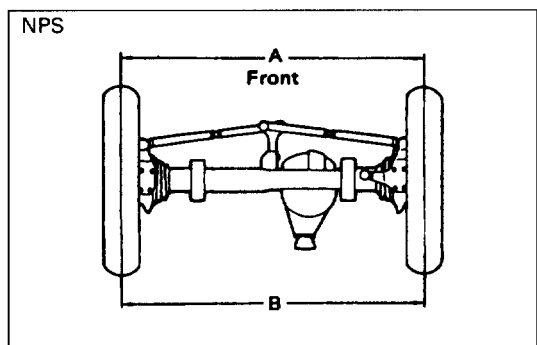
Toe-in mm(in.)

1994 – 1997 Model

Tire	Rigid	Wishbone, NPS
Bias	3 – 7 (0.12 – 0.28)	-2 – 2 (-0.08 – 0.08)
Radial	0 – 4 (0 – 0.16)	

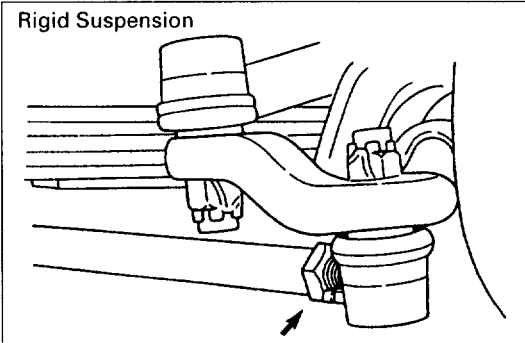
1998~ Model mm(in.)

-2 – 2 (-0.08 – 0.08)





Rigid Suspension

**Adjustment**

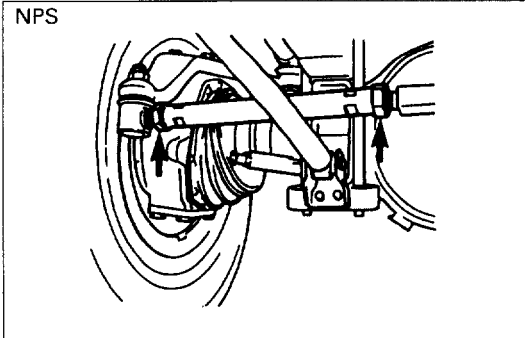
1. Loosen the lock nuts on the tie rod or outer truck rod ends.
2. Adjust length (L) of the tie rod by turning the connecting rod on outer truck rod.
3. Tighten the lock nuts to specified torque.

**Lock Nut Torque**

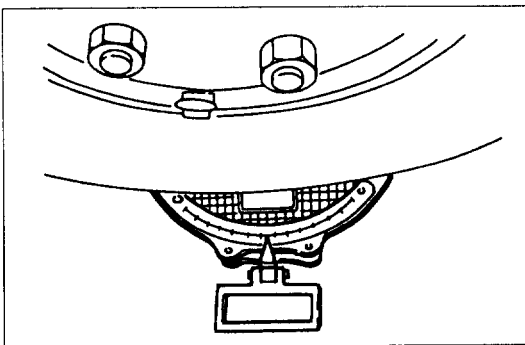
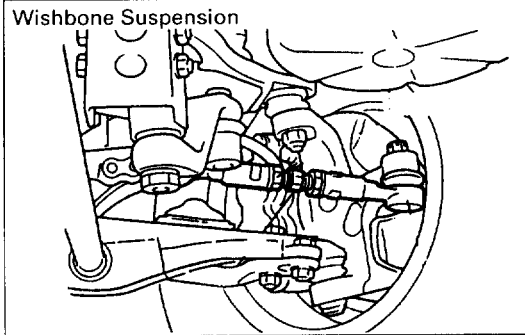
N·m (kg·m/lb·ft)

Rigid Suspension, NPS	113 (11.5 / 183)
Wishbone Suspension	167 (17.0 / 123)

NPS



Wishbone Suspension

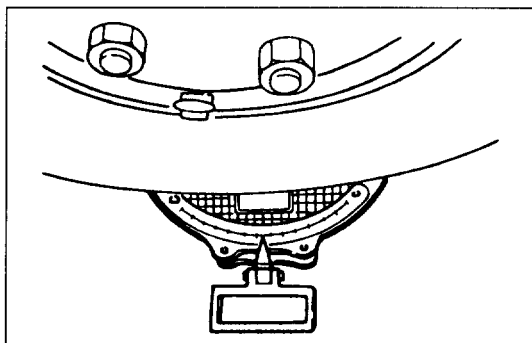
**Turning Radius**

1. Position a suitable piece of wood equivalent in thickness to the turning radius gauge under each rear wheel.
2. Position each front wheel on a turning radius gauge by aligning the tire center line with the center of the turning radius gauge.
3. Turn the steering wheel clockwise or counterclockwise until the front wheels are locked.

**NOTE:**

**Turn the steering wheel with the brake pedal depressed using brake pedal pusher.**





Reading of the turning radius gauge directly indicates the steering angle.

#### Steering Angle

##### 1994 – 1997 Model

(Deg.)

Vehicle Model	Outer	Inner
Wishbone Suspension	35	38
NHR (Rigid Suspension)	34	46
NKR (Rigid Suspension)	30	38
NPR (Rigid Suspension)	36	47
NQR (Rigid Suspension)	34	42.5
NPS	30	38

##### 1998 Wishbone Suspension Model

(Deg.)

Vehicle Model	Outer	Inner
NKR (7.00-15 Tire)	29.5	38.5
NKR (7.00-16 Tire)	27.9	35.5
NKR (7.50-16 Tire)	25.1	31.5

##### 1998 Rigid Suspension Model

(Deg.)

Vehicle Model	Outer	Inner
NHR	33.0	37.5
NKR (7.00-15 Tire)	29.5	38.5
NKR (7.00-16 Tire)	27.9	35.5
NKR (7.50-16 Tire)	25.1	31.5
NPR, NQR (7.00-16 Tire)	35.0	47.5
NPR, NQR (7.50-16 Tire)	32.7	42.5
NPR, NQR (8.25-16 Tire)	30.0	36.5
NPS	30.0	38.0

##### 1999 Wishbone Suspension Model

(Deg.)

Vehicle Model	Outer	Inner
NKR (7.00-15 Tire)	35.0	38.0

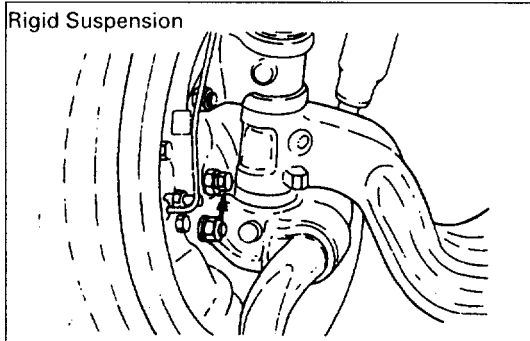
##### 1999 Rigid Suspension Model

(Deg.)

Vehicle Model	Outer	Inner
NHR	33.0	37.5
NKR (7.00-15 Tire)	29.5	38.5
NKR (7.00-16 Tire)	27.9	35.5
NKR (7.50-16 Tire)	25.1	31.5
NPR, NQR (7.00-16 Tire)	35.0	47.5
NPR, NQR (7.50-16 Tire)	32.7	42.5
NPR, NQR (8.25-16 Tire)	30.0	36.5
NPS	30.2	38.0



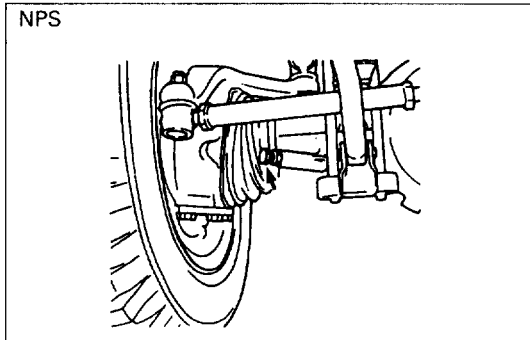
Rigid Suspension

**Adjustment**

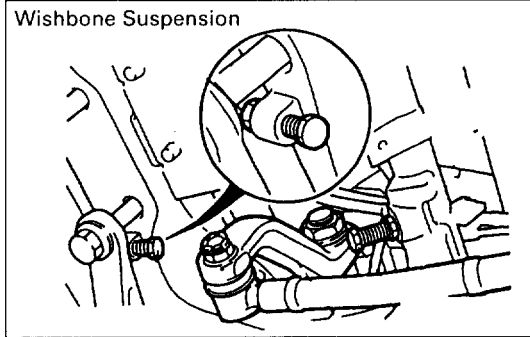
1. Loosen the lock nuts on the steering knuckle or the axle case.
2. Adjust projecting height of the stopper bolts.
3. Tighten the lock nuts to specified torque.

Stopper Bolt Torque	N·m (kg·m/lb·ft)
Rigid Suspension	186 (19.0 /137)
NPS	49 ( 5.1 / 36)
Wishbone Suspension	82 ( 8.4 / 61)

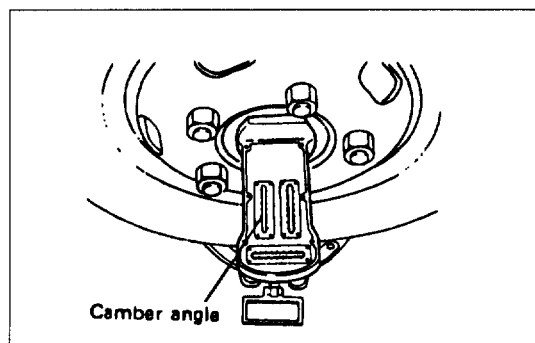
NPS



Wishbone Suspension







## Camber Angle

### All Model except NPS

The toe-in can be checked on the gauge simultaneously.

1. When inspection of turning radius is completed, calibrate the scale of the turning radius gauge to zero.
2. Remove the front hub cap.  
Install camber, caster and king pin inclination gauge on end of the knuckle spindle horizontally.

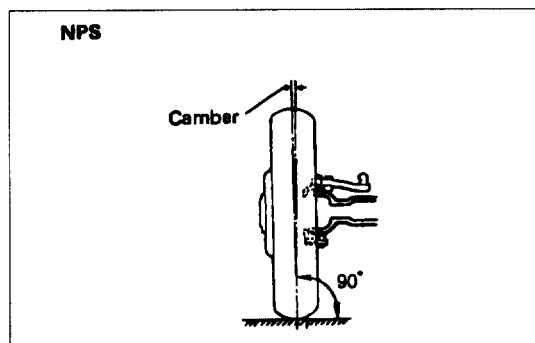
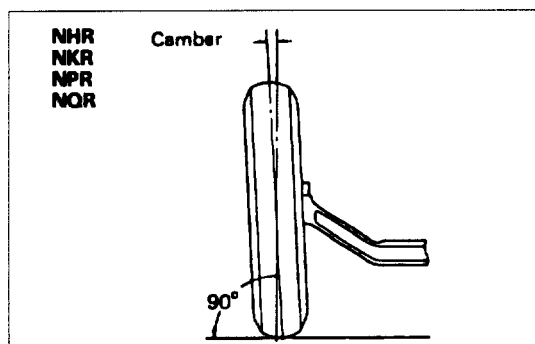
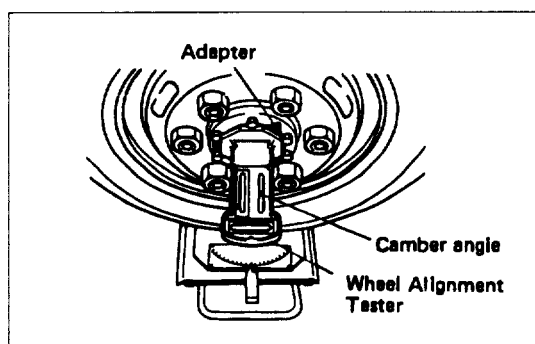
#### NOTE:

**When removing hub cap, take care so as not to cause damage to gauge fitting face at end of the spindle. If end of the spindle has been scratched or damaged, correct before setting the gauge.**

### NPS

Remove the free wheel hub lock cover assembly then install gauge adapter on end of the knuckle spindle. Install camber, caster and king pin inclination gauge on end of gauge adapter.

Gauge Adapter: 5-8840-2188-0



3. Reading of the camber scale directly indicates the camber angle.

### Camber Angle

1994 - 1997 Model (deg.)

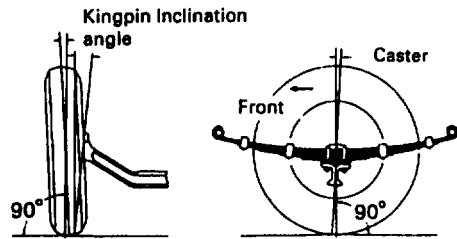
Rigid Suspension	$1^{\circ}15' \pm 45'$
Wishbone Suspension, NPS	$0^{\circ}15' \pm 45'$

1998~ Model (deg.)

NHR Rigid Suspension	$1^{\circ}15' \pm 45'$
Rigid Suspension (except NHR)	$0^{\circ}15' \pm 45'$
Wishbone Suspension, NPS	$0^{\circ}15' \pm 45'$



Rigid Suspension

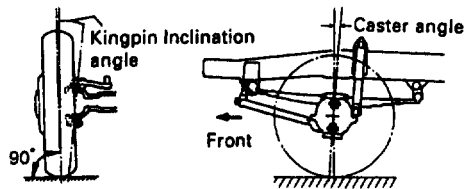


## Caster Angle and King Pin Inclination

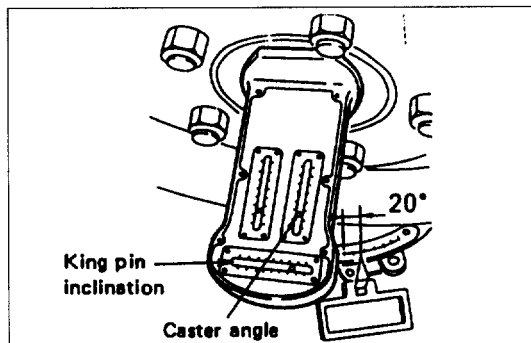
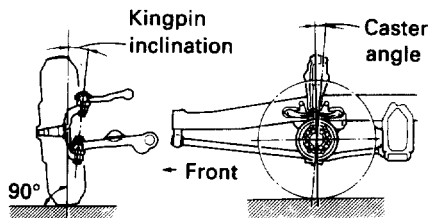
The caster angle and king pin inclination can be checked on the gauge simultaneously.

1. When inspection of camber angle is completed, calibrate the scale of the turning radius gauge to zero and turn the steering wheel clockwise (counterclockwise for checking caster angle and king pin inclination on the left side front wheel) until the front wheels are steered 20 degrees from the straight-ahead position.

NPS



Wishbone Suspension

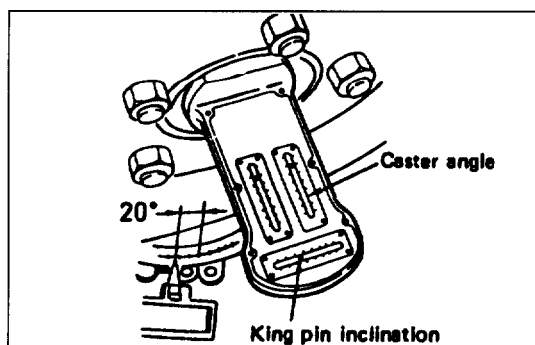


### NOTE:

**Turn the steering wheel with the brake pedal depressed using brake pedal pusher.**

2. When the front wheels are turned 20 degrees, calibrate the caster and king pin scales to zero turning the camber, caster and king pin gauge adjuster.





- Turn the steering wheel in the opposite direction until the front wheels are steered 20 degrees in the opposite direction. Reading of the caster and king pin scales directly indicates the caster and king pin inclination angles being checked.

#### Caster Angle and King Pin Inclination

1994 – 1997 Model

(deg.)

	Caster Angle	King Pin Inclination
Rigid Suspension	$1^{\circ}30' \pm 1^{\circ}$	$7^{\circ}15'$
Wishbone Suspension	$1^{\circ}00' \pm 1^{\circ}$	$9^{\circ}45' \pm 30'$
NPS	$2^{\circ}00' \pm 1^{\circ}$	$7^{\circ}15'$

1998~ Model

(deg.)

	Caster Angle	King Pin Inclination
NHR	$1^{\circ}30' \pm 1^{\circ}$	$7^{\circ}15'$
NKR Rigid Suspension	$3^{\circ}00' \pm 1^{\circ}$	$12^{\circ}00'$
NPR, NQR	$2^{\circ}45' \pm 1^{\circ}$	$12^{\circ}00'$
Wishbone Suspension	$1^{\circ}00' \pm 1^{\circ}$	$9^{\circ}45' \pm 30'$
NPS	$2^{\circ}00' \pm 1^{\circ}$	$7^{\circ}15'$

- Front springs for weakening
- Front I-beam (axle case) for distortion
- Bushings in king pin, King pin bearings for wear or determination



#### Adjustment

##### Rigid Suspension

The camber, caster and king pin inclination are built into front end and are not adjustable. If the camber, caster or king pin inclination is found to be out of alignment, check to locate the cause of trouble against the listing at left and replace the parts as necessary.

##### Wishbone Suspension

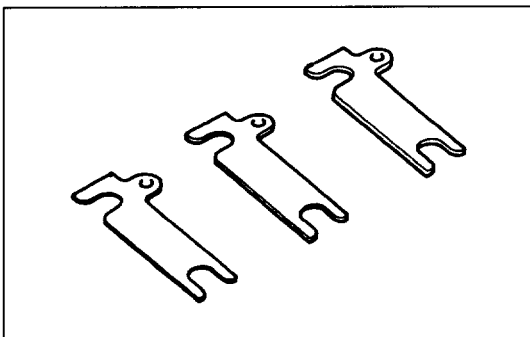
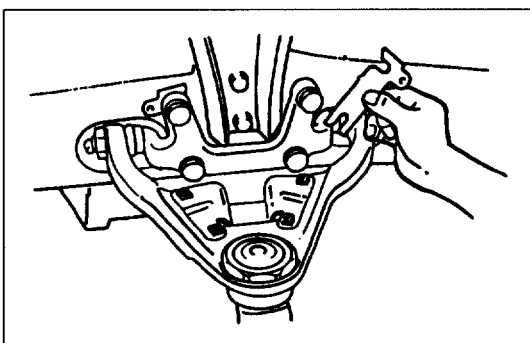
- Set the jack under the cross member of the suspension and then raise the lower link with the jack and retain the jack with applied in the place.
- Remove the shock absorber.
- Attach the fulcrum pin and loosen the bolts to the degree that it will not fall a part to adjust the camber angle using the shims.

##### Camber Angle

If the number of shims are evenly increased both at fore and aft, the camber angle becomes acute, while if decreased, the angle becomes obtuse.

##### Caster Angle

When the caster angle is obtuse, increase the number of shims at the fore side, while the angle is acute, increase the number of shims at the aft side.





Thickness of Shims Available (mm)

0.8, 1.6, 3.2

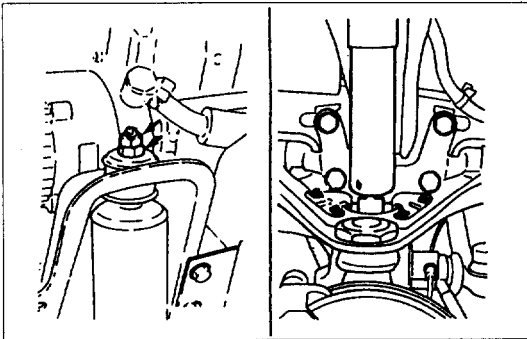
Conditions Where The Shims are Used

	Limit
Numbers of Shims	4 or less
Thickness mm (in)	9.6 (0.378) or less
Difference of Thickness (between Front and Rear) mm (in)	4.8 (0.189) or less

In case the shim has already reached at the limitation in its number or its thickness, decrease the number of shims at the aft side to adjust the obtuse caster angle, while decrease the number at the fore side to adjust the acute caster angle.

**NOTE:**

**Since the number of shims needed for caster angle adjustment varies depending on the conditions of the car, perform the adjustment procedures which are the most suitable for the car conditions.**



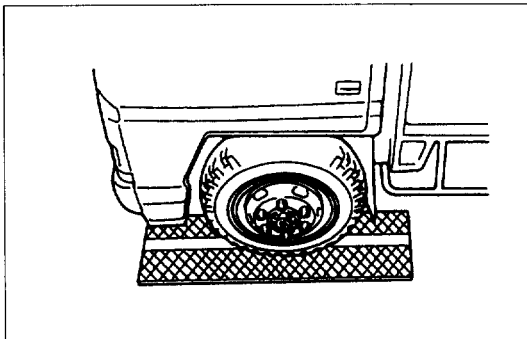
- 4) Tighten the mounting bolts of the front shock absorber.



Shock Absorber Bolt and Nut Torque

N·m (kg·m/lb·ft)

Upper	40 ( 4.1 / 30)
Lower	103 (10.5 / 76)

**Measurement of Side Slippage**

When inspection and adjustments of toe-in, camber, caster and king pin inclination are completed, check for side slippage using a side slip tester.

Roll the wheels over the side slip tester as slowly as possible and take reading on the tester. If the amount of side slippage is in excess of 5 mm per 1 m, recheck the wheel alignment.

Side Slippage mm (in)

Limit

5.0 (0.197) Per 1m



## FRONT AND REAR SUSPENSION



### Suspension Function

Check the following items.

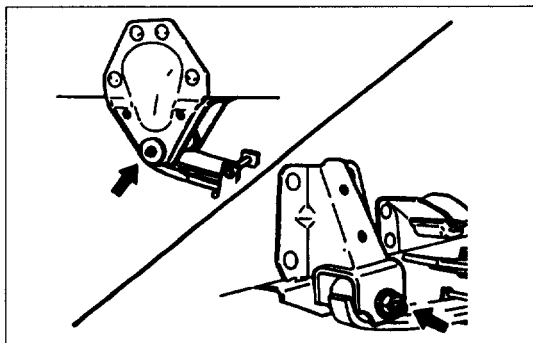
- Leaf spring breakage
- Body inclination
- Reduction of ground clearance



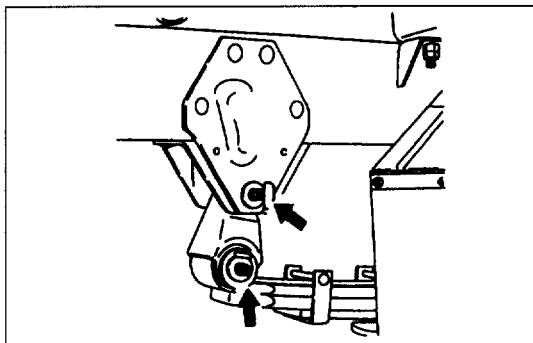
### Lubrication

Lubricate the following points with multi-purpose type grease.

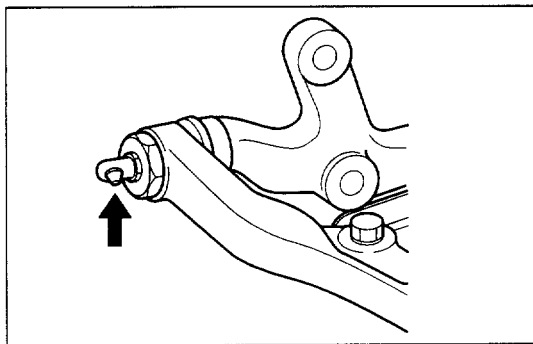
- Spring Pin



- Shackle Pin



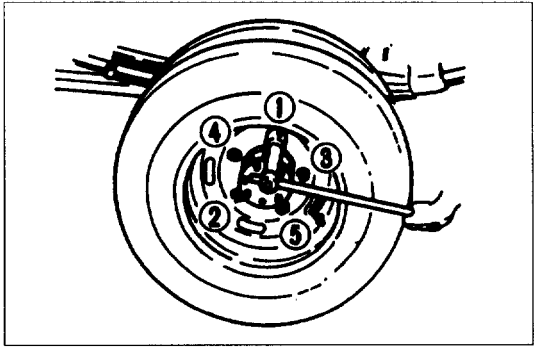
- Upper Arm (for Wishbone Suspension)



450LY00001



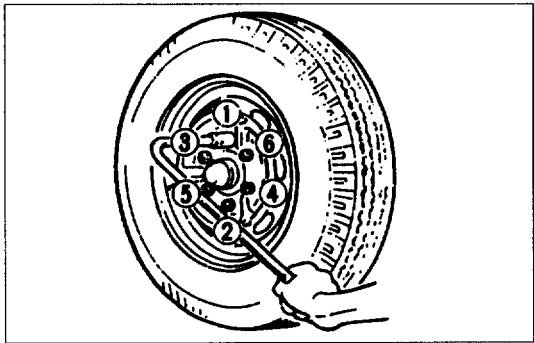
# WHEELS AND TIRES



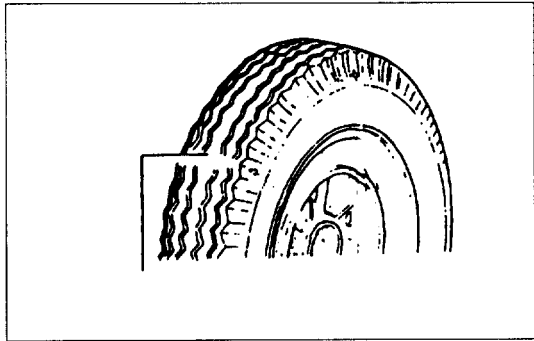
## Wheel Nut Retightening

Retighten the wheel nuts in sequence as shown in the figure.to specified torque.

Front Wheel Nut Torque		N·m (kg·m / lb·ft)
NHR / NKR Single Tire, NKR Flat Low		167 (17 / 123)
Except Above Models		441 (45 / 325)



Rear Wheel Nut Torque		N·m (kg·m / lb·ft)
NHR / NKR Single Tire		167 (17 / 123)
NHR Dual Tire, NKR Flat Low		294 (30 / 217)
Except Above Models		441 (45 / 325)



## Tread Wear Indicators

The original equipment tires have built-in tread wear indicators to show when tires need replacement.

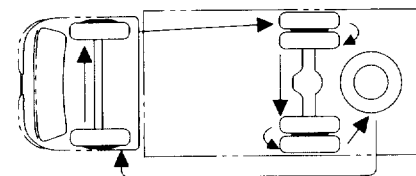
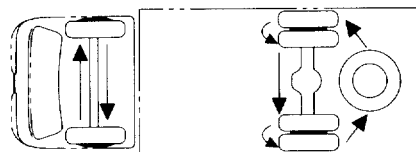
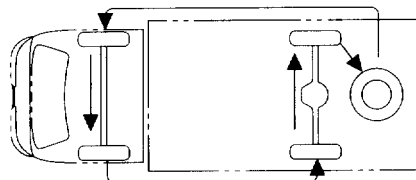
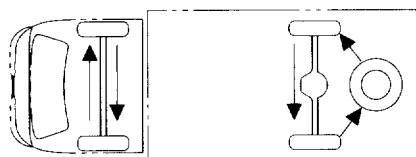
These indicators may appear as wide bands. When the indicators appear in two or more grooves at three rocatons, tire replacement is recommended.



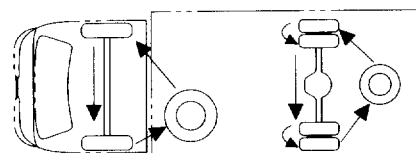
## Tire Rotation

To allow the tires to wear evenly and to prolong their life exchange the front and rear tire locations as shown in the figure.

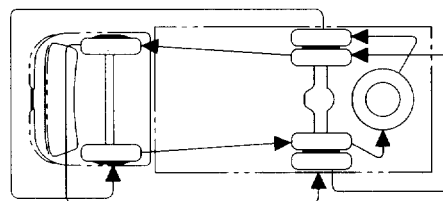
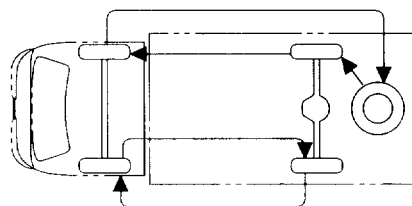
For bias tires



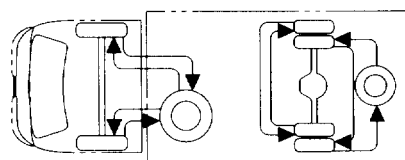
Flat low(Small dual tire)



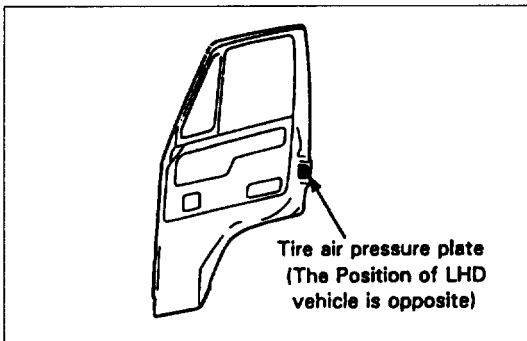
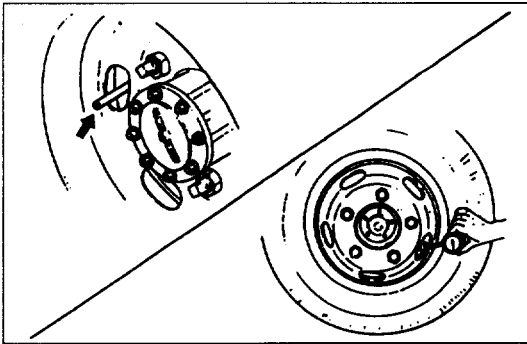
For radial tires



Flat low(Small dual tire)







## Tire Inflation Pressure

Tire pressure, in cold condition (after vehicle has set for three hours or more, or driven less than one mile), should be checked monthly or before any extended trip. Tire pressure increases approx. 15% when the tires become hot during driving. The pressure specification is shown on the label as figure.

Tire Inflation Pressure	kPa (kg/cm <sup>2</sup> / psi)
Tire Size	Inflation Pressure
6.50-15-6PR	319 (3.25 / 46)
7.00-15-6PR	
7.50-16-6PR	
5.00-12-8PR	392 (4.00 / 57)
5.50-13-8PR	
6.00-13-8PR	
6.00-14-8PR	417 (4.25 / 60)
6.00-15-8PR	
7.00-15-8PR	
7.00-16-8PR	
7.50-15-8PR	
7.50-16-8PR	
6.00R15-8PR	441 (4.50 / 64)
7.00R15-8PR	
7.00R16-8PR	
155R13-8	
205R16C8PR	466 (4.75 / 68)
7.50R16-8PR	
195/75R16C	
6.50-15-10PR	490 (5.00 / 71)
6.50-16-10PR	
7.00-15-10PR	
7.00-16-10PR	
8.25-16-12PR	
7.50-15-10PR	515 (5.25 / 75)
7.50-16-10PR	
7.00R15-10PR	
7.00R16-10PR	
215/75R16C	
6.50R16-10PR	540 (5.50 / 78)
7.00-15-12PR	564 (5.75 / 82)
7.00-16-12PR	
7.50R16-10PR	
8.25-16-14PR	
7.50-15-12PR	588 (6.00 / 85)
7.50-16-12PR	
7.00R15-12PR	
7.00R16-12PR	
215/75R-17.5	
7.50-15-14PR	637 (6.50 / 92)
7.50-16-14PR	
7.50R16-12PR	
7.00-16-14PR	711 (7.25 / 103)

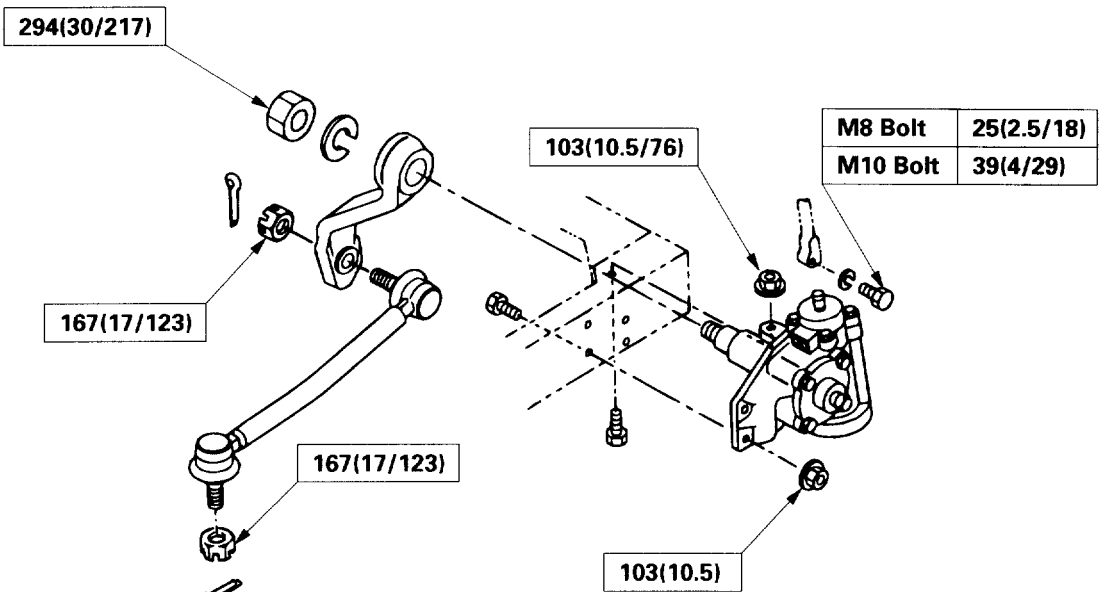


# FIXING TORQUE

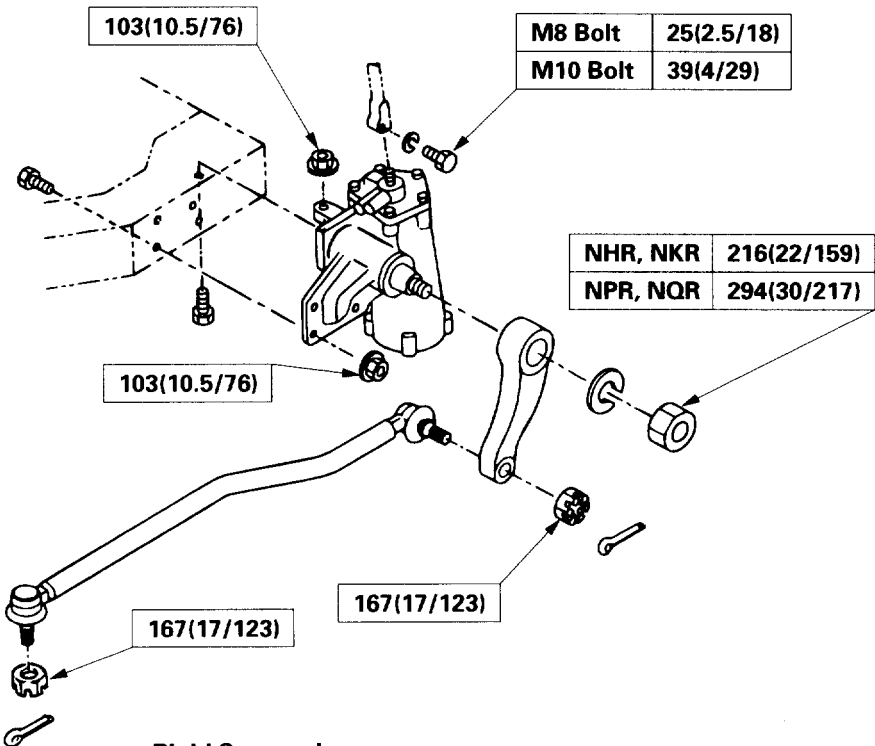
## STEERING SYSTEM

### Steering Unit, Pitman Arm and Drag Link

N•m (kg•m / lb•ft)



Wishbone Suspension

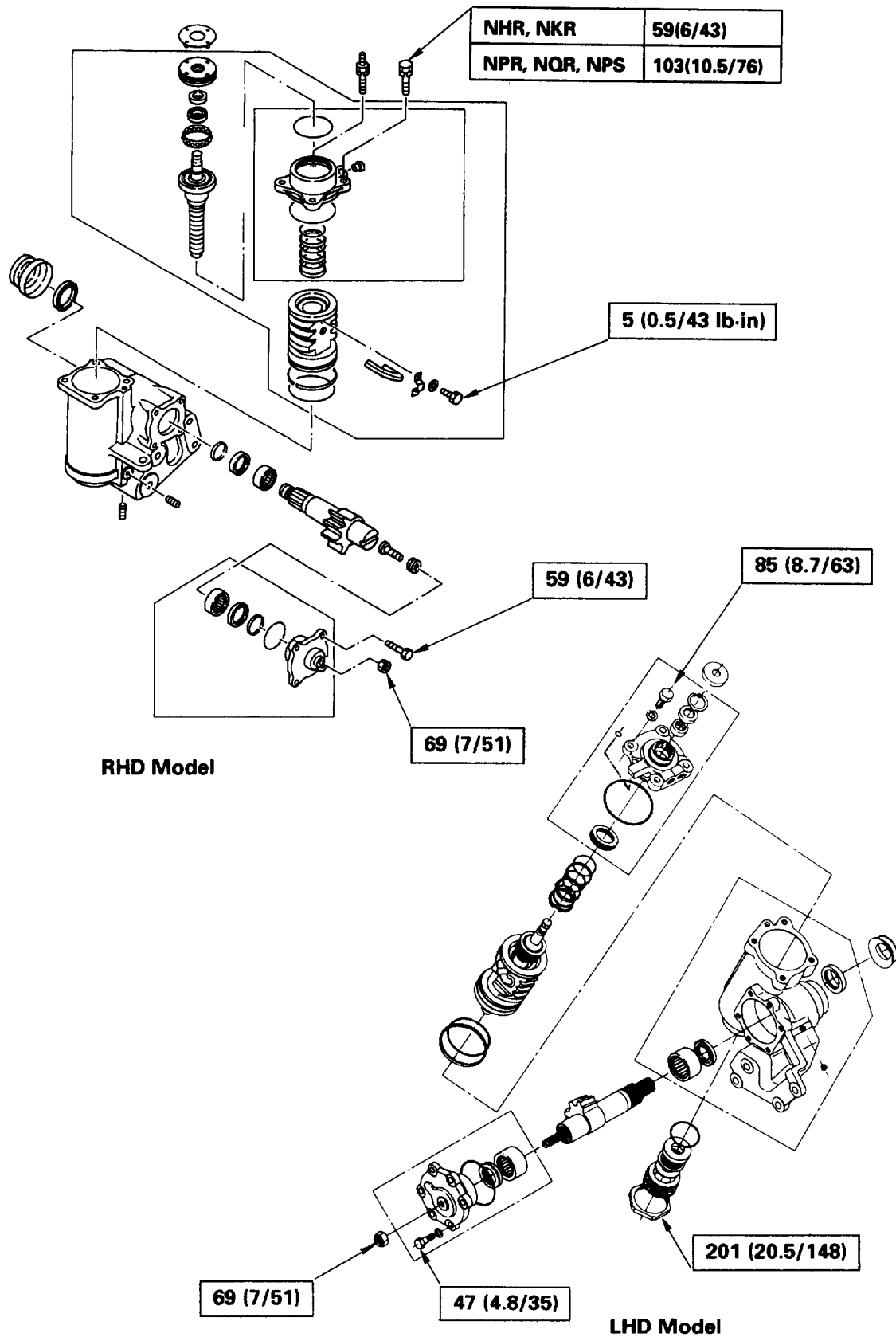


Rigid Suspension



## Power Steering Unit

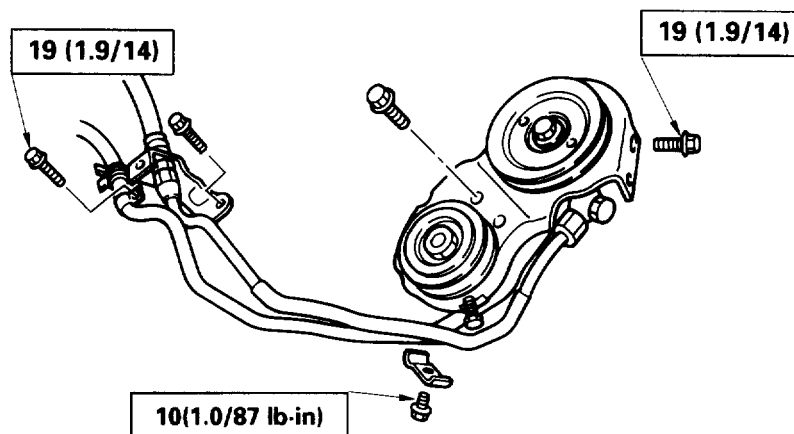
N·m (kg·m / lb·ft)



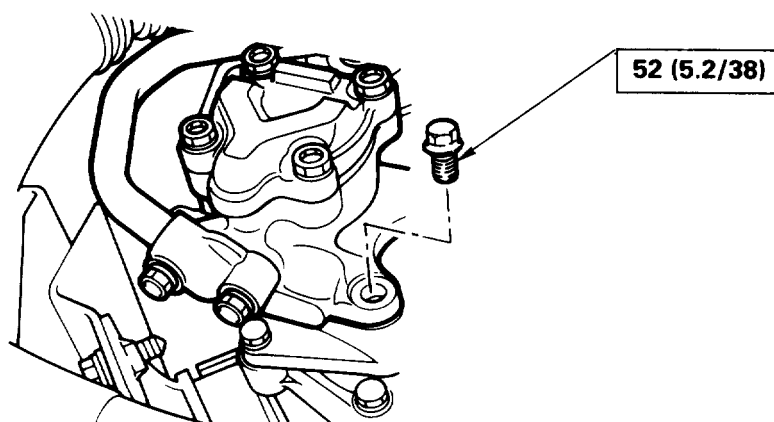


# Power Steering Pump

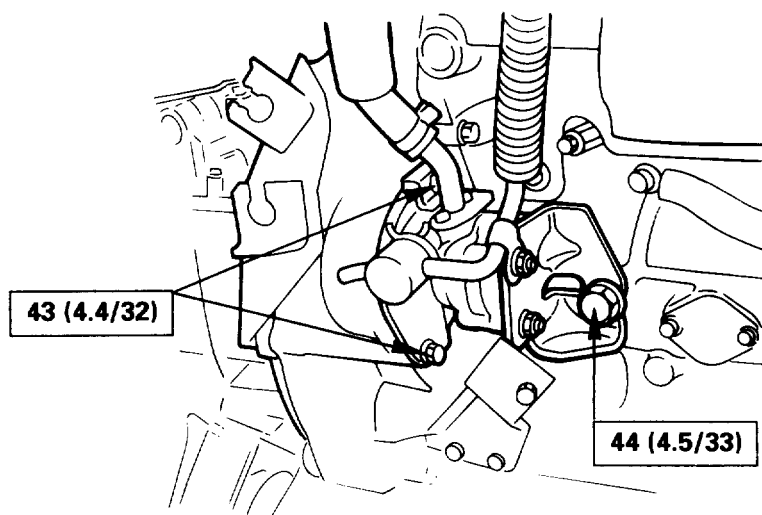
N·m (kg·m / lb·ft)



**4J Series Engine**



**4B Series Engine**

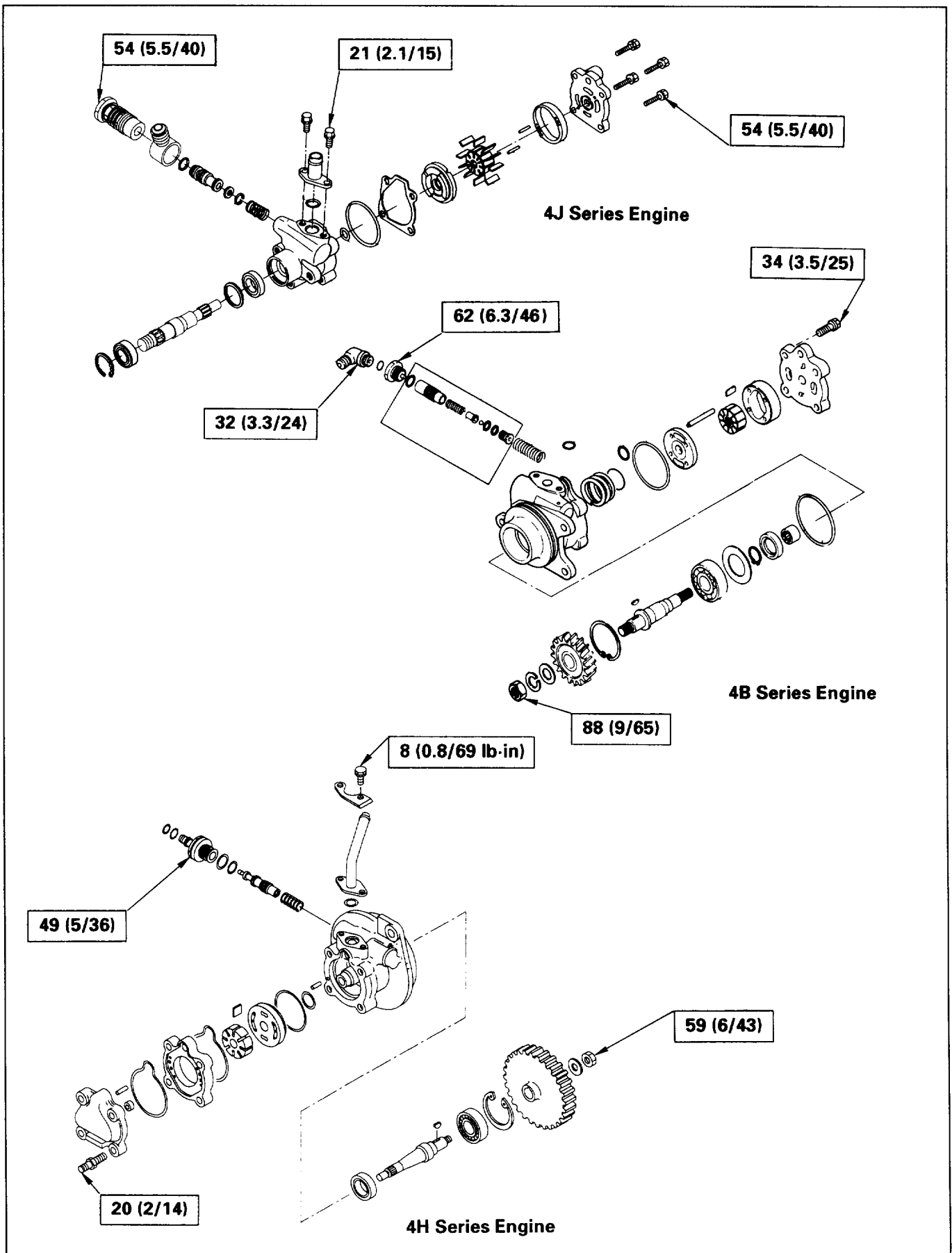


**4H Series Engine**



## Power Steering Pump Assembly

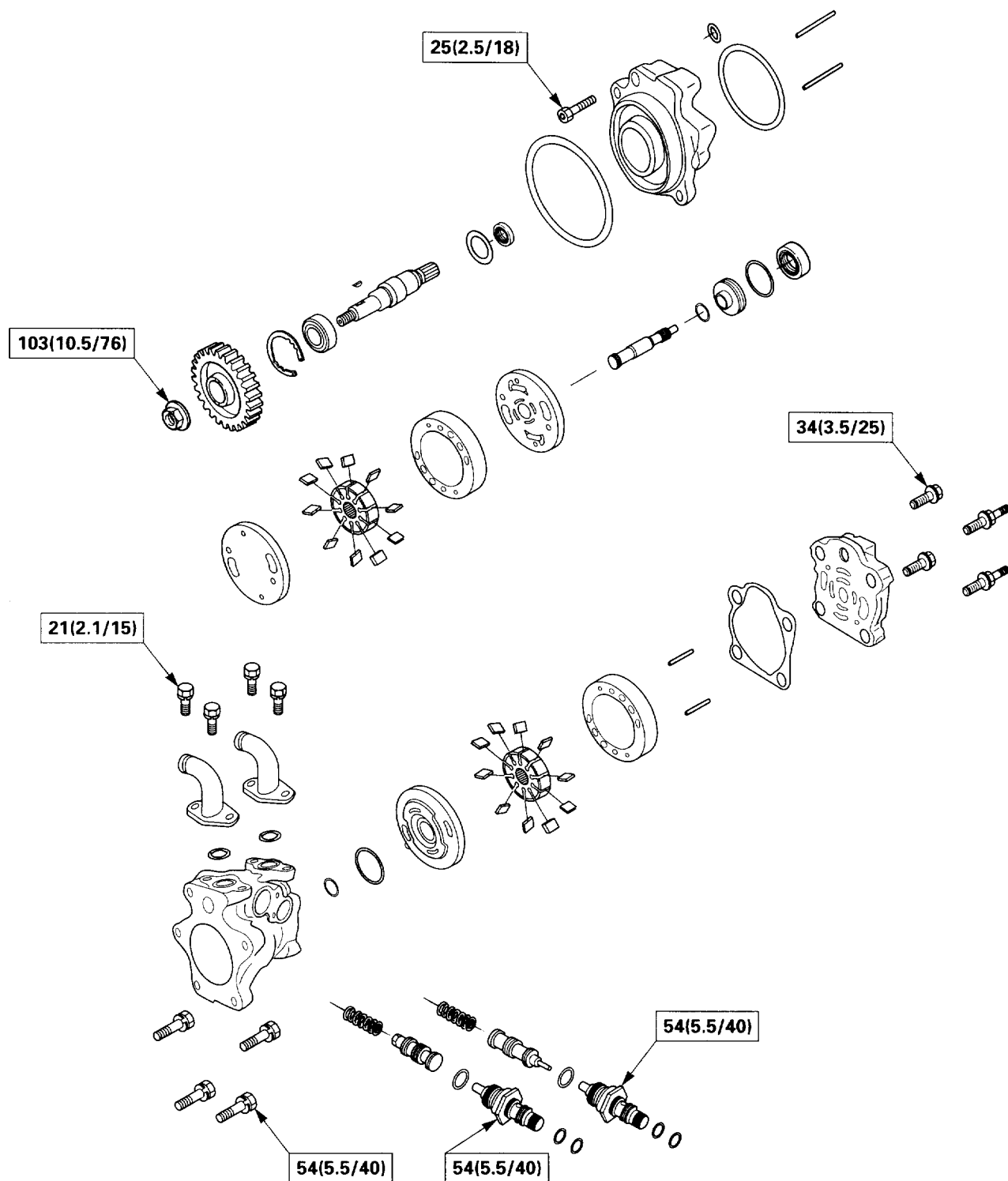
N·m (kg·m / lb·ft)





## Tandem Hydraulic Pump

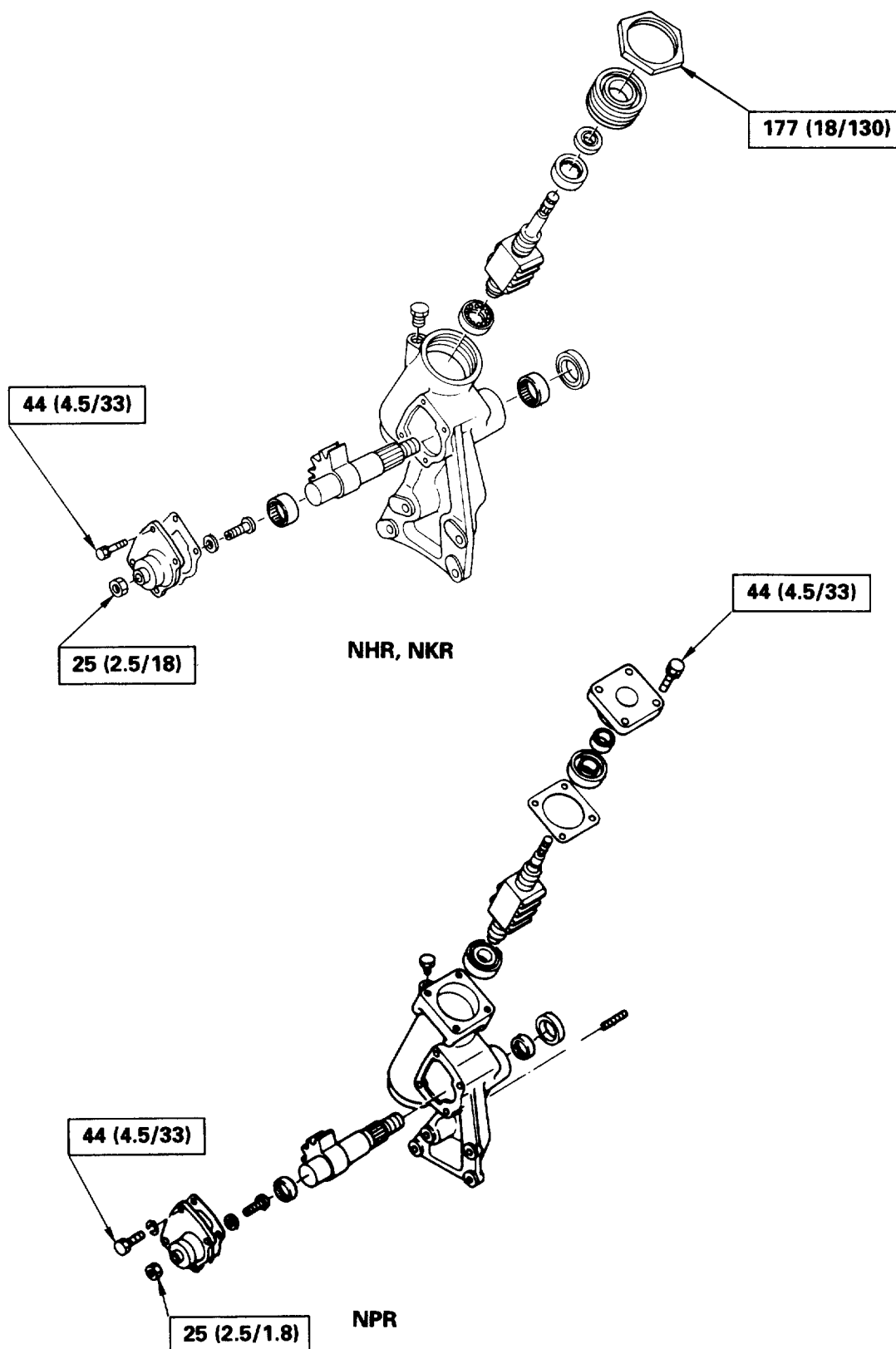
N·m (kg·m / lb·ft)





## Manual Steering Unit

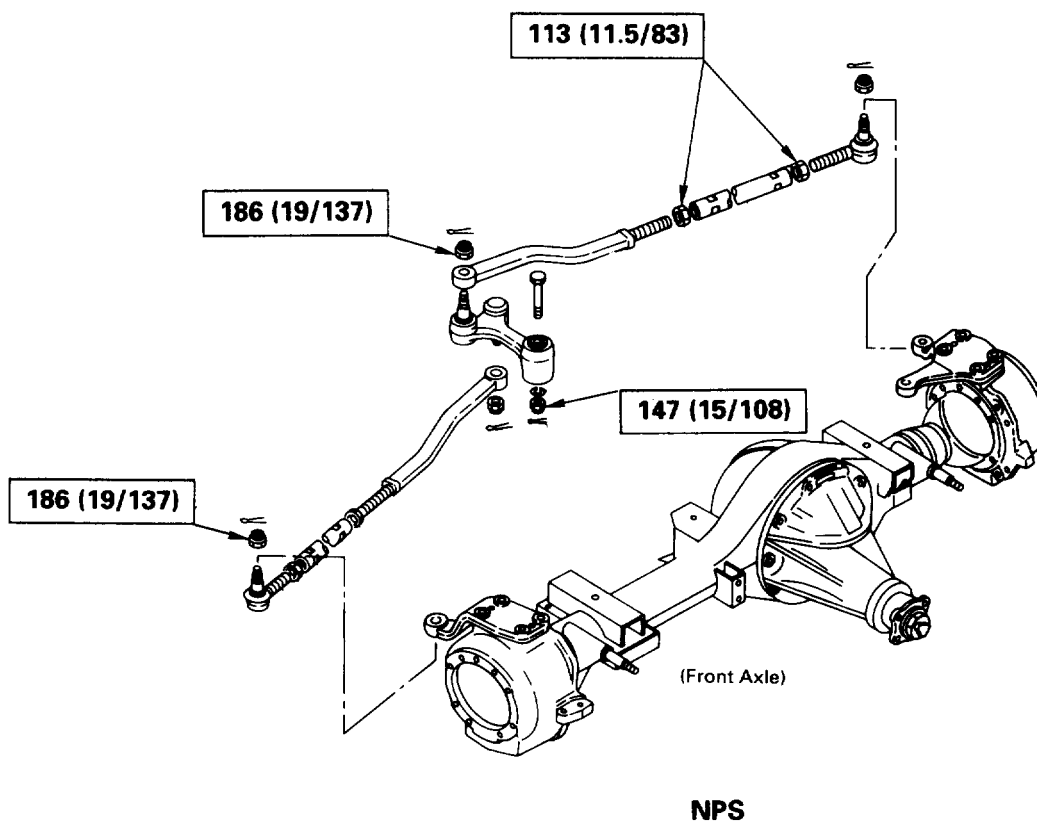
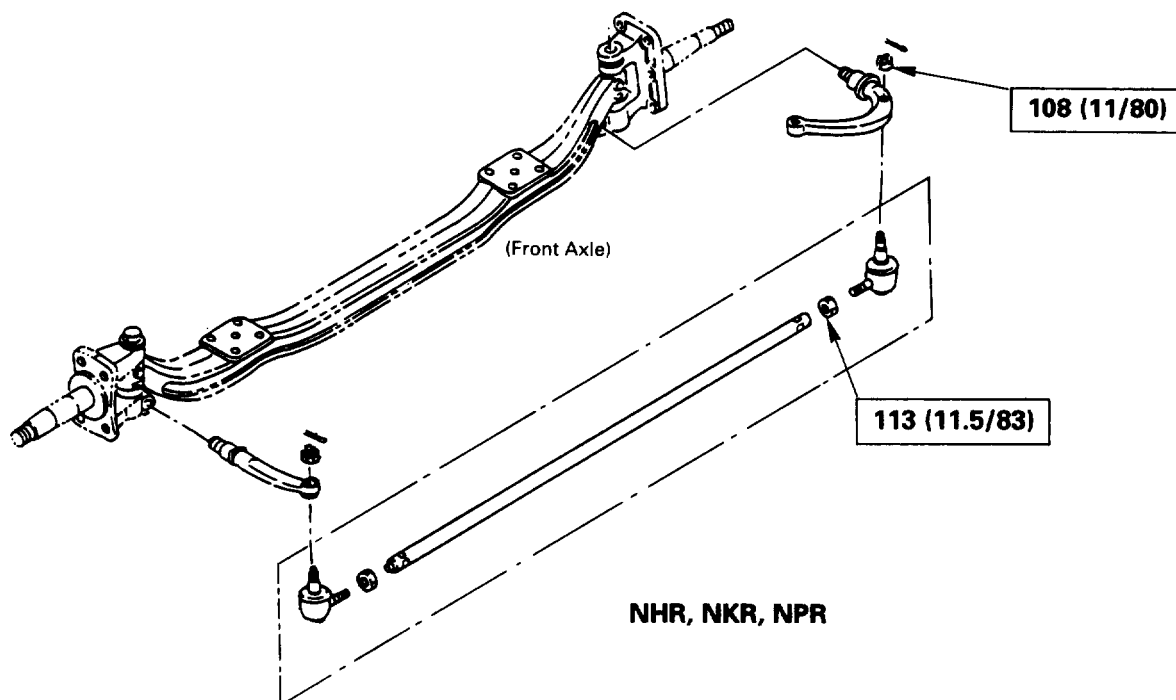
N·m (kg·m / lb·ft)





# Steering Linkage (Rigid Suspension)

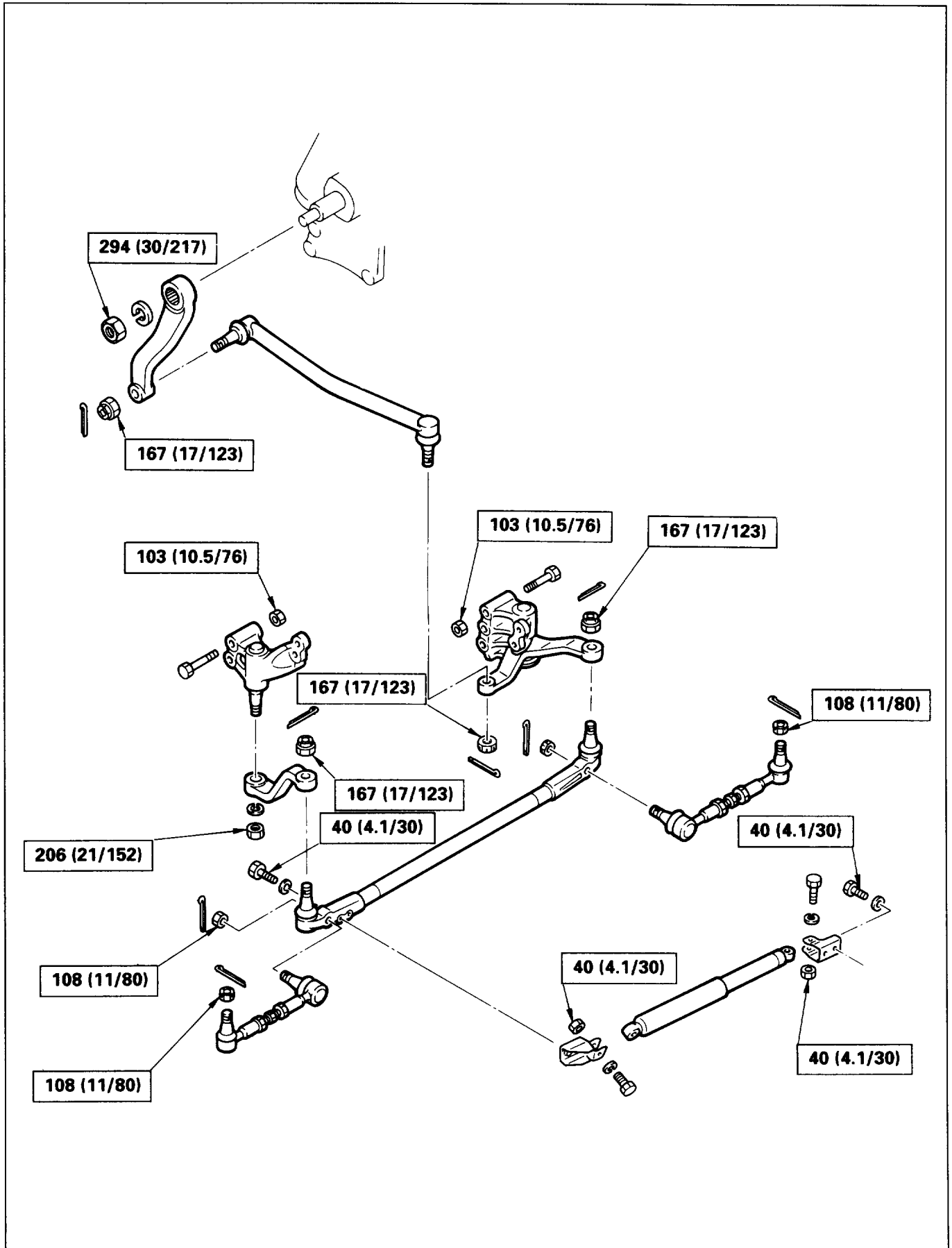
N·m (kg·m / lb·ft)





**Steering Linkage (Wishbone Suspension)**

N·m (kg·m / lb·ft)

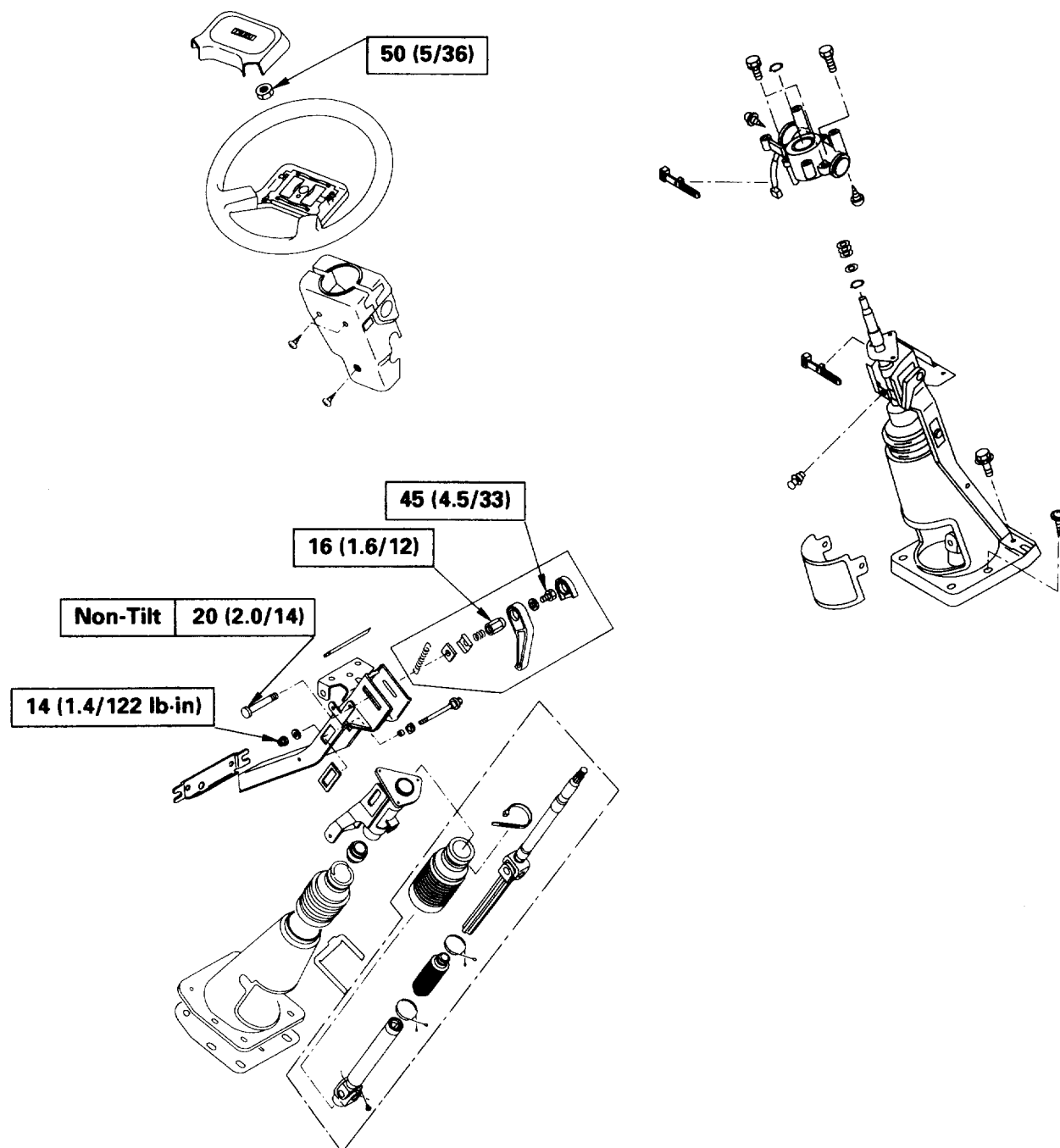




# Steering Column

N·m (kg·m / lb·ft)

This illustration is based on tilt and telescopic control type.

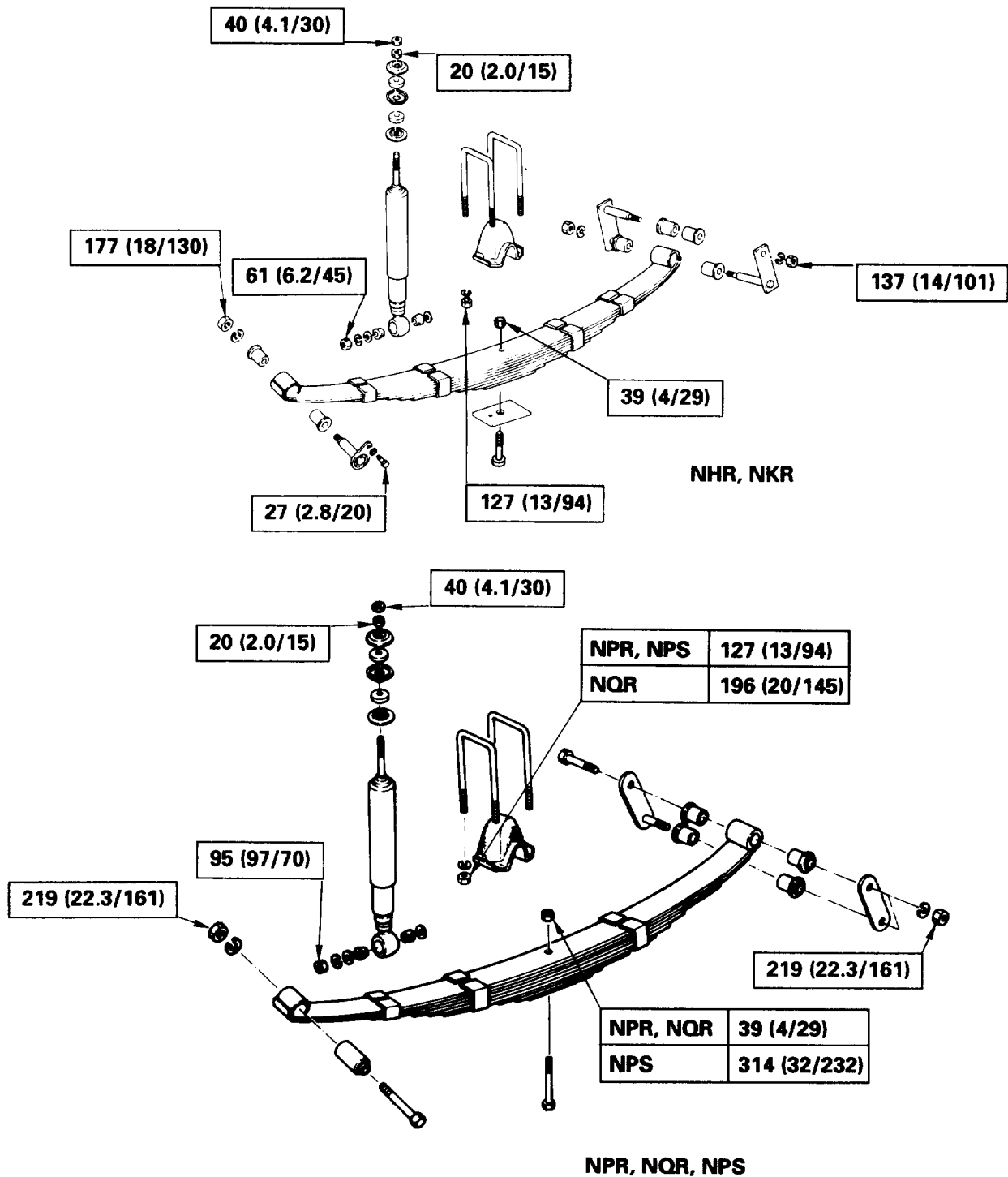




# FRONT SUSPENSION

## Front Leaf Spring and Shock Absorber

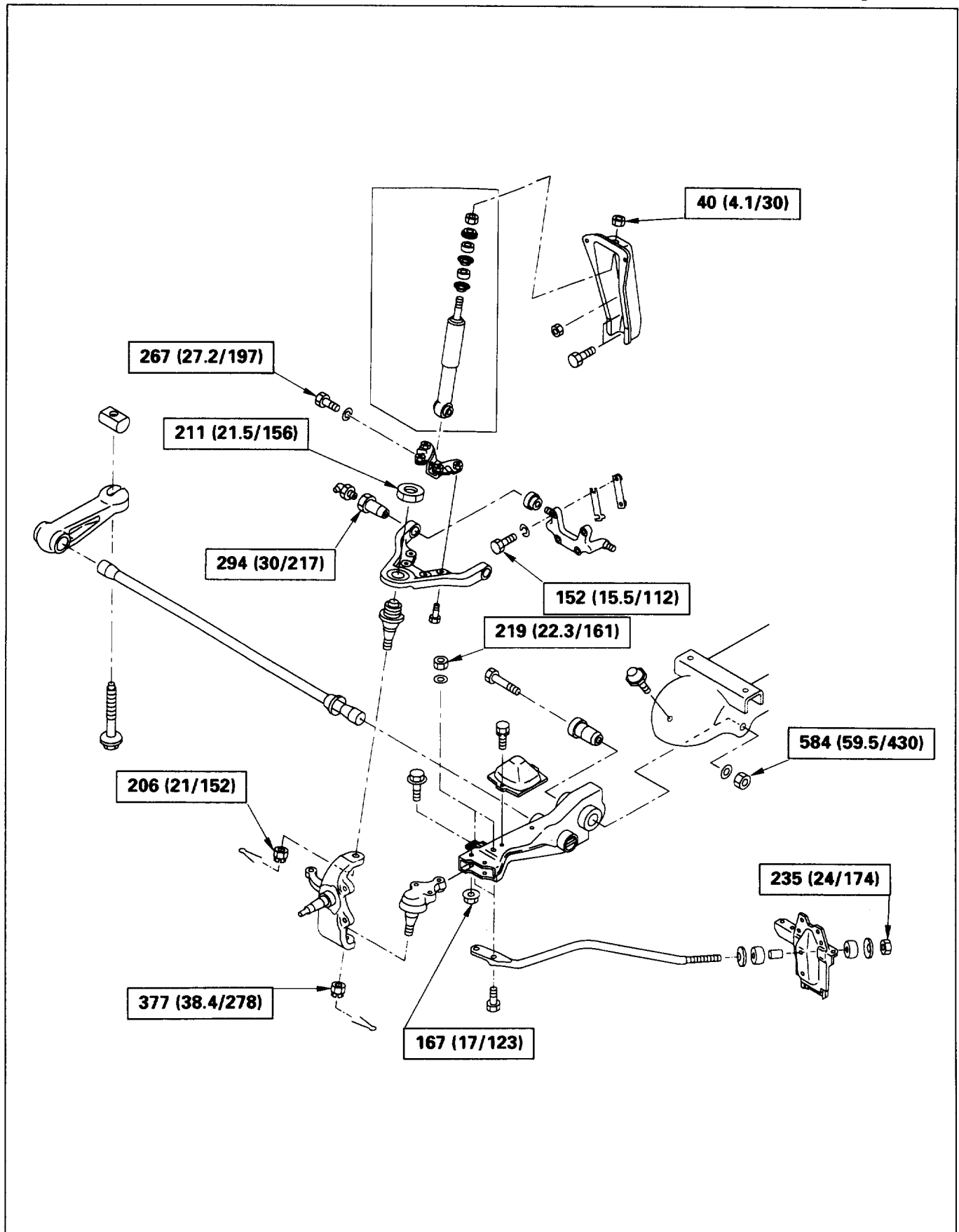
N·m (kg·m / lb·ft)





# Upper, Lower Link, Torsion Bar and Strut Bar (Wishbone Suspension)

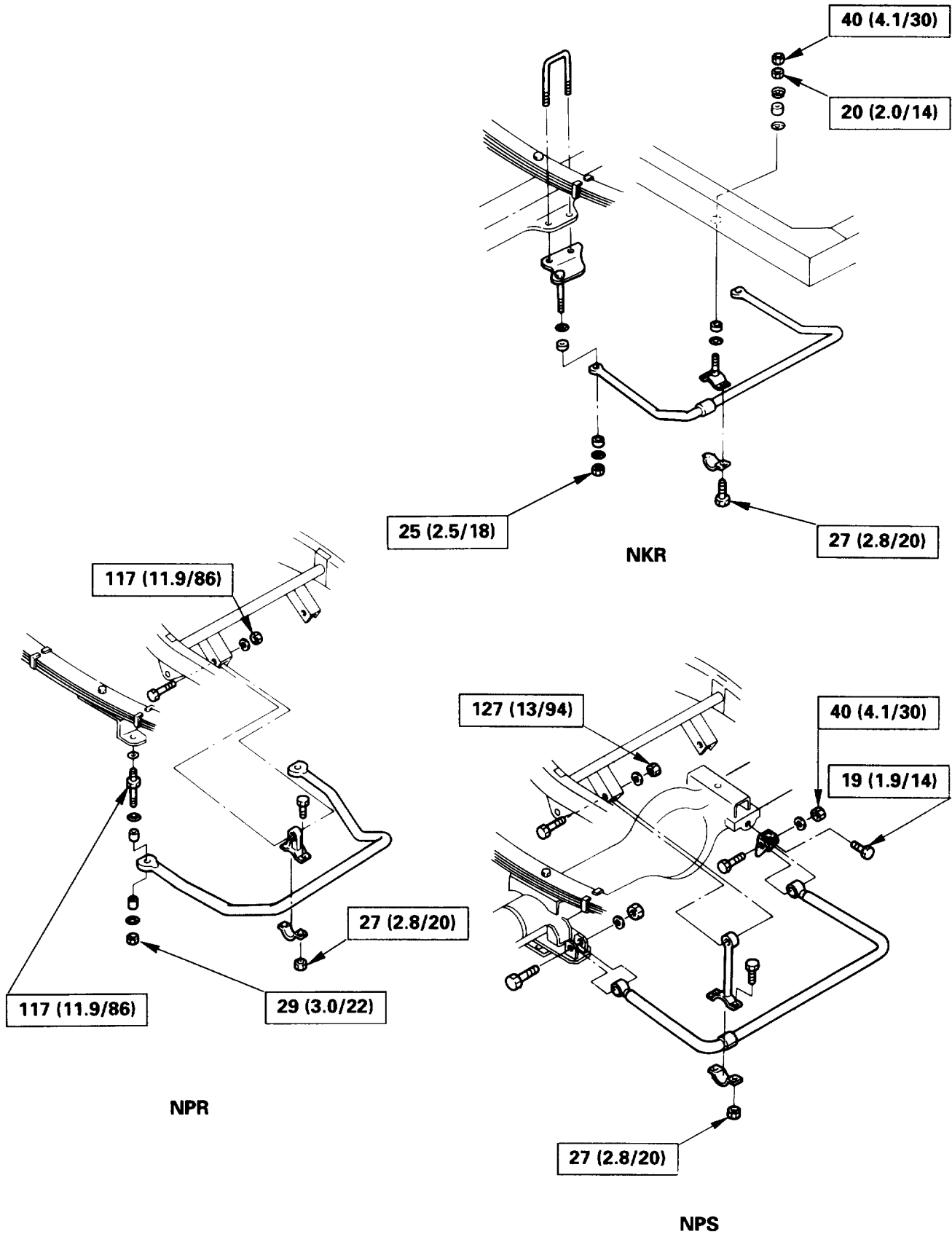
N·m (kg·m / lb·ft)





Front Stabilizer

N·m (kg·m / lb·ft)

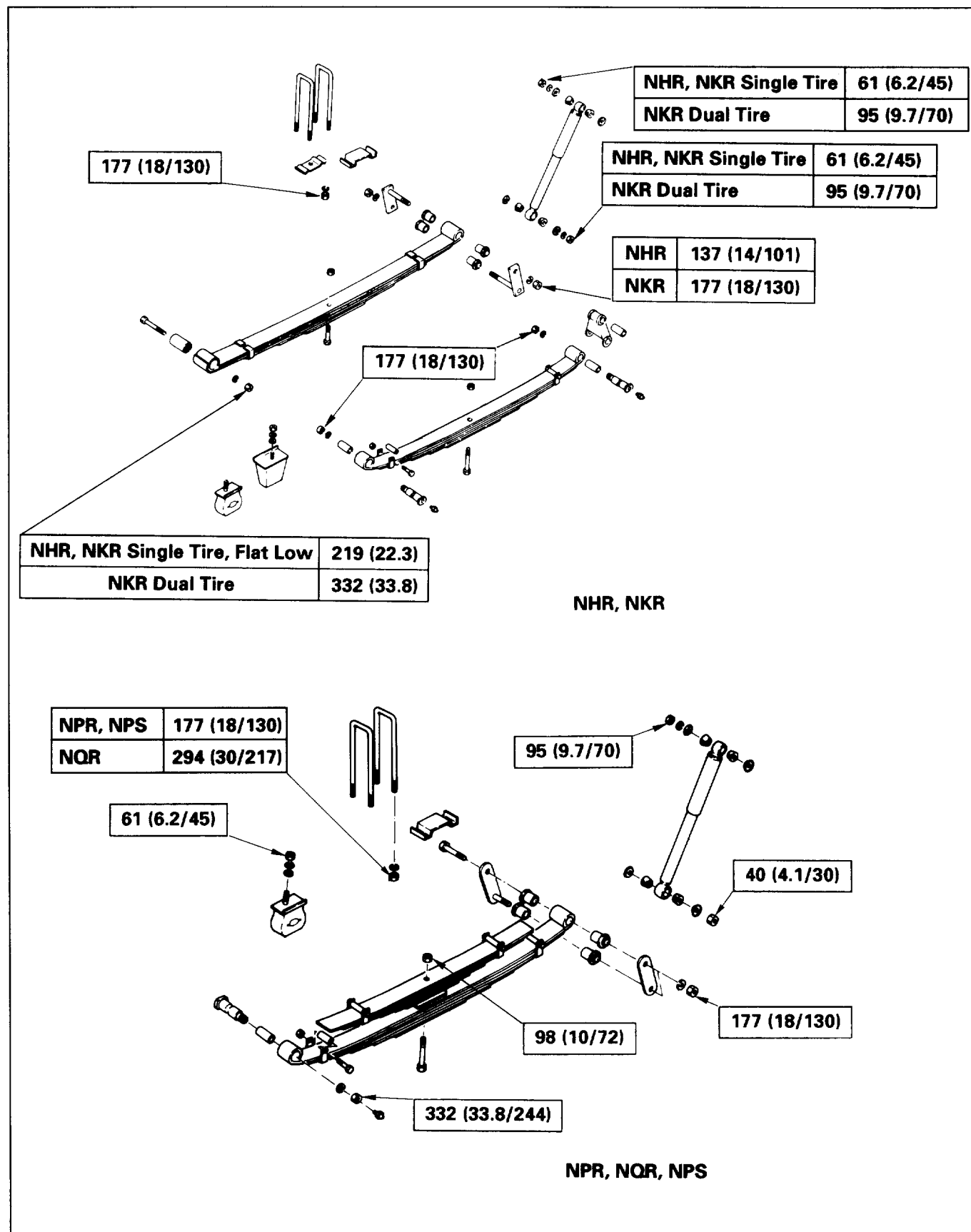




## REAR SUSPENSION

### Rear Leaf Spring and Shock Absorber

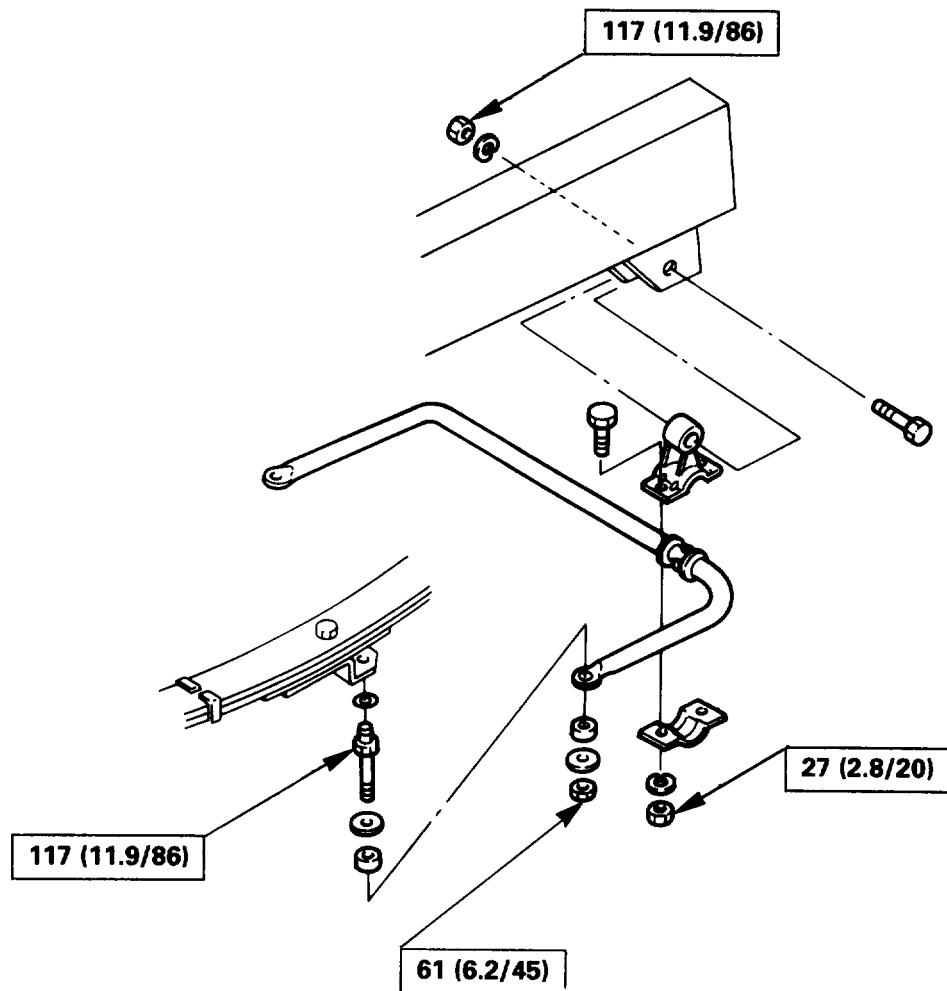
N·m (kg·m / lb·ft)





**Rear Stabilizer**

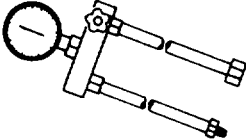
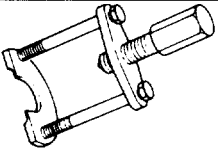
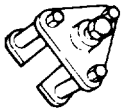
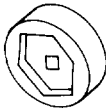
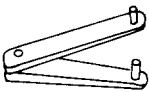

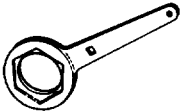

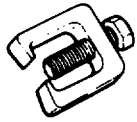
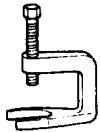
N·m (kg·m / lb·ft)





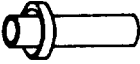



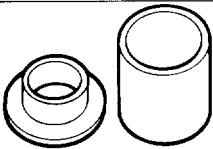
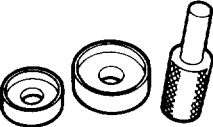
# SPECIAL TOOLS

## STEERING SYSTEM

ILLUSTRATION	PART NO.	PART NAME	REMARKS
	5-8840-0162-0	Power steering fluid pressure gauge	
	5-8840-2017-0	Ball joint remover	
	5-8840-2051-1	Pitman arm puller	
	5-8840-2059-0	Lock nut wrench	for Power steering (Left hand drive)
	5-8840-2060-0	End cover wrench	for Power steering (Left hand drive)
	5-8840-2054-0	Steering shaft driver	
	5-8840-2052-0	Steering lock nut wrench	for Manual steering (NHR, NKR)
	5-8840-2053-0	Wrench	for Manual steering (NHR, NKR)
	5-8840-2018-0	Tie rod end remover	for 2WD rigid suspension (assistant side)
	5-8840-2215-0	Steering wheel puller	



## SUSPENSION

ILLUSTRATION	PART NO.	PART NAME	REMARKS
	5-8840-2048-0	Leaf spring bushing remover and installer	
	5-8840-2049-0	Leaf spring bushing remover and installer	for metal bushing
	5-8840-2366-0	Lower link ball joint remover	for wishbone suspension
	5-8840-2364-0	Upper link ball joint remover	for wishbone suspension
	5-8840-2365-0	Upper link ball joint installer	for wishbone suspension
	5-8840-2367-0	Lower link bushing remover and installer	for wishbone suspension



## SECTION 3A

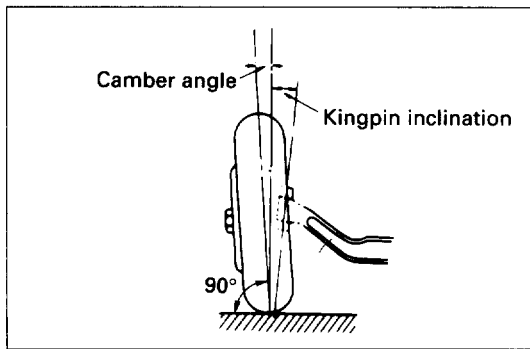
# FRONT END ALIGNMENT

## CONTENTS

	PAGE
General Description.....	3A- 2
On-Vehicle Service.....	3A- 3
Inspection.....	3A- 3
Toe - In .....	3A- 3
Turning Radius.....	3A- 5
Camber Angle .....	3A- 8
Caster Angle and King Pin Inclination .....	3A- 9
Trim Height.....	3A- 12

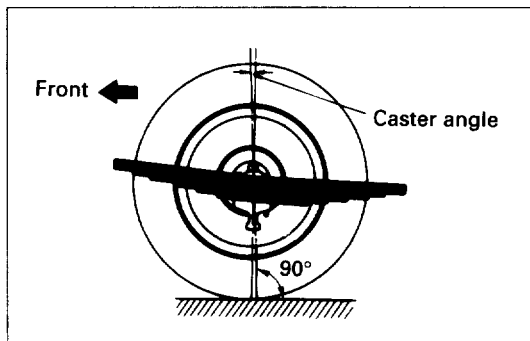


## GENERAL DESCRIPTION



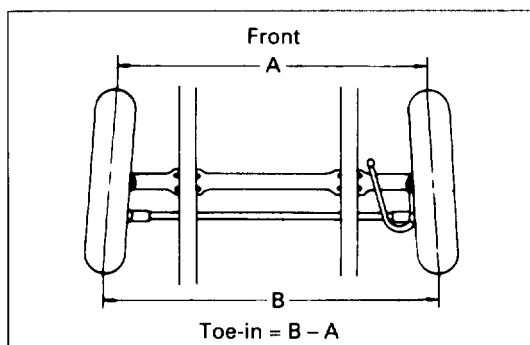
### Camber Angle

The reason why the camber is so important in wheel alignment is that it affects greatly the tire wear and characteristics. The front wheels of most cars lean slightly either inward or outward when seen from the front. This tilt of the wheel is called the camber. When the center line of the tire is completely vertical to the road, the tire has "zero camber". In the positive camber, the wheels incline outward at the tops while in the negative camber they incline inward at the tops. Excessive positive camber causes the outer edge of tire to excessively wear. On the other hand, excessive negative camber causes the inner edge of tire to wear. Improper wheel camber setting will not only cause the tires' excessive wear, but also the tire will tend to move in the direction of the wheel which has a larger camber angle affecting the car's straight traveling ability. When measuring the camber, it is indicated by the angle.



### Caster Angle

Caster is the angle between the rearward inclination of king pin axis and a vertical centerline of the wheel when the car is seen from its side. Like camber, it is also indicated by the angle. Caster angle affects greatly the straight traveling ability of the car, steering wheel maneuverability, self alignment effort and the returning ability of the car to the straight ahead position.



### Toe-In

When seen from the top of the car, the front edges of the front wheels are slightly closer each other. The amount of this slight inward turning is called toe-in and usually expressed by millimeter.



# ON-VEHICLE SERVICE

- Tire pressure and abnormal wear
- Front hub bearings for axial play
- Ball joints on steering linkage for play
- Operation of shock absorbers
- Tightness of suspension parts
- King pin bearings for play



## INSPECTION

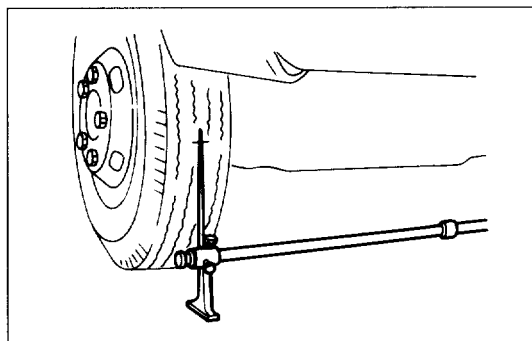
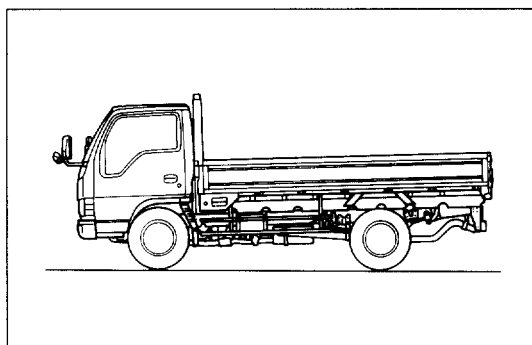
The points listed in table at left must be checked prior to inspecting front wheel alignment.

## TOE-IN



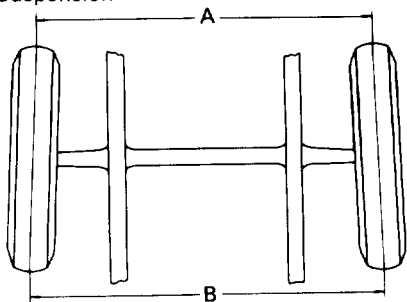
Measurement should be taken with the vehicle on a surface plate.

If a surface plate is not available, toe-in should be checked with the vehicle parked on a level floor.



1. Set front wheels to its straight ahead position.
2. Align the toe-in gauge with center height of each wheels at front end.
3. Apply center marks to each wheel, then take measurement of distance A between the center marks on each wheel.
4. Move slowly the vehicle rearward until center marks get its rear end position.
5. Take measurement of distance B between the center marks at rear end.

Rigid Suspension

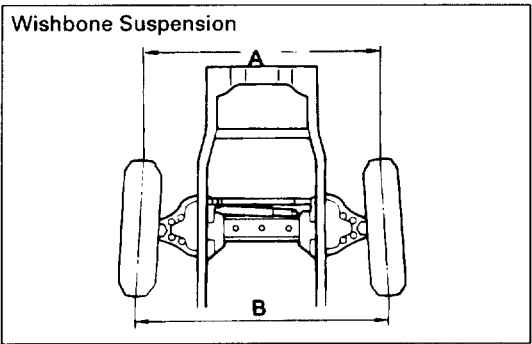
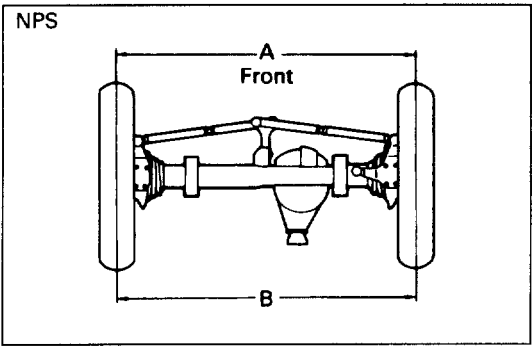


The toe-in can be calculated with next formula.

$$\text{Toe-in} = B - A$$



3A – 4 FRONT END ALIGNMENT

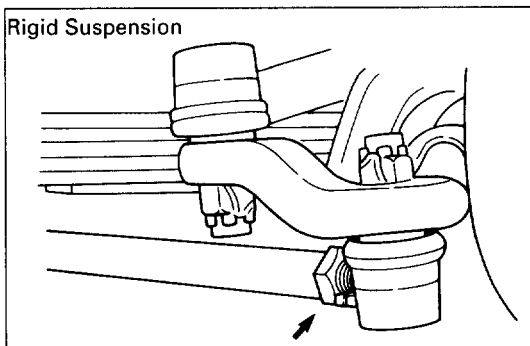


Toe-in

1994 – 1997 Model			mm(in.)
Tire	Rigid	Wishbone, NPS	
Bias	3 – 7 (0.12 – 0.28)	-2 – 2 (-0.08 – 0.08)	
Radial	0 – 4 (0 – 0.16)		
1998~ Model			mm(in.)
			-2 – 2 (-0.08 – 0.08)



Rigid Suspension



## Adjustment

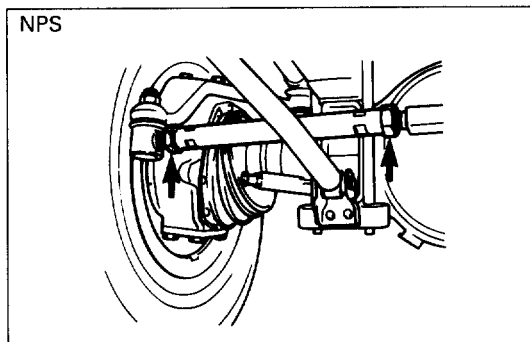
1. Loosen the lock nuts on the tie rod or outer truck rod ends.
2. Adjust length (L) of the tie rod by turning the connecting rod on outer truck rod.
3. Tighten the lock nuts to specified torque.

### Lock Nut Torque

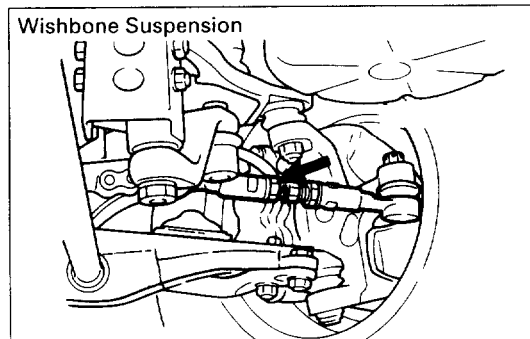
N·m (kg·m/lb·ft)

Rigid Suspension, NPS	113 (11.5/183)
Wishbone Suspension	167 (17.0/123)

NPS



Wishbone Suspension

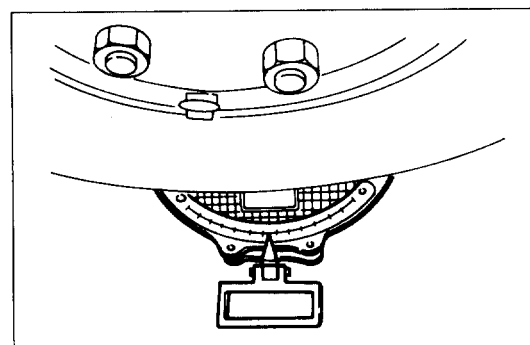


## TURNING RADIUS

1. Position a suitable piece of wood equivalent in thickness to the turning radius gauge under each rear wheel.
2. Position each front wheel on a turning radius gauge by aligning the tire center line with the center of the turning radius gauge.
3. Turn the steering wheel clockwise or counterclockwise until the front wheels are locked.

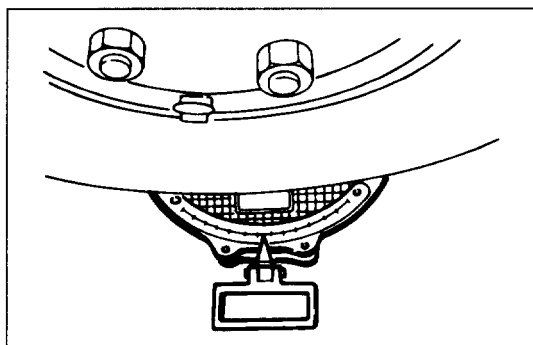
### NOTE:

Turn the steering wheel with the brake pedal depressed using brake pedal pusher.





## 3A – 6 FRONT END ALIGNMENT



Reading of the turning radius gauge directly indicates the steering angle.

### Steering Angle

1994 – 1997 Model

(Deg.)

Vehicle Model	Outer	Inner
Wishbone Suspension	35	38
NHR (Rigid Suspension)	34	46
NKR (Rigid Suspension)	30	38
NPR (Rigid Suspension)	36	47
NQR (Rigid Suspension)	34	42.5
NPS	30	38

1998~ Wishbone Suspension Model

(Deg.)

Vehicle Model	Outer	Inner
NKR (7.00-15 Tire)	29.5	38.5
NKR (7.00-16 Tire)	27.9	35.5
NKR (7.50-16 Tire)	25.1	31.5

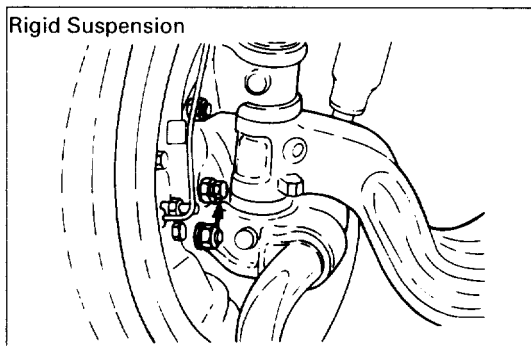
1998~ Rigid Suspension Model

(Deg.)

Vehicle Model	Outer	Inner
NHR	33.0	37.5
NKR (7.00-15 Tire)	29.5	38.5
NKR (7.00-16 Tire)	27.9	35.5
NKR (7.50-16 Tire)	25.1	31.5
NPR, NQR (7.00-16 Tire)	35.0	47.5
NPR, NQR (7.50-16 Tire)	32.7	42.5
NPR, NQR (8.25-16 Tire)	30.0	36.5
NPS	30.0	38.0



Rigid Suspension

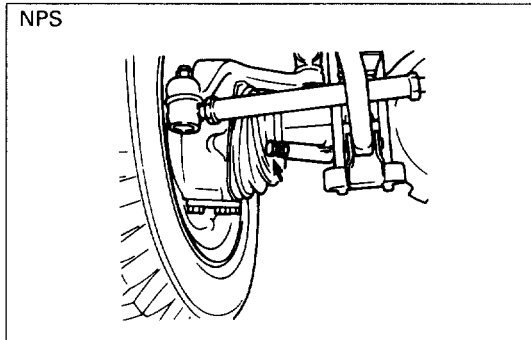


## Adjustment

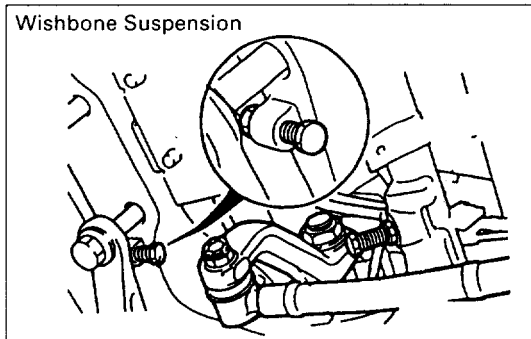
1. Loosen the lock nuts on the steering knuckle or the axle case.
2. Adjust projecting height of the stopper bolts.
3. Tighten the lock nuts to specified torque.

Stopper Bolt Torque	N•m (kg•m/lb•ft)
Rigid Suspension	186 (19.0 / 137)
NPS	49 ( 5.1 / 36)
Wishbone Suspension	82 ( 8.4 / 61)

NPS



Wishbone Suspension





## CAMBER ANGLE

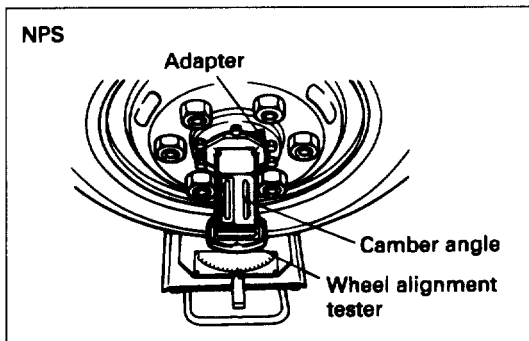
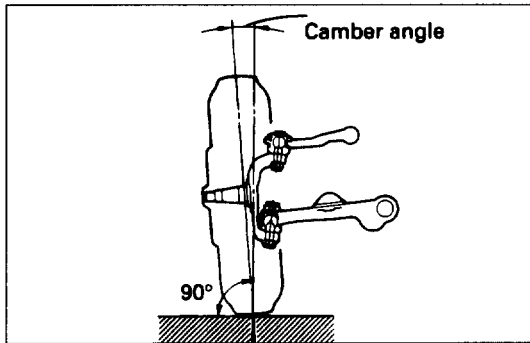
### All Model except NPS

The toe-in can be checked on the gauge simultaneously.

1. When inspection of turning radius is completed, calibrate the scale of the turning radius gauge to zero.
2. Remove the front hub cap.  
Install camber, caster and king pin inclination gauge on end of the knuckle spindle horizontally.

#### NOTE:

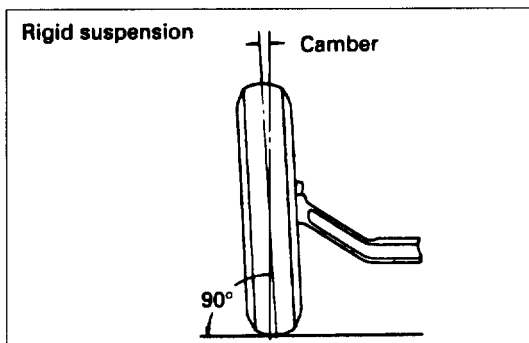
**When removing hub cap, take care so as not to cause damage to gauge fitting face at end of the spindle. If end of the spindle has been scratched or damaged, correct before setting the gauge.**



### NPS

Remove the free wheel hub lock cover assembly then install gauge adapter on end of the knuckle spindle. Install camber, caster and king pin inclination gauge on end of gauge adapter.

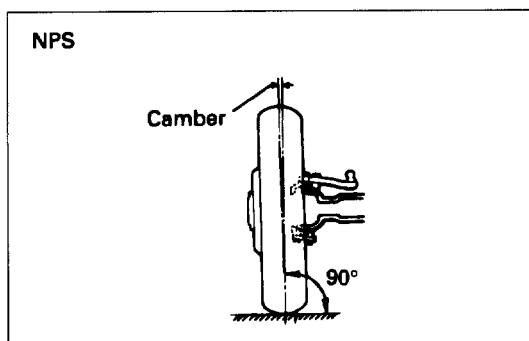
Gauge Adapter: 5-8840-2188-0



3. Reading of the camber scale directly indicates the camber angle.

#### Camber Angle

1994 – 1997 Model (deg.)	
Rigid Suspension	$1^{\circ}15' \pm 45'$
Wishbone Suspension, NPS	$0^{\circ}15' \pm 45'$
1998~ Model (deg.)	
NHR Rigid Suspension	$1^{\circ}15' \pm 45'$
Rigid Suspension (except NHR)	$0^{\circ}15' \pm 45'$
Wishbone Suspension, NPS	$0^{\circ}15' \pm 45'$

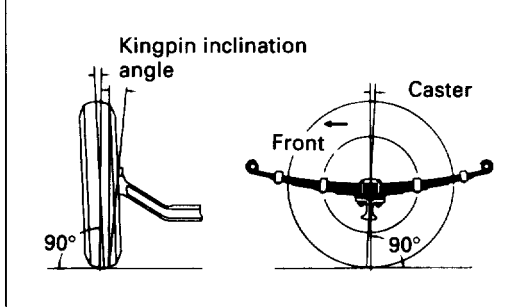






## CASTER ANGLE AND KING PIN INCLINATION

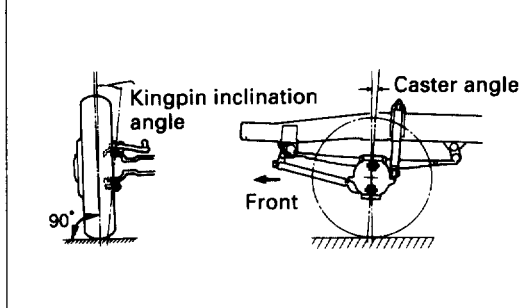
Rigid Suspension



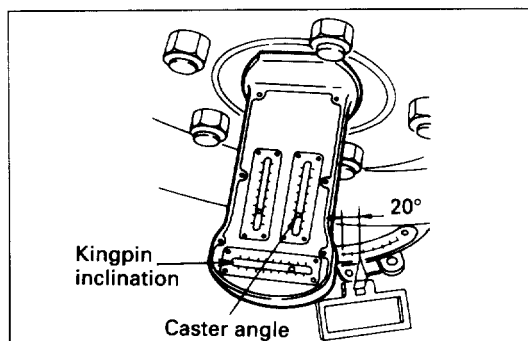
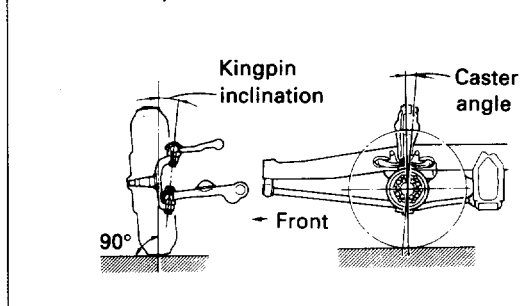
The caster angle and king pin inclination can be checked on the gauge simultaneously.

1. When inspection of camber angle is completed, calibrate the scale of the turning radius gauge to zero and turn the steering wheel clockwise (counterclockwise for checking caster angle and king pin inclination on the left side front wheel) until the front wheels are steered 20 degrees from the straight-ahead position.

NPS



Wishbone Suspension

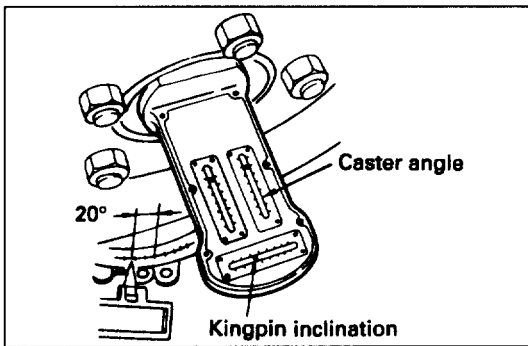


### NOTE:

**Turn the steering wheel with the brake pedal depressed using brake pedal pusher.**

2. When the front wheels are turned 20 degrees, calibrate the caster and kingpin scales to zero turning the camber, caster and king pin gauge adjuster.





- Turn the steering wheel in the opposite direction until the front wheels are steered 20 degrees in the opposite direction. Reading of the caster and king pin scales directly indicates the caster and king pin inclination angles being checked.

#### Caster Angle and King Pin Inclination

1994 – 1997 Model

(deg.)

	Caster Angle	King Pin Inclination
Rigid Suspension	$1^{\circ}30' \pm 1^{\circ}$	$7^{\circ}15'$
Wishbone Suspension	$1^{\circ}00' \pm 1^{\circ}$	$9^{\circ}45' \pm 30'$
NPS	$2^{\circ}00 \pm 1^{\circ}$	$7^{\circ}15'$

1998~ Model

(deg.)

	Caster Angle	King Pin Inclination
NHR Rigid Suspension	$1^{\circ}30' \pm 1^{\circ}$	$7^{\circ}15'$
NKR Rigid Suspension	$3^{\circ} \pm 1^{\circ}$	$12^{\circ}00'$
NPR, NQR	$2^{\circ}45' \pm 1^{\circ}$	$12^{\circ}00'$
Wishbone Suspension	$1^{\circ}00' \pm 1^{\circ}$	$9^{\circ}45' \pm 30'$
NPS	$2^{\circ}00 \pm 1^{\circ}$	$7^{\circ}15'$

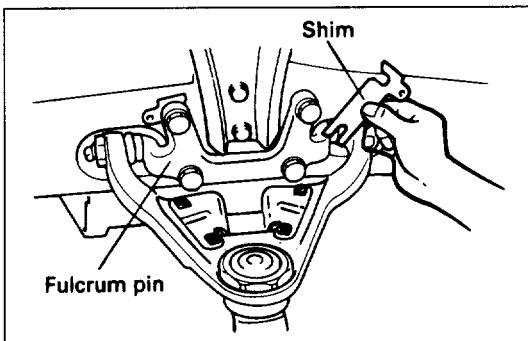
- Front springs for weakening
- Front I-beam (axle case) for distortion
- Bushings in king pin, King pin bearings for wear or determination



### Adjustment

#### Rigid Suspension

The camber, caster and king pin inclination are built into front end and are not adjustable. If the camber, caster or king pin inclination is found to be out of alignment, check to locate the cause of trouble against the listing at left and replace the parts as necessary.



#### Wishbone Suspension

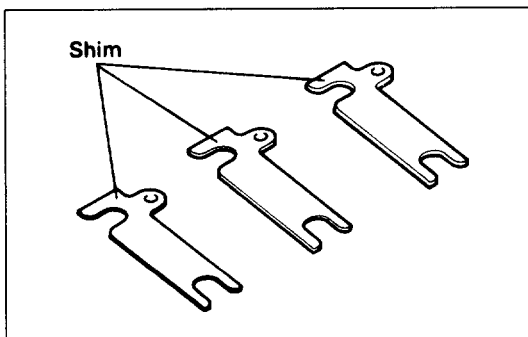
- Set the jack under the cross member of the suspension and then raise the lower link with the jack and retain the jack with applied in the place.
- Remove the shock absorber.
- Attach the fulcrum pin and loosen the bolts to the degree that it will not fall a part to adjust the camber angle using the shims.

#### Camber Angle

If the number of shims are evenly increased both at fore and aft, the camber angle becomes acute, while if decreased, the angle becomes obtuse.

#### Caster Angle

When the caster angle is obtuse, increase the number of shims at the fore side, while the angle is acute, increase the number of shims at the aft side.





Thickness of Shims Available (mm)

0.8, 1.6, 3.2

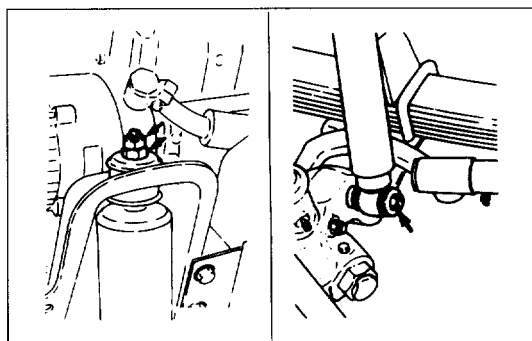
Conditions Where The Shims are Used

	Limit
Numbers of Shims	4 or less
Thickness mm (in)	9.6 (0.378) or less
Difference of Thickness (between Front and Rear) mm (in)	4.8 (0.189) or less

In case the shim has already reached at the limitation in its number or its thickness, decrease the number of shims at the aft side to adjust the obtuse caster angle, while decrease the number at the fore side to adjust the acute caster angle.

**NOTE:**

**Since the number of shims needed for caster angle adjustment varies depending on the conditions of the car, perform the adjustment procedures which are the most suitable for the car conditions.**

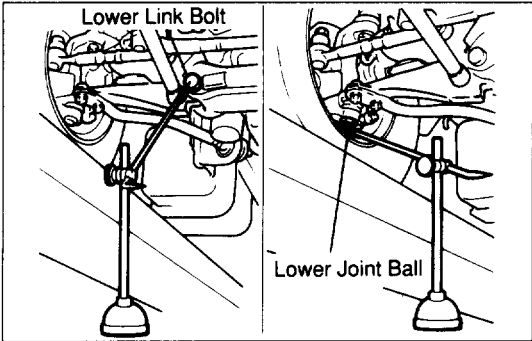


- 4) Tighten the mounting bolts of the front shock absorber.

Shock Absorber Bolt and Nut Torque	N·m (kg·m/lb·ft)
Upper	40 ( 4.1 / 30)
Lower	103 (10.5 / 76)



# TRIM HEIGHT (WISHBONE SUSPENSION ONLY)



## Adjustment

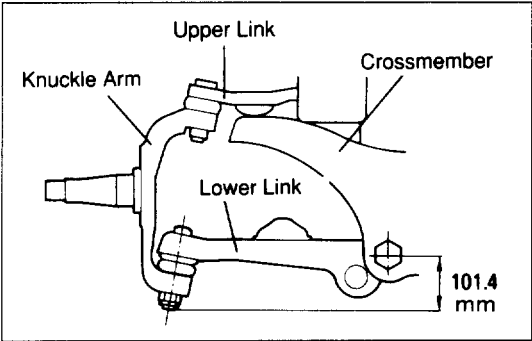
Adjust the trim height by means of adjusting bolt on the height control arms.



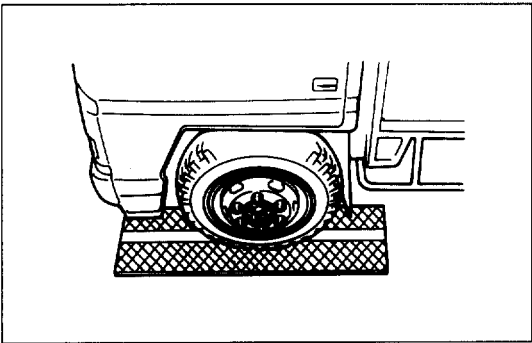
### CAUTION:

**When adjusting front end alignment, be sure to begin with trim height as trim height adjustment may change other adjusted alignments.**

1. Check and adjust the tire inflation pressures.
2. Park the vehicle on a level ground and move the front of the vehicle up and down several times to settle the suspension.
3. Make necessary adjustment with the adjusting bolt on the height control arms.



Trim Height	mm(in)
<hr/>	
101.4±5 (3.992±0.197)	
<hr/>	



## Measurement of Side Slippage

When inspection and adjustments of toe-in, camber, caster and kingpin inclination are completed, check for side slippage using a side slip tester.

Roll the wheels over the side slip tester as slowly as possible and take reading on the tester. If the amount of side slippage is in excess of 5 mm per 1 m, recheck the wheel alignment.

Side Slippage	mm (in)
<hr/>	
Limit	
<hr/>	
5.0 (0.197) Per 1m	
<hr/>	



## SECTION 3B1

# POWER STEERING

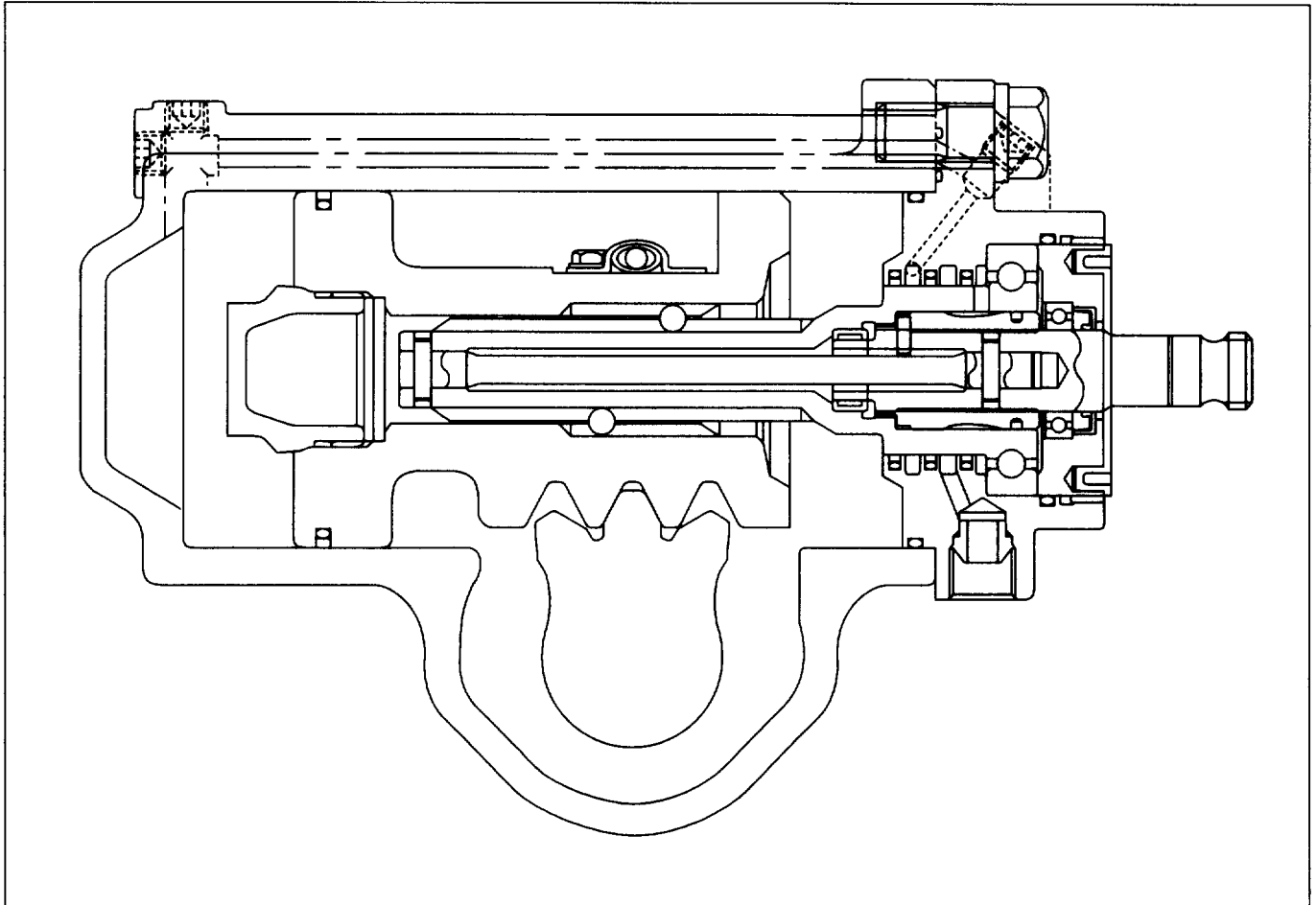
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Power Steering Pump (4B Series Engine) .....	3B1-56
Power Steering Pump (4HF1 Engine) .....	3B1-62
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## GENERAL DESCRIPTION

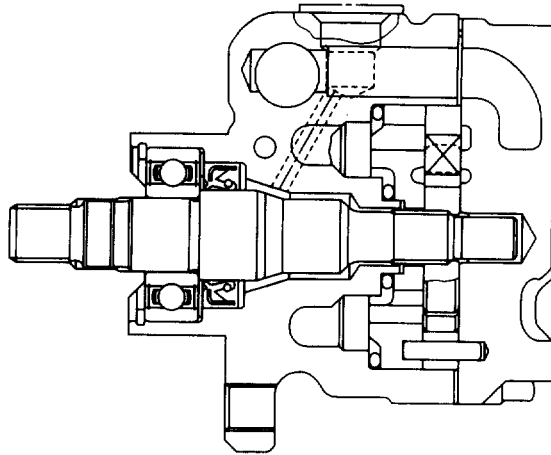
### Power Steering Unit



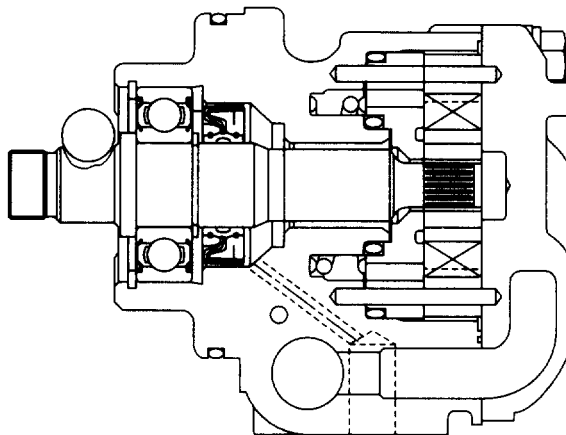


## Power Steering Pump

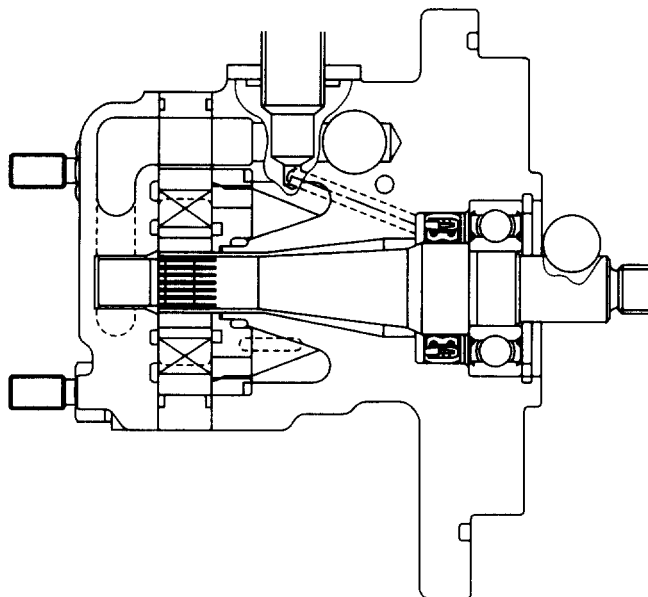
4J Series Engine



4B Series Engine



4HF1 Engine





## **Tandem Hydraulic Pump**

A tandem hydraulic pump has two independent hydraulic pumps inside one casing. Its main parts can be classified into the following three.

- hydraulic pump (vane type)
- flow control valve
- pressure relief valve

The following is a description of the functions and operation of the main parts.

## **Hydraulic pump**

### **Functions**

The heart of the system, namely the part that supplies hydraulic pressure, which operates the hydro boost and the P/S. The hydraulic pump is installed directly to the engine and is driven by gears. It smoothly adapts itself to severe conditions of use, including a wide range of rotation speeds, changes in the temperature at which it is used, and frequent changes in load pressure, and it is able to fully perform its functions.

### **Operation**

Its drive is transmitted by gears from the engine to the drive shaft of the oil pump, and it turns a rotor that is fitted into the spline part of the drive shaft. When the rotor rotates, the ten vanes built into the rotor groove fly out by centrifugal force, are pressed against the inside surface of the cam ring, and rotate along the inside surface so that the pump operates.

Suction and discharge of the hydraulic oil is done by a pressure plate and side plate attached to both ends of the cartridge.

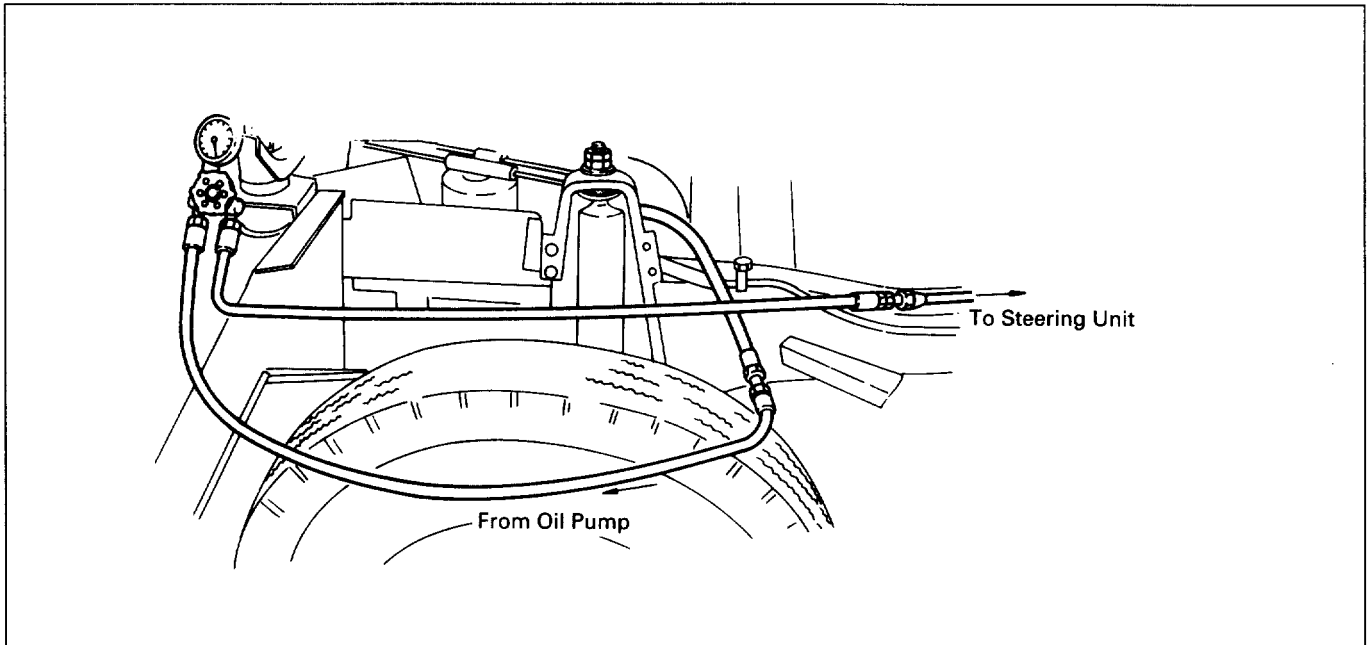
Suction openings and discharge openings are provided in two locations each in symmetrical positions with respect to the axis of rotation, and because the load on the bearings due to the discharge pressure is balanced, a tandem oil pump is also called a balanced hydraulic pump.

Because it has a double pump effect per rotation, this pump provides large discharge flow in proportion to the space it occupies. Also, some of the hydraulic oil that is discharged is led to the base of the vanes and ensures the quality of the seal between the vane tips and the cam, and even if the vanes and cam rings become a little worn, the seal is hardly affected at all (with respect to discharge, oil tightness).



# ON-VEHICLE SERVICE

## POWER STEERING SYSTEM TEST



### Preparation



- Inspect the fluid reservoir for proper fluid level.
- Inspect the pump belt for proper tension.

### System Test Procedure

1. Place a container under the pump to catch the fluid when disconnecting or connecting the hoses.
2. With the engine NOT running, install the power steering fluid pressure gauge unit between the power steering unit and discharge side of oil pump.

The gauge must be between the stop valve and oil pump.



Gauge kit : 5-8840-0162-1

3. Check the fluid level. Fill the reservoir with Dexron®-IIE to "Full" mark. Check the connections at gauge kit for leakage.
4. Fully open the stop valve, and bleed the system.  
Refer to "Power Steering System Bleeding" of this section.
5. Start the engine and being idled, and raise oil temperature to 50 - 60°C (122 - 144°F). Check the fluid level again. Fill the reservoir with Dexron®-IIE to "Full" mark if required.
6. Hold the steering wheel in the forward position.  
Fully close the stop valve, and record the highest value of fluid pressure.



**CAUTION:**

**Do not continue this test. It should be done within 10 seconds, because otherwise oil temperature would rise to excess to cause trouble.**



Standard Operating Pressure                      kPa (kg / cm<sup>2</sup> / psi)

NHR, NKR, NPR (except NPR66)	10,297 - 10,983 (105 - 112 / 1,493 - 1,593)
NPR66, NPS66	10,787 - 11,474 (110 - 117 / 1,564 - 1,664)

- If the pressure recorded is within specified range, the steering system is functioning within its specifications.
  - If the pressure recorded is higher than specified range, oil pump relief valve is defective.
  - If the pressure recorded is lower than specified range, oil pump or relief valve is defective.
7. Fully open the stop valve and keep engine idled. Turn and hold steering wheel to full left lock, and record the highest value of fluid pressure. Turn and hold steering wheel to full right lock, and record the highest value of fluid pressure.

**CAUTION:**

**Do not continue this test. It should be done within 5 seconds.**



Standard Operating Pressure                      kPa (kg / cm<sup>2</sup> / psi)

NHR, NKR, NPR (except NPR66)	10,297 - 10,983 (105 - 112 / 1,493 - 1,593)
NPR66, NPS66	10,787 - 11,474 (110 - 117 / 1,564 - 1,664)

- If the pressure recorded is within specified range, the steering system is functioning within its specifications.
- If the pressure recorded is lower than specified range, steering unit is leaking internally and must be disassembled and repaired.



## POWER STEERING SYSTEM BLEEDING

1. Raise the front wheels with a jack. (It is recommended that a turn-table should be placed under right hand and left hand side front wheels at this time.)
2. Replenish the fluid tank with ATF Dexron®-III, and repeat the full steering (turning to the extreme ends of the steering) in both right hand side and left hand side directions quietly with the engine stopped.

**CAUTION:**

**Under this condition, the air trapped in the fluid piping will be released from the fluid tank to the atmosphere in the form of large air bubbles.**

3. Whenever the fluid level in the tank is lowered, replenish the tank with ATF Dexron® -III in the amount equivalent to the consumption.

**CAUTION:**

**Pay extra care over the fluid level so that fluid will not run out.**

4. Start the engine and repeat the full steering several times quietly with the engine kept idling.

**CAUTION:**

**The time needed for full steering should be less than five minutes. (Prolonged full steering of more than five seconds will cause the fluid temperature to raise significantly.)**

5. Lower the front wheels and turn the steering wheel in both left hand and right hand sides several times with the engine run. If no abnormal noise can be heard at this time, air might be completely released.

**CAUTION:**

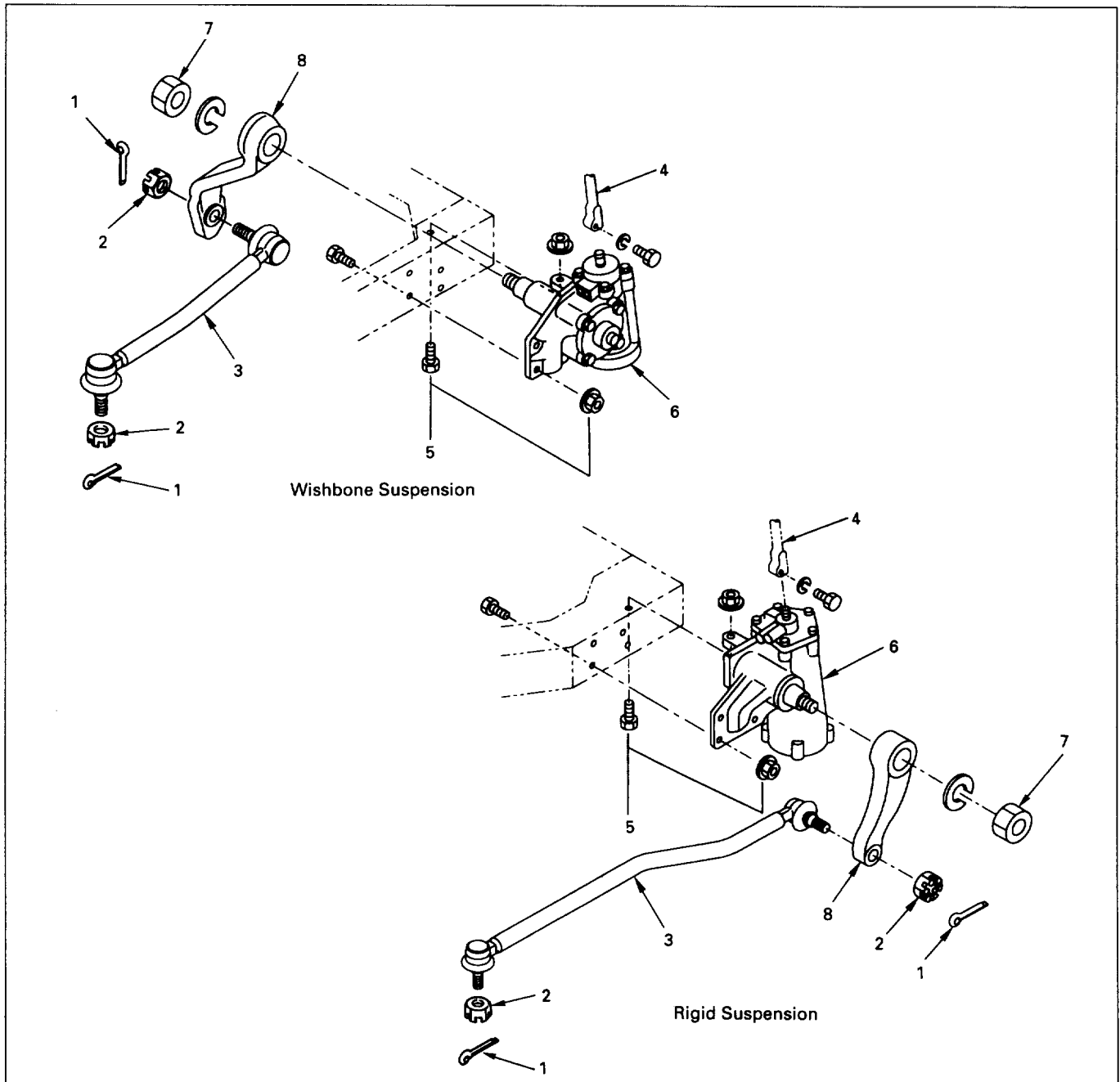
**If the abnormal noise (creaky, "zi-zi" sound etc.) can be heard in the piping after the step No.5 has been completed, the air is still trapped in the piping and air release has not been completed.**

**In this case, continue repetition of steering wheel turn in the both directions of left hand and right hand sides until the fluid temperature is increased up to around 50 - 80 degrees C. When the temperature reaches this degree, stop the engine and leave the engine for about five minutes. (Within five minutes, air bubbles can be collected.) Start the engine again and repeat the full steering several times.**

6. After air release has been completed, check the fluid level in the tank and also confirm that the joints have no fluid leak.



## POWER STEERING UNIT



### Removal Steps

1. Cotter pin
2. Nut
3. Drag link
4. Universal joint
5. Unit fixing nut and bolt
6. Power steering unit
7. Nut
8. Pitman arm

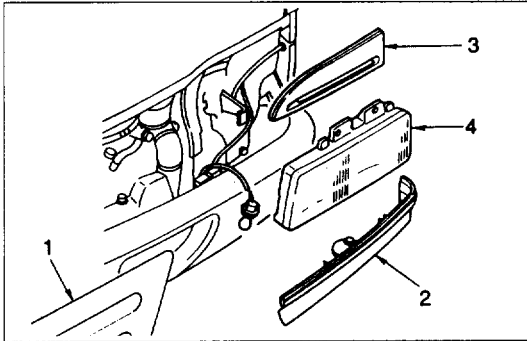
### Installation Steps

8. Pitman arm
7. Nut
6. Power steering unit
5. Unit fixing nut and bolt
4. Universal joint
3. Drag link
2. Nut
1. Cotter pin





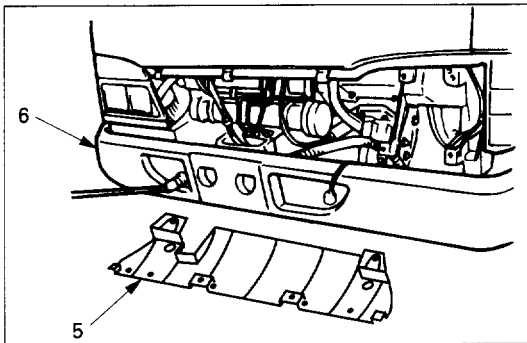
## REMOVAL



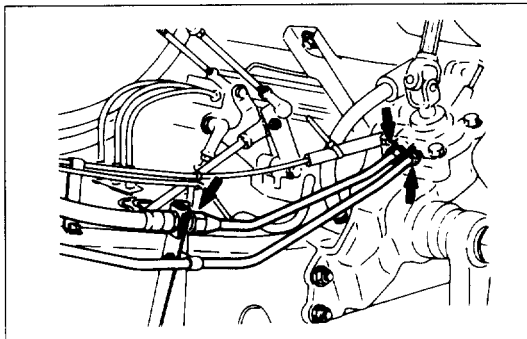
### Preparation (for Non-Tilt Cab Model)

- 1) Remove the radiator grill.
- 2) Remove the head lamp grill. (driver side only)
- 3) Remove the head lamp ornament. (driver side only)
- 4) Remove the head lamp assembly. (driver side only)

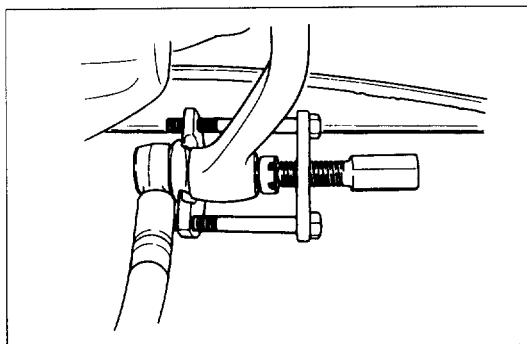
Be careful not to remove adjust screw.



601LY00001



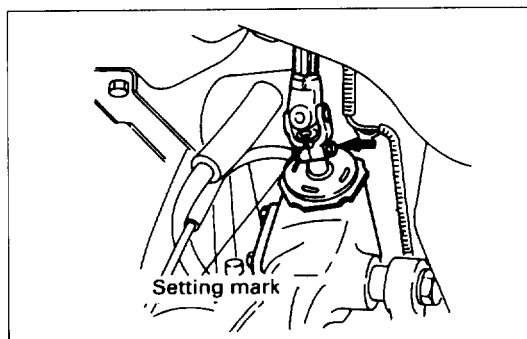
- Remove the oil pipe.  
Before disconnecting the oil pipe, clean the steering unit paying particular attention to the area around the joint and plug or tape the oil port after disconnecting the pipe to prevent entry of dust or other foreign matter.



1. Cotter Pin
2. Nut
3. Drag Link

Disconnect the drag link at the knuckle arm and the pitman arm.

Remover: 5-8840-2017-0

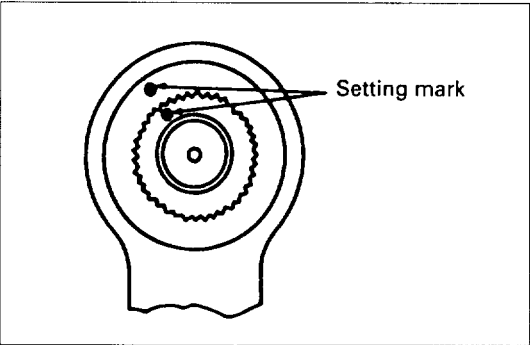


### 4. Universal Joint

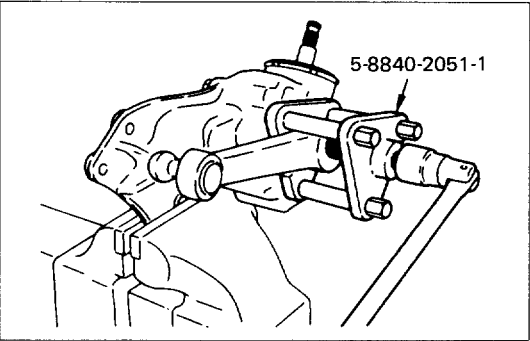
Apply a setting mark across the yoke and worm shaft in unit to ensure reassembly of the parts in the original position.



- 5. Unit Fixing Bolt and Nut
- 6. Power Steering Unit
- 7. Nut
- 8. Pitman Arm



Apply a setting mark across the pitman arm and worm shaft.



Puller: 5-8840-2051-1

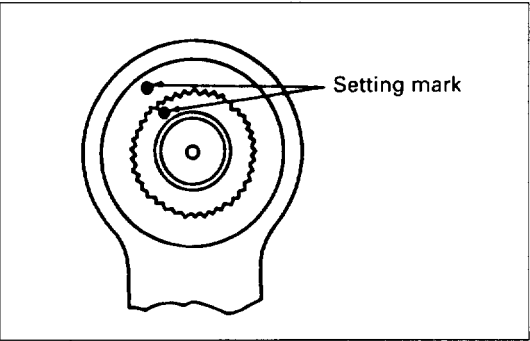


## INSTALLATION

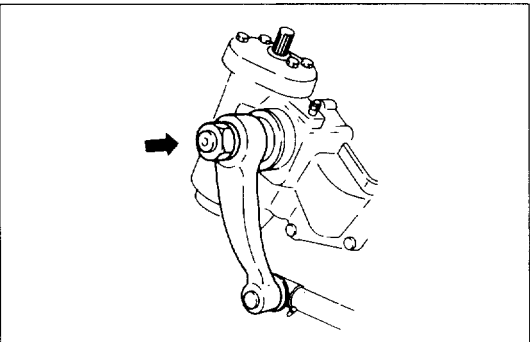
- 8. Pitman Arm



Align the setting mark applied at removal.



- 7. Nut



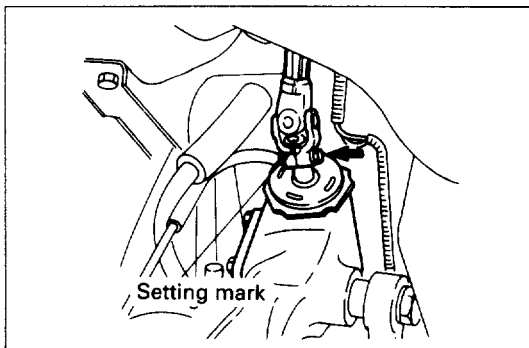
Pitman Arm Nut Torque		N•m (kg•m/lb•ft)
NHR, NKR Rigid Suspension		216 (22 / 159)
NPR, Wishbone Suspension		294 (30 / 217)

- 6. Power Steering Unit
- 5. Unit Fixing Nut and Bolt



Torque		N•m (kg•m/lb•ft)
		103 (10.5 / 76)





#### 4. Universal Joint

Install the parts by aligning setting marks applied at removal.



Universal Joint Bolt Torque	N•m (kg•m/lb•ft)
M8 Bolt	25 (2.5 / 18)
M10 Bolt	39 (4.0 / 29)

#### 3. Drag Link

##### 2. Nut

##### 1. Cotter Pin

- 1) Install the drag link to the pitman arm and the knuckle arm.
- 2) Tighten nuts to specified torque, with just enough additional torque to align cotter pin holes.  
Install new cotter pin.

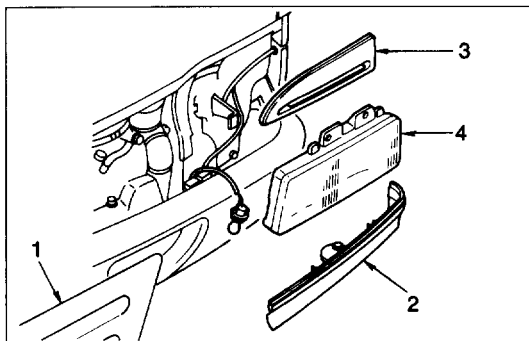


Nut Torque	N•m (kg•m/lb•ft)
	167 (17 / 123)

- Connect the oil pipe. Tighten flare nuts to specified torque.



Flare Nut Torque	N•m (kg•m/lb•ft)
	44 (4.5 / 33)



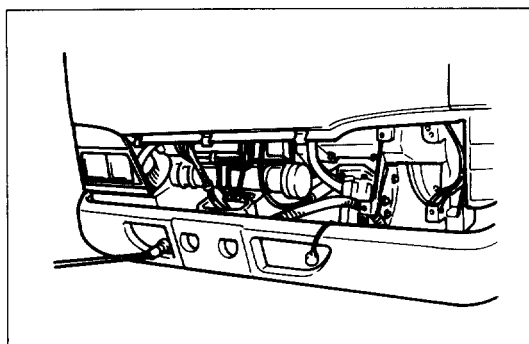
#### for Non-Tilt Cab Model



- 1) Install the bumper assembly.

Bumper Bolt Torque	N•m (kg•m/lb•ft)
	40 (4.1 / 30)

- 2) Install the under panel.



- 3) Install the head light assembly, ornament and grill.
- 4) Install the radiator grill.

#### NOTE:

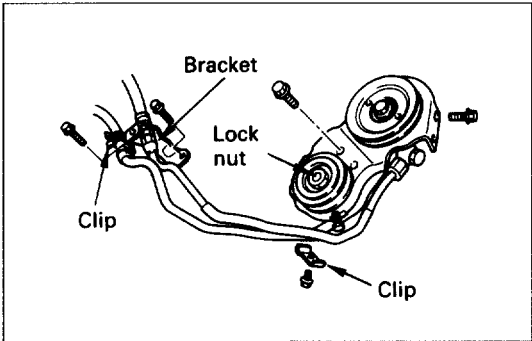
After installation, adjust head light aiming. Refer to "Chassis Electricals" in Section 8.



# POWER STEERING PUMP

## Preparation

- Drain the fluid through the pipe which is connected to the return board for the power steering pump.
- Disconnect the fluid piping.



## 4J SERIES ENGINE



## REMOVAL

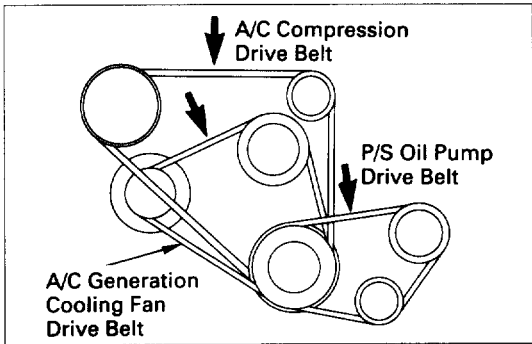
- Loosen the idler pulley locking nuts for the power steering pump.
- Loosen the adjusting bolts for the drive belt and remove the drive belt.
- Remove the pipe brackets and clips on the alternator side.
- Remove the pump mounting brackets.



## INSTALLATION



Bolt and Nut Torque	N•m (kg•m/lb•ft)
Pump and Bracket Assembly Oil Pipe Bracket	19 (1.9 / 14)
Clip Bolt	10 (1.0 / 87 lb-in)

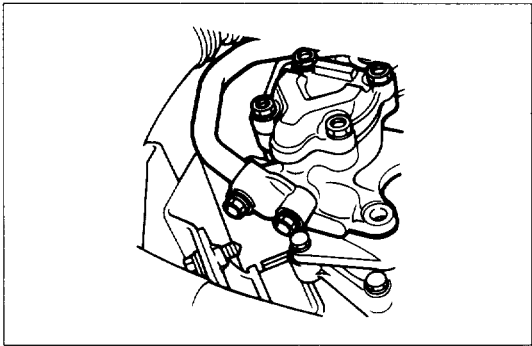


- Install the drive belt for the power steering pump and adjust the belt tension. Press the middle of the belt with a 98N (10kg) weight to measure the deflection of the belt.

Belt Deflection	mm (in)
8 – 12 (0.315 – 0.472)	



### 4B SERIES ENGINE



#### REMOVAL

- Loosen three retaining bolts for the power steering pump and remove the bolts.

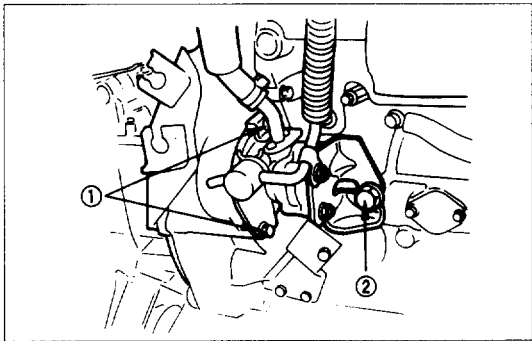


#### INSTALLATION

- Apply grease over the timing gear case for the engine, and attach new O-rings and tighten them to the specified torque.



Power Steering Pump Bolt Torque	N•m (kg•m/lb•ft)
52 (5.2 / 38)	



#### REMOVAL

- Loosen three fixing bolts for power steering pump (Two on the flywheel side and one on the cylinder body side) and remove them.



#### INSTALLATION

- Attach new O-rings and tighten them to the specified torque.



Power Steering Pump Bolt Torque	N•m (kg•m/lb•ft)
Flywheel side	43 (4.4 / 32)
Cylinder Body Side	44 (4.5 / 33)

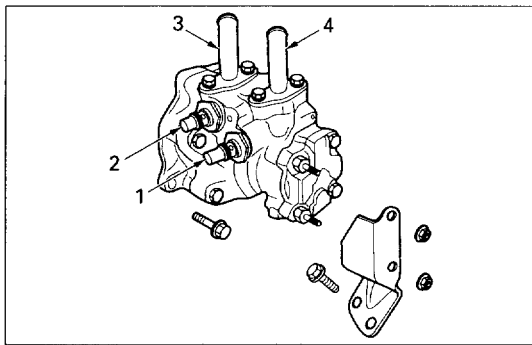


## TANDEM HYDRAULIC PUMP



### REMOVAL

- Block the vehicle wheels and apply the parking brake.
  - Battery ground cable.
1. Disconnect air intake hose at turbocharger side.
  2. Raise the vehicle and remove front exhaust pipe with exhaust brake.
    - Remove bolts at manifold, silencer and support bracket.
  3. Place a container under the hydraulic pump assembly to catch fluid when disconnecting hoses. Clean the surfaces around fittings before removing them.
  4. Remove power steering outlet flexible hose (1) and nut.
  5. Remove hydraulic booster outlet pipe nut.
  6. Remove clips for hydraulic booster lines on the flywheel housing.
  7. Remove clip for hydraulic booster lines on the left sidemember.
  8. Hydraulic booster inlet hose (3).
  9. Power steering inlet hose (4).
  10. Remove hydraulic booster outlet pipe (2) from the pump.
  11. Remove hydraulic pump assembly with bracket and O-ring.



436LW003



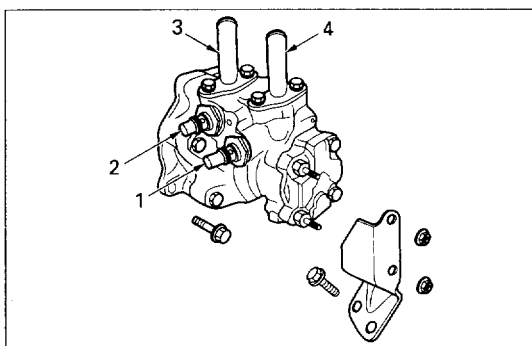
### INSTALLATION

1. Attach new O-ring and install hydraulic pump assembly to the engine.
2. Install booster outlet pipe (2) and nut.
 

Bolt and Nut Torque	N•m (kg•m/lb•ft)
	23.5 (0.0/17)
3. Install power steering outlet flexible hose (1) and nut.
 

Bolt and Nut Torque	N•m (kg•m/lb•ft)
	23.5 (0.0/17)

  - Put the cap on the eye joint and clamp the cap with the fastener.
4. Connect hydraulic booster inlet hose (3).
5. Connect power steering inlet hose (4).
6. Install clips for hydraulic booster lines.
7. Connect air intake hose.
8. Install exhaust pipe with exhaust brake.
9. Fill the power steering and hydraulic booster systems with ATF DEXRON®-III.  
Bleed the power steering system as outlined in this section.  
Bleed the hydraulic booster system. Refer to HYDRAULIC BOOSTER SYSTEM (SEC. 5A).



436LW003

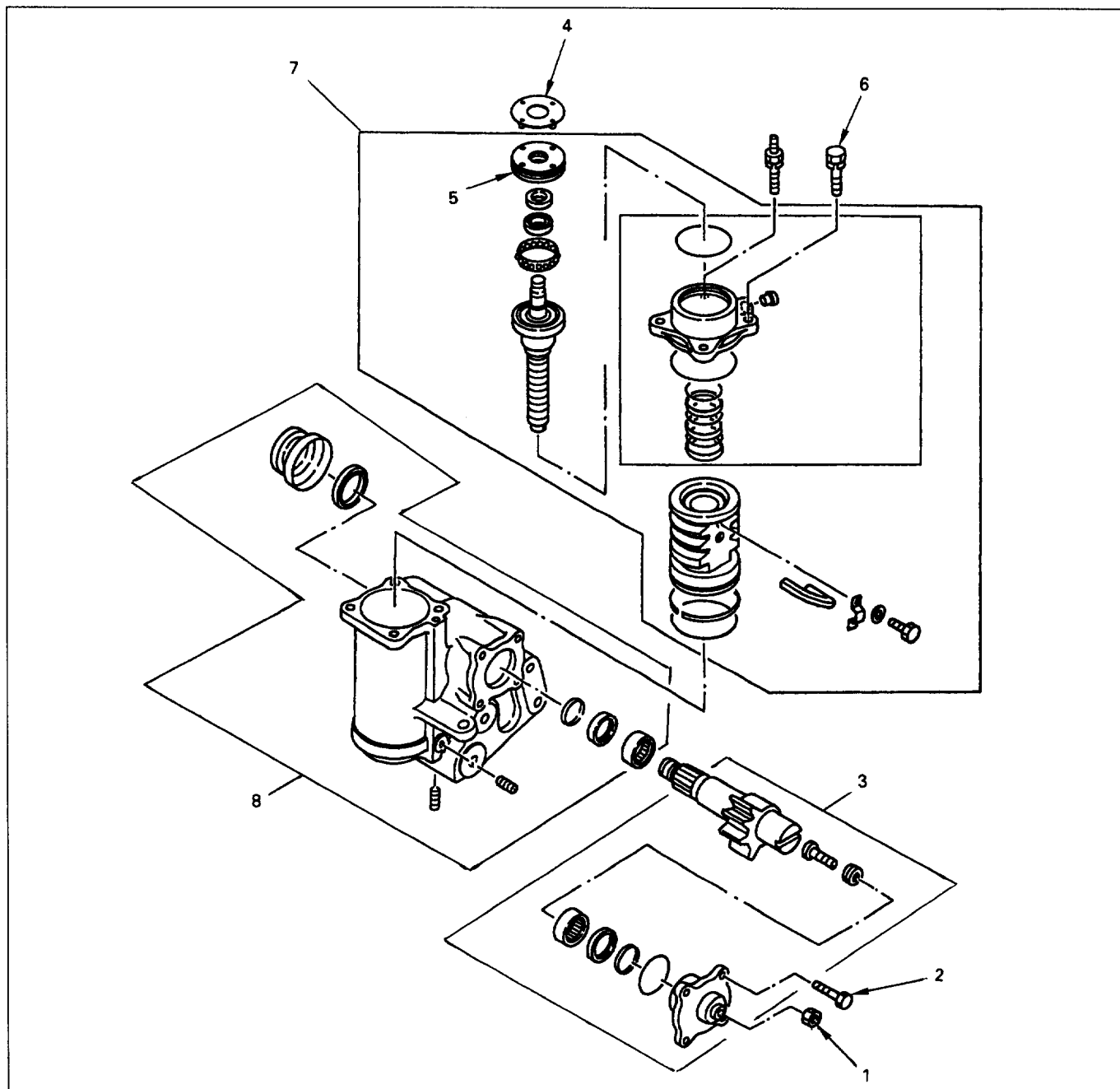


# UNIT REPAIR

## POWER STEERING UNIT (RHD MODEL)

### DISASSEMBLY

#### Power Steering Unit



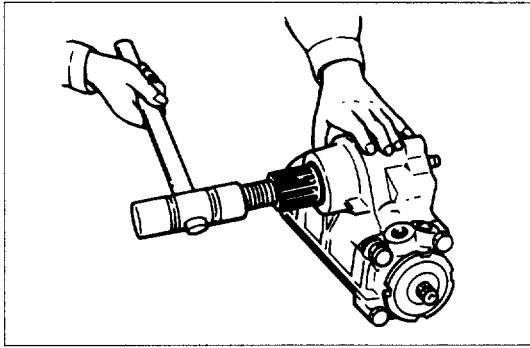
#### Disassembly Steps

1. Lock nut
2. Bolt
3. Sector shaft assembly and side cover assembly
4. Dust cover
5. Adjust plug
6. Bolt
7. Valve housing assembly
8. Body assembly





## Disassembly Steps

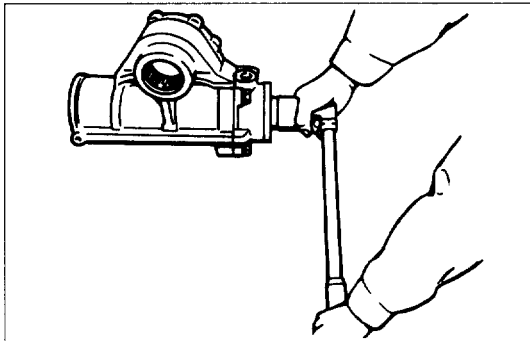


**1. Lock Nut**

**2. Bolt**

**3. Sector Shaft Assembly and Side Cover Assembly**

When removing, take care so as not to cause damage to the serrations, threads and oil seal.

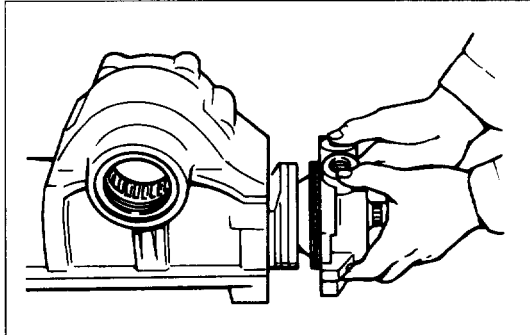


**4. Dust Cover**

**5. Adjust Plug**

Using adjust plug wrench.

Loosen the adjust plug, do not remove completely.



**6. Bolt**

**7. Valve Housing Assembly**

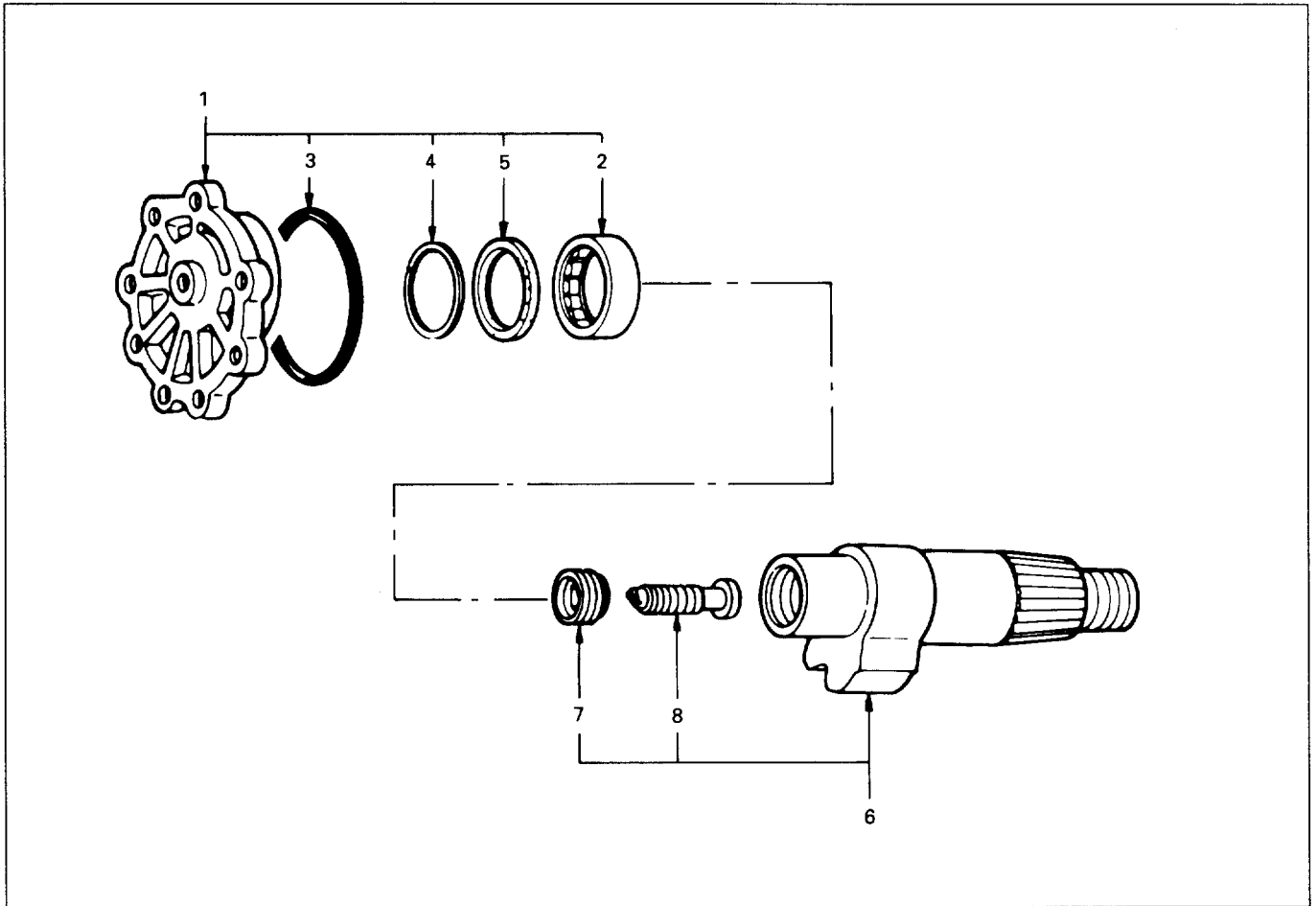
Remove piston with valve housing.

Always keep ball-nut assembly in a horizontal position and avoid holding it vertically.

**8. Body Assembly**



## Side Cover and Sector Shaft Assembly



### Disassembly Steps

1. Side cover assembly
2. Bearing
3. O-ring
4. Back up ring
5. Y-gasket
6. Sector shaft assembly
7. Retainer
8. Adjust screw



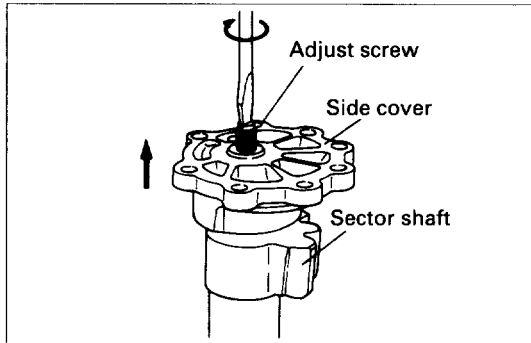


## Disassembly Steps

If the sector shaft is going to be fixed on the bench vice during disassembly, be sure to protect the sector shaft with cloth or other soft material.

### 1. Side Cover

Gradually turn the adjustment screw clockwise, and the side cover assembly will be lifted. Thus, you can separate the side cover assembly from the sector shaft assembly.



### 2. Bearing

Unless otherwise a problem, it is not necessary to disassembly.

### 3. O-ring

### 4. Back Up Ring



### 5. Y-Gasket

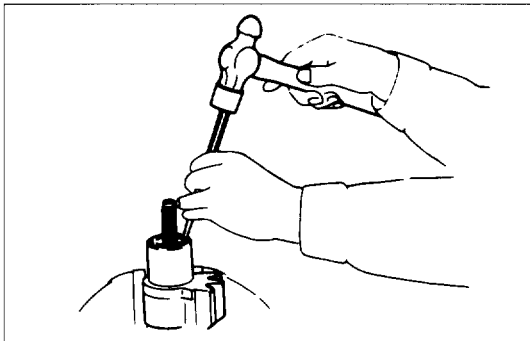
Using needle, scriber or equivalent.

### 6. Sector Shaft Assembly

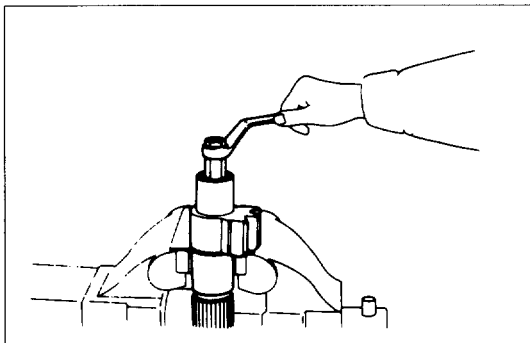
Unless otherwise a problem, it is not necessary to disassembly.

### 7. Retainer

1) Raise the two lips of the retainer.



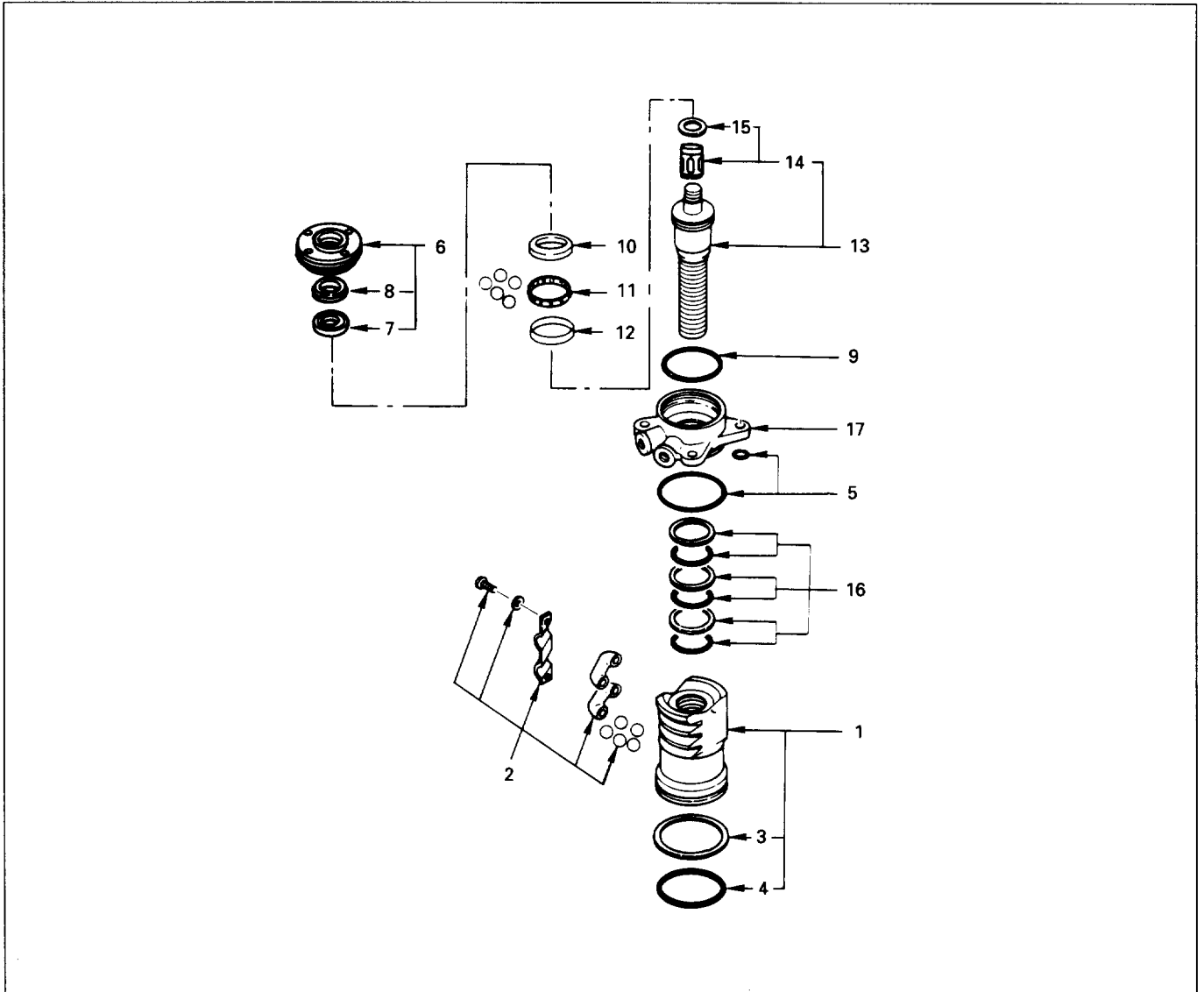
2) Using retaining bar.



### 8. Adjust Screw



## Valve Housing Assembly



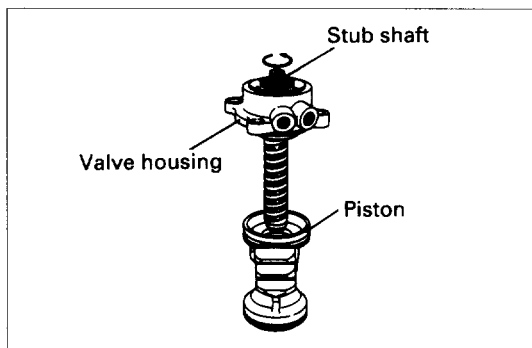
### Disassembly Steps

- |  |                          |
|--|--------------------------|
| 1. Piston assembly                         | 9. O-ring                |
| 2. Ball, tube, tube grip, screw and washer | 10. Upper race           |
| 3. Seal ring                               | 11. Cage and ball        |
| 4. O-ring                                  | 12. Lower race           |
| 5. O-ring                                  | 13. Worm shaft assembly  |
| 6. Adjust plug assembly                    | 14. Rotor                |
| 7. Bearing                                 | 15. O-ring               |
| 8. Oil seal                                | 16. Seal ring and O-ring |
|  | 17. Valve housing        |





## Disassembly Steps



### 1. Piston Assembly

Hold the housing with the piston end facing downward, and turn the stub shaft counterclockwise. Then, the worn shaft can be removed from the piston.



### CAUTION:

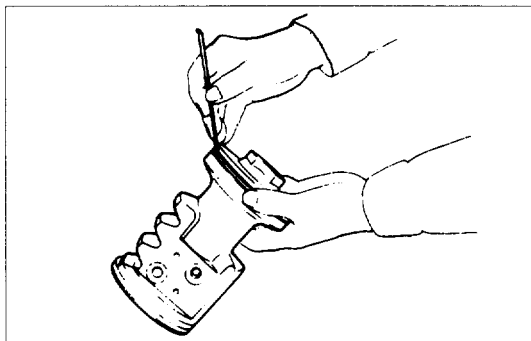
The steel ball put in the ball race for the piston and worm shaft will drop inside of the piston. Be careful not to let the piston fall down.

### 2. Ball, Tube, Tube Grip, Screw and Washer

Be careful to lost the ball when remove the ball tube.

Number of Balls

28



### 3. Seal Ring

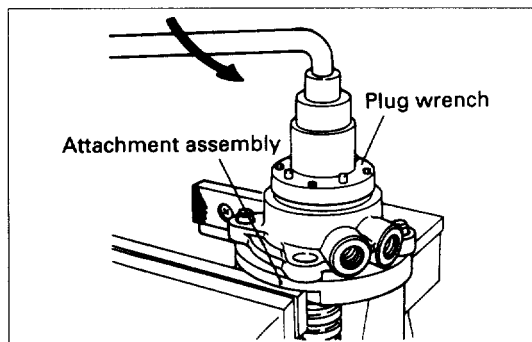
### 4,5.O-ring

Using needle, scribe or equivalent.



### 6. Adjust Plug

Using adjust plug wrench.



### 7. Bearing

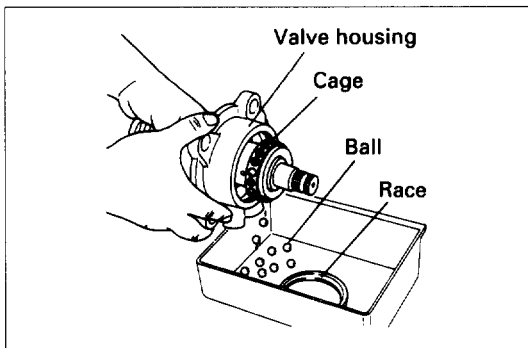
### 8. Oil Seal

### 9. O-ring

Using needle, scribe or equivalent

### 10. Upper Race



**11. Cage and Ball**

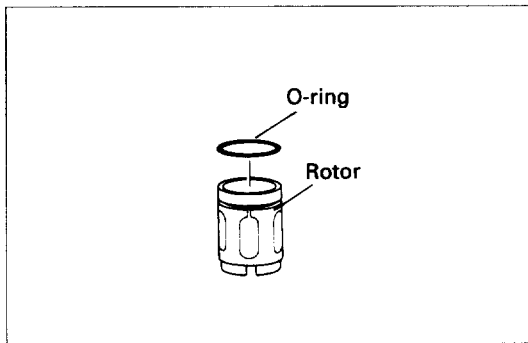
Be careful to lost the ball when remove the side race.

Number of Balls

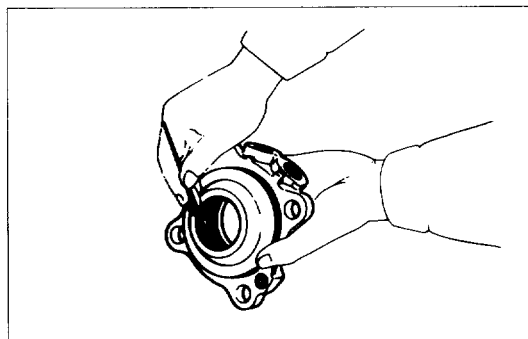
17

**12. Lower Race****13. Worm Shaft Assembly****14. Rotor****15. O-ring**

Using needle, scribe or equivalent.

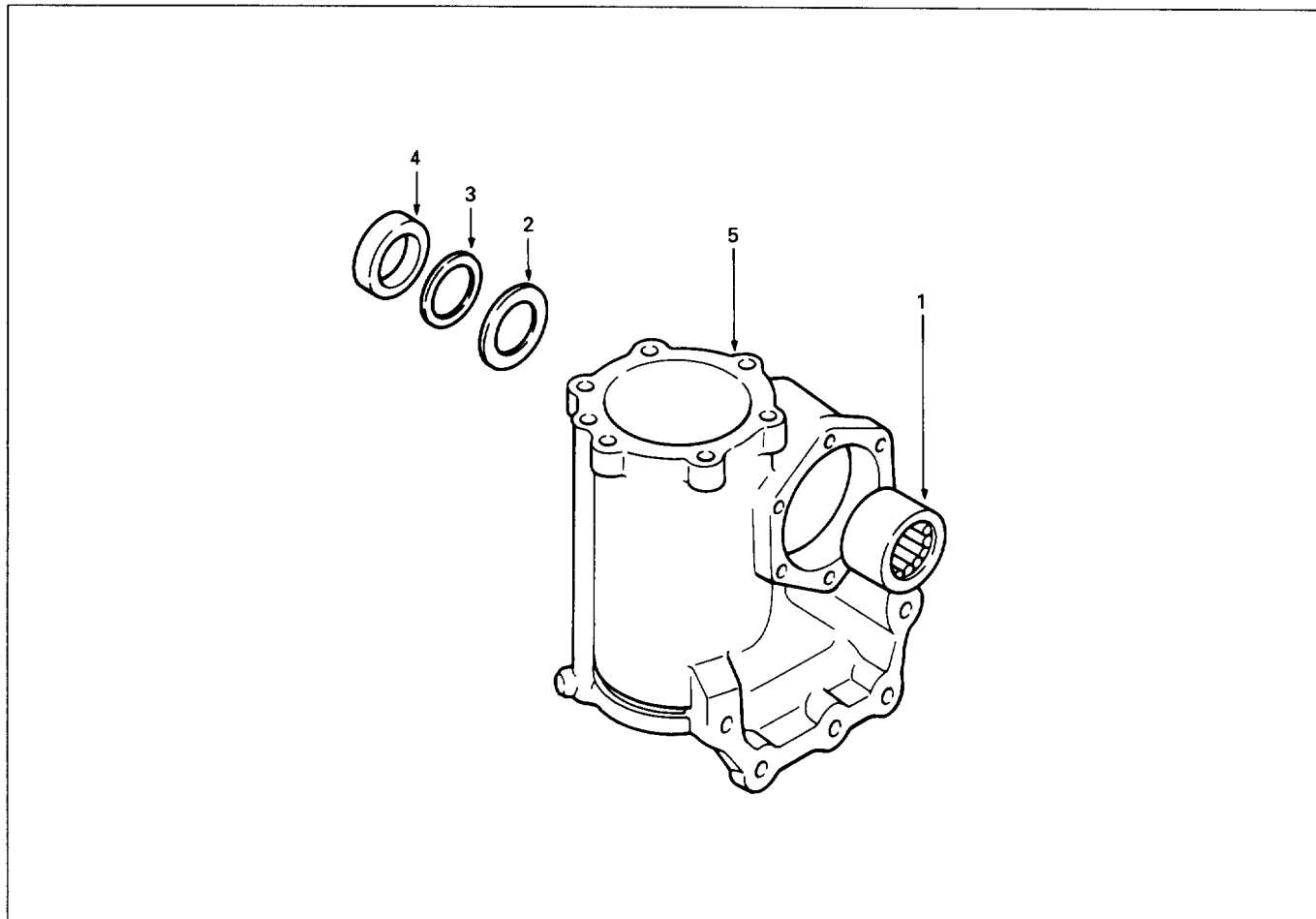
**16. Seal Ring and O-ring**

Using needle, scribe or equivalent.

**17. Valve Housing**



## Body Assembly



### Disassembly Steps

1. Bearing
2. Y-gasket
3. Back up ring
4. Oil seal
5. Body



### Disassembly Steps

#### 1. Bearing

Unless otherwise a problem, it is not necessary to disassemble.

#### 2. Y-gasket

#### 3. Back Up Ring

#### 4. Oil Seal

#### 5. Body



## INSPECTION AND REPAIR

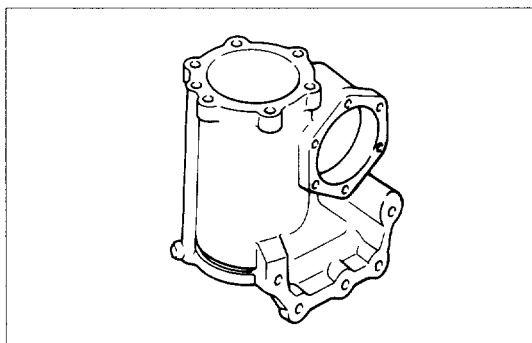
Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.

1. Gear box
2. Sector shaft
3. Needle roller bearing
4. Piston and worm shaft
5. Oil seal, Dust cover, Y-gasket, O-ring and seal ring



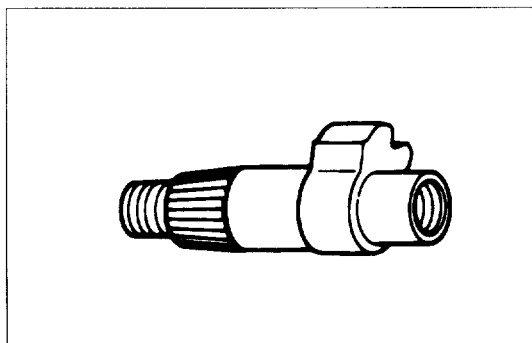
### Visual Check

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



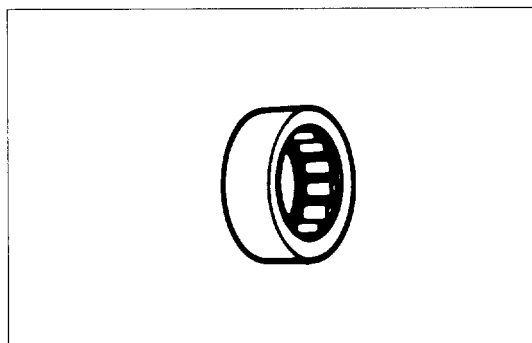
### Gear Box

Check the body for cracks and body inner surface and piston sliding surface or scratches.



### Sector Shaft

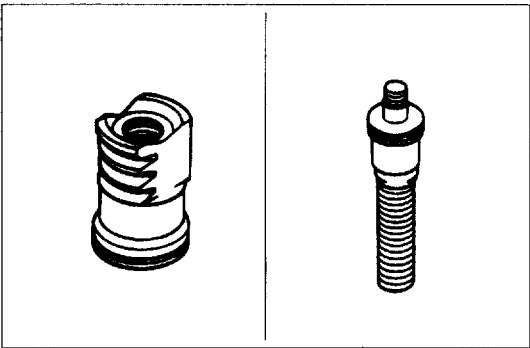
If the shaft is worn, twisted, scratched or partially worn, replace it with a new one.



### Bearing

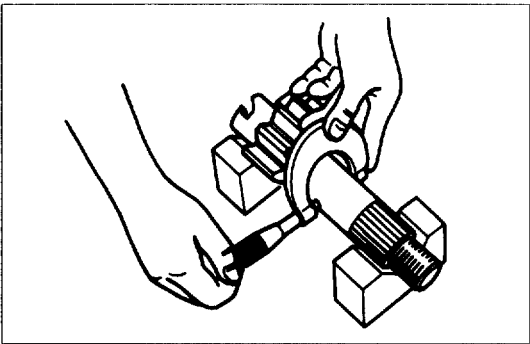
If the bearing race surface is worn, scratched or seized, replace it with a new one.





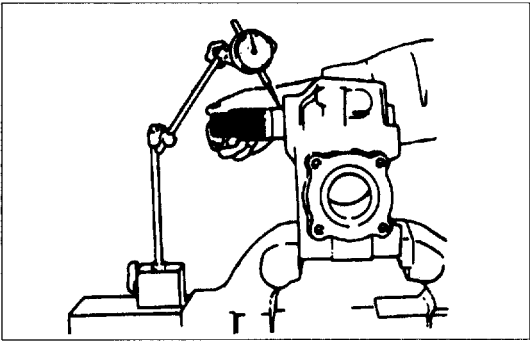
**Piston and Worm Shaft**

If the worm shaft inner surface, rotor outer surface or rotor pin is remarkable worn or play is excessive, replace with a new assembly.



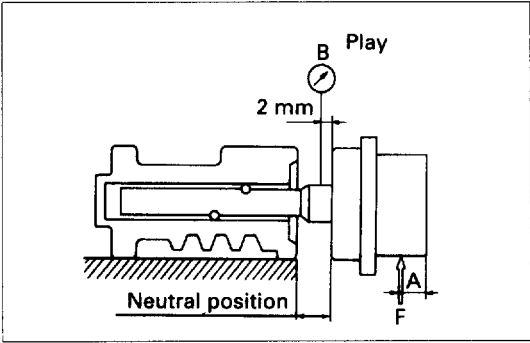
**Measurement of Sector Shaft Outside Diameter**

mm (in)	
Standard	Limit
39.975 (1.574)	39.925 (1.572)



**Measurement of Play between Sector Shaft and Needle Roller Bearing**

mm (in)	
Limit	0.12 (0.0047)



**Valve Housing Assembly**

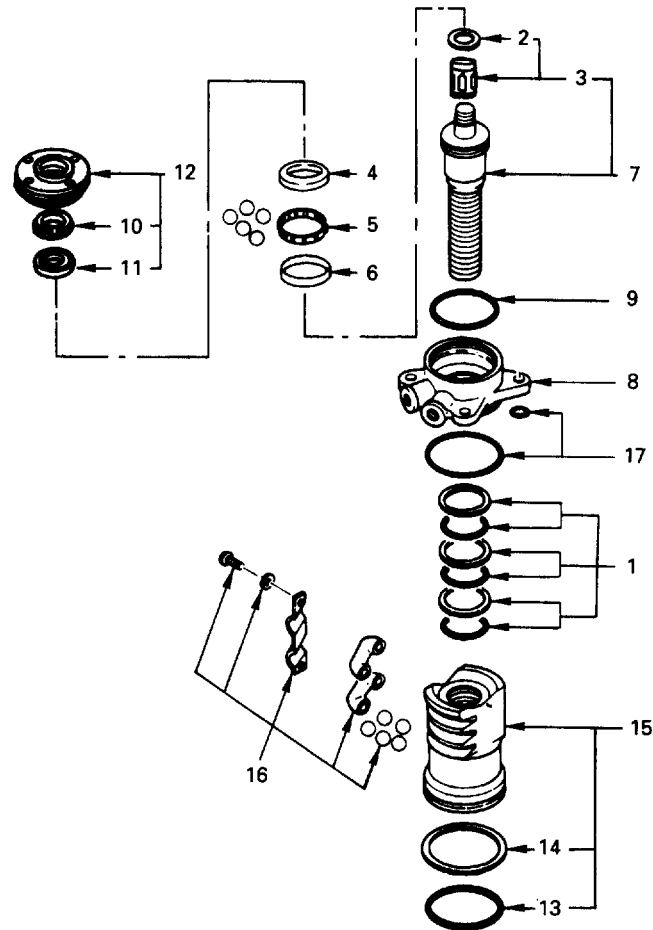
Measure the end play of the ball screw in the axial direction.

A mm (in)	F N (kg / lb)	B (end play) mm (in)
16 (0.6299)	39 (4 / 11)	0.5 (0.0197) or less



## REASSEMBLY

### Valve Housing Assembly



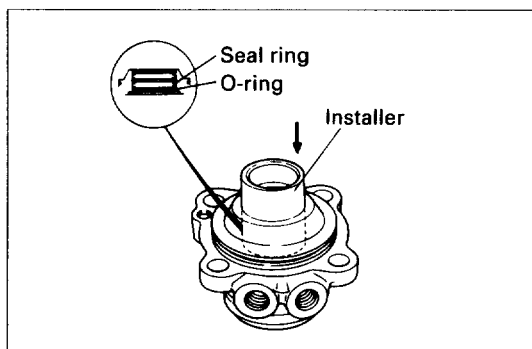
### Reassembly Steps

- |                         |   |
|-------------------------|---|
| 1. Seal ring and O-ring | 10. Oil seal                                |
| 2. Seal ring            | 11. Bearing                                 |
| 3. Rotor                | 12. Adjust plug assembly                    |
| 4. Upper race           | 13. O-ring                                  |
| 5. Cage and ball        | 14. Seal ring                               |
| 6. Lower race           | 15. Piston assembly                         |
| 7. Worm shaft assembly  | 16. Ball, tube, tube grip, screw and washer |
| 8. Valve housing        | 17. O-ring                                  |
| 9. O-ring               |   |



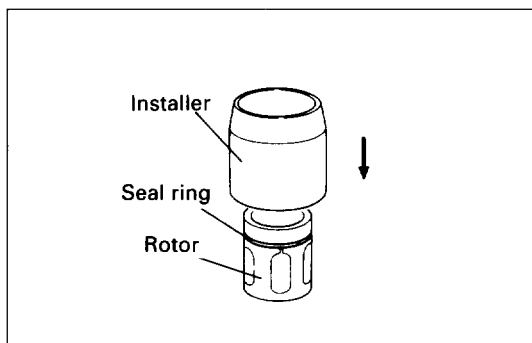


## Reassembly Steps



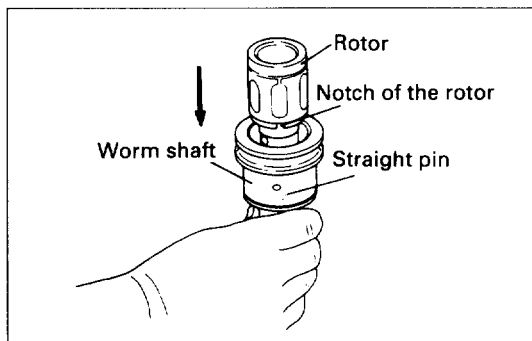
### 1. Seal Ring and O-ring

There are five grooves inside the valve housing (at the piston side). Put a seal ring and O-ring into each of the three narrower grooves. For shaping and alignment of the seal rings, use the installer.



### 2. Seal Ring

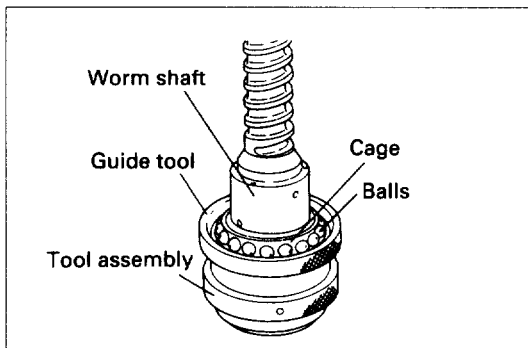
When the seal ring is installed, use installer for alignment.



### 3. Rotor

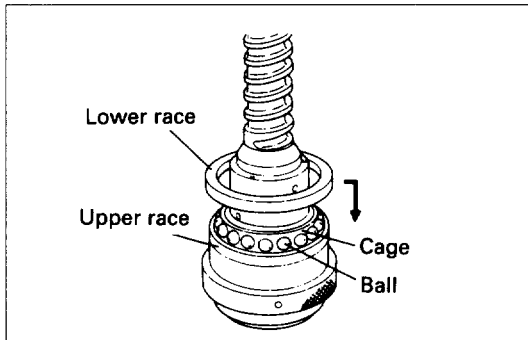
Put the rotor between the stub shaft and worm shaft so that the notch in the rotor may be properly matched with the straight pin at the inmost part.





4. **Upper Race**
5. **Cage and Ball**
6. **Lower Race**

- 1) Fix the guide tool to the tool assembly.
- 2) Insert the worm shaft assembly into the tool with the input end of the worm shaft assembly facing downward.
- 3) Mount the upper race, cage, and balls in that order.
- 4) Slide the tool downward, and the balls will be put in their positions.
- 5) Remove the guide tool, and mount the lower race.



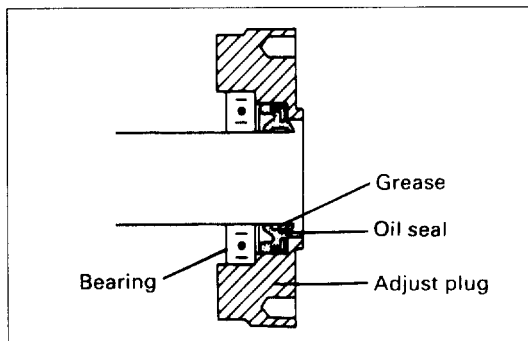
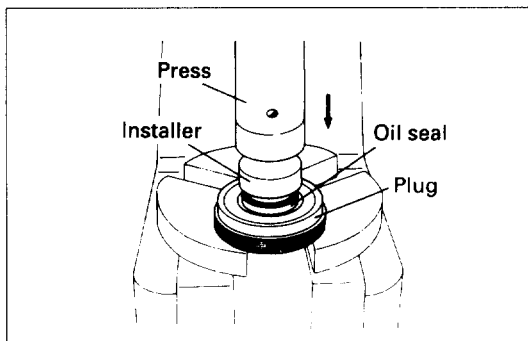
#### 7. **Worm Shaft Assembly**

#### 8. **Valve Housing**

#### 9. **O-ring**

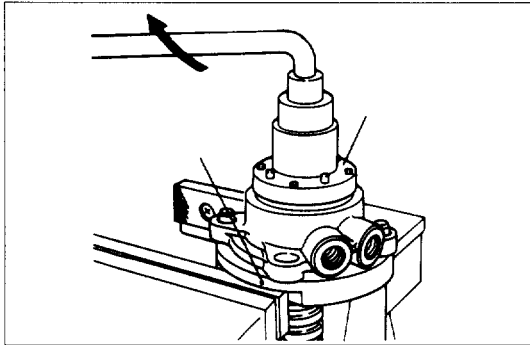
#### 10. **Oil Seal**

Using an adequate installer.



Note the setting direction.  
Apply bearing grease.



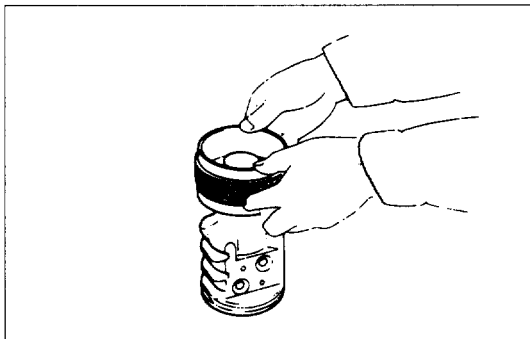
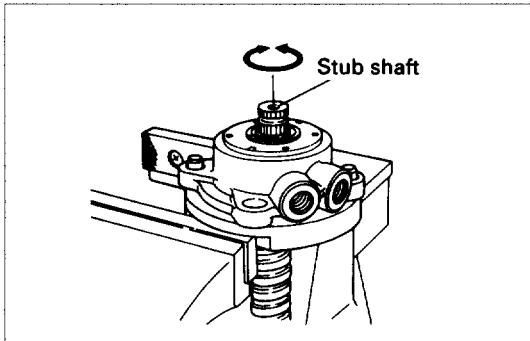


#### 11. Bearing



#### 12. Adjust Plug Assembly

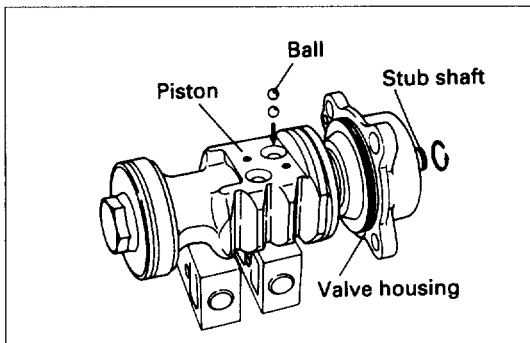
Fasten the adjust plug with a plug wrench. Make certain that the stub shaft can be rotated smoothly and evenly. Then, loosen the adjustment plug by about 180°.



#### 13. O-ring

#### 14. Seal Ring

When the O-ring and seal ring are installed, use installer for alignment.

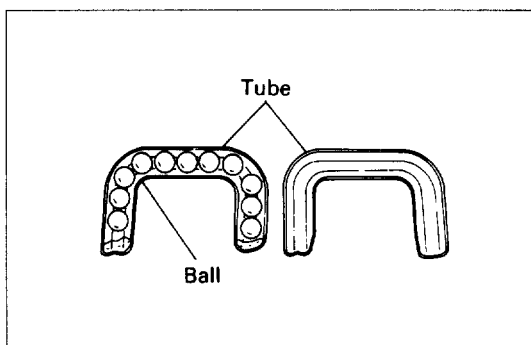


#### 15. Piston Assembly

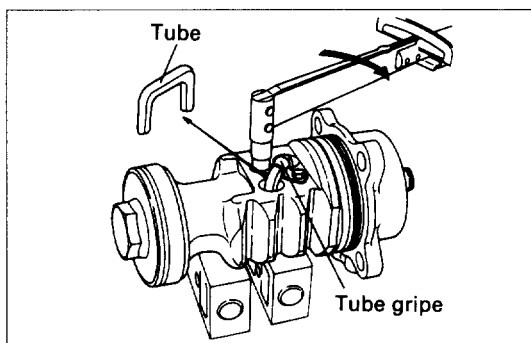
#### 16. Ball, Tube, Tube Grip, Screw and Washer

- 1) Put the valve housing assembly horizontally. Insert the ball into the ball tube hole in the piston while rotating the stub shaft. Thus, the ball can be easily mounted.





- 2) Apply a sufficient amount of grease to the inner surface of the tube. Put and paste the balls to the inner surface of the tube. Then, put the other ball tube onto the tube to which grease has been applied and the balls have been pasted.



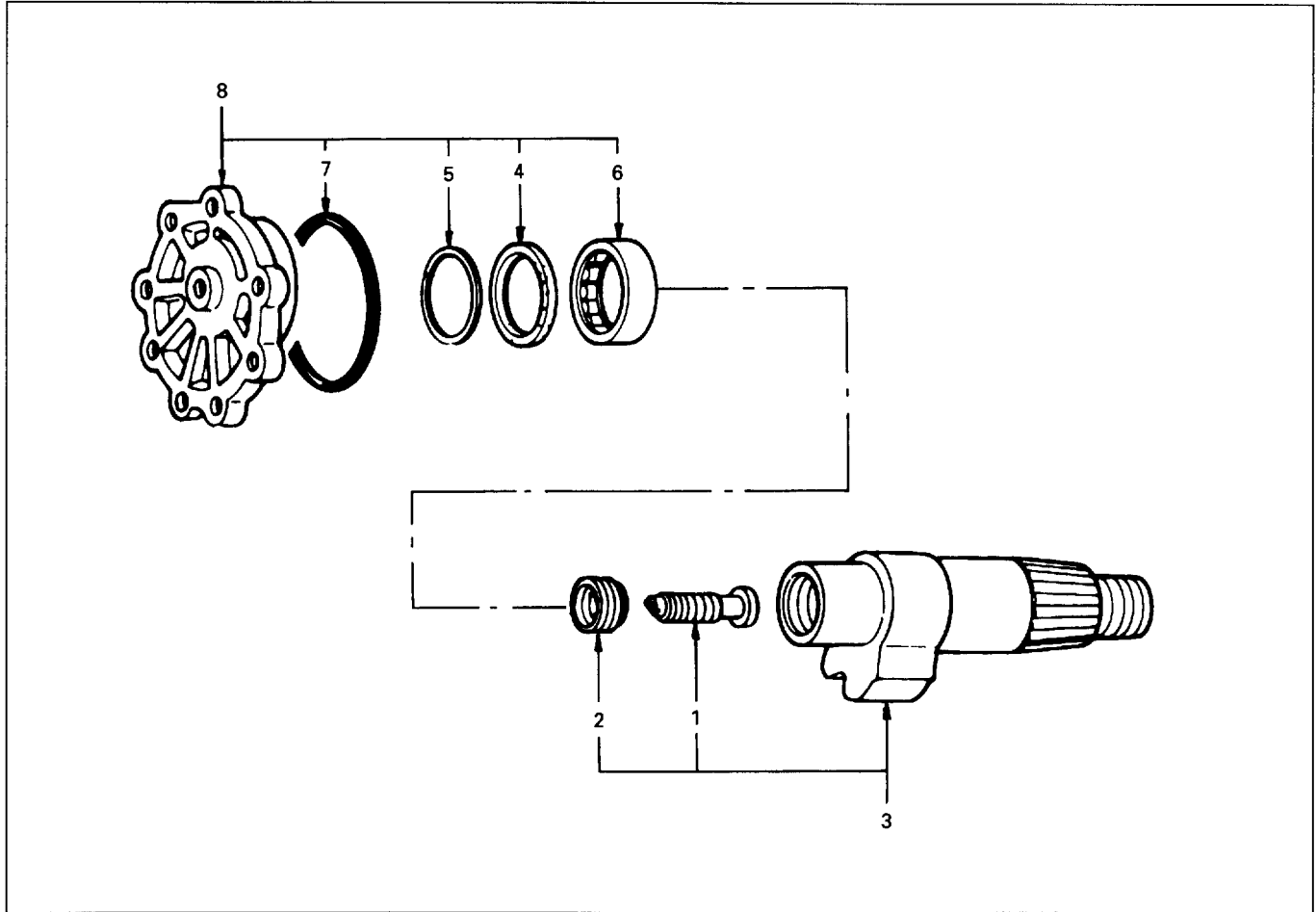
- 3) Then tighten the screw.

Tube Screw Torque	N•m (kg•m / lb•in)
	5 (0.5 / 43)

## 17. O-ring



## Sector Shaft Assembly and Side Cover Assembly



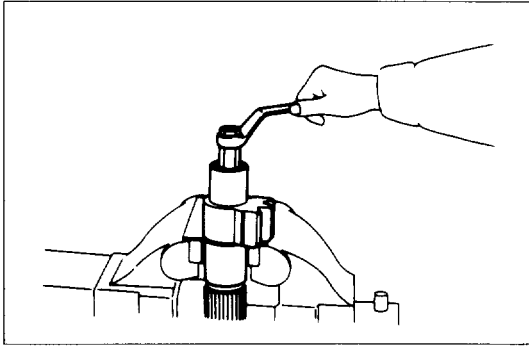
### Reassembly Steps

- |                          |                 |
|--------------------------|-----------------|
| 1. Adjust screw          | 5. Back up ring |
| 2. Retainer              | 6. Bearing      |
| 3. Sector shaft assembly | 7. O-ring       |
| 4. Y-gasket              | 8. Side cover   |





## Reassembly Steps



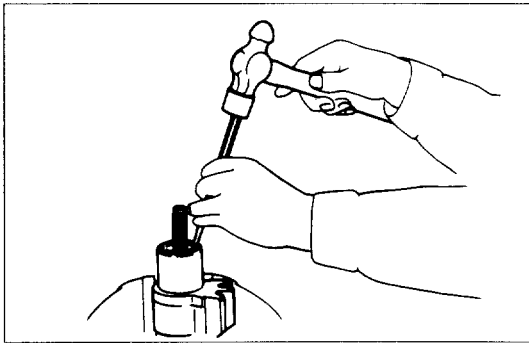
### 1. Adjust Screw

### 2. Retainer

Discard used retainer and install a new one.

Install and fully tighten the retainer and back off 180 degrees.

Retighten to a torque of 39N (4kg /44lb) and back off 20 degrees. Check that the adjusting screw turns smoothly.



Caulk the retainer in position.

### 3. Sector Shaft Assembly



### 4. Y-Gasket

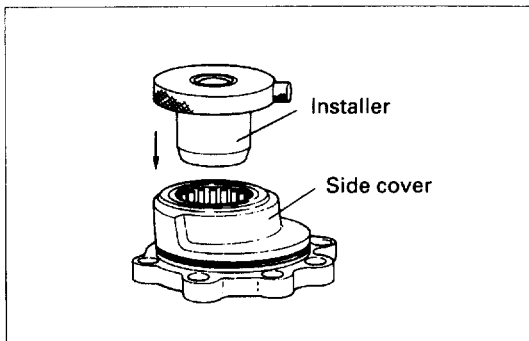
Install the gasket so that its lip faces to the bearing.  
If the lip is deformed, correct.

Apply grease to Y-gasket.



### 5. Back Up Ring

When the back up ring is installed, use installer for alignment.

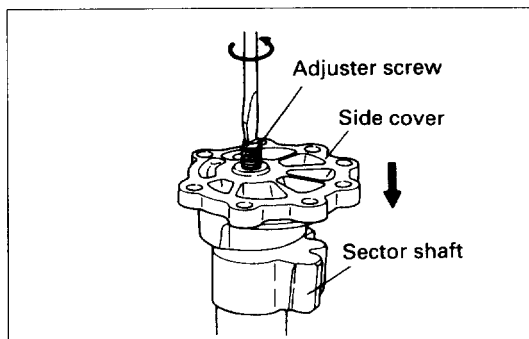


### 6. Bearing

### 7. O-ring

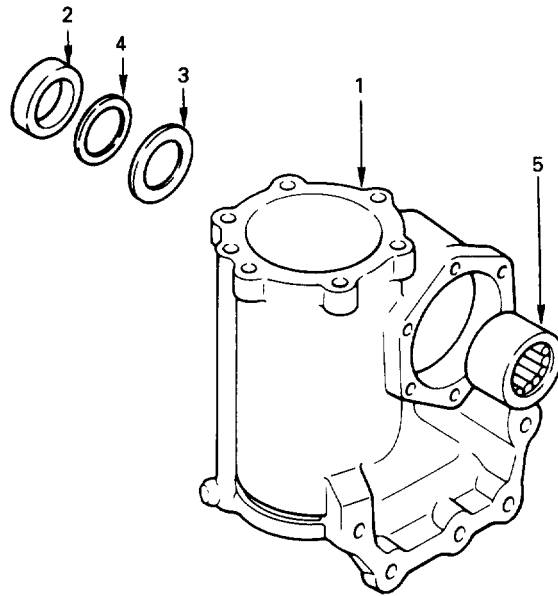
### 8. Side Cover Assembly

Mate the screw hole at the center of the side cover with the adjust screw on the sector shaft assembly, and fix the side cover assembly to the sector shaft assembly by turning the adjust screw counterclockwise.





## Body Assembly



### Reassembly Steps

- |             |                 |
|-------------|-----------------|
| 1. Body     | 4. Back up ring |
| 2. Oil seal | 5. Bearing      |
| 3. Y-gasket |                 |





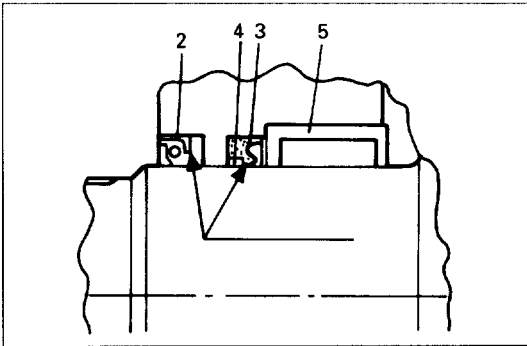
## Reassembly Steps



Note the direction of installation.



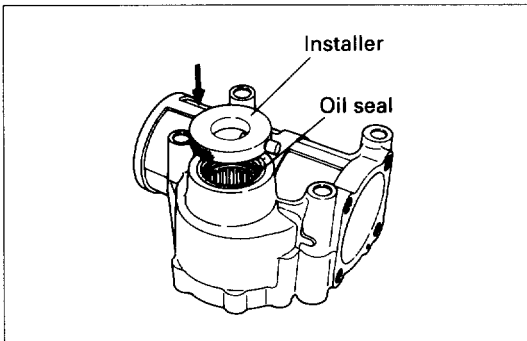
Apply grease to these parts.



### 1. Body

### 2. Oil Seal

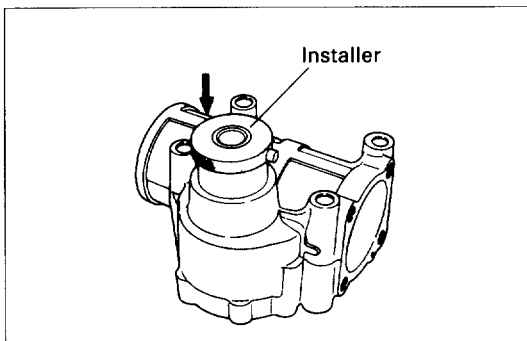
Using installer.



### 3. Y-gasket

### 4. Back Up Ring

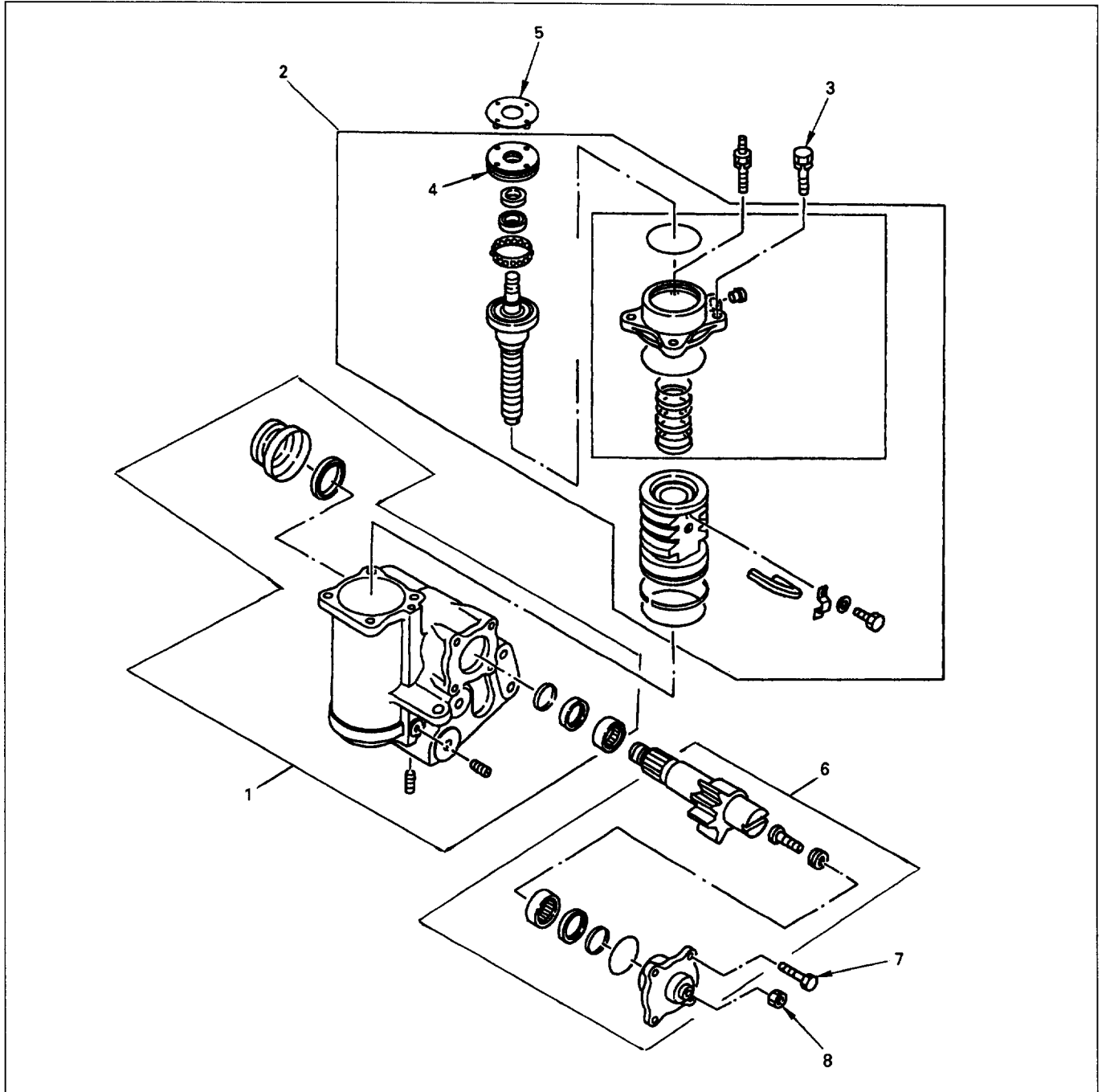
When the back up ring is installed, use installer for alignment.



### 5. Bearing



## Power Steering Unit



### Reassembly Steps

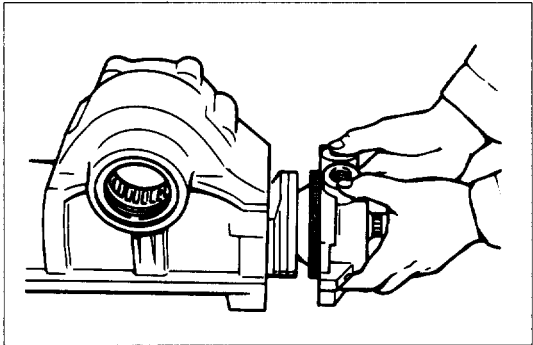
1. Body assembly
2. Valve housing assembly
3. Bolt
4. Adjust plug assembly
5. Dust cover
6. Sector shaft assembly and side cover assembly
7. Bolt
8. Lock nut





## Reassembly Steps

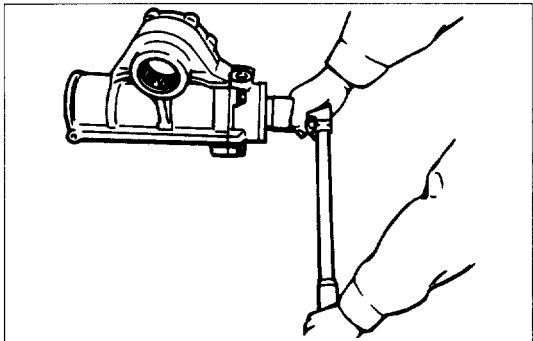
1. Body Assembly
2. Valve Housing Assembly



Valve Housing Assembly Bolt Torque	N•m (kg•m/lb•ft)
NHR, NKR	59 ( 6.0 / 43)
NPR, NQR, NPS	103 (10.5 / 76)

Install the parts with the valve side turned to front and worm gear of piston toward the sector gear. Apply liquid to the valve housing contact surface.

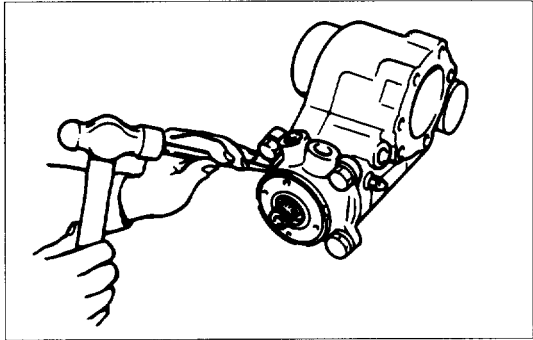
3. Bolt
4. Adjust Plug Assembly



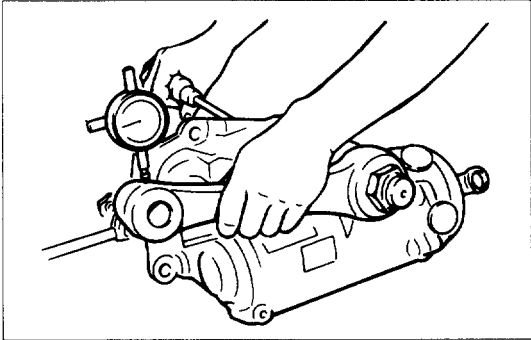
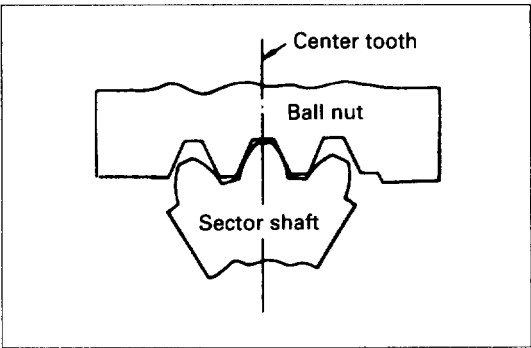
Adjust Plug Torque	N•m (kg•m/lb•ft)
	157 (16 / 116)

After tightening the lock nut, check the mark applied previously to see if the adjust plug has been turned with lock nut.

Caulk the lock nut after tightening.







**6. Sector Shaft Assembly and Side Cover Assembly**

**7. Bolt**



Side Cover Bolt Torque	N•m (kg•m/lb•ft)
59 (6.0 / 43)	



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

**8. Lock Nut**

- 1) Install drop arm.
- 2) Hold the sector shaft in a straight ahead position.
- 3) With the adjust screw, adjust the backlash to specification.



Backlash between Sector Shaft and Ball Nut	mm (in)
0.05 – 0.25 (0.0020 – 0.0098)	

- 4) Tighten the lock nut.



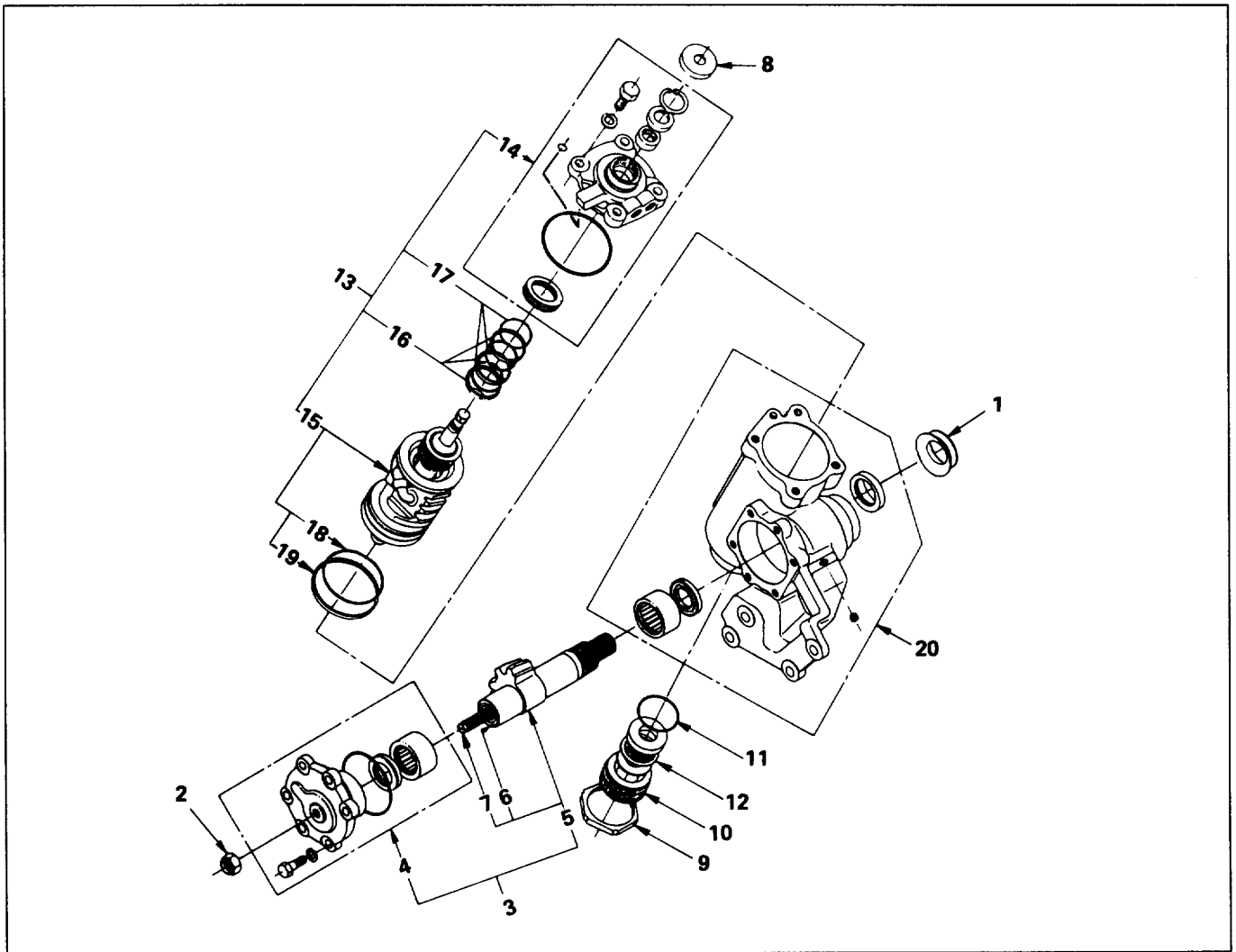
Lock Nut Torque	N•m (kg•m/lb•ft)
69 ( 7.0 / 51)	



# POWER STEERING UNIT (LHD MODEL)

## DISASSEMBLY

### Power Steering Unit



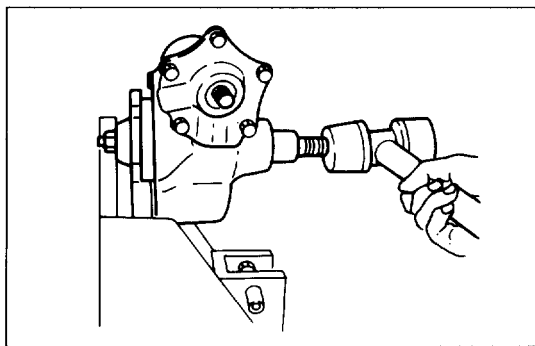
### Disassembly Steps

- |   |   |
|---|---|
| 1. Dual seal                            | 11. O-ring                                |
| 2. Lock nut                             | 12. Bearing                               |
| 3. Side cover and sector shaft assembly | 13. Valve housing and ball screw assembly |
| 4. Side cover assembly                  | 14. Valve housing assembly                |
| 5. Sector shaft assembly                | 15. Ball screw assembly                   |
| 6. Retainer                             | 16. O-ring                                |
| 7. Adjust screw                         | 17. Tefron ring                           |
| 8. Dust seal                            | 18. Tefron ring                           |
| 9. End cover lock nut                   | 19. O-ring                                |
| 10. End cover                           | 20. Gear box assembly                     |





## Disassembly Steps



### 1. Dual Seal

### 2. Lock Nut

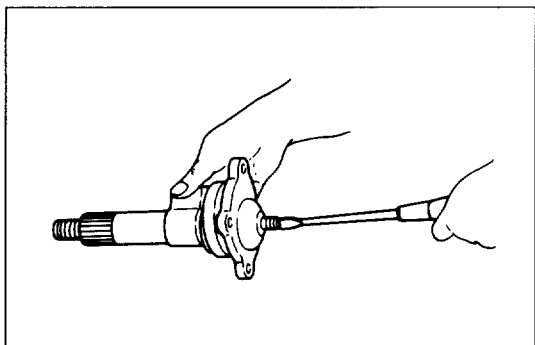


### 3. Side Cover and Sector Shaft Assembly

Align the sector shaft to neutral position by turning the input shaft to lock and backing off approx. 2.5 turns.

Turn the adjust screw counter-clockwise slightly, then remove the side cover fixing bolts.

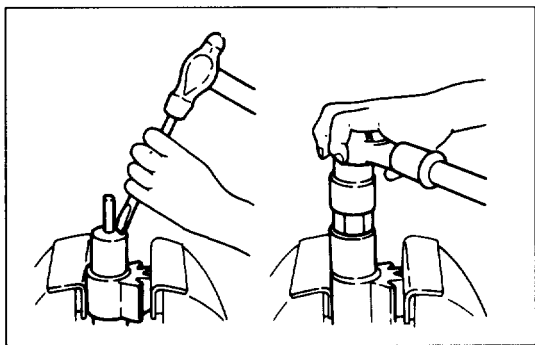
Then remove the side cover and sector shaft assembly by tapping on the end of sector shaft with a plastic hammer.



### 4. Side Cover Assembly

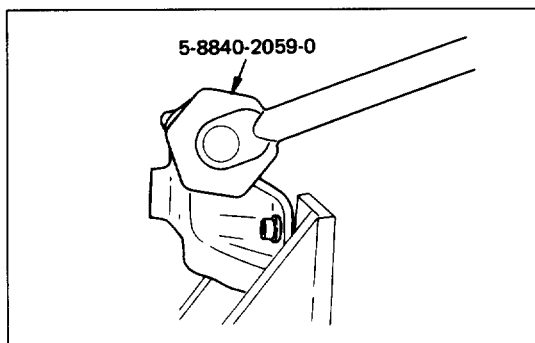
### 5. Sector Shaft Assembly

Remove the sector shaft assembly from the side cover assembly by turning the adjust screw clockwise.



### 6. Retainer

Flatten out caulked portion of the retainer.



### 7. Adjust Screw

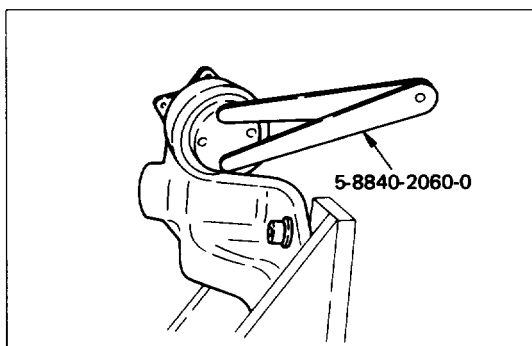
### 8. Dust Seal

### 9. End Cover Lock Nut

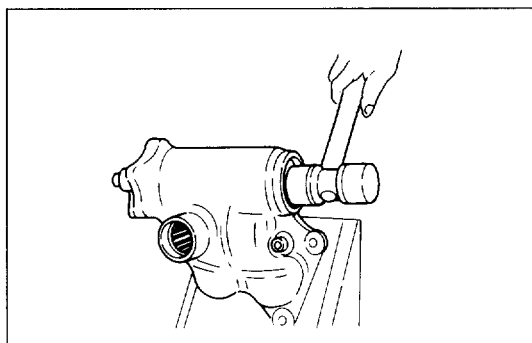


Lock Nut Wrench : 5-8840-2059-0



**10. End Cover**

Wrench : 5-8840-2060-0

**11. O-ring****12. Bearing****13. Valve Housing and Ball Screw Assembly**

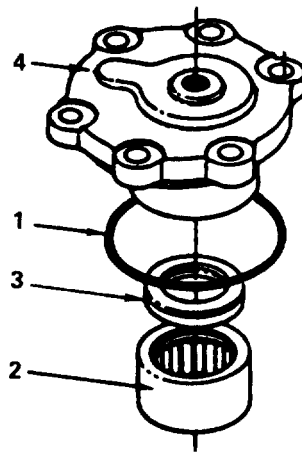
Always keep the ball screw assembly in a horizontal position and avoid holding it vertically, or ball nut will slide out.

Remove this assembly by tapping on the end of ball screw assembly with a plastic hammer.

**14. Valve Housing Assembly****15. Ball Screw Assembly****16. O-ring****17. Tefron Ring****18. Tefron Ring****19. O-ring****20. Gear Box Assembly**



## Side Cover Assembly



### Disassembly Steps

- |                   |               |
|-------------------|---------------|
| 1. O-ring         | 3. U-packing  |
| 2. Needle bearing | 4. Side cover |

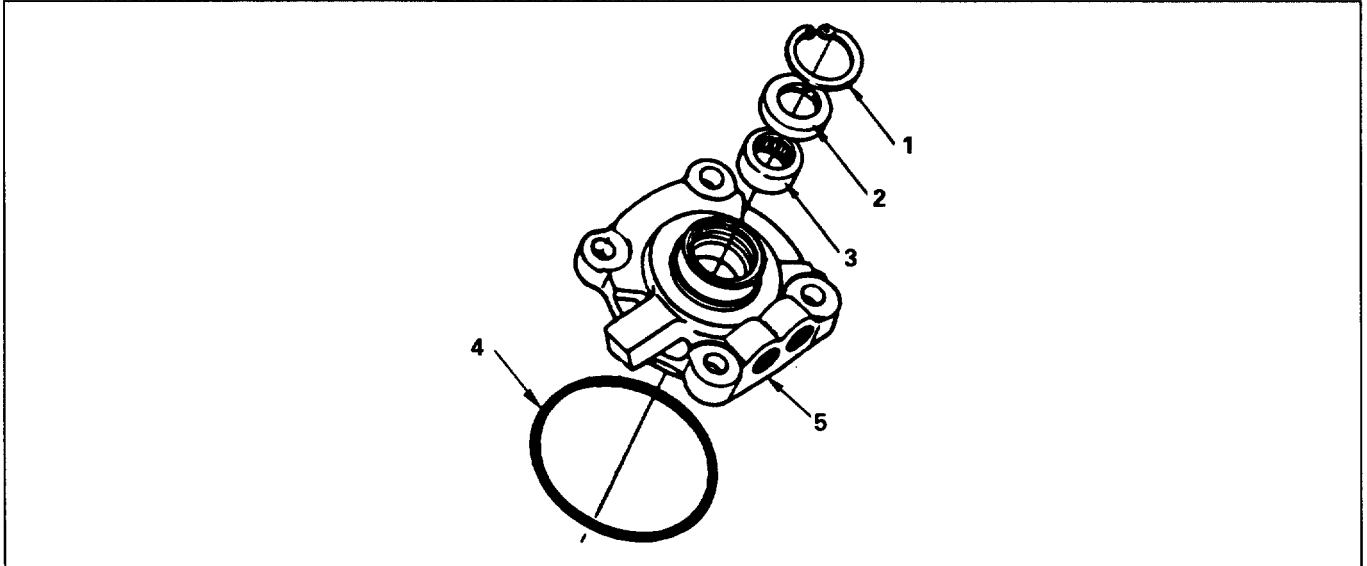


### Disassembly Steps

1. O-ring
2. Needle Bearing
3. U-Packing
4. Side Cover



## Valve Housing Assembly



### Disassembly Steps

1. Snap ring
2. Oil seal
3. Needle bearing
4. O-ring
5. Valve housing

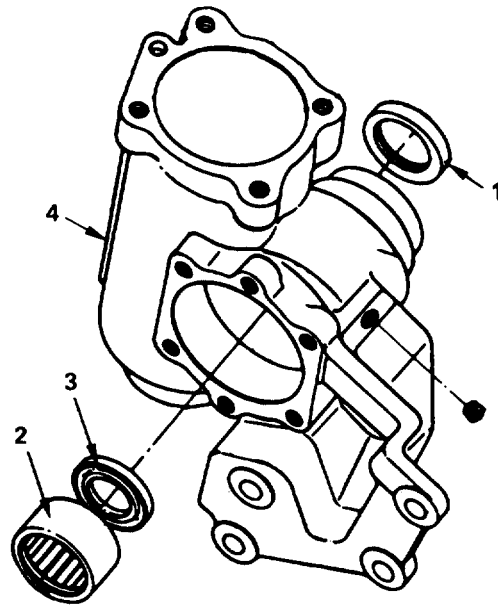


### Disassembly Steps

1. Snap Ring
2. Oil Seal
3. Needle Bearing
4. O-ring
5. Valve Housing



## Gear Box Assembly



### Disassembly Steps

- |                   |              |
|-------------------|--------------|
| 1. Oil seal       | 3. U-packing |
| 2. Needle bearing | 4. Body      |



### Disassembly Steps

1. Oil Seal
2. Needle Bearing
3. U-Packing
4. Body



## INSPECTION AND REPAIR

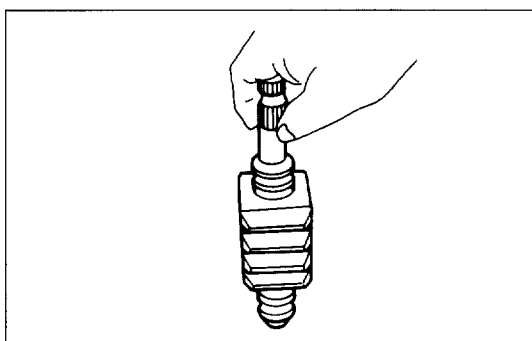
Make the necessary adjustments, repairs, and part replacements if excessive wear or damage is discovered during inspection.

- Body
- Sector shaft
- Needle bearing
- Ball screw assembly
- Oil seal, dust cover, U-packing, O-ring and seal ring



### Visual Checks

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

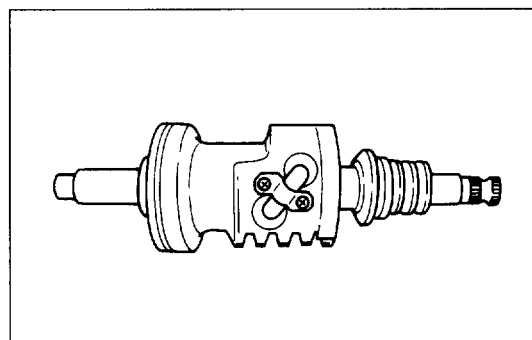


### Ball Nut Rotation

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 burrs, dents and presence of foreign matter.

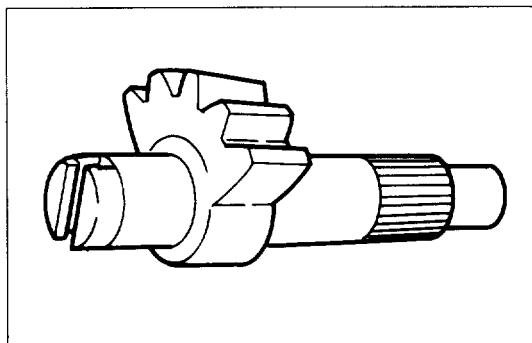
#### NOTE:

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



### Ball Screw Assembly

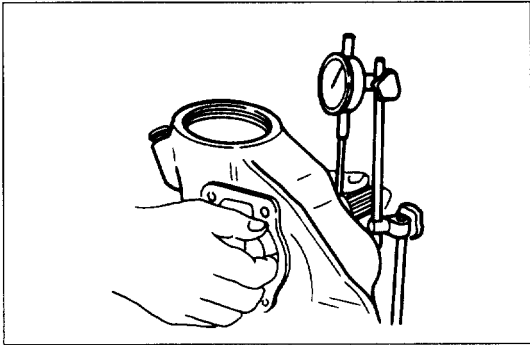
- Ball screw assembly and control valve assembly include precision finished parts of selective fitting. The entire assemblies should be replaced with new one.
- Always keep ball screw assembly in a horizontal position and avoid holding it vertically, or ball nut will slide out.



### Measurement of Sector Shaft Outside Diameter

Sector Shaft Outside Diameter		mm(in.)
Standard	Limit	
38.125 (1.501)	38.043 (1.4978)	



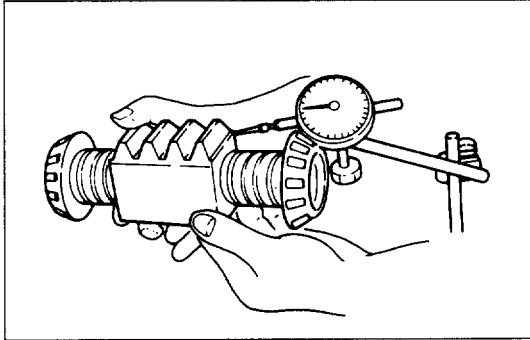


**Sector Shaft and Needle Bearing Play**

mm(in.)

Limit

0.2 (0.008)



**Ball Nut Axial Play**

mm(in.)

Limit

0.12 (0.0047)



**Clearance between Gear Box and Ball Nut Piston**

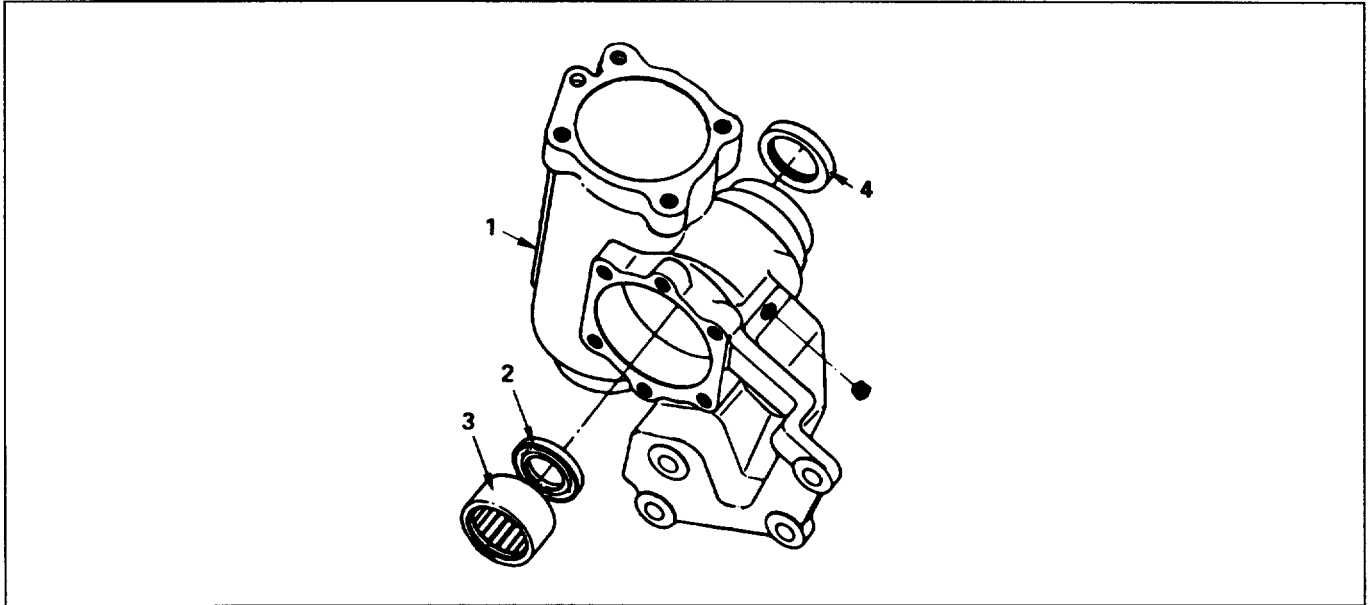
mm(in.)

Standard	Limit
0.04 – 0.09 (0.0016 – 0.0035)	0.15 (0.0059)



## REASSEMBLY

### Gear Box Assembly



#### Reassembly Steps

- |              |                   |
|--------------|-------------------|
| 1. Body      | 3. Needle bearing |
| 2. U-packing | 4. Oil seal       |

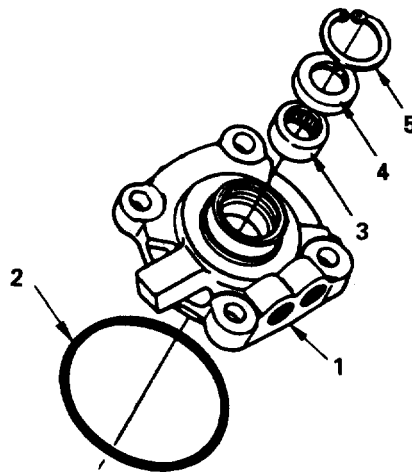


#### Reassembly Steps

1. Body
2. U-Packing
3. Needle Bearing
4. Oil Seal



## Valve Housing Assembly



### Reassembly Steps

- |                   |              |
|-------------------|--------------|
| 1. Valve housing  | 4. Oil seal  |
| 2. O-ring         | 5. Snap ring |
| 3. Needle bearing |              |

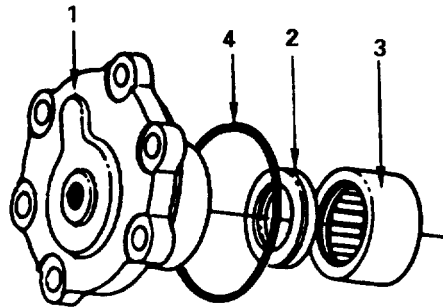


### Reassembly Steps

1. Valve Housing
2. O-ring
3. Needle Bearing
4. Oil Seal
5. Snap Ring



## Side Cover Assembly



### Reassembly Steps

- |               |                   |
|---------------|-------------------|
| 1. Side cover | 3. Needle bearing |
| 2. U-packing  | 4. O-ring         |

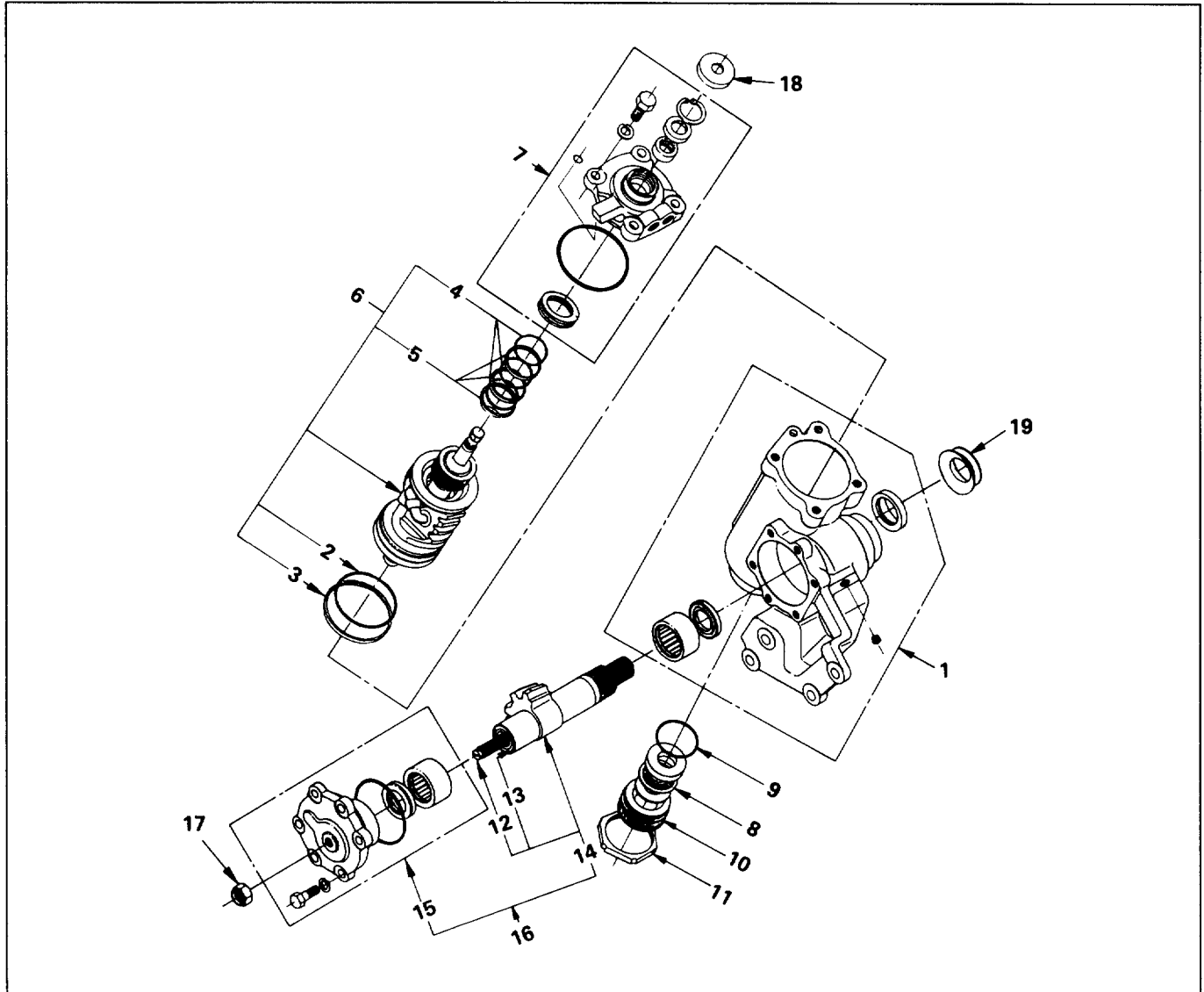


### Reassembly Steps

1. Side Cover
2. U-Packing
3. Needle Bearing
4. O-ring



## Power Steering Unit (LHD Model)



### Reassembly Steps

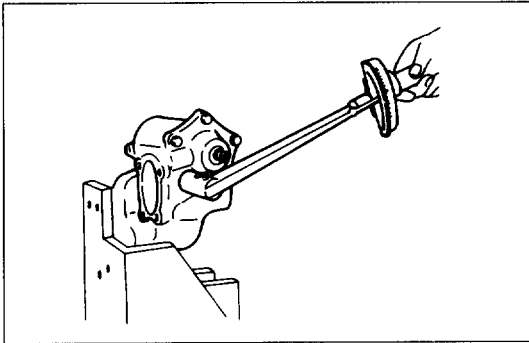
- |                           |  |
|---------------------------|--|
| 1. Gear box assembly      | 11. End cover lock nut                   |
| 2. Tefron ring            | 12. Adjust screw                         |
| 3. O-ring                 | 13. Retainer                             |
| 4. Tefron ring            | 14. Sector shaft assembly                |
| 5. O-ring                 | 15. Side cover assembly                  |
| 6. Ball screw assembly    | 16. Side cover and sector shaft assembly |
| 7. Valve housing assembly | 17. Lock nut                             |
| 8. Bearing                | 18. Dust seal                            |
| 9. O-ring                 | 19. Dust seal                            |
| 10. End cover             |  |





## Reassembly Steps

1. Gear Box Assembly
2. Tefron Ring
3. O-ring
4. Tefron Ring
5. O-ring
6. Ball Screw Assembly
7. Valve Housing Assembly

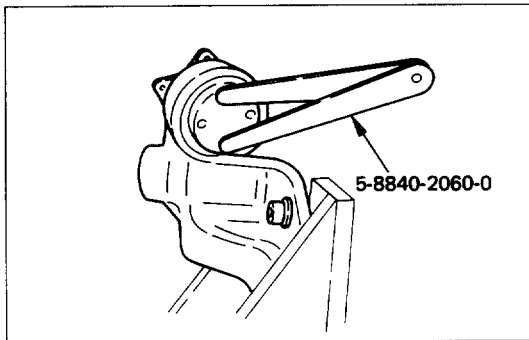


Valve Housing Bolt Torque	N•m (kg•m/lb•ft)
85 (8.7 / 63)	

8. Bearing
9. O-ring
10. End Cover

Tighten the end cover with a special wrench until the starting torque of input shaft become within the specified range.

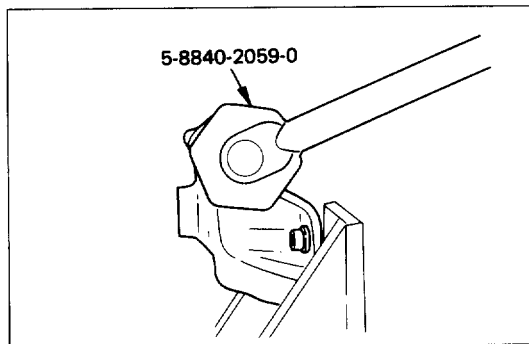
Wrench : 5-8840-2060-0



Starting Torque	N•m (kg•m/lb•ft)
0.29 – 0.49 (0.03 – 0.05 / 0.22 – 0.36)	

11. End Cover Lock Nut

Lock Nut Wrench : 5-8840-2059-0



Lock Nut Torque	N•m (kg•m/lb•ft)
201 (20.5 / 148)	

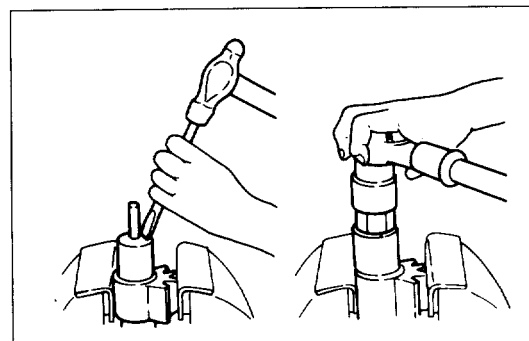
After tightening, recheck the starting torque of input shaft. Readjust the tightening of end cover if the starting torque is not within the specified range.

12. Adjust Screw
13. Retainer

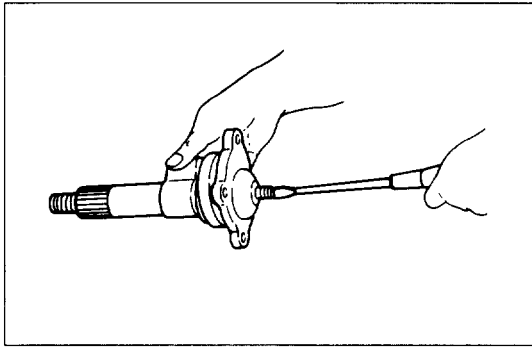
Discard used retainer and install a new one.

Install and fully tighten the retainer and back off 180 degrees. Retighten to a torque of 39 N•m (4 kg•m/29 lb•ft) and back off 20 degrees. Check that the adjust screw turns smoothly.

Caulk the retainer in position.



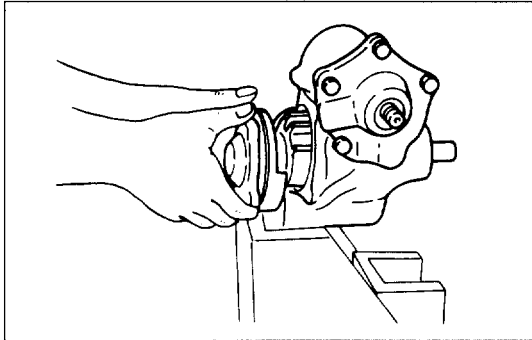




#### 14. Sector Shaft Assembly

#### 15. Side Cover Assembly

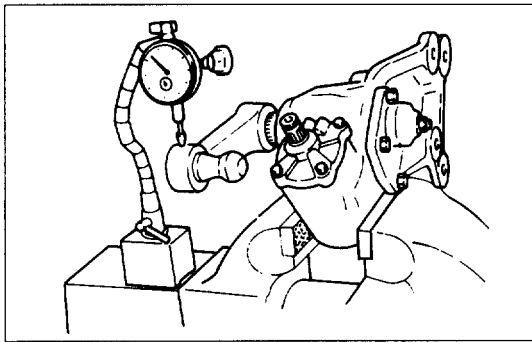
Turn the adjust screw counter-clockwise until the end of the sector shaft bottoms to the side cover, then back off 1 full turn.



#### 16. Side Cover and Sector Shaft Assembly

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

Side Cover Bolt Torque	N•m (kg•m/lb•ft)
47 (4.8 / 35)	



#### 17. Lock Nut

Adjust the backlash between the sector gear and ball screw.

- 1) Install the pitman arm.
- 2) Set the sector shaft in a straight ahead position.
- 3) With the adjust screw, adjust the backlash to the specification.

Backlash (at End of Pitman Arm)	mm(in.)
0.33 (0.013) or less	

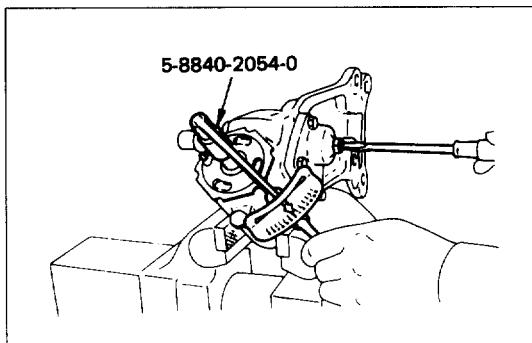
- 4) Lock the adjust screw with the lock nut.

Lock Nut Torque	N•m (kg•m/lb•ft)
69 (7 / 51)	

- 5) Inspect the starting torque of the input shaft.

Starting Torque	N•m (kg•m/lb•ft)
0.49 – 0.88 (0.05 – 0.09 / 0.36 – 0.65)	

Steering Shaft Driver : 5-8840-2054-0

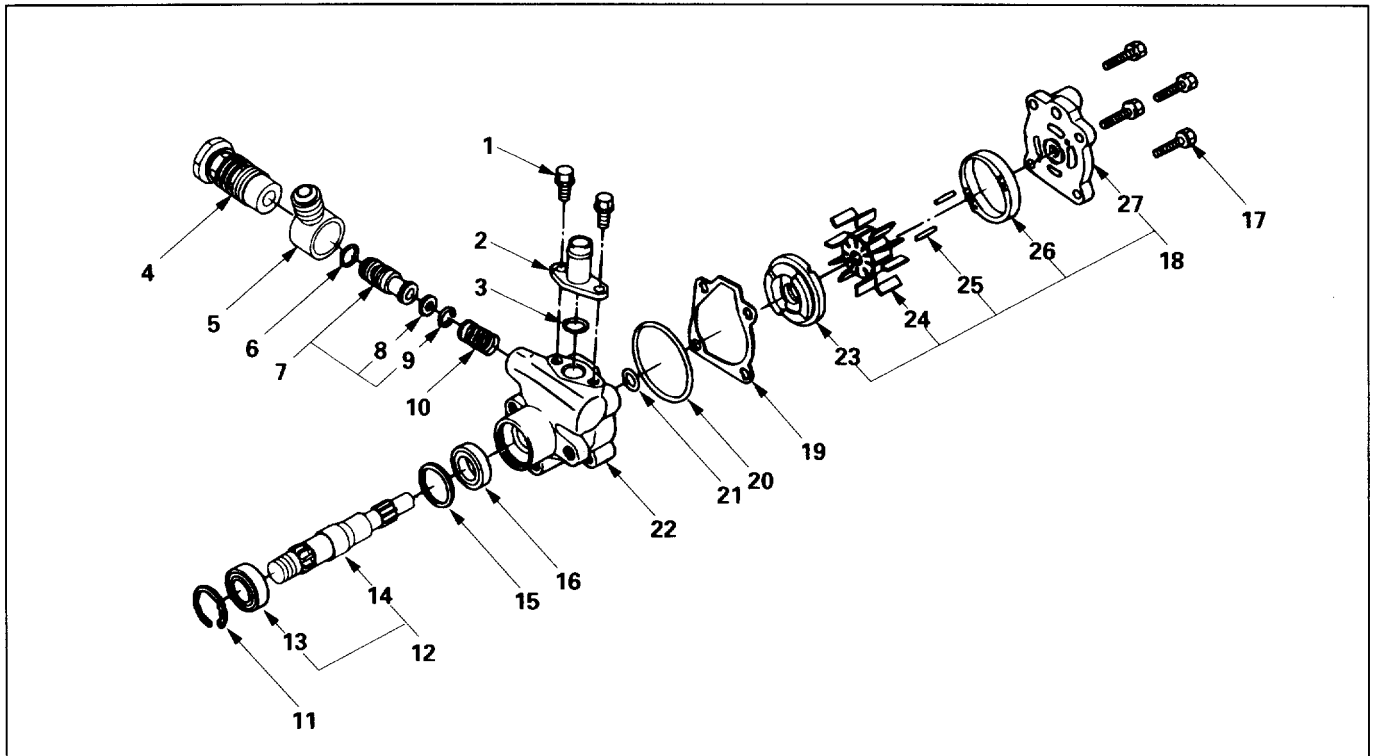




# POWER STEERING PUMP

## DISASSEMBLY

### 4J Series Engine



442LY00001

### Disassembly Steps

- |                    |  |
|--------------------|--|
| 1. Bolt            | 15. Retaining ring                           |
| 2. Pipe, suction   | 16. Oil seal                                 |
| 3. O-ring          | 17. Bolt                                     |
| 4. Connector       | 18. Rear housing assembly and pump cartridge |
| 5. Connector       | 19. Gasket                                   |
| 6. O-ring          | 20. O-ring                                   |
| 7. Valve           | 21. O-ring                                   |
| 8. Retaining ring  | 22. Front housing                            |
| 9. Filter          | 23. Pressure plate                           |
| 10. Spring         | 24. Rotor and vane                           |
| 11. Snap ring      | 25. Cam                                      |
| 12. Shaft assembly | 26. Pin                                      |
| 13. Bearing        | 27. Rear housing                             |
| 14. Shaft          |  |





## Disassembly Steps

### Preparation:

Clean oil pump with solvent (its plug discharge and suction port to prevent the entry of solvent). Be careful not to expose the oil seal of shaft assembly to solvent.

1. Bolt
2. Pipe, Suction
3. O-ring
4. Connector
5. O-ring
6. Valve
7. Retaining Ring
8. Filter
9. Spring
10. Retaining Ring
11. Shaft Assembly
12. Bearing
13. Shaft
14. Retaining Ring
15. Oil Seal



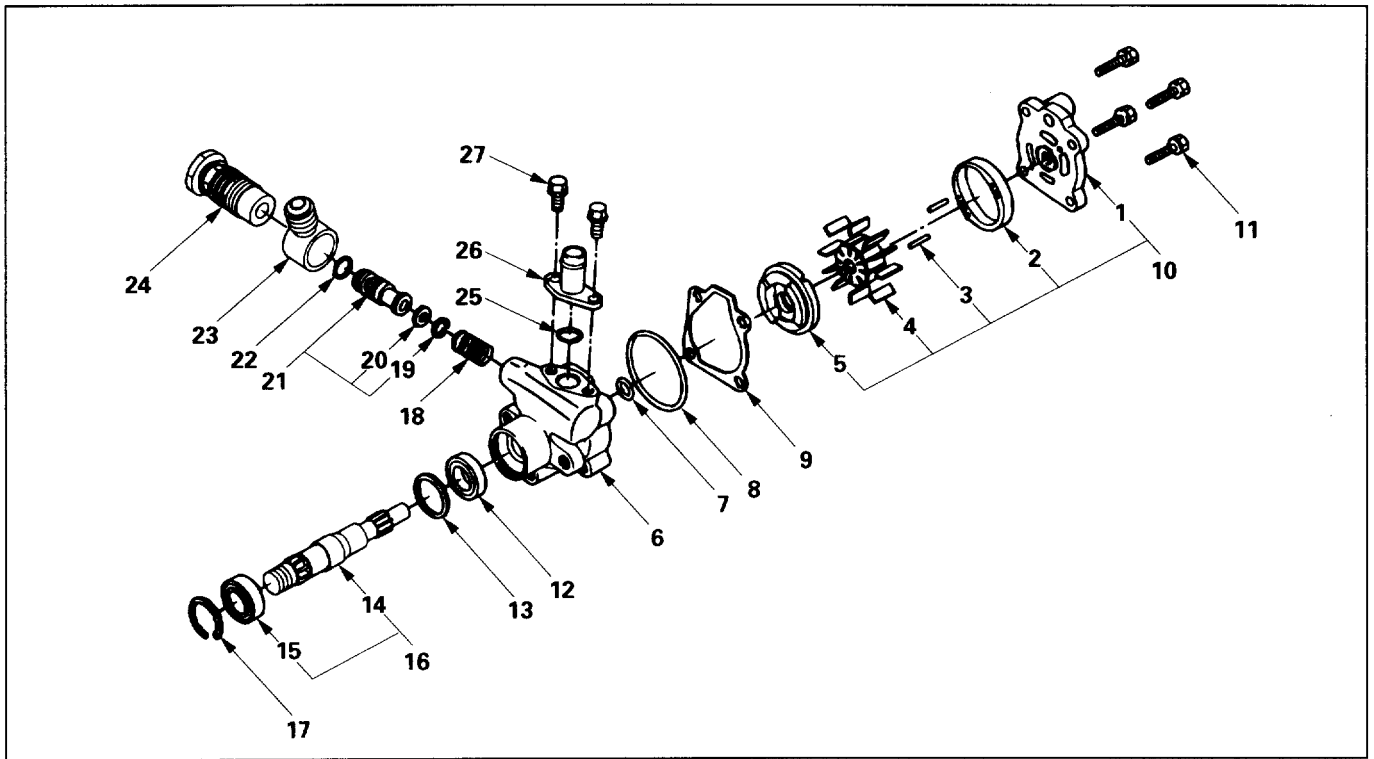
### CAUTION:

When removing the oil seal, be careful not to damage the housing.

16. Bolt
17. Rear Housing Assembly and Pump Cartridge
18. Gasket
19. O-ring
20. O-ring
21. Front Housing
22. Pressure Plate
23. Rotor and Vane
24. Cam
25. Pin
26. Rear Housing



## REASSEMBLY

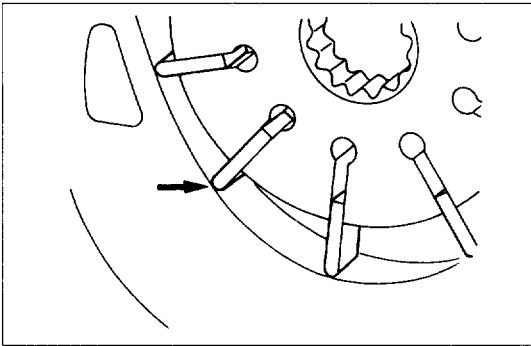


442LY00002

### Reassembly Steps

- |  |                    |
|--|--------------------|
| 1. Rear housing                              | 15. Bearing        |
| 2. Pin                                       | 16. Shaft assembly |
| 3. Cam                                       | 17. Retaining ring |
| 4. Rotor and vane                            | 18. Spring         |
| 5. Pressure plate                            | 19. Filter         |
| 6. Front housing                             | 20. Retaining ring |
| 7. O-ring                                    | 21. Valve          |
| 8. O-ring                                    | 22. O-ring         |
| 9. Gasket                                    | 23. Connector      |
| 10. Rear housing assembly and pump cartridge | 24. Connector      |
| 11. Bolt                                     | 25. O-ring         |
| 12. Oil seal                                 | 26. Pipe, suction  |
| 13. Retaining ring                           | 27. Bolt           |
| 14. Shaft                                    |                    |





## Reassembly Steps

1. Rear Housing
2. Pin
3. Cam



### 4. Rotor and Vane

Install the vane with curved face in contact with the inner wall of the cam.

### 5. Pressure Plate



#### CAUTION:

**When install pressure plate, be careful not to damage its inner surface. Damaged pressure plate may cause poor pump performance, pump seizure or oil leakage.**

### 6. Front Housing

### 7. O-ring

Be sure to discard used parts, and always used new parts for installation.

### 8. O-ring

Be sure to discard used parts, and always used new parts for installation.

### 9. Gasket

Be sure to discard used parts, and always used new parts for installation.

### 10. Rear Housing Assembly and Pump Cartridge

### 11. Bolt



Rear Housing Bolt Torque	N•m (kg•m/lb•ft)
54 (5.5 / 40)	

### 12. Oil Seal

Be sure to discard used parts, and always used new parts for installation.



#### CAUTION:

**When install pressure plate, be careful not to damage its inner surface. Damaged pressure plate may cause poor pump performance, pump seizure or oil leakage.**

### 13. Retaining Ring

### 14. Shaft

### 15. Bearing

### 16. Shaft Assembly

### 17. Retaining Ring

### 18. Spring

### 19. Filter

### 20. Retaining Ring

### 21. Valve

### 22. O-ring

Be sure to discard used parts, and always used new parts for installation.

### 23. Connector



Connector Torque	N•m (kg•m/lb•ft)
54 (5.5 / 40)	



24. O-ring

Be sure to discard used parts, and always used new parts for installation.

25. Pipe, Suction

26. Bolt

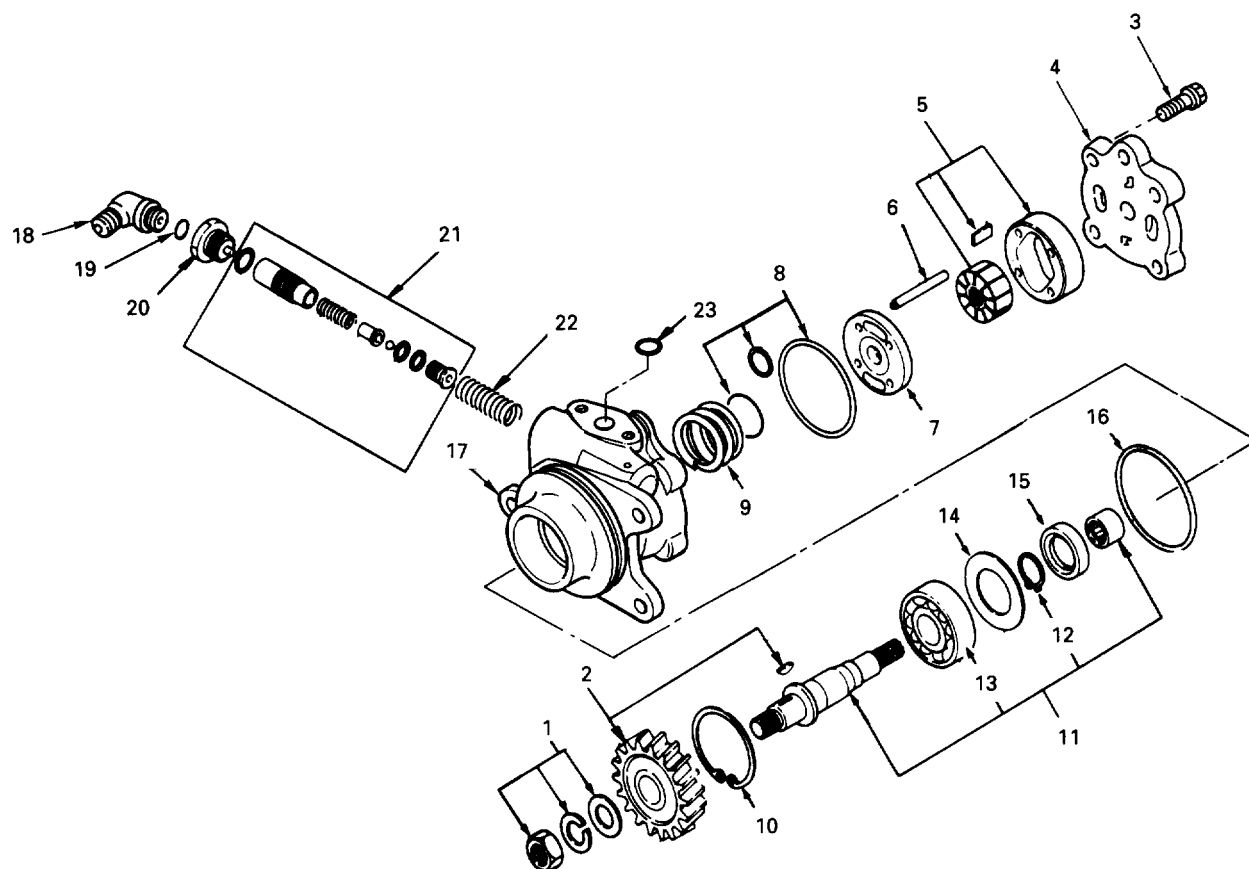


Suction Pipe Bolt Torque	N•m (kg•m/lb•ft)
21 (2.1 / 15)	



# DISASSEMBLY

## 4B Series Engine



### Disassembly Steps

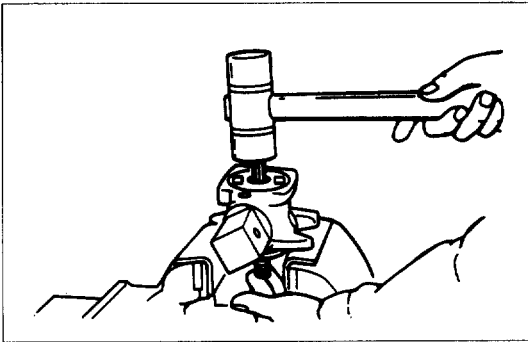
- |   |                               |
|---|-------------------------------|
| 1. Nut and washers                            | 12. Snap ring                 |
| 2. Gear and key                               | 13. Bearing                   |
| 3. Bolt                                       | 14. Retaining ring            |
| 4. Cover                                      | 15. Oil seal                  |
| 5. Cartridge assembly                         | 16. O-ring                    |
| 6. Straight pin                               | 17. Body                      |
| 7. Side plate                                 | 18. Elbow                     |
| 8. O-ring                                     | 19. O-ring                    |
| 9. Spring                                     | 20. Connector                 |
| 10. Snap ring                                 | 21. Valve assembly and O-ring |
| 11. Shaft with bushing, snap ring and bearing | 22. Spring                    |
|   | 23. O-ring                    |





## Disassembly Steps

1. Nut and Washers
2. Gear and Key
3. Bolt
4. Rear Cover
5. Cartridge Assembly
6. Straight Pin
7. Side Plate
8. O-ring
9. Spring
10. Snap Ring
11. Shaft with Bushing, Snap Ring and Bearing  
Use a mallet for removal.

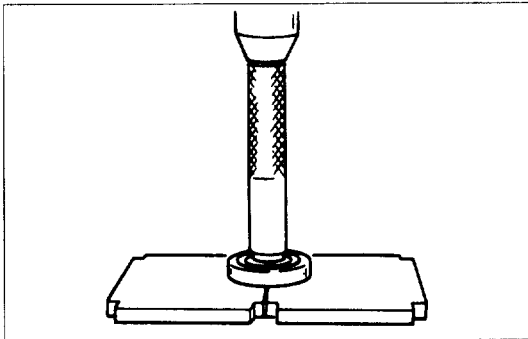


12. Snap Ring



13. Bearing

Using a bench press and a suitable rod.

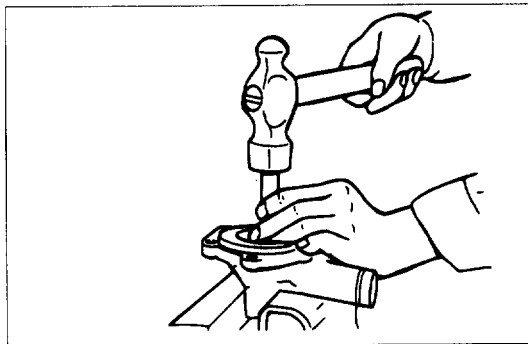


14. Retaining Ring



15. Oil Seal

Using a adequate remover.





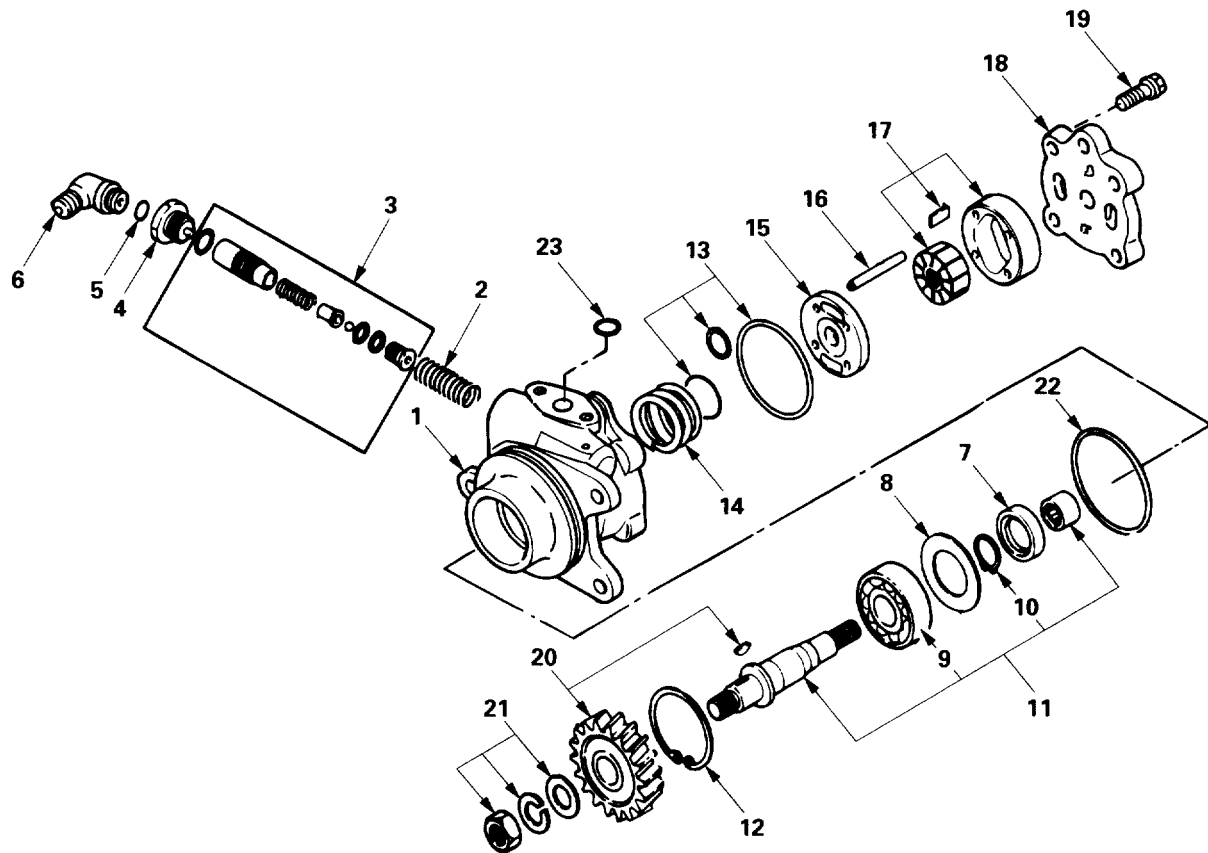
- 16. O-ring**
- 17. Body**
- 18. Elbow**
- 19. O-ring**
- 20. Connector**
- 21. Valve Assembly and O-ring**
- 22. Spring**
- 23. O-ring**

## **INSPECTION AND REPAIR**

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



## REASSEMBLY



442LY00003

### Reassembly Steps

- |   |                        |
|---|------------------------|
| 1. Rear body  | 12. Snap ring          |
| 2. Spring   | 13. O-ring             |
| 3. Valve assembly   | 14. Spring             |
| 4. Connector  | 15. Side plate         |
| 5. O-ring   | 16. Straight pin       |
| 6. Elbow  | 17. Cartridge assembly |
| 7. Oil seal   | 18. Rear cover         |
| 8. Retaining ring   | 19. Bolt               |
| 9. Bearing  | 20. Gear and key       |
| 10. Snap ring   | 21. Nut and washers    |
| 11. Shaft with bushing, retaining ring, Snap ring, Oil seal and bearing | 22. O-ring             |
|   | 23. O-ring             |





## Reassembly Steps

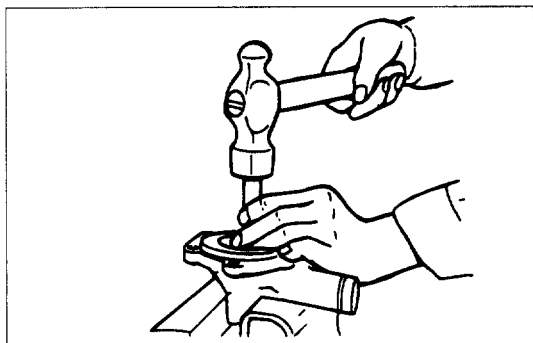
1. Body
2. Spring
3. Valve Assembly
4. Connector

Connector Torque	N•m (kg•m/lb•ft)
62 (6.3 / 46)	

5. O-ring
6. Elbow

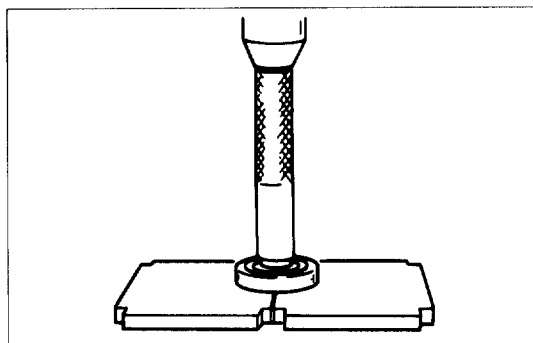


Elbow Torque	N•m (kg•m/lb•ft)
32 (3.3 / 24)	



7. Oil Seal

Use a hammer and bar to install the oil seal.



8. Retaining Ring
9. Bearing

Use a bench press to install the ball bearing.

10. Snap Ring
11. Shaft with Bushing, Retaining Ring, Snap Ring, Oil Seal and Bearing
12. Snap Ring
13. O-ring
14. Spring
15. Side Plate
16. Straight Pin
17. Cartridge Assembly
18. Rear Cover
19. Bolt



Bolt Torque	N•m (kg•m/lb•ft)
34 (3.5 / 25)	



20. Gear and Key

21. Nut and Washers



Oil Pump Gear Nut Torque	N•m (kg•m/lb•ft)
88 (9 / 65)	

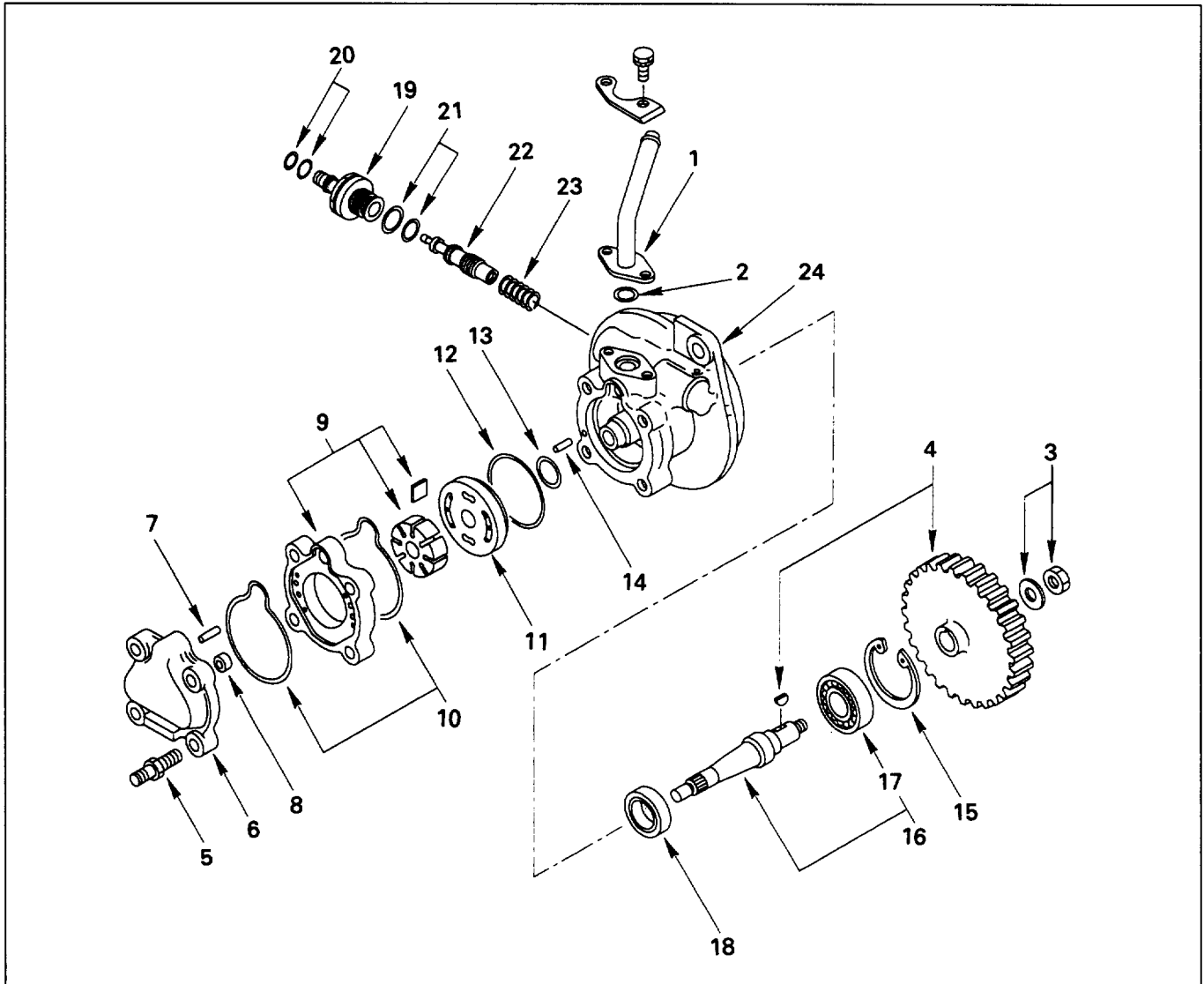
22. O-ring

23. O-ring



# DISASSEMBLY

## 4HF1 Engine



### Disassembly Steps

- |                       |                    |
|-----------------------|--------------------|
| 1. Suction pipe       | 13. O-ring         |
| 2. O-ring             | 14. Pin            |
| 3. Nut and washer     | 15. Snap ring      |
| 4. Gear and key       | 16. Shaft assembly |
| 5. Bolt               | 17. Bearing        |
| 6. Rear cover         | 18. Oil seal       |
| 7. Pin                | 19. Connector      |
| 8. Bushing            | 20. O-ring         |
| 9. Cartridge assembly | 21. O-ring         |
| 10. O-ring            | 22. Valve assembly |
| 11. Side plate        | 23. Spring         |
| 12. O-ring            | 24. Body           |



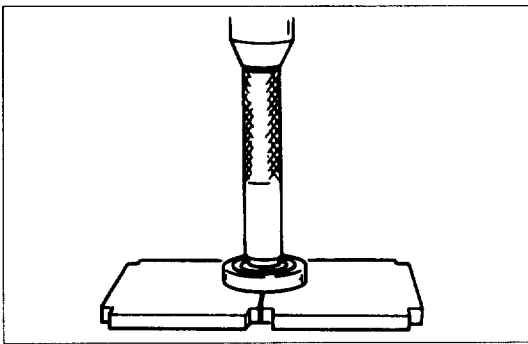


## Disassembly Steps

1. Suction Pipe
2. O-ring
3. Nut and Washer
4. Gear and Key
5. Bolt
6. Rear Cover
7. Pin
8. Bushing
9. Cartridge Assembly
10. O-ring
11. Side Plate
12. O-ring
13. O-ring
14. Pin
15. Snap Ring
16. Shaft Assembly
17. Bearing



Using a bench press and a suitable remover.



18. Oil Seal



### CAUTION:

When removing the oil seal, be careful not to damage the housing.

19. Connector
20. O-ring
21. O-ring
22. Valve Assembly
23. Spring
24. Body

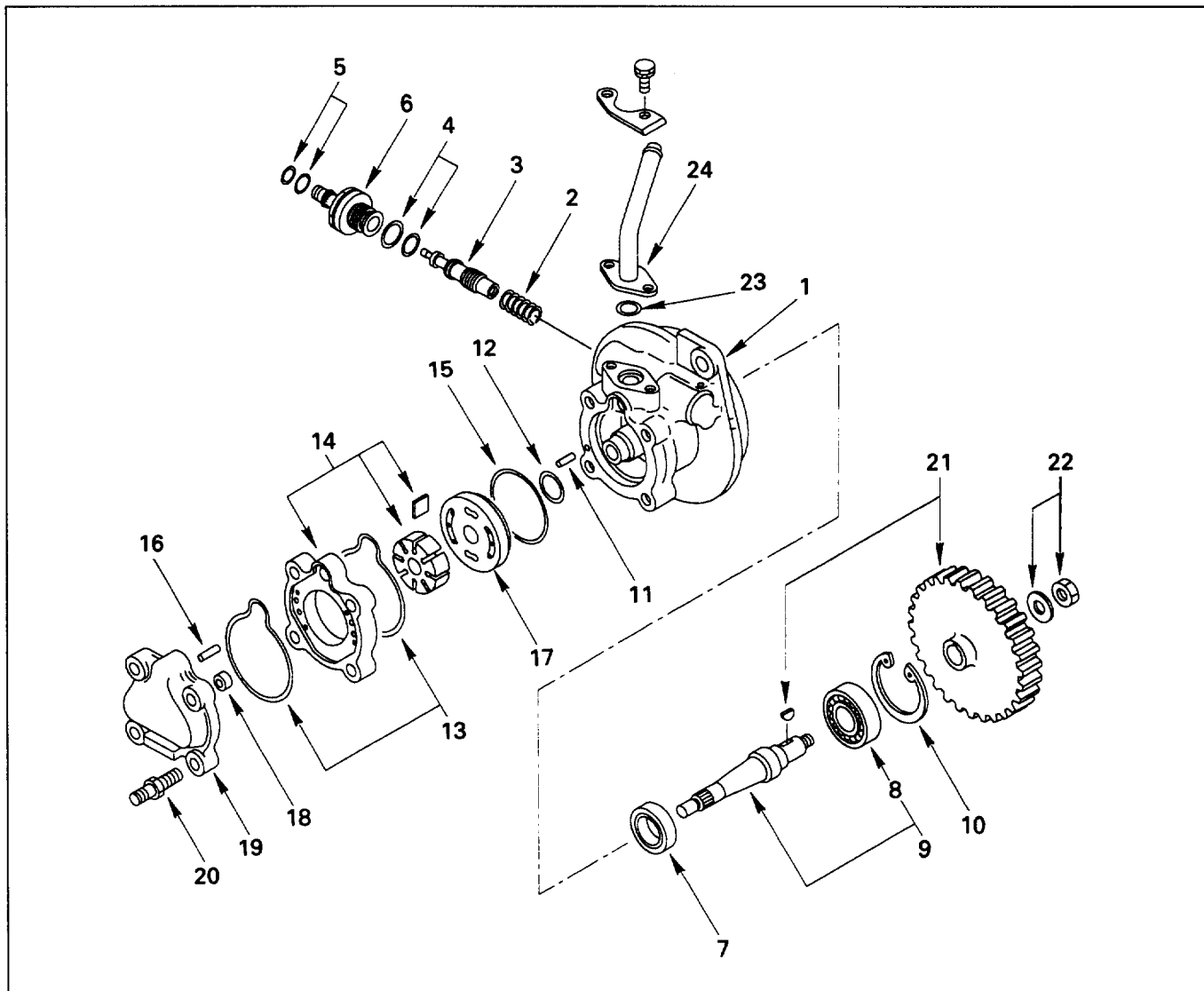
## INSPECTION AND REPAIR

Make the necessary adjustments, repairs, and part replacements if excessive wear or damage is discovered during inspection.



## REASSEMBLY

### 4HF1 Engine



### Reassembly Steps

- |                   |                        |
|-------------------|------------------------|
| 1. Body           | 13. O-ring             |
| 2. Spring         | 14. Cartridge assembly |
| 3. Valve assembly | 15. O-ring             |
| 4. O-ring         | 16. Pin                |
| 5. O-ring         | 17. Side plate         |
| 6. Connector      | 18. Bushing            |
| 7. Oil seal       | 19. Rear cover         |
| 8. Bearing        | 20. Bolt               |
| 9. Shaft assembly | 21. Gear and key       |
| 10. Snap ring     | 22. Nut and washer     |
| 11. Pin           | 23. O-ring             |
| 12. O-ring        | 24. Suction pipe       |





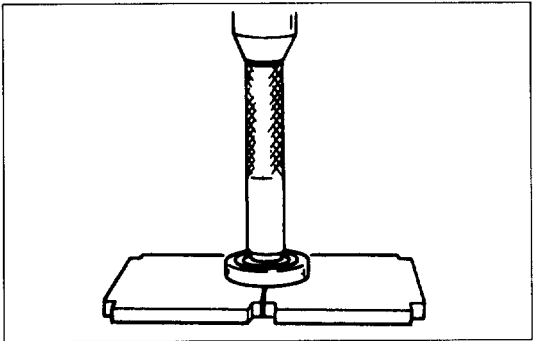
## Reassembly Steps

1. Body
2. Spring
3. Valve Assembly
4. O-ring
5. O-ring



### 6. Connector

Connector Torque	N•m (kg•m/lb•ft)
49 (5 / 36)	



### 7. Oil Seal

### 8. Bearing

Use a bench press and suitable installer to install the bearing.

### 9. Shaft Assembly

### 10. Snap Ring

### 11. Pin

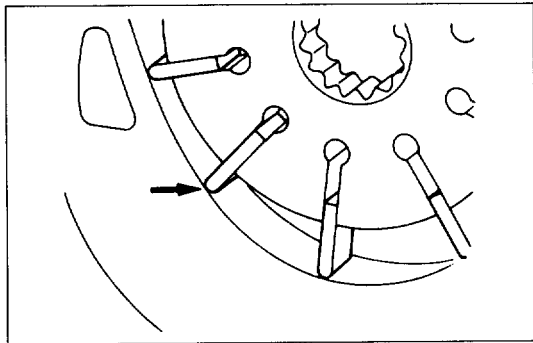
### 12. O-ring

### 13. O-ring



### 14. Cartridge Assembly

Install the vane with curved face in contact with the inner wall of the cam.



### 15. O-ring

### 16. Pin

### 17. Side Plate

### 18. Bushing

### 19. Rear Cover

### 20. Bolt



Rear Cover Bolt Torque	N•m (kg•m/lb•ft)
20 (2 / 14)	



- 21. Gear and Key
- 22. Nut and Washer



Oil Pump Gear Nut Torque	N•m (kg•m/lb•ft)
59 (6 / 43)	

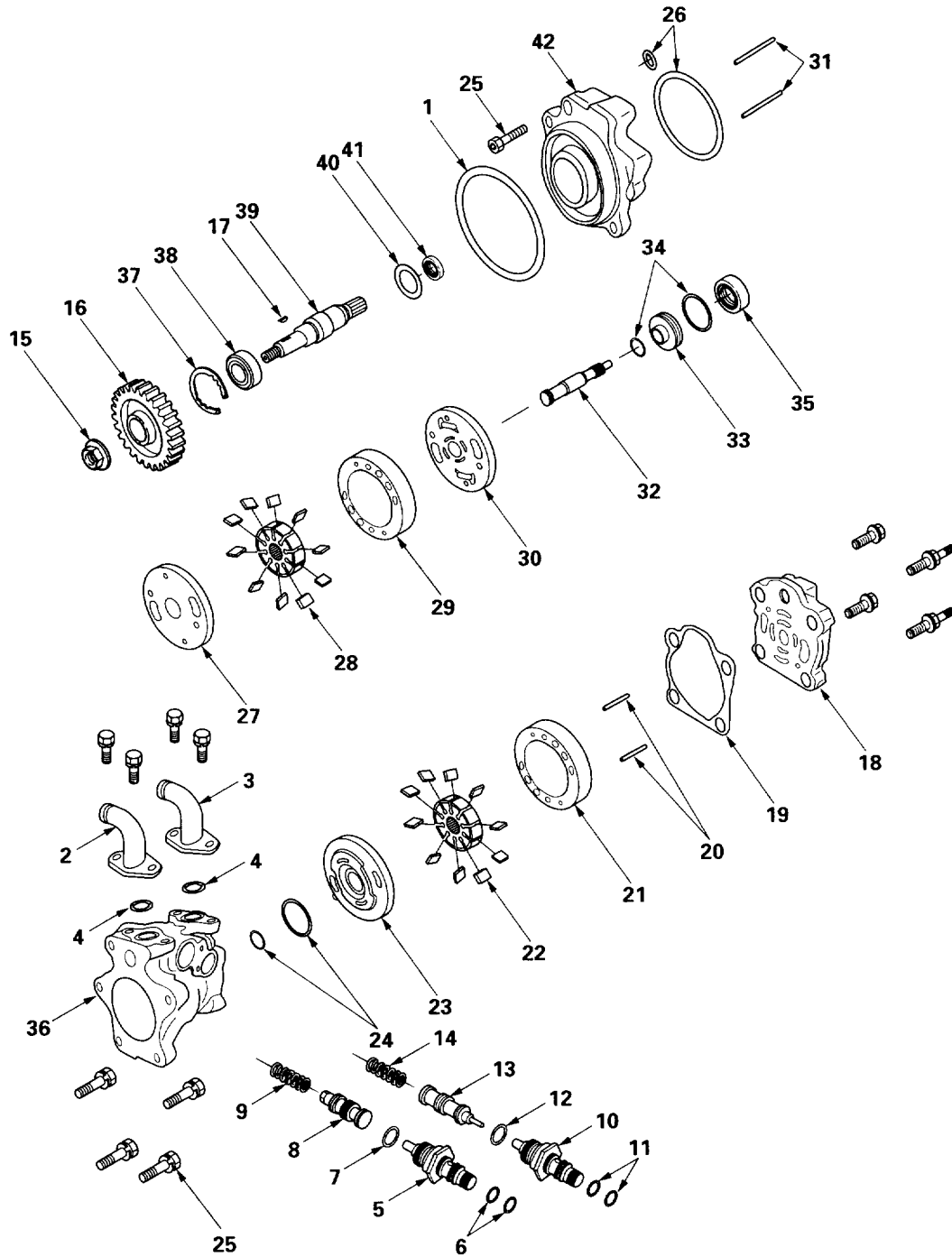
- 23. O-ring
- 24. Suction Pipe



Suction Pipe Bolt Torque	N•m (kg•m/lb•in)
8 (0.8 / 69)	



# TANDEM HYDRAULIC PUMP DISASSEMBLY





## **Disassembly Steps**

- |                         |                              |
|-------------------------|------------------------------|
| 1. O-ring               | 23. Pressure Plate           |
| 2. Hose Connector: HBB  | 24. O-ring                   |
| 3. Hose Connector: PS   | 25. Bolt                     |
| 4. O-ring               | 26. O-ring                   |
| 5. Connector: HBB       | 27. Side Plate               |
| 6. O-ring               | 28. Rotor and Vane: HBB      |
| 7. O-ring               | 29. Cam                      |
| 8. Valve                | 30. Pressure Plate           |
| 9. Spring               | 31. Pin                      |
| 10. Connector: P/S      | 32. Shaft                    |
| 11. O-ring              | 33. Retainer                 |
| 12. O-ring              | 34. O-ring                   |
| 13. Valve               | 35. Oil Seal                 |
| 14. Spring              | 36. Pump Housing             |
| 15. Nut                 | 37. Snap Ring                |
| 16. Gear                | 38. Ball Bearing             |
| 17. Key                 | 39. Shaft                    |
| 18. Rear Body           | 40. Retainer Ring            |
| 19. Gasket              | 41. Oil Seal                 |
| 20. Pin                 | 42. Front Body               |
| 21. Cam                 | P/S: Power Steering          |
| 22. Rotor and Vane: P/S | HBB: Hydraulic Booster Brake |



## **Disassembly Steps**

1. O-ring
2. Hose Connectors: HBB
3. Hose Connector: P/S
4. O-rings
5. Connector: HBB
6. O-ring
7. O-ring
8. Valve
9. Spring
10. Connector: P/S
11. O-ring
12. O-ring
13. Valve
14. Spring
15. Nut
16. Gear
17. Key
18. Rear Body
19. Gasket
20. Pin
21. Cam
22. Rotor and Vane: P/S
23. Pressure Plate
24. O-ring
25. Bolt



- 26. **O-ring**
- 27. **Side Plate**
- 28. **Rotor and Vane: HBB**
- 29. **Cam**
- 30. **Pressure Plate**
- 31. **Pin**
- 32. **Shaft**
- 33. **Retainer**
- 34. **O-rings**
- 35. **Oil Seal**
- 36. **Pump Housing**
  - Use a brass drift to remove the oil seal from the pump housing.
- 37. **Snap Ring**
  - Use a mallet to remove the shaft assembly from the front body.
- 38. **Ball Bearing**
- 39. **Shaft**
  - A press and rod will be necessary to remove the ball bearing from the shaft.
- 40. **Retainer Ring**
- 41. **Oil Seal**
- 42. **Front Body**
  - Use a brass drift to remove the oil seal from the front body.

**Clean**

- All parts in a suitable solvent and blow dry with compressed air. Be sure to use clean solvent to clean internal parts.





## INSPECTION

- Cartridge assembly
  - Vane tips of cartridge assembly for wear.
  - Vanes for scoring or wear.
  - Inner surface of the ring for scoring, wear, damage, etc.
  - Fit of the vanes in the rotor. The vanes must fit properly in the rotor slots, without sticking or excessive play. Also check for burrs in the rotor slots, and excessive wear at the thrust faces.
  - If heavy wear is present, or if parts are damaged, replace the entire cartridge assembly.

- Side plate for wear at the thrust faces.

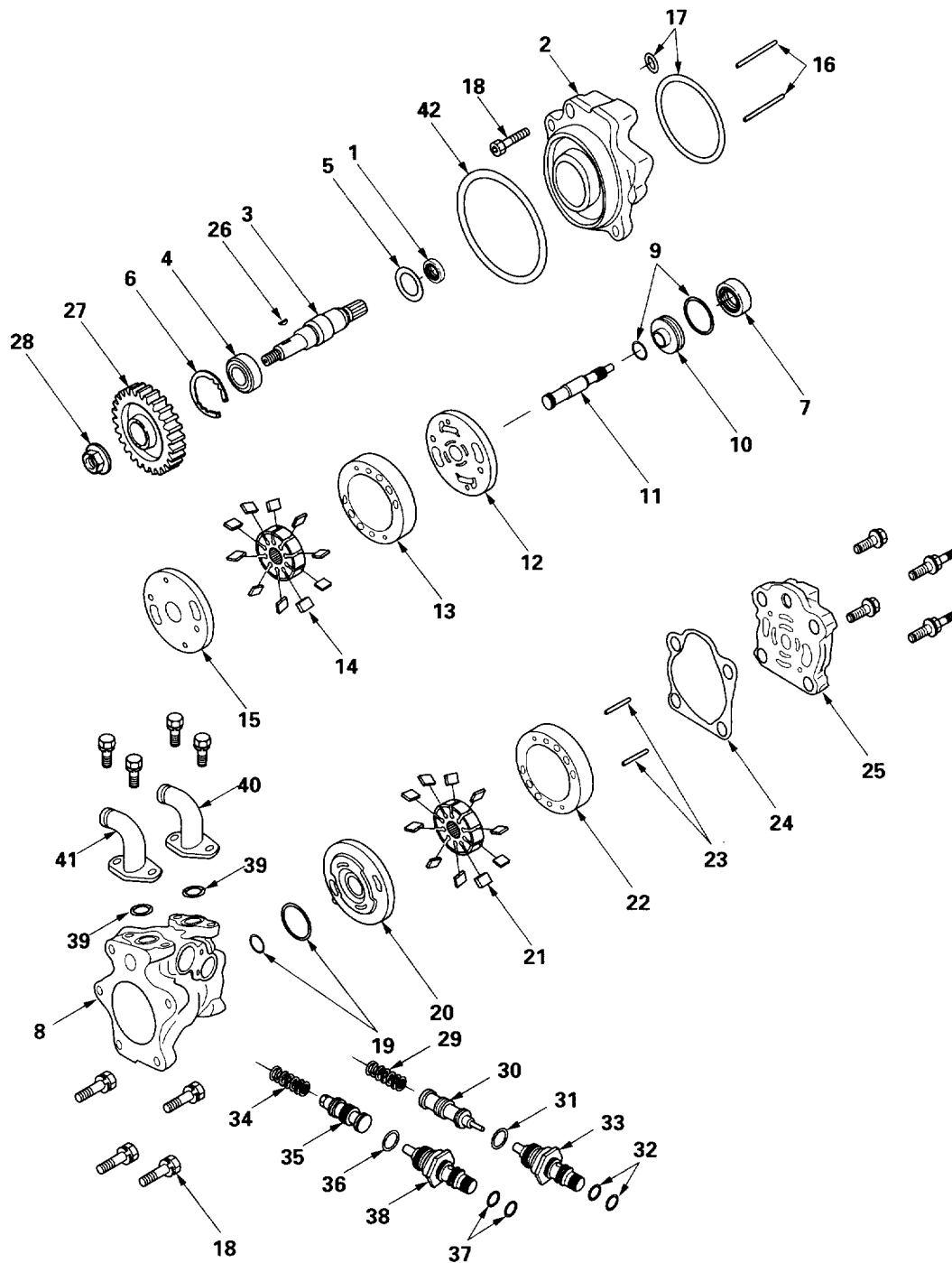
Replace if excessive wear is evident.

- Ball bearing. If the bearing is rough or loose, replace it.
- Seal contact area of the shaft. If fretting or roughness is present, replace the shaft.
- Gear for rough or chipped teeth.
- Flow control valve assembly for scoring or burrs. Also, inspect the flow control valve bore in the pump housing for burrs.

If heavy damage is present, replace pump housing assembly together with valves.



## REASSEMBLY



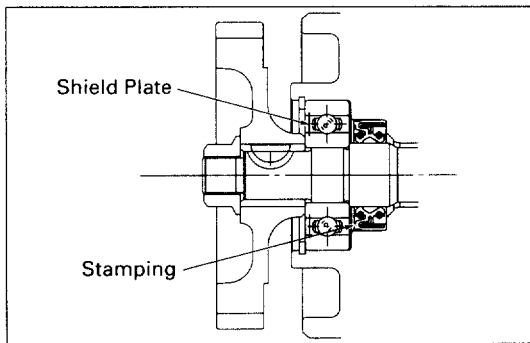


## Reassembly Steps

- |                         |                             |
|-------------------------|-----------------------------|
| 1. Oil Seal             | 23. Pin                     |
| 2. Front Body           | 24. Gasket                  |
| 3. Shaft                | 25. Rear Body               |
| 4. Ball Bearing         | 26. Key                     |
| 5. Retaining Ring       | 27. Gear                    |
| 6. Snap Ring            | 28. Nut                     |
| 7. Oil Seal             | 29. Spring                  |
| 8. Pump Housing         | 30. Valve                   |
| 9. O-ring               | 31. O-ring                  |
| 10. Retainer            | 32. O-ring                  |
| 11. Shaft               | 33. Connector: P/S          |
| 12. Pressure Plate      | 34. Spring                  |
| 13. Cam                 | 35. Valve                   |
| 14. Rotor and Vane: HBB | 36. O-ring                  |
| 15. Side Plate          | 37. O-ring                  |
| 16. Pin                 | 38. Connector: HBB          |
| 17. O-ring              | 39. O-ring                  |
| 18. Bolt                | 40. Hose Connector: P/S     |
| 19. O-ring              | 41. Hose Connector: HBB     |
| 20. Pressure Plate      | 42. O-ring                  |
| 21. Rotor and Vane: P/S | P/S: Power Steering         |
| 22. Cam                 | HBB:Hydraulic Booster Brake |



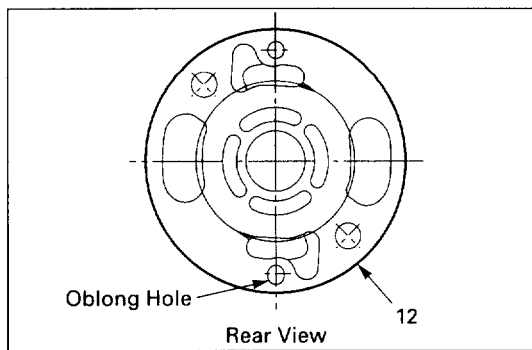
## Reassembly Steps



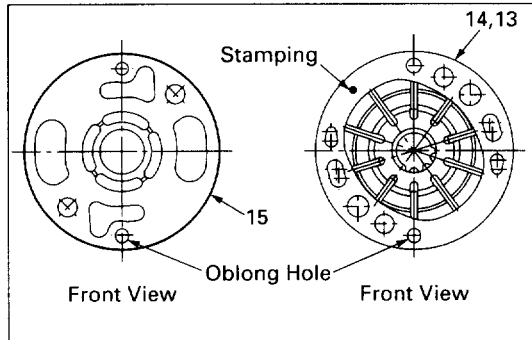
A05LW007

1. **Oil Seal**
2. **Front Body**
  - Oil seal into the front body using a proper size rod and press or hammer.
3. **Shaft**
4. **Ball Bearing**
  - Press the shaft, into the ball bearing as illustration.
5. **Retaining Ring**
  - Place the retaining ring in the front body and install the shaft assembly into the front body using a press or hammer.
6. **Snap Ring**
  - Snap ring into front body.
7. **Oil Seal**
8. **Pump Housing**
  - Oil seal into pump housing using a proper size rod and press or hammer.
9. **O-ring**
10. **Retainer**
11. **Shaft**

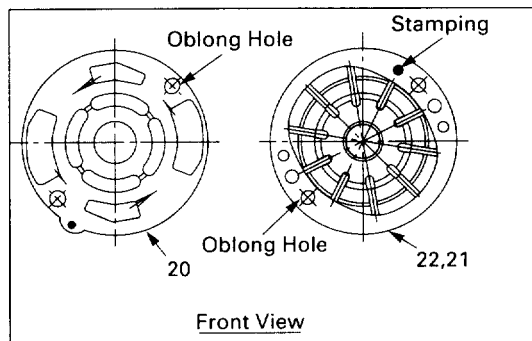




A05LW006



A05LW005



A05LW008

12. Pressure Plate
13. Cam
14. Rotor and Vane: HBB
15. Side Plate
16. Pin

- Set pressure plate, cam, rotor and vane, side plate, and pins into pump housing as illustration.

#### 17. O-ring

#### 18. Bolt

- Attach O-rings into front body grooves and assemble front body and pump housing by tightening bolts.



Bolt and Nut Torque	N•m (kg•m/lb•ft)
4 (four) bolts	54 (5.5 / 40)
1 (one) bolt	25 (2.5 / 18)

#### 19. O-ring

#### 20. Pressure Plate

#### 21. Rotor and Vane: P/S

#### 22. Cam

#### 23. Pin

- Set pressure plate, rotor and vane, cam and pins into pump housing as illustration.

#### 24. Gasket

#### 25. Rear Body

Bolt and Nut Torque	N•m (kg•m/lb•ft)
	34 (3.5 / 25)

#### 26. Key

#### 27. Gear

#### 28. Nut

- Key, gear and nut onto shaft.
- The long hub of the gear faces front body..

Bolt and Nut Torque	N•m (kg•m/lb•ft)
	103 (10.5 / 76)



29. Spring

30. Valve

31. O-ring

32. O-ring

33. Connector: P/S

- Spring, valve, O-ring, O-rings and connector into pump housing.

Bolt and Nut Torque	N•m (kg•m/lb•ft)
54 (5.5 / 40)	

34. Spring

35. Valve

36. O-ring

37. O-ring

38. Connector: HBB

- Spring, valve O-ring, O-rings and connectors into pump housing.

Bolt and Nut Torque	N•m (kg•m/lb•ft)
54 (5.5 / 40)	

39. O-ring

40. Hose Connector: P/S

41. Hose Connector: HBB

Bolt and Nut Torque	N•m (kg•m/lb•ft)
21 (2.1 / 15)	

42. O-ring



## SECTION 3B2

# MANUAL STEERING

### CONTENTS

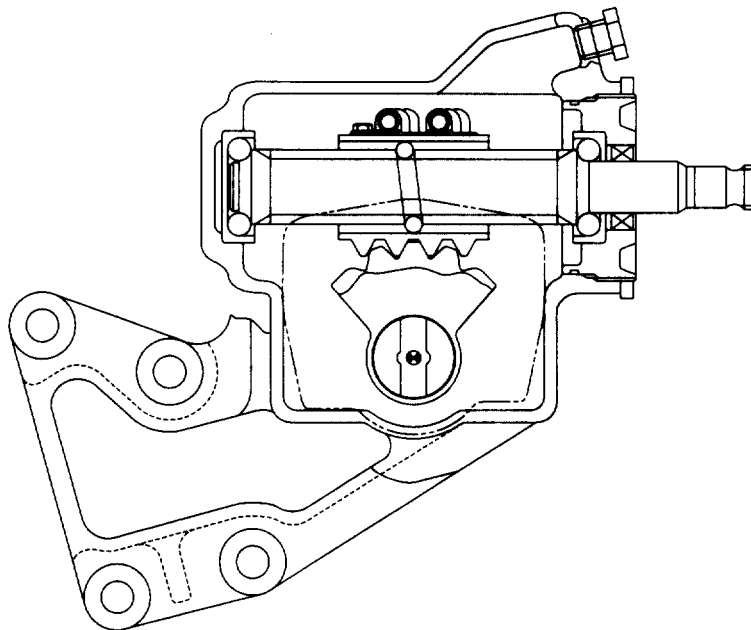
	PAGE
General Description.....	3B2- 2
On-Vehicle Service.....	3B2- 3
Manual Steering Unit Replacement .....	3B2- 3
Unit Repair .....	3B2- 7
Manual Steering Unit (NHR, NKR) .....	3B2- 7
Manual Steering Unit (NPR, NQR) .....	3B2-14



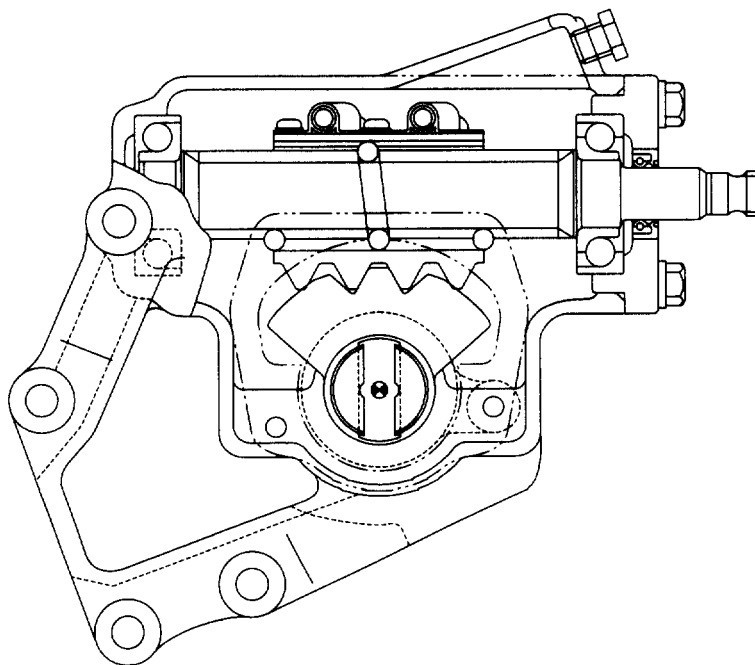
## GENERAL DESCRIPTION

### Manual Steering Unit

NHR, NKR



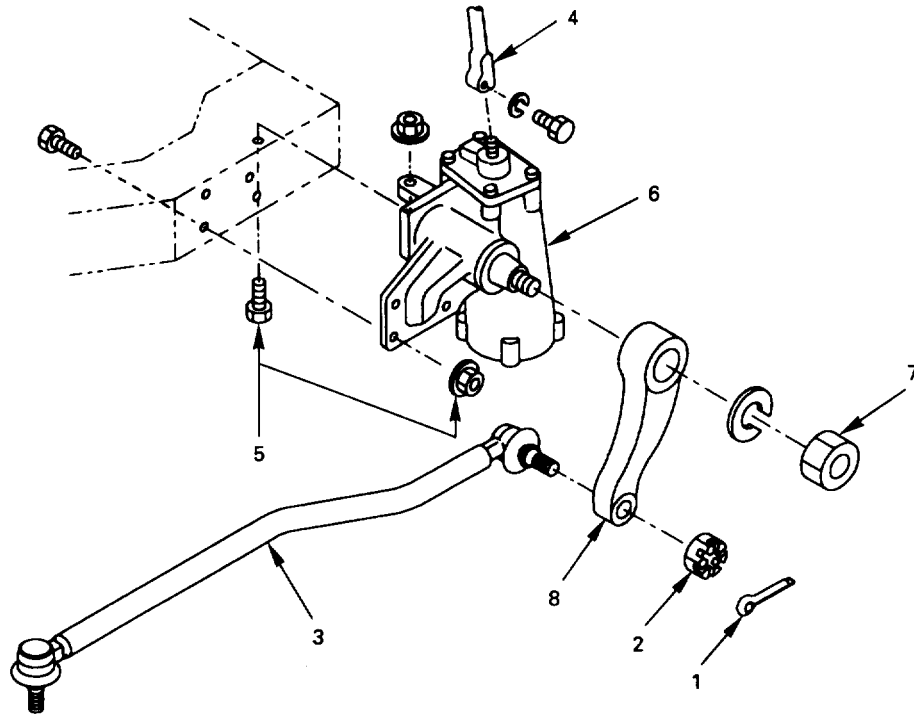
NPR, NQR





# ON-VEHICLE SERVICE

## MANUAL STEERING UNIT REPLACEMENT



### Removal Steps

1. Cotter pin
2. Nut
3. Drag link
4. Universal joint
5. Unit fixing nut and bolt
6. Steering unit
7. Pitman arm fixing nut
8. Pitman arm

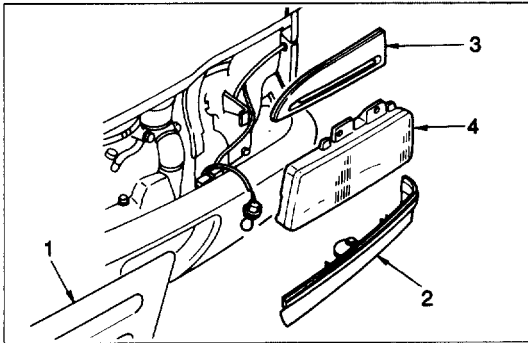
### Installation Steps

8. Pitman arm
7. Pitman arm fixing nut
6. Steering unit
5. Unit fixing nut and bolt
4. Universal joint
3. Drag link
2. Nut
1. Cotter pin





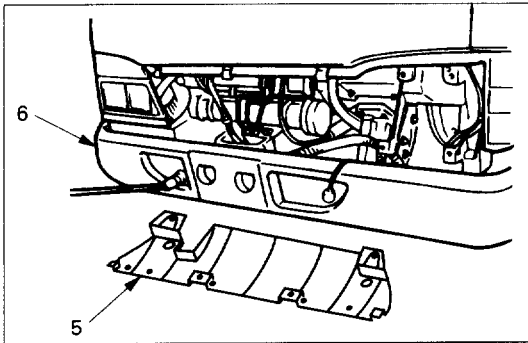
## Removal



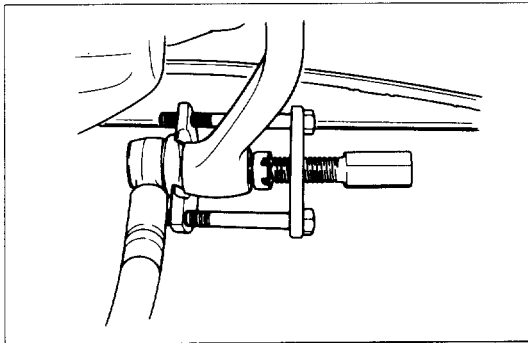
### Preparation (for Non-Tilt Cab Model)

- 1) Remove the radiator grill.
- 2) Remove the head lamp grill. (driver side only)
- 3) Remove the head lamp ornament. (driver side only)
- 4) Remove the head lamp assembly. (driver side only)

Be careful not to remove adjust screw.



- 5) Remove the under panel.
- 6) Remove the front bumper assembly.



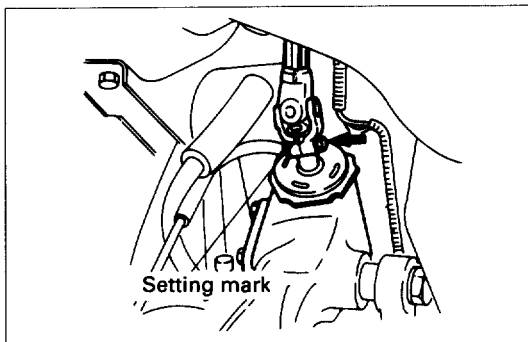
### 1. Cotter Pin

### 2. Nut

### 3. Drag Link

Disconnect the drag link at the knuckle arm and the pitman arm.

Remover: 5-8840-2017-0



### 4. Universal Joint

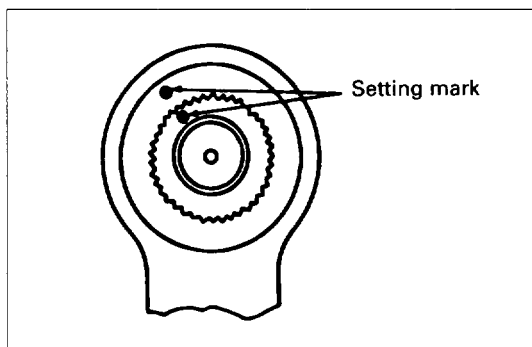
Apply a setting mark across the yoke and worm shaft in unit to ensure reassembly of the parts in the original position.



### 5. Unit Fixing Nut and Bolt

### 6. Steering Unit

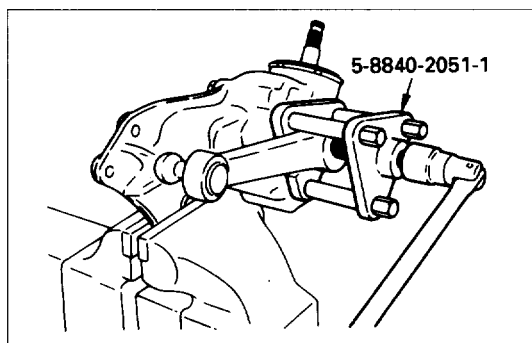




## 7. Pitman Arm Fixing Nut

## 8. Pitman Arm

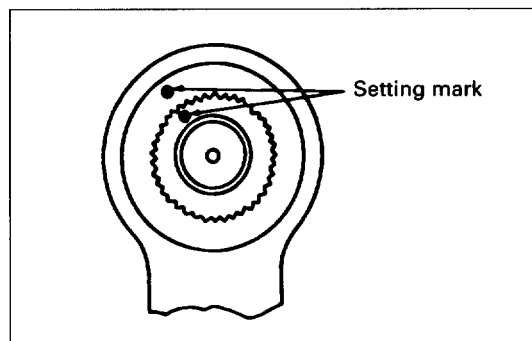
- 1) Apply a setting mark across the pitman arm and worm shaft.



Puller: 5-8840-2051-1

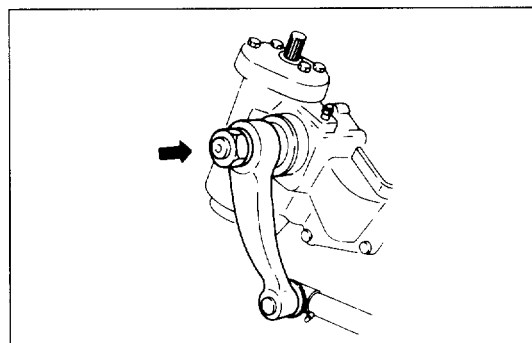


## INSTALLATION



## 8. Pitman Arm

- Align the setting mark applied at removal.



## 7. Pitman Arm Fixing Nut

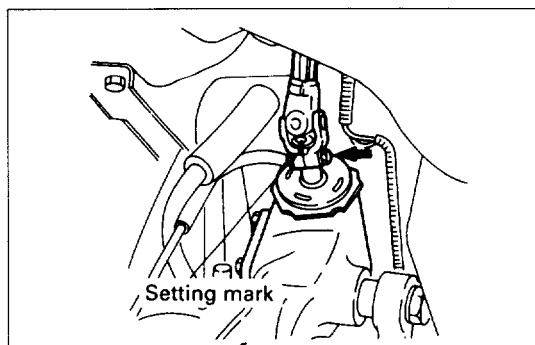
Nut Torque		N•m (kg•m/lb•ft)
NHR, NKR		216 (22 / 159)
NPR, NQR		294 (30 / 217)

## 6. Steering Unit

## 5. Unit Fixing Nut and Bolt

Torque		N•m (kg•m/lb•ft)
		103 (10.5 / 76)





#### 4. Universal Joint

Install the parts by aligning setting marks applied at removal.



Universal Joint Bolt Torque		N•m (kg•m/lb•ft)
M8 Bolt		25 (2.5 / 18)
M10 Bolt		39 (4.0 / 29)

#### 3. Drag Link

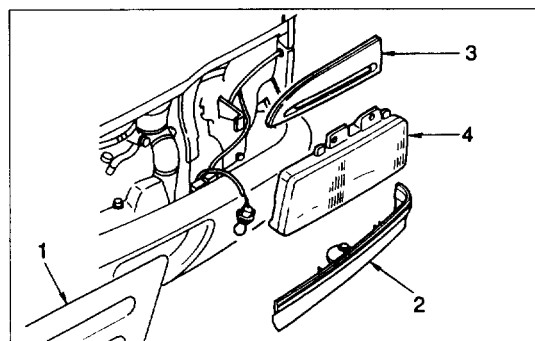
##### 2. Nut

##### 1. Cotter Pin

- 1) Install the drag link to the pitman arm and the knuckle arm.
- 2) Tighten nuts to specified torque, with just enough additional torque to align cotter pin holes.  
Install new cotter pin.



Nut Torque		N•m (kg•m/lb•ft)
		167 (17 / 123)



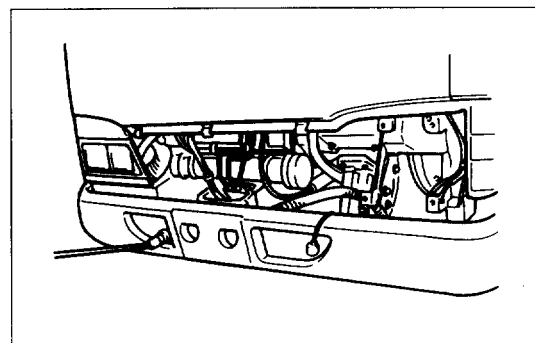
#### for Non-Tilt Cab Model

- 1) Install the bumper assembly.



Bumper Bolt Torque		N•m (kg•m/lb•ft)
		40 (4.1 / 30)

- 2) Install the under panel.



- 3) Install the head light assembly, ornament and grill.
- 4) Install the radiator grill.

#### NOTE:

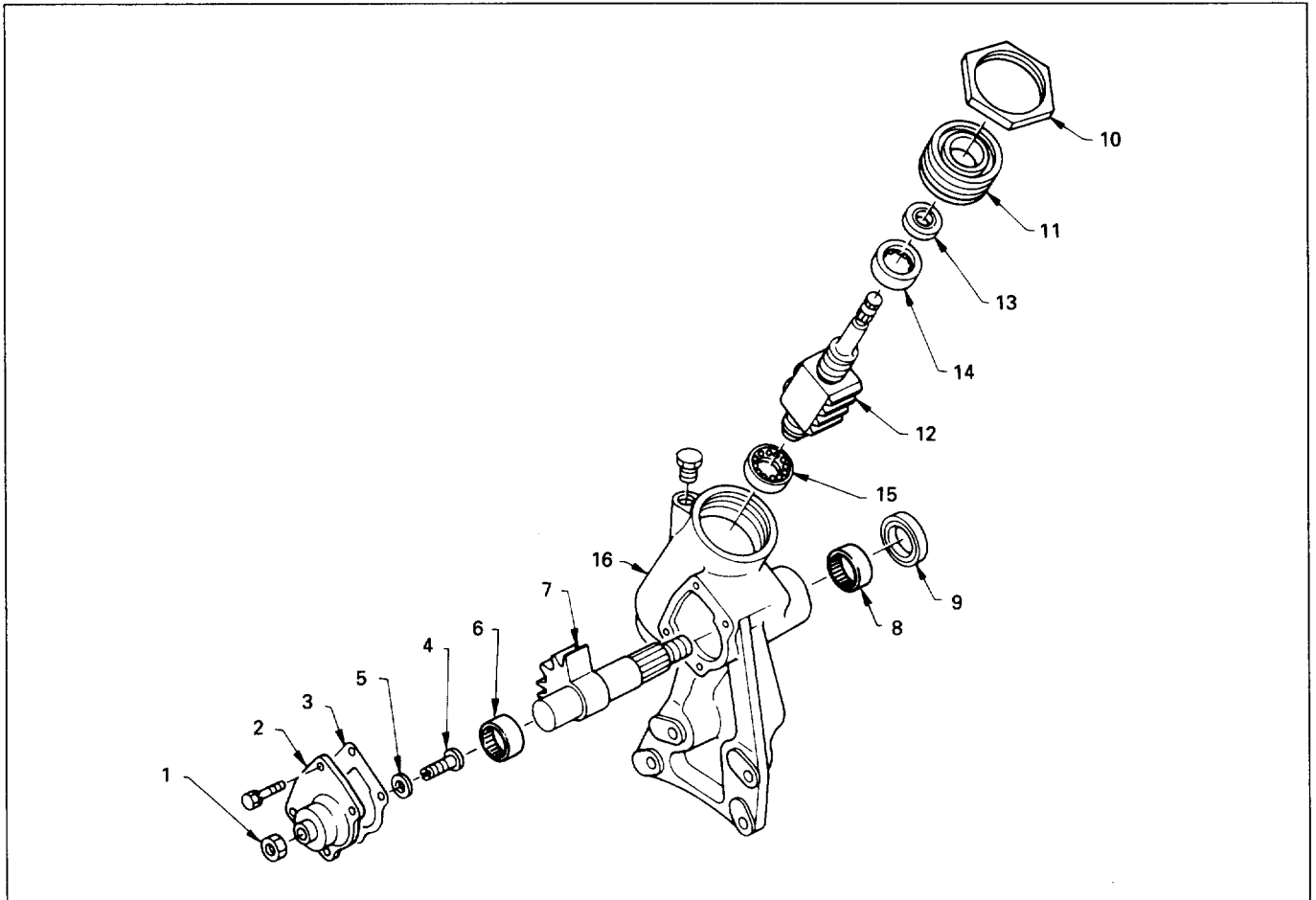
After installation, adjust head light aiming. Refer to "Chassis Electrical" in Section 8.



# UNIT REPAIR

## MANUAL STEERING UNIT (NHR, NKR)

### DISASSEMBLY



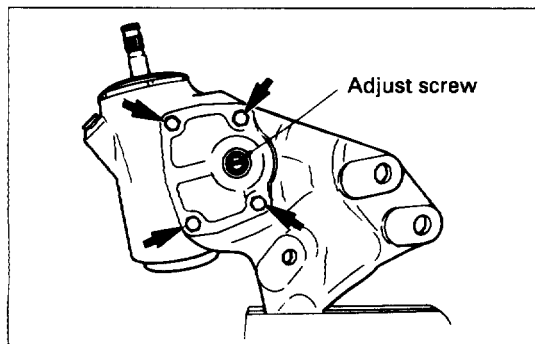
#### Disassembly Steps

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





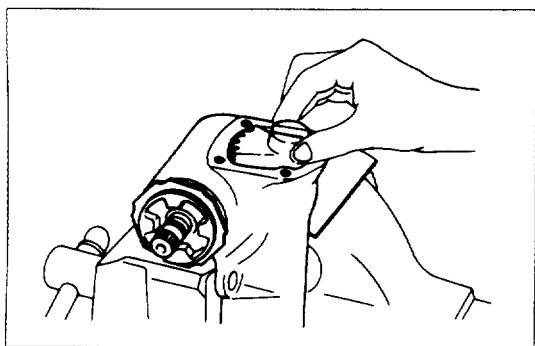
## Disassembly Steps



### 1. Lock Nut

### 2. Side Cover

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



### 3. Gasket

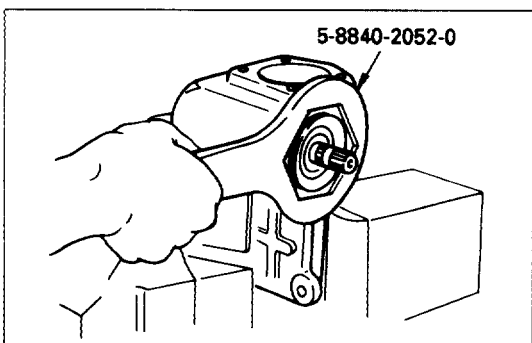
### 4. Adjust Screw

### 5. Adjust Shim

### 6. Needle Bearing

### 7. Sector Shaft

When removing, use care so as not to cause damage to the serrations, threads and oil seal.

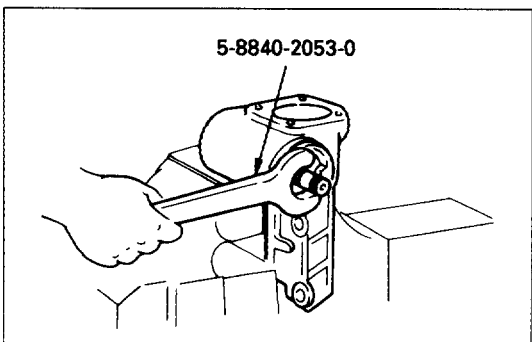


### 8. Needle Bearing

### 9. Oil Seal

### 10. Lock Nut

Steering Lock Nut Wrench : 5-8840-2052-0

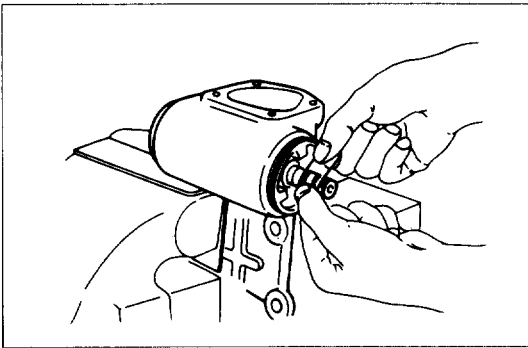


### 11. End Cover

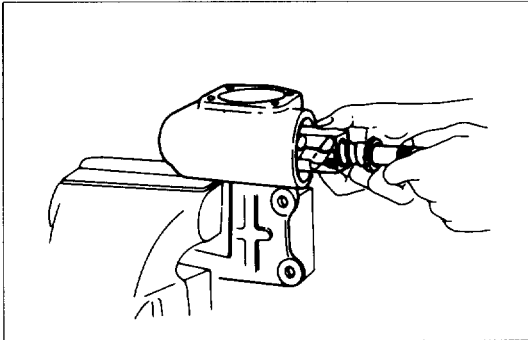
- 1) Wrench : 5-8840-2053-0







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



#### 12. 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.

#### 13. Oil Seal

#### 14. Bearing

#### 15. Bearing

#### 16. Gear Box

## INSPECTION AND REPAIR

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

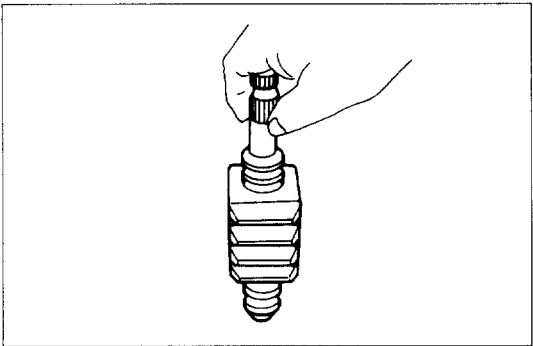
- Bearing
- Sector shaft
- Ball nut and worm shaft



#### Visual Check

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



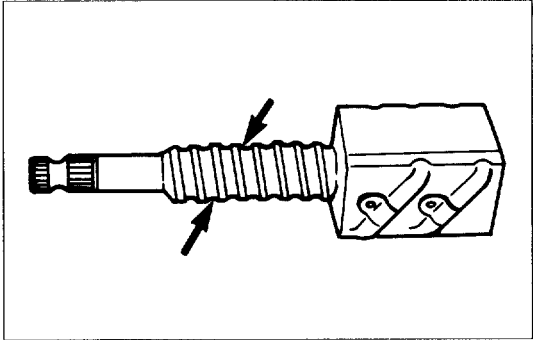


**Ball Nut Rotation**

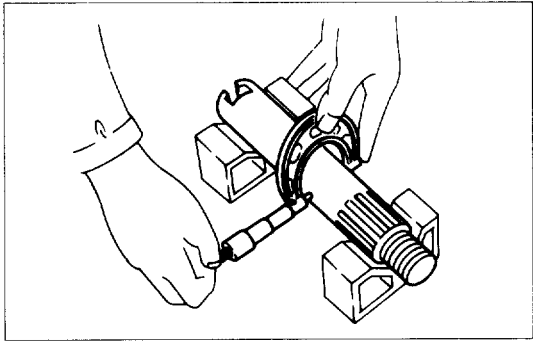
Hold the worm shaft vertically and see if the ball nut lowers with turning motion smoothly. If lowering of the ball nut with its own weight is unsmooth, check the worm shaft for bending and ball-groove for burrs, dents and presence of foreign matter.

**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.**



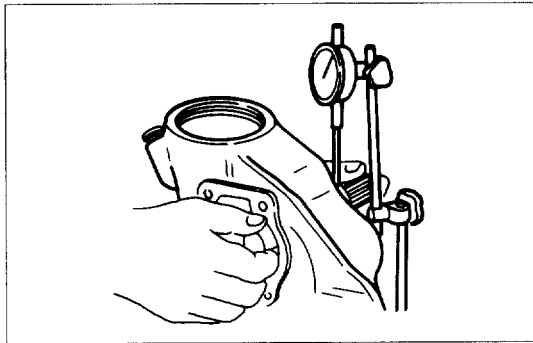
If any of the parts in the ball nut and worm shaft assembly is found to be defective, the entire parts should be replaced using a new worm shaft assembly. As these parts are of selective combination and are sealed to prohibit disassembly, the faulty parts should not be replaced individually.



**Sector Shaft Outside Diameter**

mm(in.)

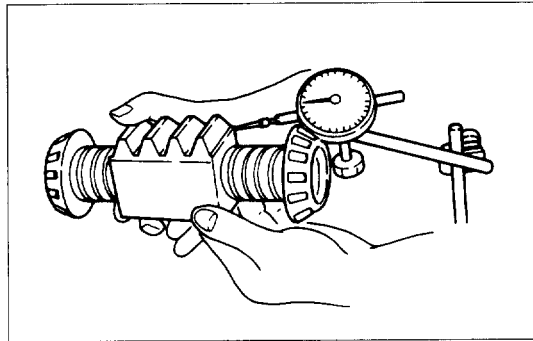
Standard	Limit
34.925 (1.375)	34.825 (1.371)



**Sector Shaft and Needle Bearing Play**

mm(in.)

Limit
0.2 (0.008)



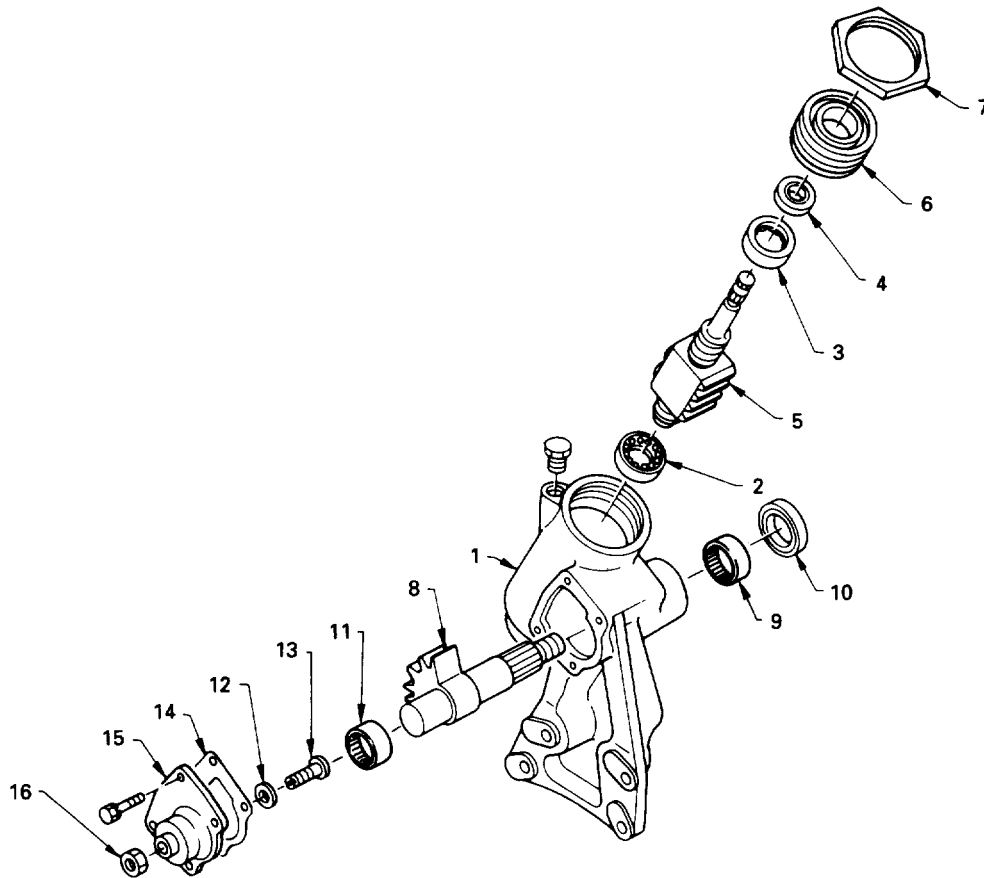
**Ball Nut Axial Play**

mm(in.)

Limit
0.1 (0.004)



# REASSEMBLY



## Reassembly Steps

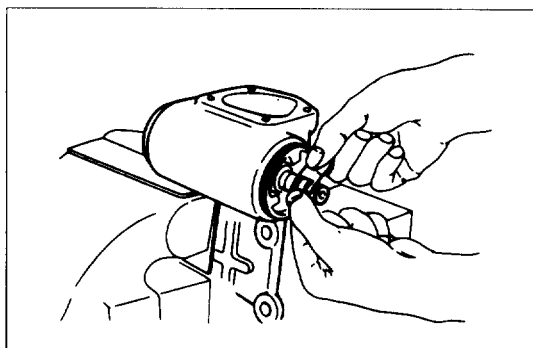
1. Gear box
2. Bearing
3. Bearing
4. Oil seal
5. Ball nut and worm shaft
6. End cover
7. Lock nut
8. Sector shaft
9. Needle bearing
10. Oil seal
11. Needle bearing
12. Adjust shim
13. Adjust screw
14. Gasket
15. Side cover
16. Lock nut



## Reassembly Steps

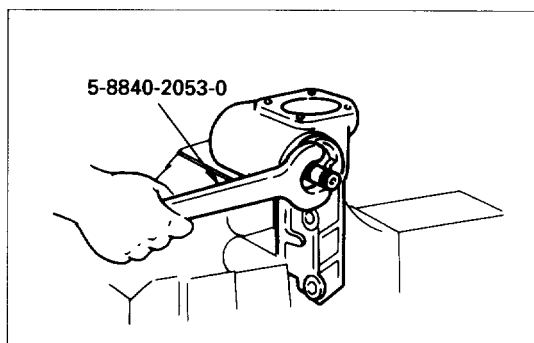
1. Gear Box
2. Bearing
3. Bearing
4. Oil Seal
5. Ball Nut and Worm Shaft



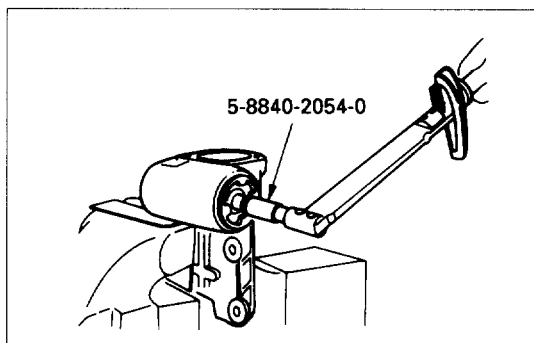


## 6. End Cover

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



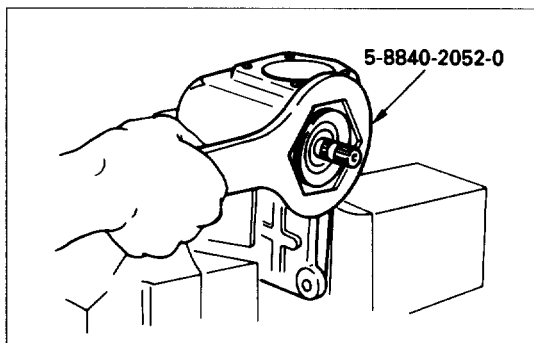
- 2) Adjust the starting torque of steering input shaft by turning the end cover with a special tool.  
Wrench : 5-8840-2053-0



Starting Torque	N•m (kg•m/lb•ft)
0.34 – 0.64 (0.035 – 0.065 / 0.25 – 0.47)	



Steering Shaft Driver : 5-8840-2054-0

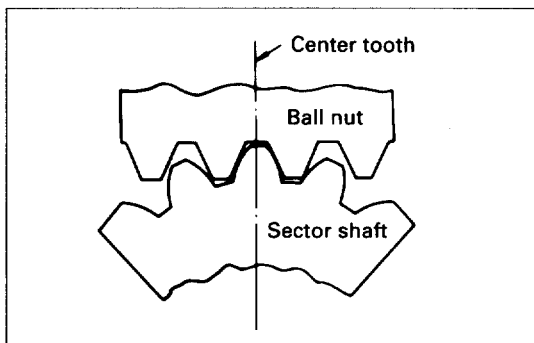


## 7. Lock Nut

Steering Lock Nut Wrench : 5-8840-2052-0



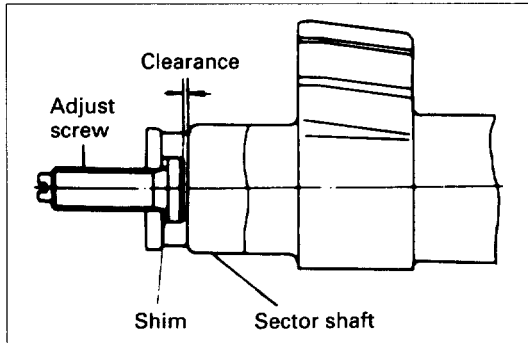
Lock Nut Torque	N•m (kg•m/lb•ft)
177 (18 / 130)	



## 8. Sector Shaft

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

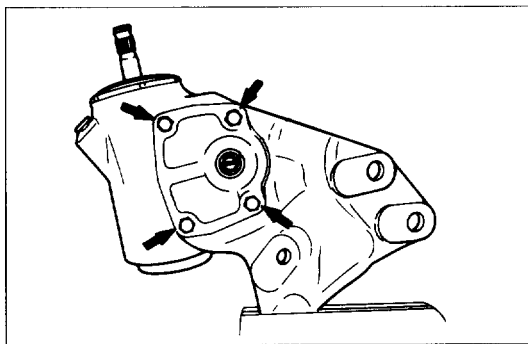


**9. Needle Bearing****10. Oil Seal****11. Needle Bearing****12. Adjust Shim****13. Adjust Screw**

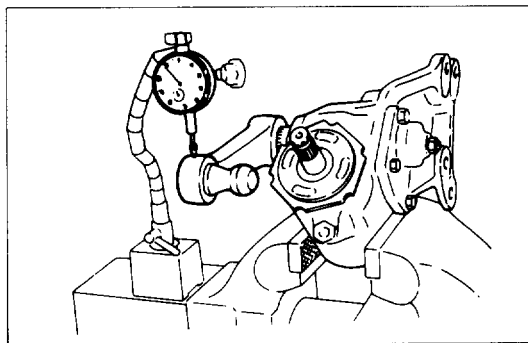
Adjust the clearance and check that the adjust screw slides freely.

Clearance	mm(in.)
0.1 (0.0039)	

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

**14. Gasket****15. Side Cover**

Side Cover Bolt Torque	N•m (kg•m/lb•ft)
44 (4.5 / 33)	

**16. Lock Nut**

Adjust the backlash between the sector gear and ball nut.

- 1) Install the pitman arm.
- 2) Set the sector shaft in a straight ahead position.
- 3) With the adjusting screw, adjust the backlash to the specification.

Backlash (at End of Pitman Arm)	mm(in.)
0.2 (0.0079) or less	

- 4) Lock adjusting screw with lock nut.



Lock Nut Torque	N•m (kg•m/lb•ft)
25 (2.5 / 18)	

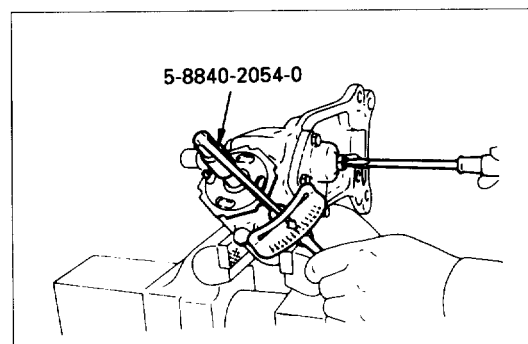
- 5) Inspect the starting torque of the steering input shaft.



Starting Torque	N•m (kg•m/lb•ft)
0.54 - 1.03 (0.055 - 0.105 / 0.40 - 0.76)	

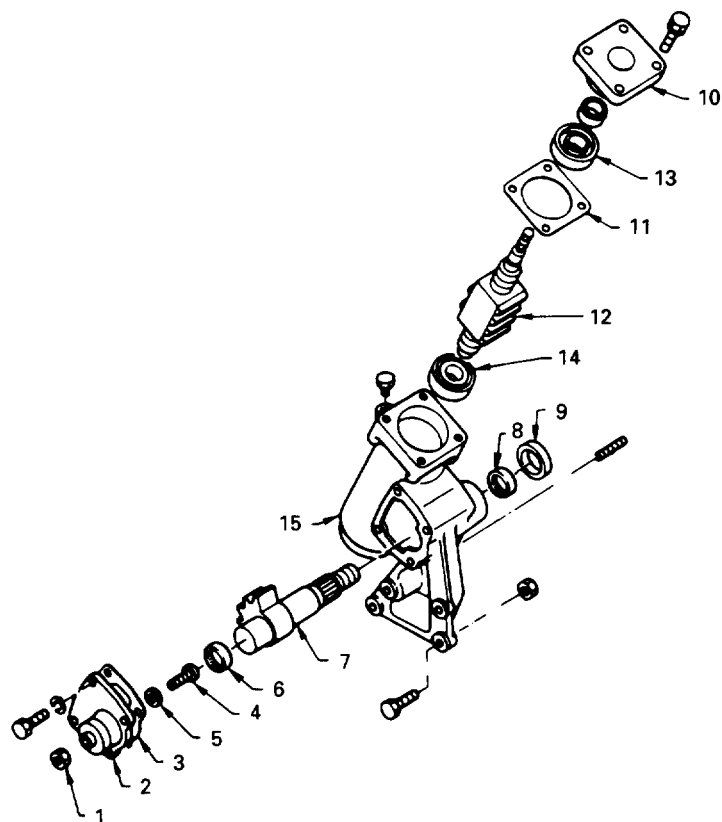


Steering Shaft Driver : 5-8840-2054-0





## MANUAL STEERING UNIT (NPR, NQR) DISASSEMBLY



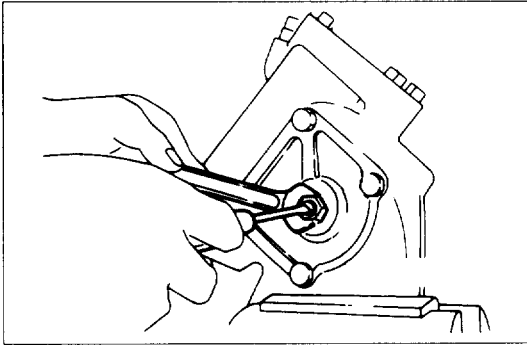
### Disassembly Steps

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





## Disassembly Steps



### 1. Lock Nut

### 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.

### 3. Gasket

### 4. Adjust Screw

### 5. Adjust Shim

### 6. Needle Bearing

### 7. Sector Shaft

When removing, use care so as not to cause damage to the serrations, threads and oil seal.

### 8. Needle Bearing

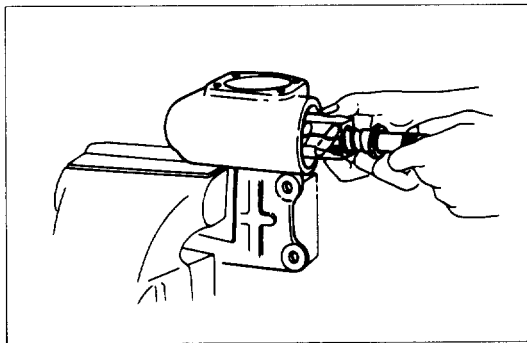
### 9. Oil Seal

### 10. End Cover

### 11. Adjust Shim

### 12. 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.



## INSPECTION AND REPAIR

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

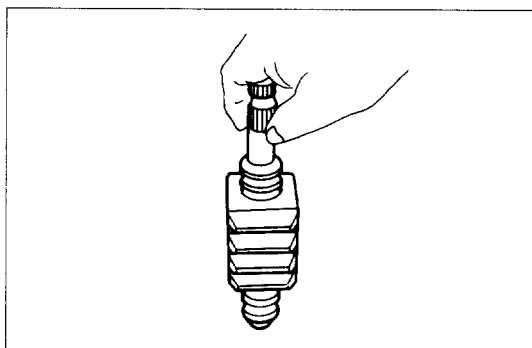
- Bearing
- Sector shaft
- Ball nut and worm shaft



### Visual Checks

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



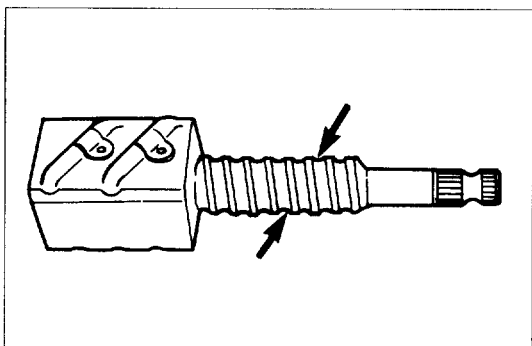


### Ball Nut Rotation

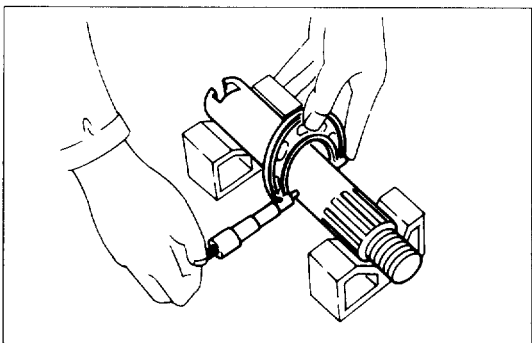
Hold the worm shaft vertically and see if the ball nut lowers with turning motion smoothly. If lowering of the ball nut with its own weight is unsmooth, check the worm shaft for bending and ball-groove for burrs, dents and presence of foreign matter.

#### 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.**



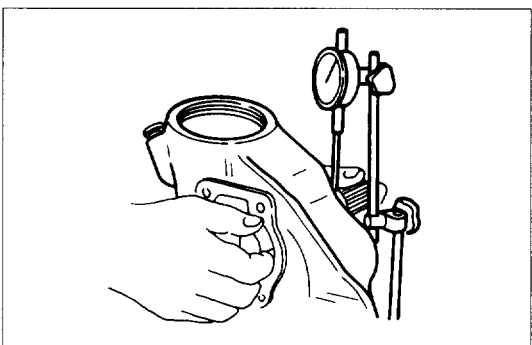
If any of the parts in the ball nut and worm shaft assembly is found to be defective, the entire parts should be replaced using a new worm shaft assembly. As these parts are of selective combination and are sealed to prohibit disassembly, the faulty parts should not be replaced individually.



### Sector Shaft Outside Diameter

mm(in.)

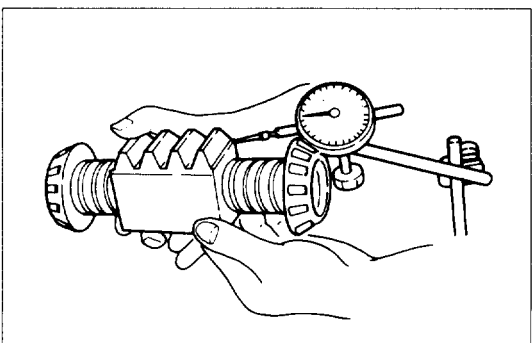
Standard	Limit
38.1 (1.50)	38.0 (1.496)



### Sector Shaft and Needle Bearing Play

mm(in.)

Limit
0.2 (0.008)



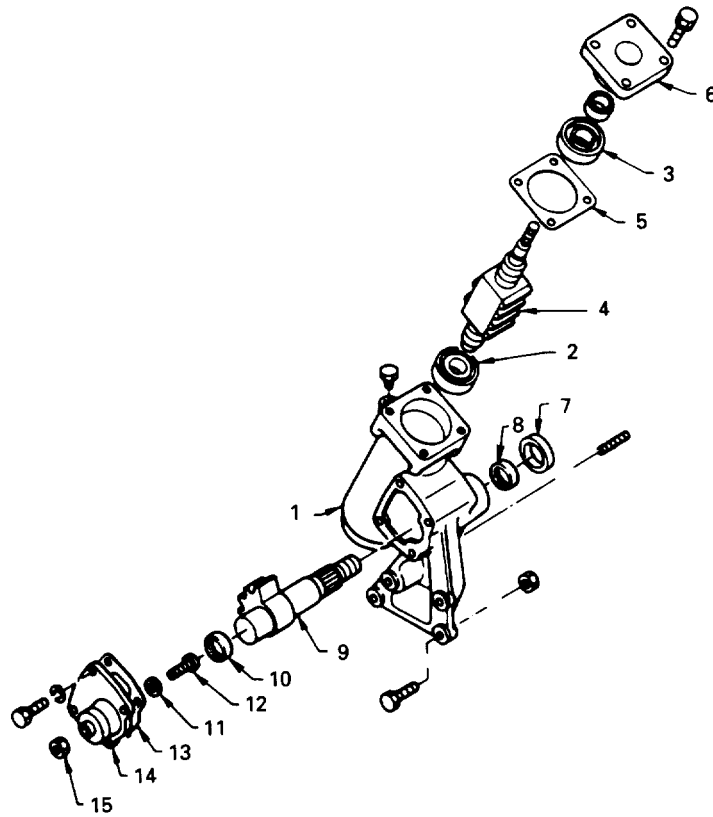
### Ball Nut Axial Play

mm(in.)

Limit
0.1 (0.004)



## REASSEMBLY



### Reassembly Steps

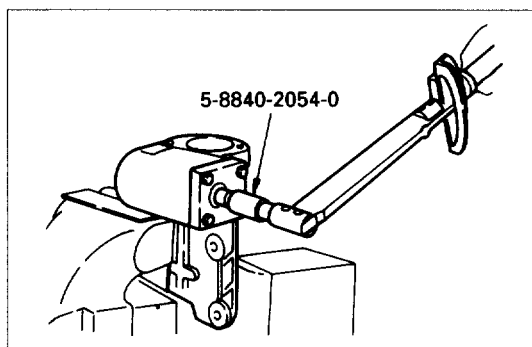
- |                            |                    |
|----------------------------|--------------------|
| 1. Gear box                | 9. Sector shaft    |
| 2. Bearing                 | 10. Needle bearing |
| 3. Bearing                 | 11. Adjust shim    |
| 4. Ball nut and worm shaft | 12. Adjust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



### Reassembly Steps

1. Gear Box
2. Bearing
3. Bearing
4. Ball Nut and Worm Shaft



**5. Adjust Shim**

- 1) Adjust the starting torque of input shaft by varying shim thickness.

Steering Shaft Driver : 5-8840-2054-0



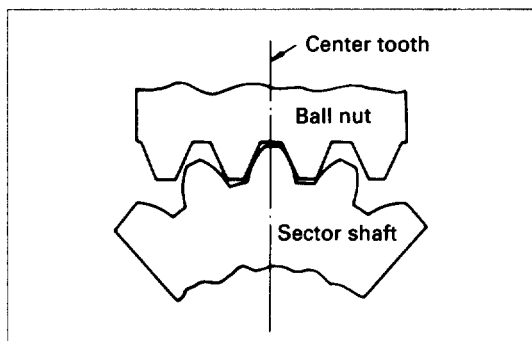
Starting Torque	N•m (kg•m/lb•ft)
0.29 – 0.69 (0.030 – 0.070 / 0.22 – 0.51)	
Adjust Shims Available	mm(in.)
0.01, 0.02, 0.05, 0.07, 0.08 (0.0004, 0.0008, 0.0020, 0.0028, 0.0031)	

**6. End Cover**

Fixing Bolt Torque	N•m (kg•m/lb•ft)
44 (4.5 / 33)	

**7. Oil Seal****8. Sector Shaft**

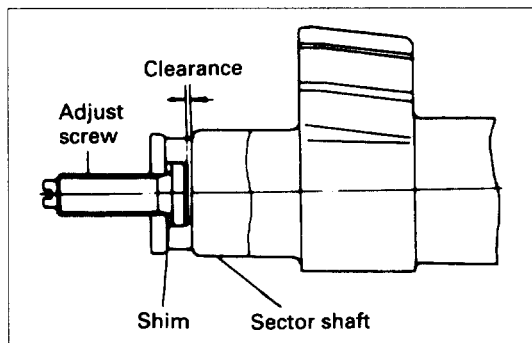
Align the center tooth of ball nut with that of the sector shaft.

**9. Sector Shaft****10. Needle Bearing****11. Adjust Shim****12. Adjust Screw**

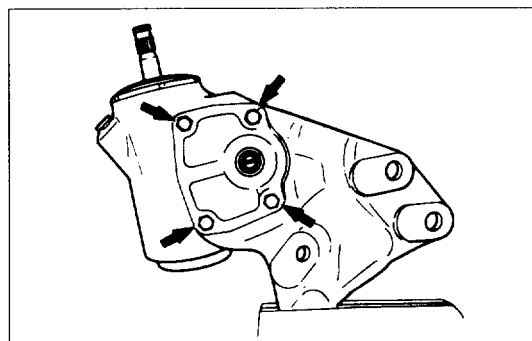
Adjust the clearance and check that the adjust screw slides freely.



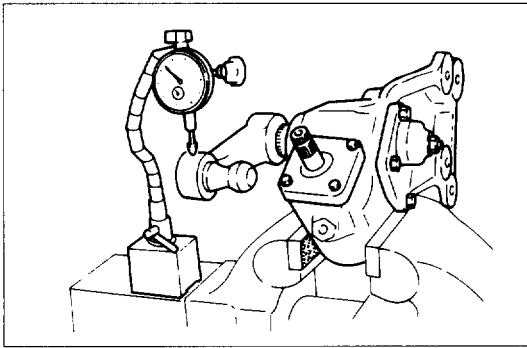
Clearance	mm(in.)
0.1 (0.0039)	
Adjust Shims Available	mm(in.)
1.53, 1.56, 1.59, 1.62, 1.65 (0.060, 0.061, 0.063, 0.064, 0.065)	

**13. Gasket****14. Side Cover**

Side Cover Bolt Torque	N•m (kg•m/lb•ft)
44 (4.5 / 33)	







### 15. Lock Nut

Adjust the backlash between the sector gear and ball nut.

- 1) Install the pitman arm.
- 2) Set the sector shaft in a straight ahead position.
- 3) With the adjusting screw, adjust the backlash to the specification.



Backlash (at End of Pitman Arm)	mm(in.)
0.5 (0.0197) or less	

- 4) Lock adjusting screw with lock nut.



Lock Nut Torque	N•m (kg•m/lb•ft)
25 (2.5 / 1.8)	

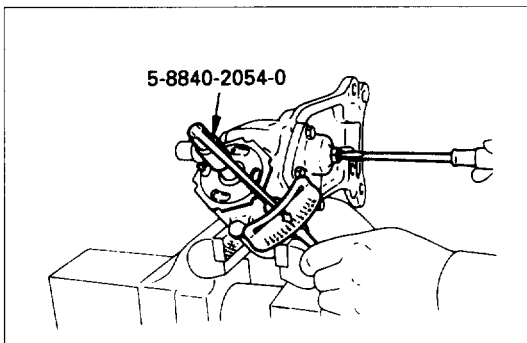
- 5) Inspect the starting torque of the input shaft.



Starting Torque	N•m (kg•m/lb•ft)
0.98 (0.1 / 0.72) or less	



Steering Shaft Driver : 5-8840-2054-0





## **SECTION 3B3**

# **STEERING LINKAGE**

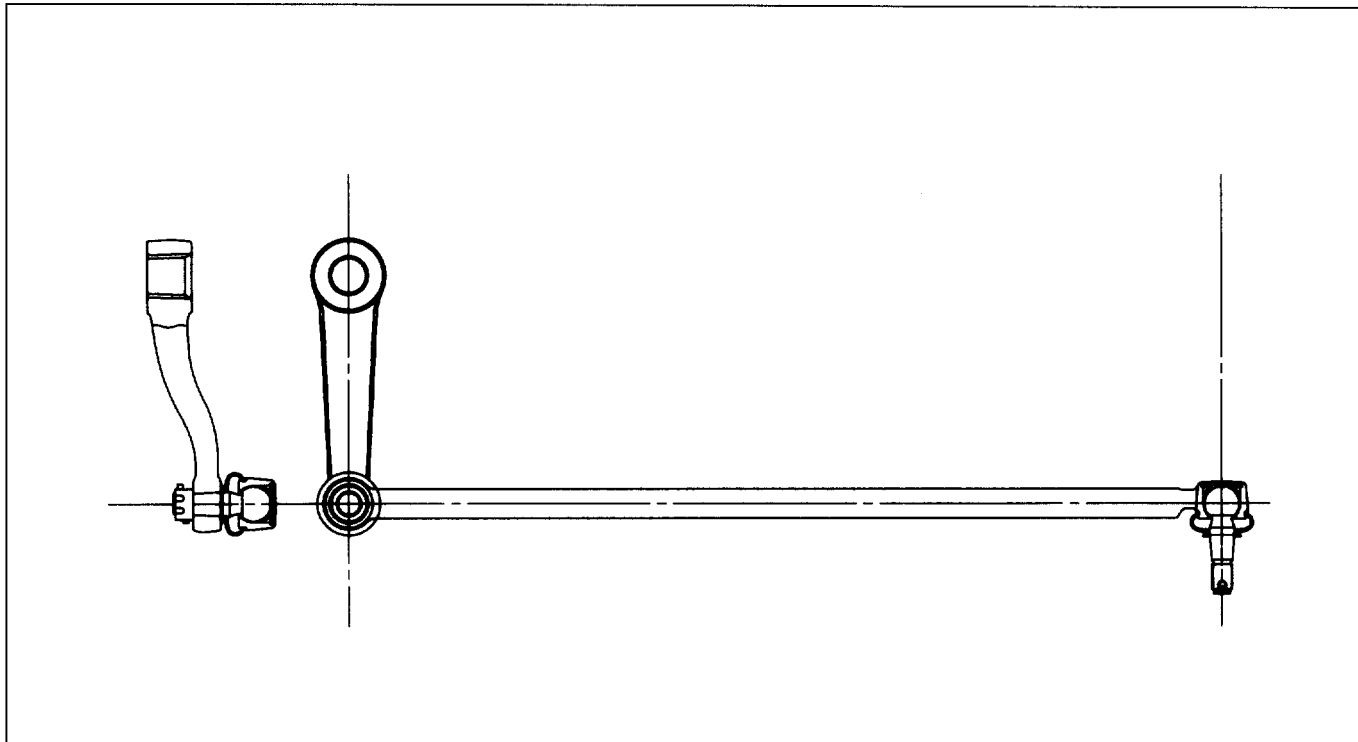
## **CONTENTS**

	<b>PAGE</b>
<b>General Description.....</b>	<b>3B3- 2</b>
<b>On-Vehicle Service.....</b>	<b>3B3- 4</b>
<b>Drag Link Replacement.....</b>	<b>3B3- 4</b>
<b>Tie Rod Replacement (2WD Rigid Suspension) .....</b>	<b>3B3- 6</b>
<b>Tie Rod Replacement (NPS).....</b>	<b>3B3- 9</b>
<b>Steering Link Replacement (Wishbone Suspension) .....</b>	<b>3B3-12</b>

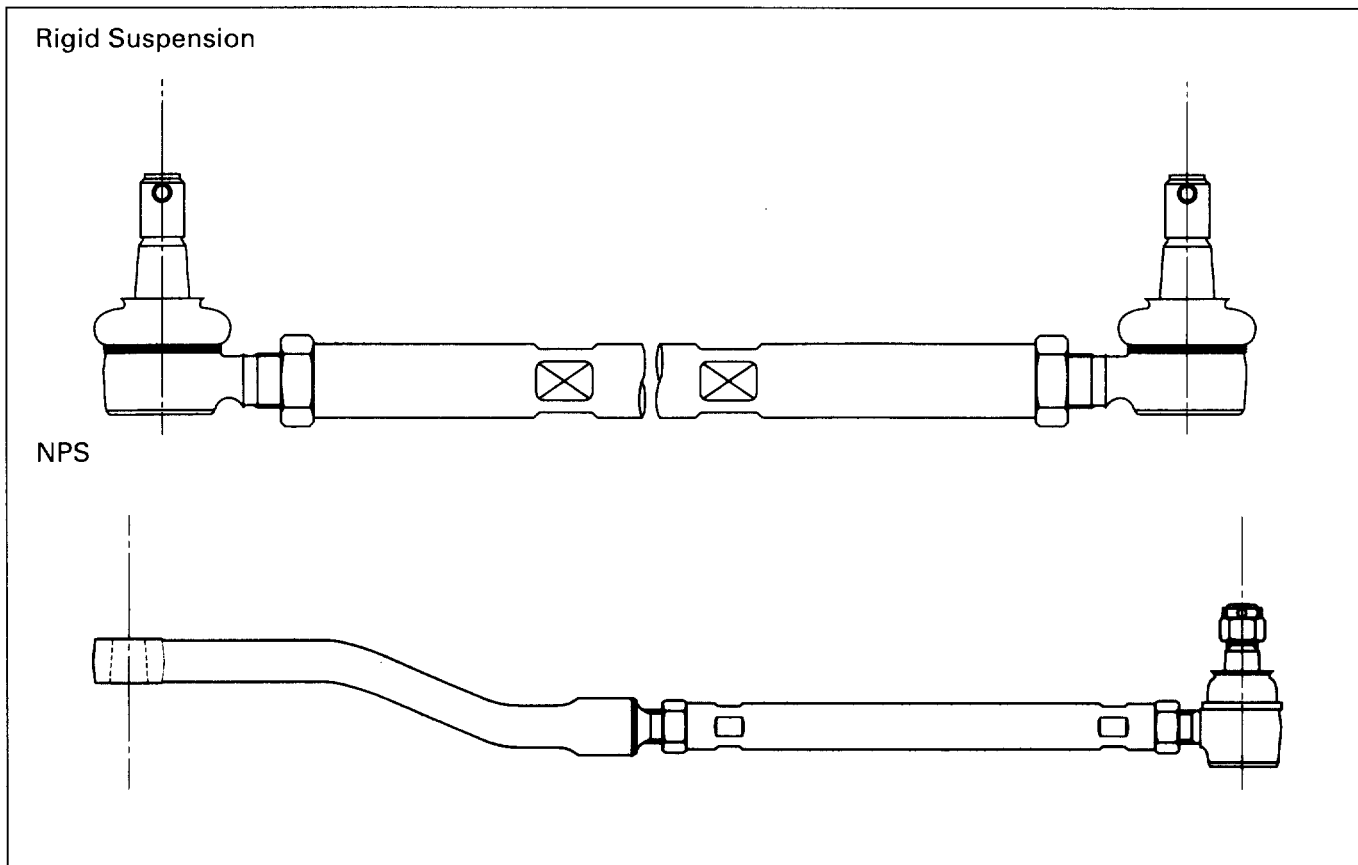


## GENERAL DESCRIPTION

### Drag Link and Pitman Arm

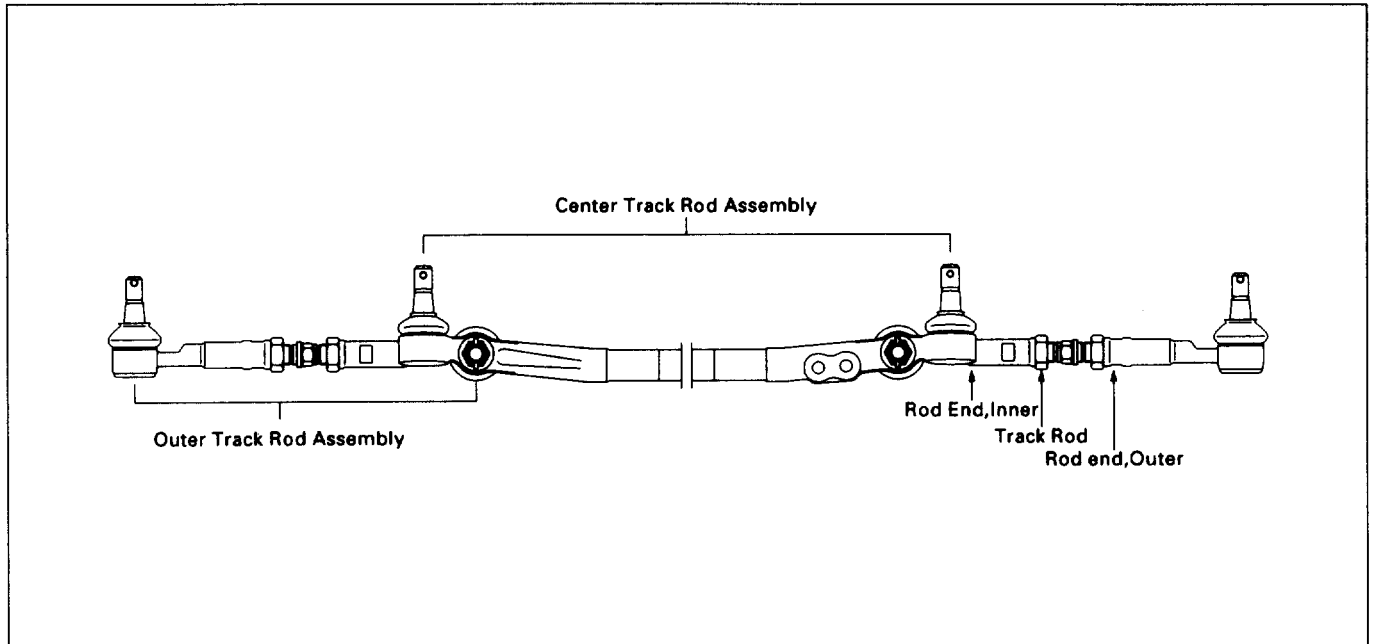


### Tie Rod Assembly





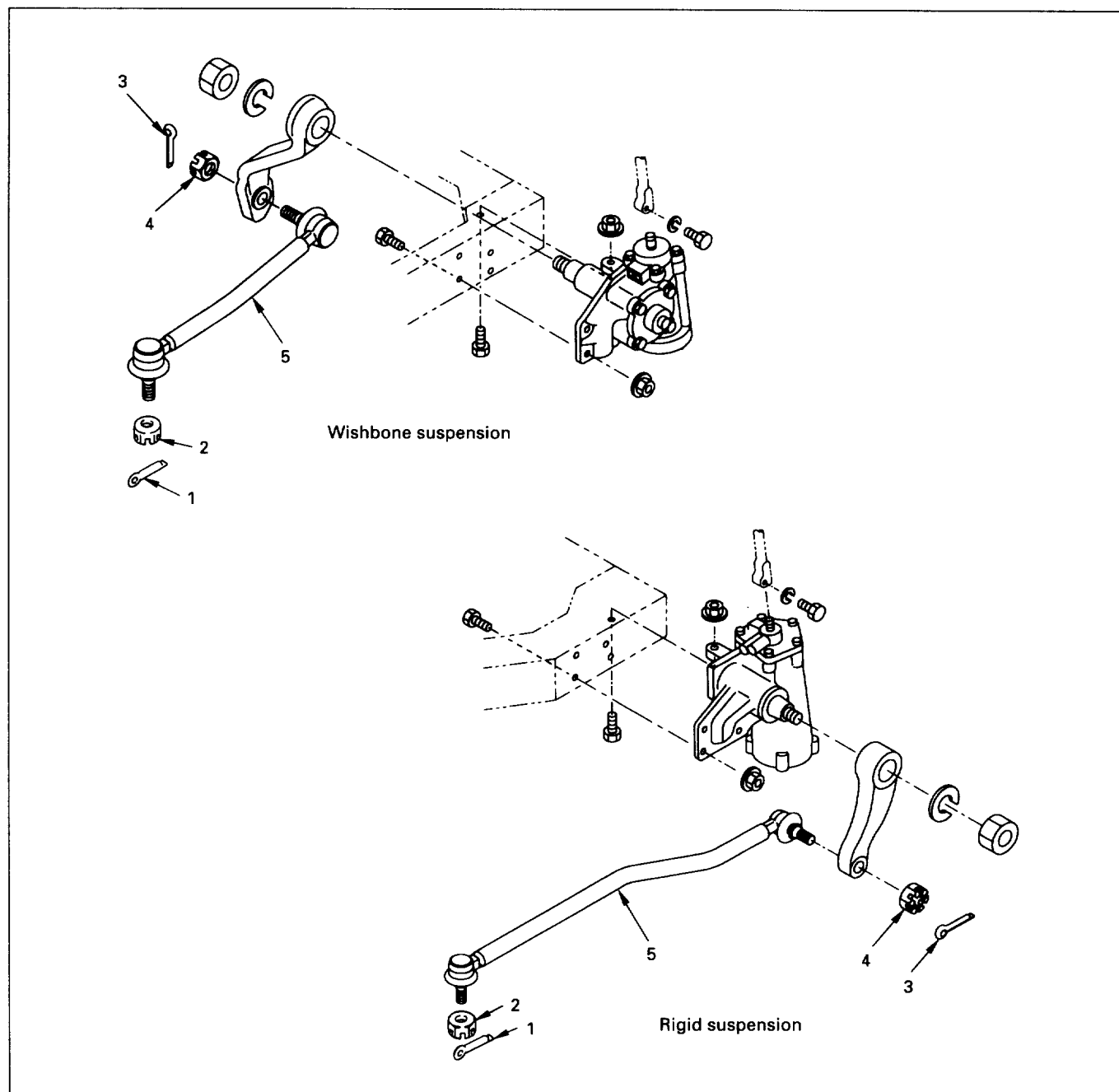
## Steering Link Assembly





## ON-VEHICLE SERVICE

### DRAW LINK REPLACEMENT



#### Removal Steps

1. Cotter pin
2. Nut
3. Cotter pin
4. Nut
5. Drag link

#### Installation Steps

5. Drag link
4. Nut
3. Cotter pin
2. Nut
1. Cotter pin

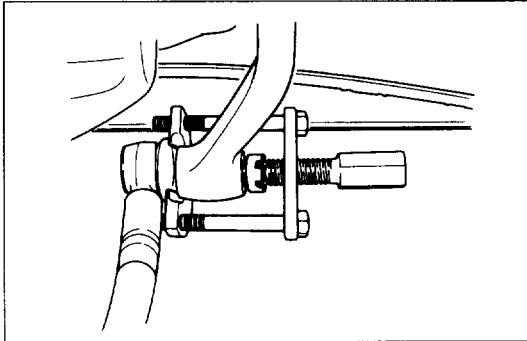




## REMOVAL

1. Cotter Pin
2. Nut
3. Cotter Pin
4. Nut
5. Drag Link

Remove the drag link using a special tool.



Remover : 5-8840-2017-0



### CAUTION:

**Be careful not to damage the ball joint boot.**

## INSPECTION AND REPAIR

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

Check the following parts.

- Ball joint (Boot, screws and tapered surface)



## INSTALLATION

5. Drag Link
4. Nut
3. Cotter Pin
2. Nut
1. Cotter Pin

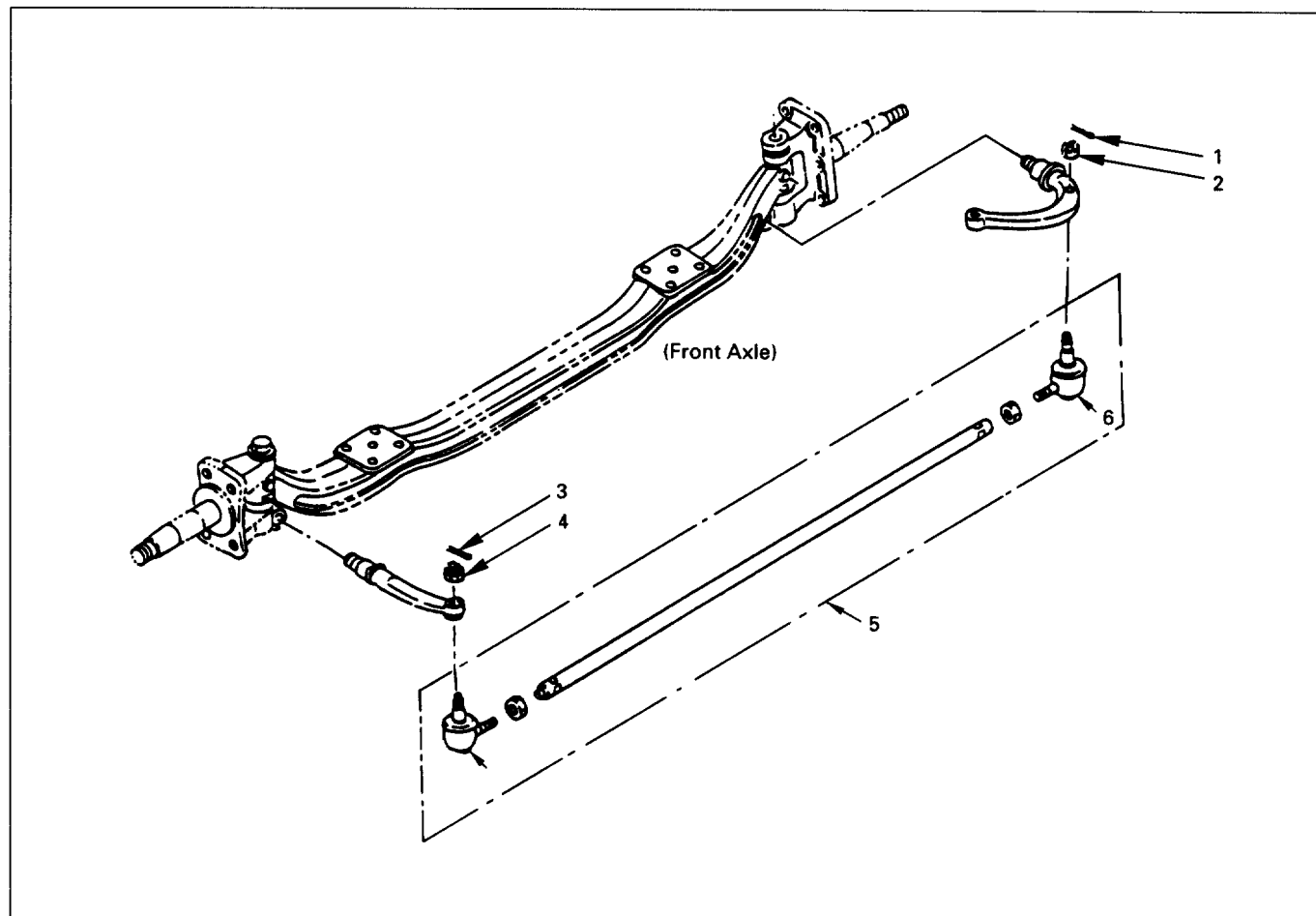
Tighten the nut to the specified torque, with just enough additional torque to align cotter pin holes. Install new cotter pin.



Drag Link Nut Torque	N·m (kg·m/lb·ft)
17 (167 / 123)	



## TIE ROD REPLACEMENT (2WD RIGID SUSPENSION)



### Removal Steps

1. Cotter pin
2. Nut
3. Cotter pin
4. Nut
5. Tie rod assembly
6. Tie rod end

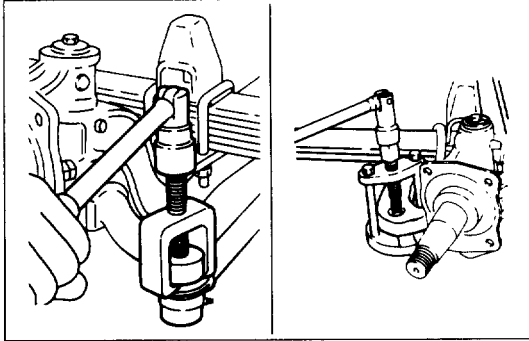
### Installation Steps

6. Tie rod end
5. Tie rod assembly
4. Nut
3. Cotter pin
2. Nut
1. Cotter pin





## REMOVAL



1. Cotter Pin
2. Nut
3. Cotter Pin
4. Nut
5. Tie Rod Assembly

Remove the tie rod assembly using a special tool.



Remover

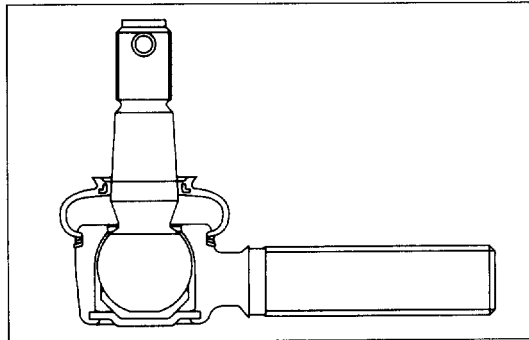
Driver side : 5-8840-2017-0

Assistant side : 5-8840-2018-0

6. Tie Rod End

## INSPECTION AND REPAIR

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



### Tie Rod End

Inspect the ball joint taper fitting part for contact condition or abnormal wear.

Inspect the boot for damage or grease leak. Move the ball joint to confirm its normal movement.

If abnormal condition is found, replace the assembly because it cannot be disassembled.



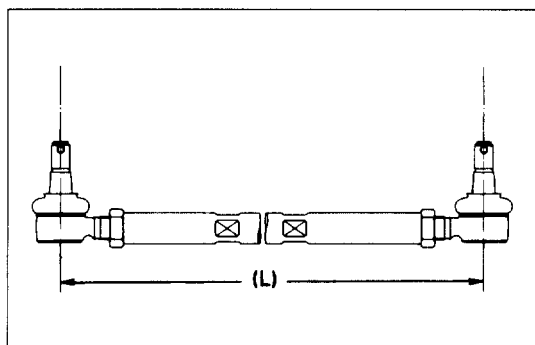
### Tie Rod

Inspect the tie rod tube for bending, or damaged threads.

If abnormal condition is found, replace the assembly or correct if bending is small.



## INSTALLATION



### 6. Tie Rod End

### 7. Tie Rod Assembly



- 1) Install the tie rod end to the tie rod.
- 2) Adjust length of tie rod by turning the connecting rod.

Tie Rod Length (L)

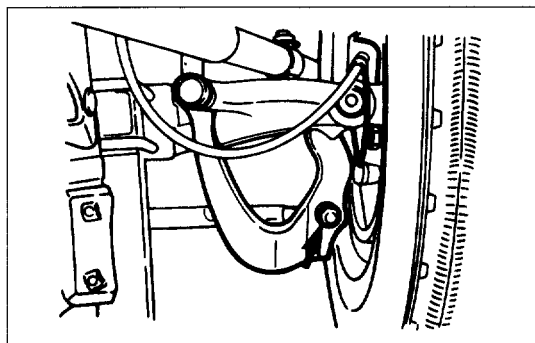
1994 – 1997 Model mm(in.)

NHR, NKR	1153.5 (45.413)
NPR, NQR	1446.5 (56.949)

1998~ Model mm(in.)

NHR	1153.5 (45.413)
NKR	1160.5 (45.925)
NPR, NQR	1446.5 (56.949)

- 3) After adjustment of length, temporarily tighten the tie rod end lock nut.



### 4. Nut

### 3. Cotter Pin

### 2. Nut

### 1. Cotter Pin

- 1) Tighten the nut to specified torque, with just enough additional torque to align cotter pin hole. Install new cotter pin.



Tie Rod Nut N·m (kg·m/lb·ft)

108 (11 / 80)



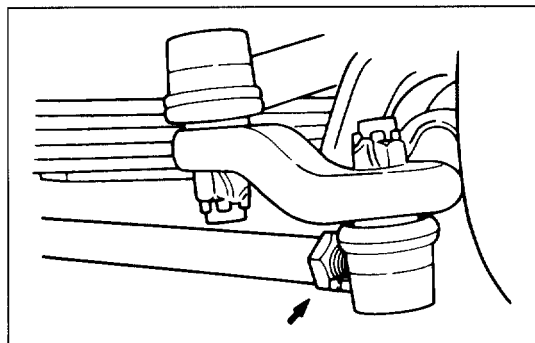
- 2) Adjust the front end alignment after installation. Refer to "Front end alignment" in Section 3A.

- 3) Tighten tie rod end lock nuts to specified torque after adjustment of front end alignment.



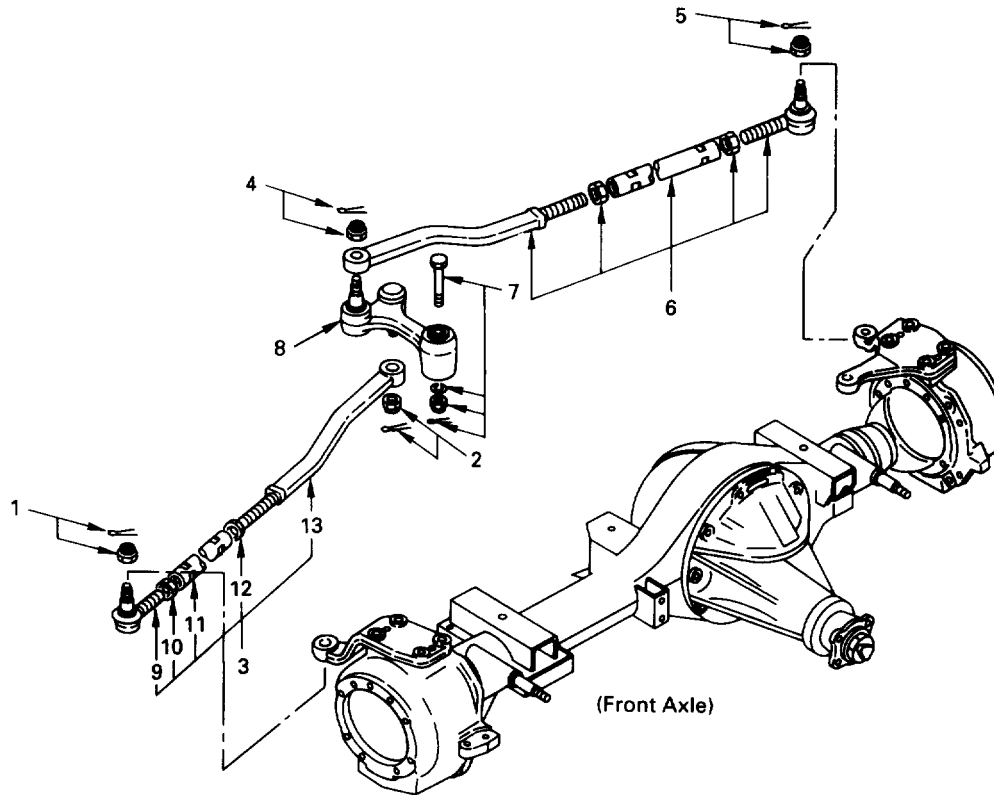
Lock Nut Torque N·m (kg·m/lb·ft)

113 (11.5 / 83)





## TIE ROD REPLACEMENT (NPS)



### Removal Steps

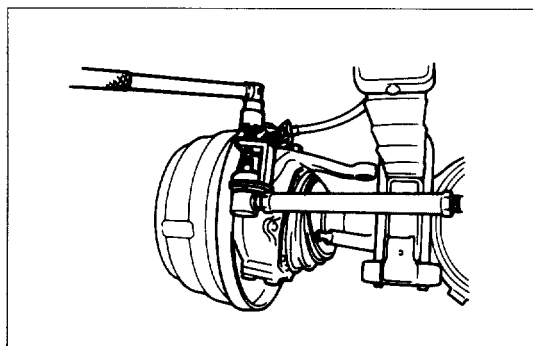
1. Nut and cotter pin
2. Nut and cotter pin
3. Tie rod assembly
4. Nut and cotter pin
5. Nut and cotter pin
6. Tie rod assembly
7. Bolt, nut, washer and cotter pin
8. Relay lever
9. Tie rod end
10. Lock nut
11. Tie rod tube
12. Lock nut
13. Tie rod

### Installation Steps

13. Tie rod
12. Lock nut
11. Tie rod tube
10. Lock nut
9. Tie rod end
8. Relay lever
7. Bolt, nut, washer and washer
6. Tie rod assembly
5. Nut and cotter pin
4. Nut and cotter pin
3. Tie rod assembly
2. Nut and cotter pin
1. Nut and cotter pin



## REMOVAL



1. Nut and Cotter Pin
2. Nut and Cotter Pin
3. Tie Rod Assembly
4. Nut and Cotter Pin
5. Nut and Cotter Pin
6. Tie Rod Assembly

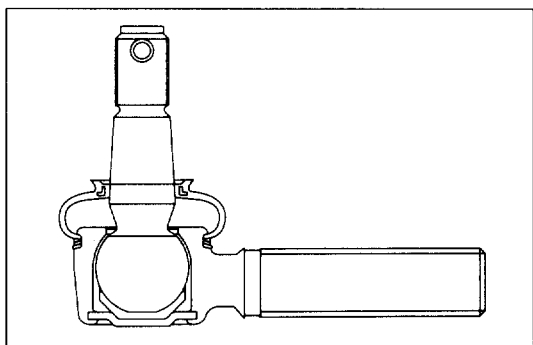


Remover : 5-8840-2189-0

7. Bolt, Nut, Washer and Cotter Pin
8. Relay Lever
9. Tie Rod End
10. Lock Nut
11. Tie Rod Tube
12. Lock Nut
13. Tie Rod

## INSPECTION AND REPAIR

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



### Tie Rod End

- Inspect the ball joint taper fitting part for contact condition or abnormal wear.
- Inspect the boot for damage or grease leak.
- Move the ball joint to confirm its normal movement.
- If abnormal condition is found, replace the assembly because it cannot be disassembled.



### Tie Rod

Inspect the tie rod tube for bending, or damaged threads.

If abnormal condition is found, replace the assembly or correct if bending is small.



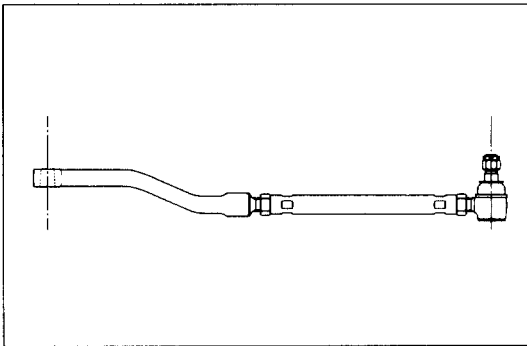
### Relay Lever

Inspect the relay lever bushing. If bushing is defective, replace the relay lever assembly.





## INSTALLATION



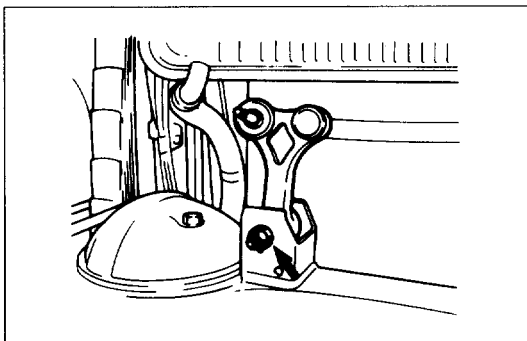
13. Tie Rod
12. Lock Nut
11. Tie Rod Tube
10. Lock Nut
9. Tie Rod End

1) Install all parts and adjust tie rod length (L).



Tie Rod Length (L)	mm(in.)
781 (30.748)	

2) After adjustment, tighten lock nuts temporarily.

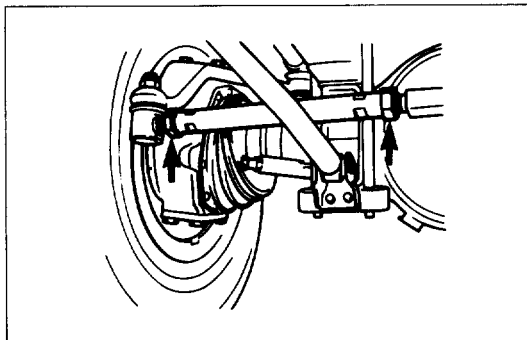


8. Relay Lever
7. Bolt, Nut, Washer and Cotter Pin

- 1) Install the relay lever to the bracket.
- 2) Tighten the nut to specified torque, with just enough additional torque to align cotter pin hole.
- 3) Install new cotter pin.



Relay Lever Nut Torque	N·m (kg·m/lb·ft)
147 (15 / 108)	



6. Tie Rod Assembly
5. Nut and Cotter Pin
4. Nut and Cotter Pin
3. Tie Rod Assembly
2. Nut and Cotter Pin
1. Nut and Cotter Pin

- 1) Tighten tie rod end nut to specified torque, with just enough additional torque to align cotter pin hole.  
Install new cotter pin.

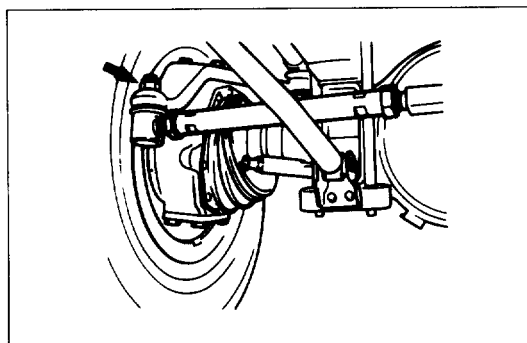


Tie Rod End Nut Torque	N·m (kg·m/lb·ft)
186 (19 / 137)	

- 2) Adjust the front end alignment after installation.  
Refer to "Front end alignment" in Section 3A.
- 3) After adjustment, tighten the lock nuts to specified torque.

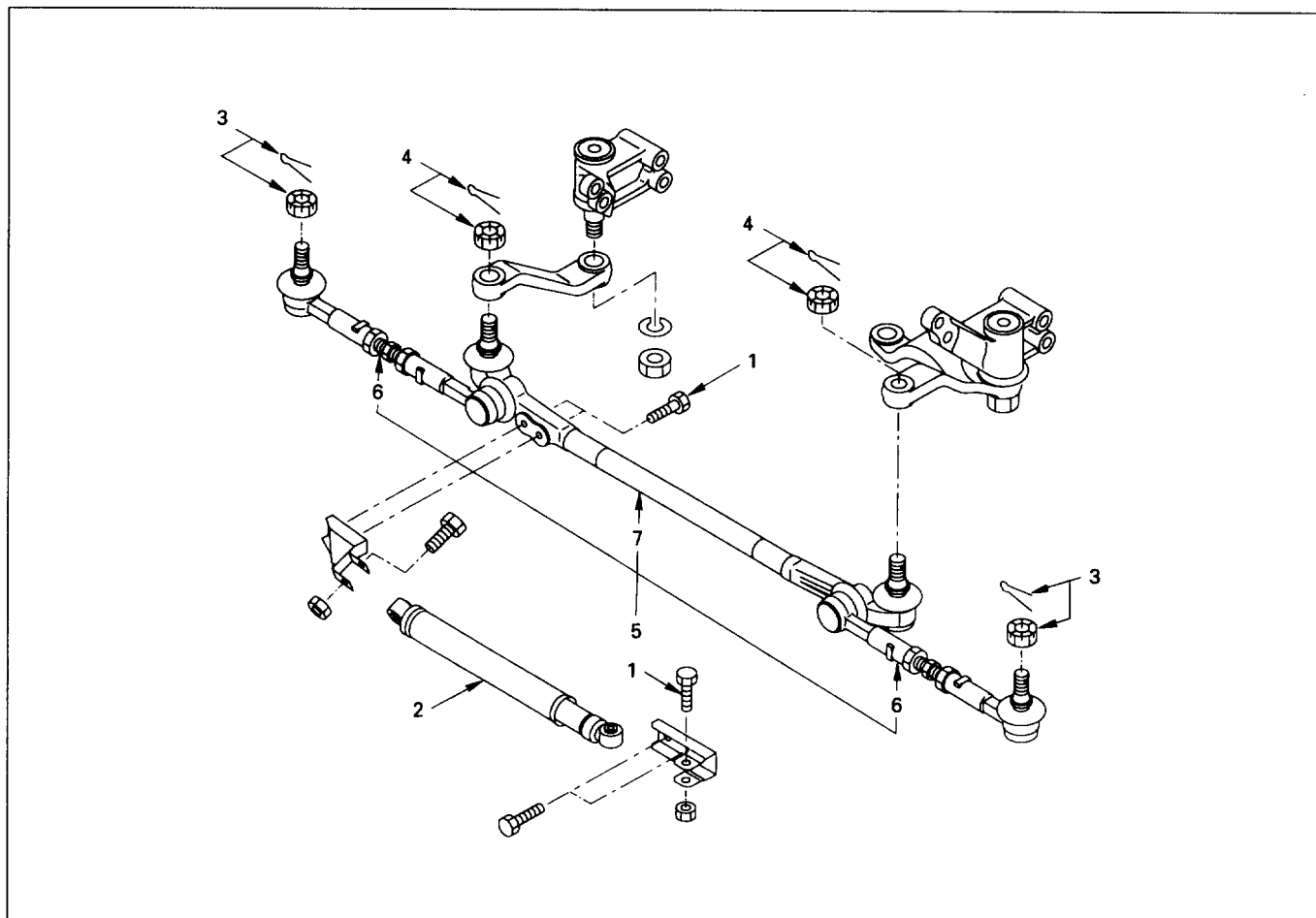


Lock Nut Torque	N·m (kg·m/lb·ft)
113 (11.5 / 83)	





## STEERING LINK REPLACEMENT (WISHBONE SUSPENSION)



### Removal Steps

1. Bolt
2. Steering damper
3. Nut and cotter pin
4. Nut and cotter pin
5. Steering link assembly
6. Outer track rod
7. Center track rod

### Installation Steps

7. Center track rod
6. Outer track rod
5. Steering link assembly
4. Nut and cotter pin
3. Nut and cotter pin
2. Steering damper
1. Bolt



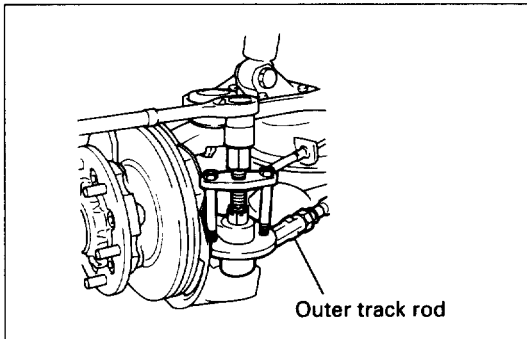


## REMOVAL

### Preparation:

Raise the vehicle and support the frame with suitable safety stands.

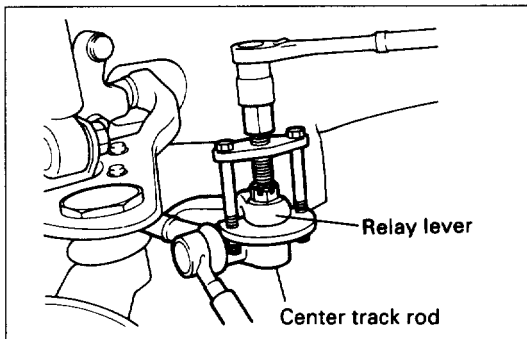
1. Bolts
2. Steering Damper



### 3. Nut and Cotter Pin

Disconnect outer track rods from knuckle.

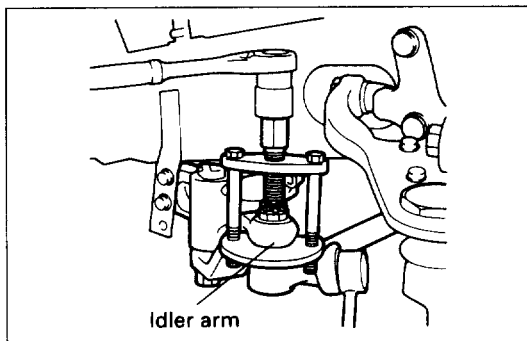
Remover : 5-8840-2017-0



### 4. Nut and Cotter Pin

- 1) Disconnect center track rod from relay lever.

Remover : 5-8840-2017-0



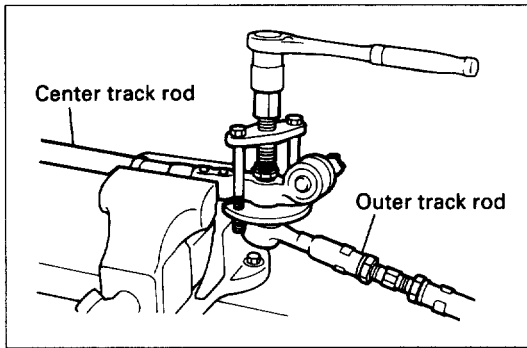
- 2) Disconnect center track rod from idler arm.

Remover : 5-8840-2017-0



### 5. Steering Link Assembly





#### 6. Outer Track Rod

#### 7. Center Track Rod

Disconnect outer track rods from the center track rod.

Remover : 5-8840-2017-0



### INSPECTION

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



#### Outer Track Rod End

- Inspect the ball joint taper fitting part for contact condition or abnormal wear.
  - Inspect the boot for damage or grease leak.
  - Move the ball joint to confirm its normal movement.
- If abnormal condition is found, replace the rod end assembly because it cannot be disassembled.



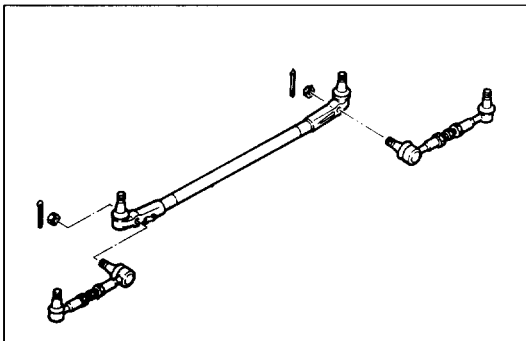
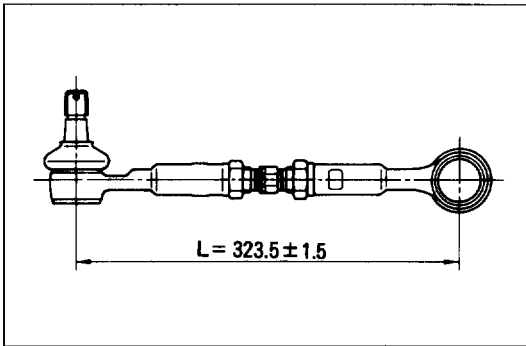
#### Center Track Rod

- Inspect the center track rod for bending or any other abnormal conditions.
  - Inspect the ball joint taper fitting part for contact condition or abnormal wear.
  - Inspect the boot for damage or grease leak.
  - Move the ball joint to confirm its normal movement.
- If abnormal condition is found, replace the center track rod assembly because it cannot be disassembled.





## INSTALLATION



### 7. Center Track Rod

### 6. Outer Track Rod

- 1) Adjust outer track rod length (L) to specified length.



Rod Length (L)	mm(in.)
	323.5 (12.736)

- 2) After adjustment, tighten track rod end lock nut temporarily.
- 3) Install outer track rods to the center track rod. Tighten nuts to specified torque, with just enough additional torque to align cotter pin hole. Install new cotter pin.



Outer Track Rod Nut Torque	N·m (kg·m/lb·ft)
	108 (11 / 80)

### 5. Steering Link Assembly

### 4. Nut and Cotter Pin

### 3. Nut and Cotter Pin

- 1) Connect center track rod ends to the idler arm and relay lever.
- 2) Connect outer track rod ends to knuckle.
- 3) Tighten nuts to specified torque, with just enough additional torque to align cotter pin hole. Install new cotter pin.



Center Track Rod End Nut Torque	N·m (kg·m/lb·ft)
	167 (17 / 123)



Outer Track Rod End Nut Torque	N·m (kg·m/lb·ft)
	108 (11 / 80)



- 4) Adjust the front end alignment after installation. Refer to "Front end alignment" in Section 3A.

- 5) Tighten outer track rod end lock nuts to specified torque after adjustment of front end alignment.



Lock Nut Torque	N·m (kg·m/lb·ft)
	167 (17 / 123)



2. **Steering Damper**

1. **Bolt**



Steering Damper Bolt Torque	N·m (kg·m/lb·ft)
40 (4.1 / 30)	



**SECTION 3B4**  
**STEERING COLUMN**

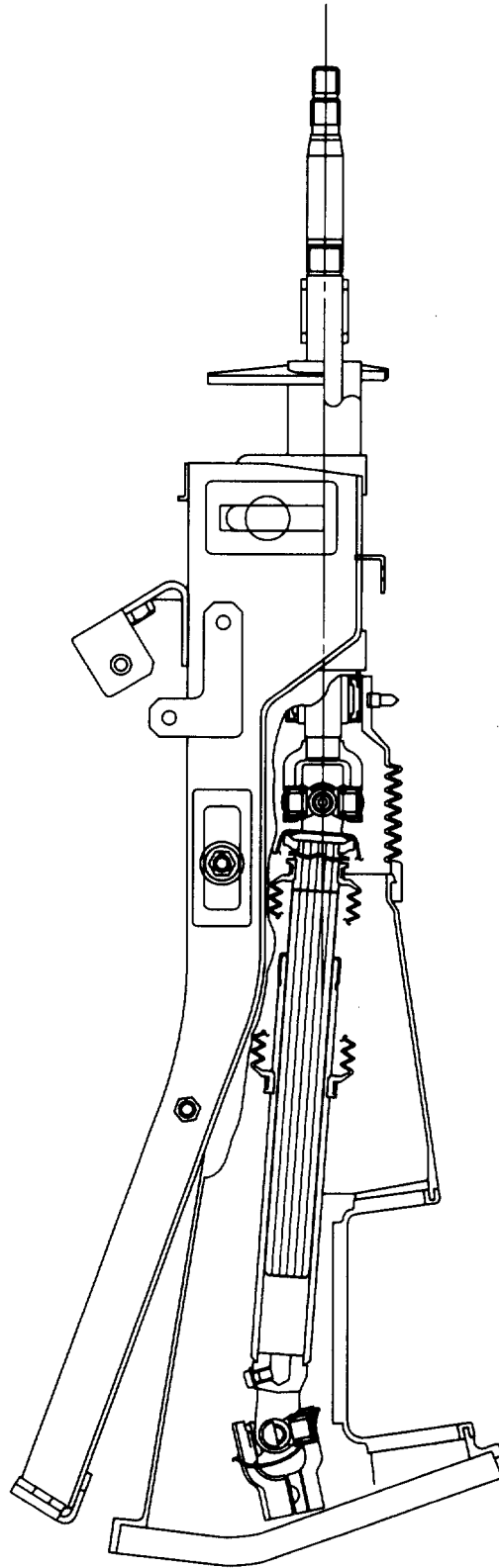
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	<b>PAGE</b>
<b>General Description.....</b>	<b>3B4- 2</b>
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<b>Steering Wheel, Shaft and Column .....</b>	<b>3B4- 3</b>



## GENERAL DESCRIPTION

This illustration is based on tilt and telescopic control type.

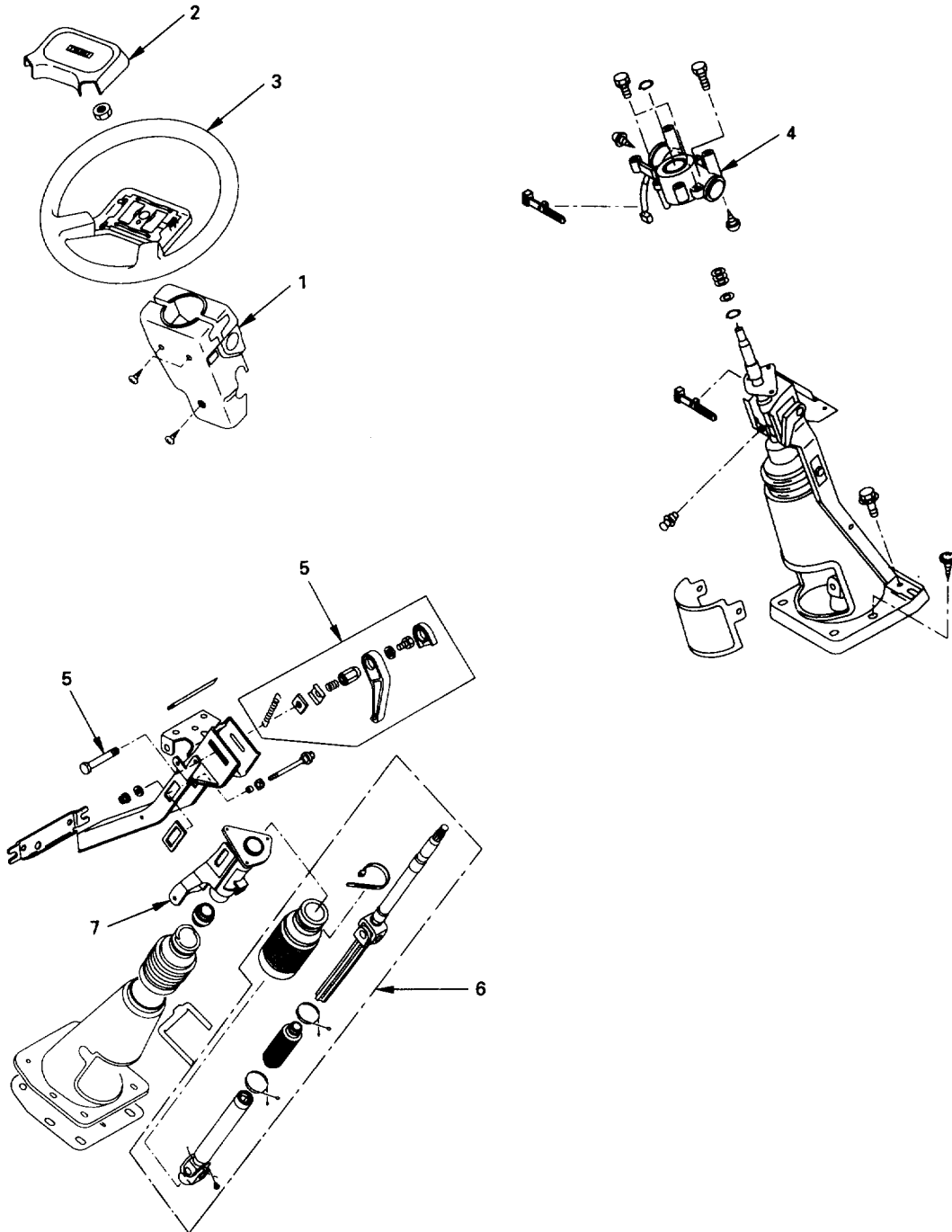




# ON-VEHICLE SERVICE

## STEERING WHEEL, SHAFT AND COLUMN

This illustration is based on RHD tilt and telescopic control type.





### Removal Steps

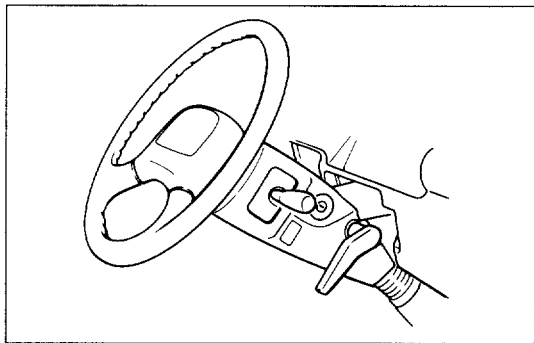
1. Steering cowl
2. Horn button
3. Steering wheel
4. Starter switch and key cylinder assembly
5. Tilt control (or support bolt)
6. Steering shaft assembly
7. Steering column

### Installation Steps

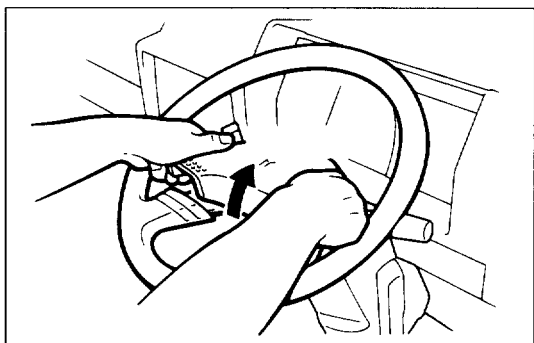
7. Steering column
6. Steering shaft assembly
5. Tilt control (or support bolt)
4. Starter switch and key cylinder assembly
3. Steering wheel
2. Horn button
1. Steering cowl



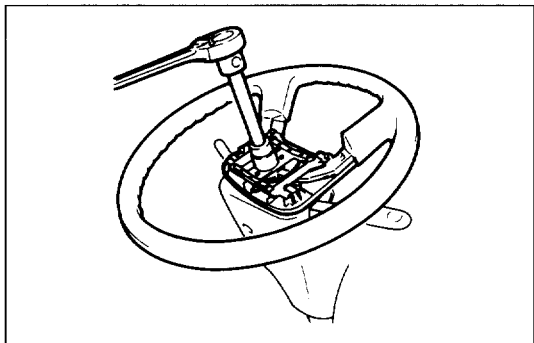
## REMOVAL



### 1. Steering Cowl



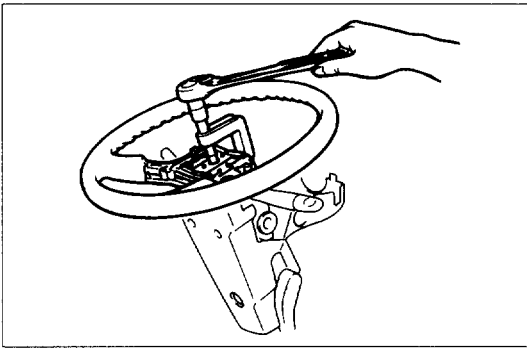
### 2. Horn Button



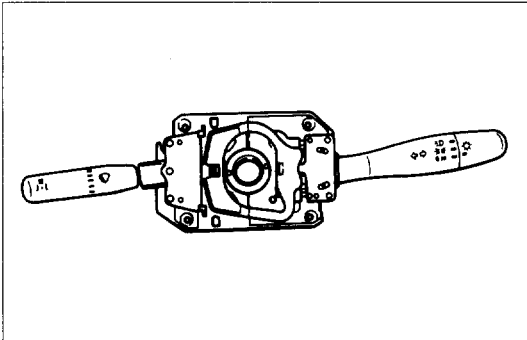
### 3. Steering Wheel

- Remove the locking nuts for the steering wheel.

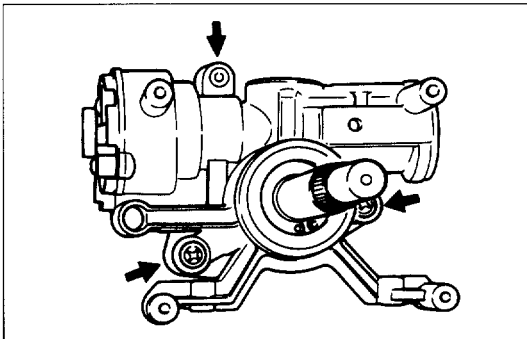




- Remove the steering wheel using the special tool.  
Remover: 5-8840-2215-0

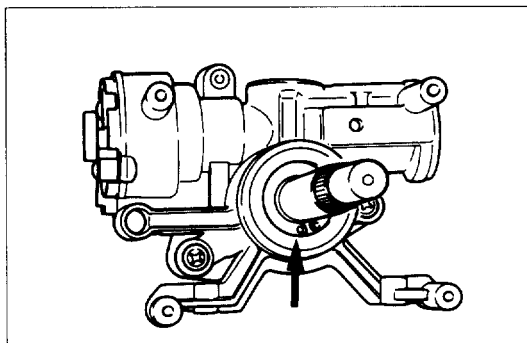


- Take out the combination switch.

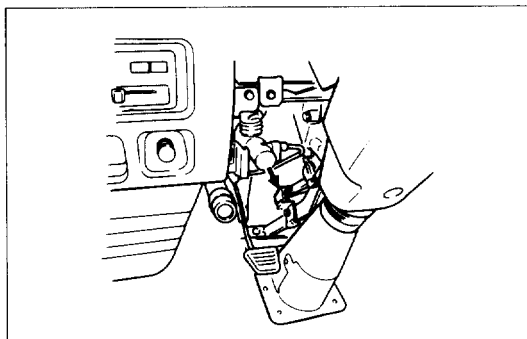


#### 4. Starter Switch and Key Cylinder Assembly

- Cut the steering lock with a hack saw to loosen the screws.

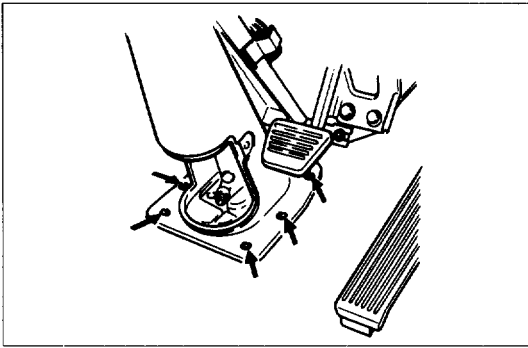


- Remove the snap rings and remove the steering lock assembly.

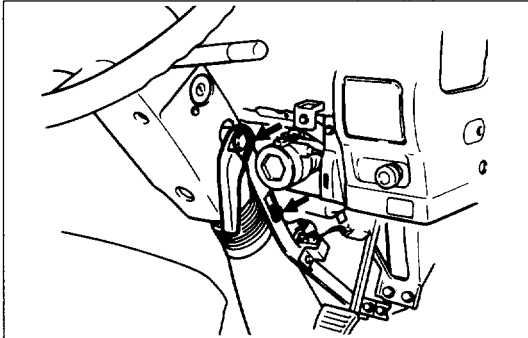


- Remove the harness connectors.



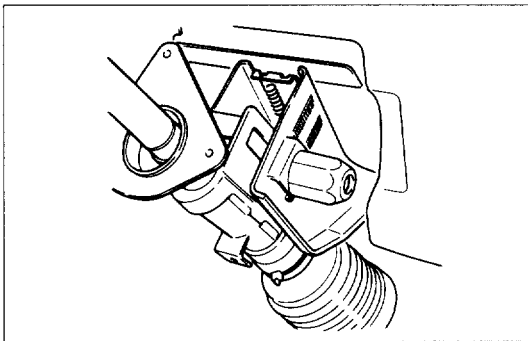


- Remove the inspection window in the boots to describe a mating mark on the steering shaft and the yolk of universal joint.



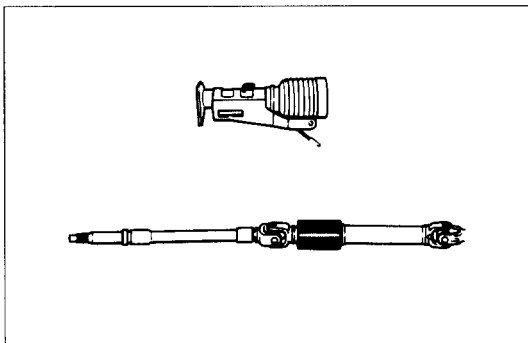
#### 5. Tilt control

- Remove the tilt control and the support brackets retaining bolts for the steering wheel column.



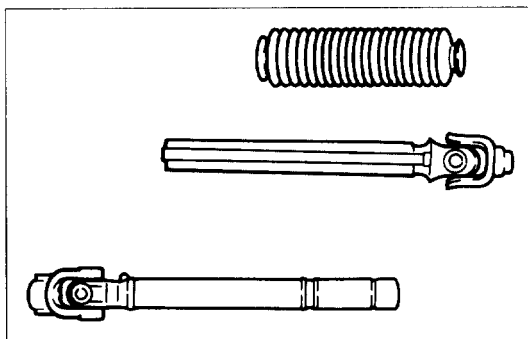
#### for Tilt Steering

- Remove the tilt spring.



#### 6. Steering Shaft

- Pull the steering shaft out of the column.



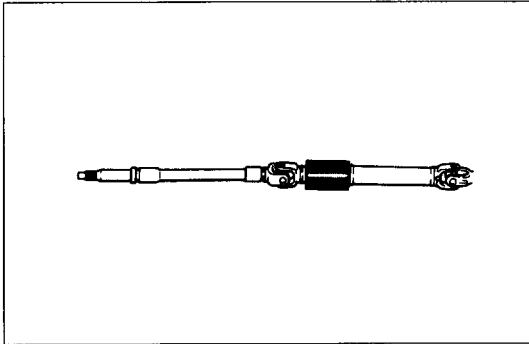
- Describe a mating mark on the spline shaft and steering shaft and dismantle them.

#### 7. Steering Column



## INSPECTION AND REPAIR

Clean up the dismantled components to perform inspection over each component.



### Steering Shaft

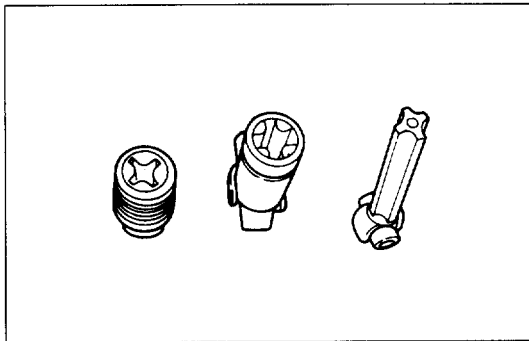
- Inspect the bend.
- Inspect the universal joint.  
Check the yolk for crack and deformation.  
Chattering in the joint pairing.



### CAUTION:

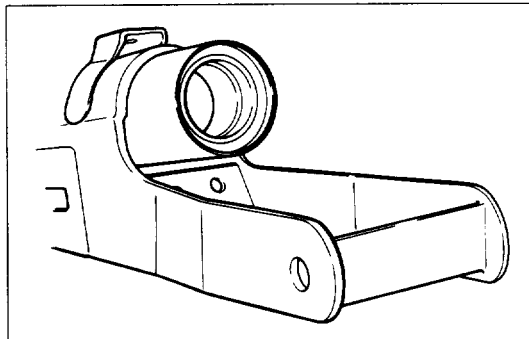
**The universal joint is non-repairable type.**

- Inspect the spline shaft.  
Significant chattering in the turning direction of steering shaft  
Chattering in the joints  
Fracture and deterioration in the boots



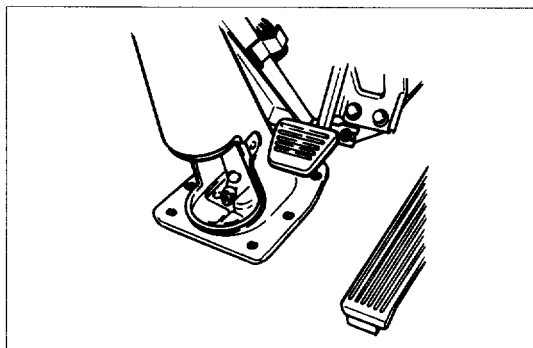
### Steering Column

- Check to see if there is no significant deformation in the steering column.
- Check the boots for fracture and deterioration.
- Check the bushing for wear and deformation.





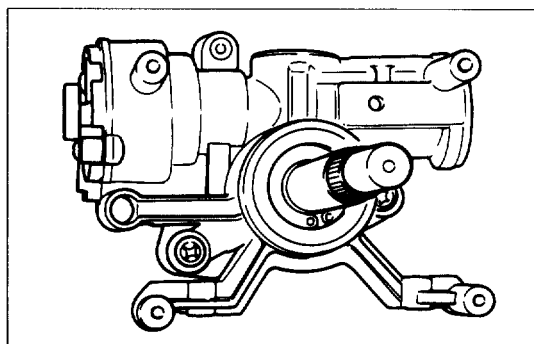
## INSTALLATION



### 7. Steering Column

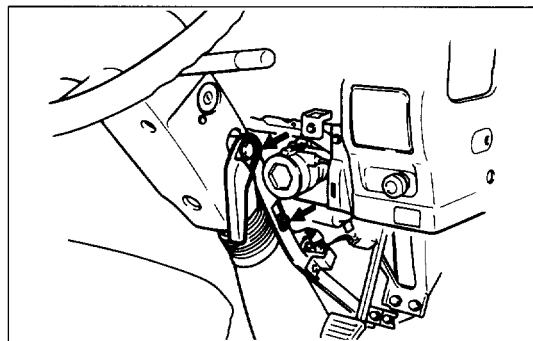
### 6. Steering Shaft

- Assemble the steering shaft referring to the mating mark described at the time of dismantling and install the shaft.
- Install the steering shaft to the steering unit referring to the mating mark described at the time of dismantling.



### 4. Starter Switch and Key Cylinder Assembly

- Install the steering lock assembly and insert the snap ring positively.
- Use new screws.



### 5. Tilt Control ( or Support Bolt)

- Tighten the retaining nuts for the lower steering column support brackets to the specified torque.
- Tighten the nuts outside the tilt control to the specified torque to install the lever, and tighten the lever retaining bolts to the specified torque.



Lower Support Bolt and Nut Torque    N•m (kg•m/lb•ft)

---

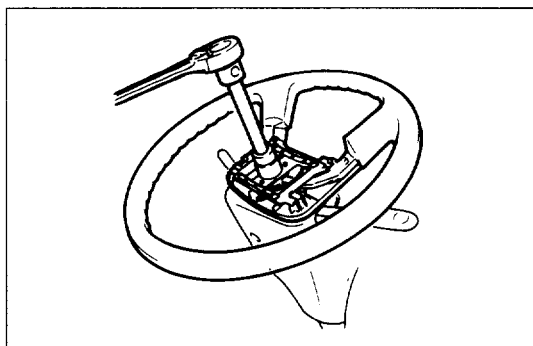
14 (1.4 / 122)

---



Tilt Control Bolt and Nut Torque    N•m (kg•m/lb•ft)	
Bolt	45 (4.5 / 33)
Nut	16 (1.6 / 12)
Nut (Non-tilt)	20 (2.0 / 14)





### 3. Steering Wheel

- Install the combination switch.
- Install the steering wheel and tighten the nuts to the specified torque.

Steering Wheel Nut Torque	N•m (kg•m/lb•ft)
50 (5 / 36)	

### 2. Horn Button

#### 1. Steering Cowl

- Hook up the harness connectors and install the steering cowl.



# SECTION 3C

## FRONT SUSPENSION

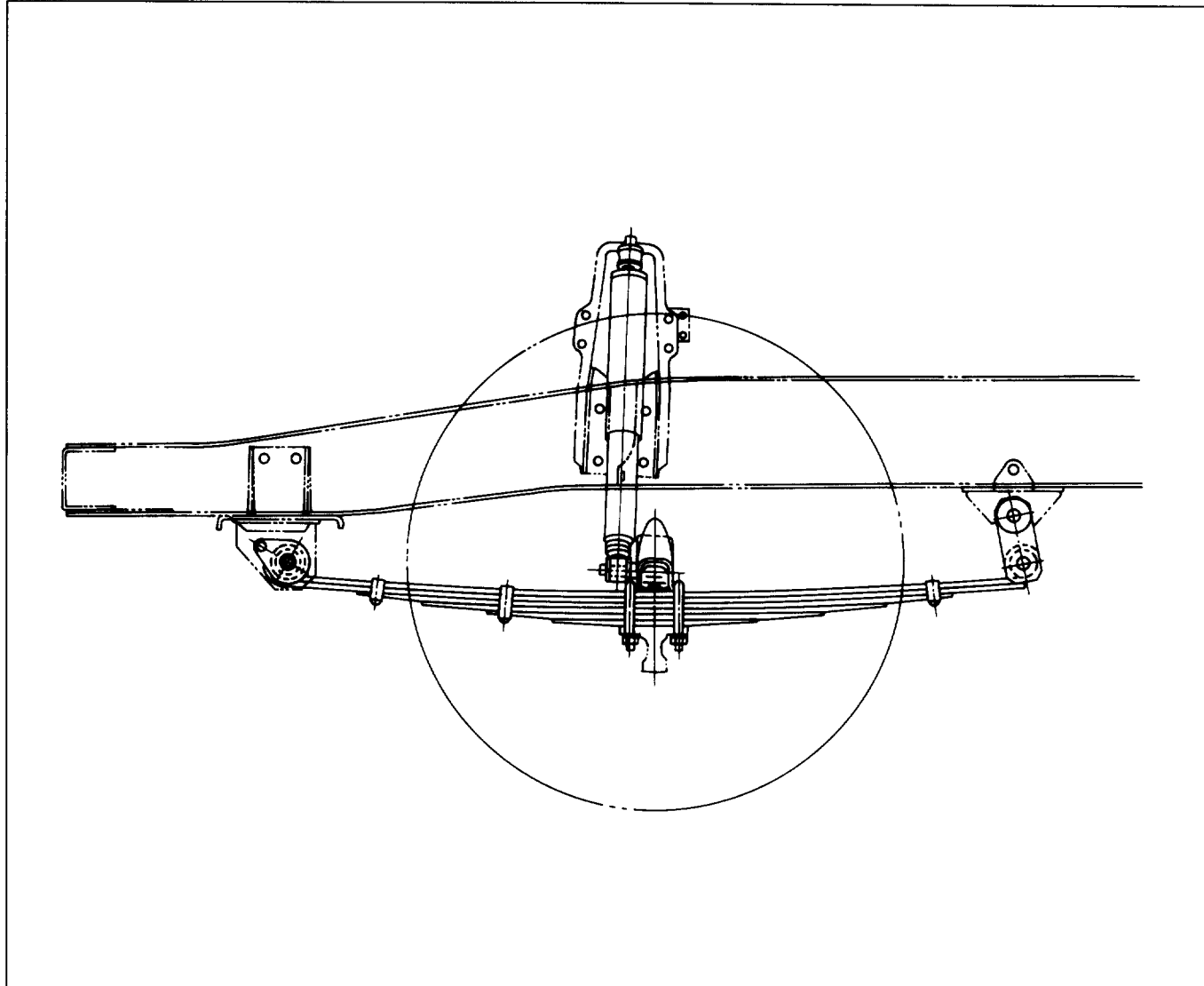
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Front Suspension (Rigid Suspension) .....	3C– 4
Front Suspension (Wishbone Suspension) .....	3C– 20



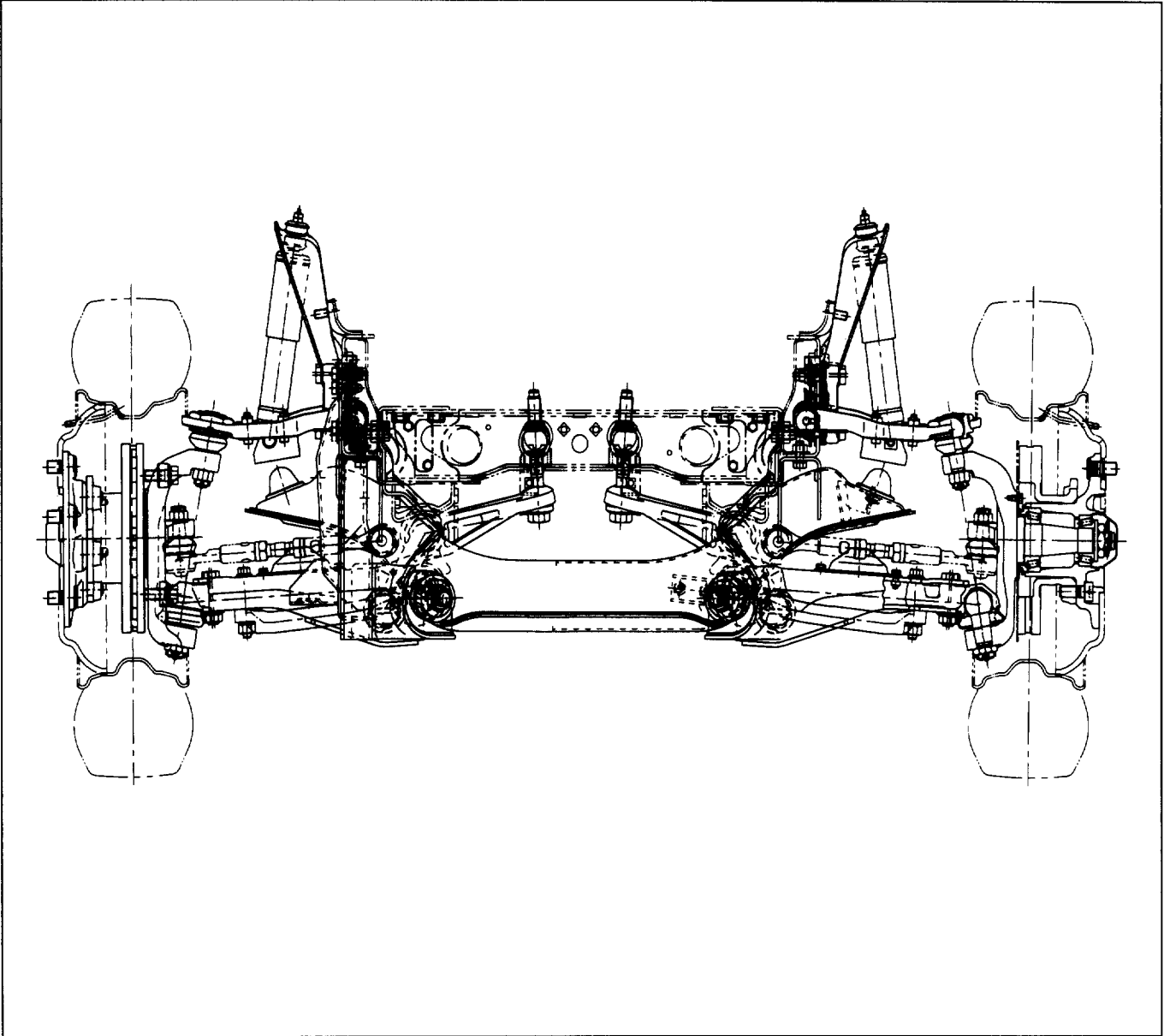
## GENERAL DESCRIPTION

### Rigid Suspension





## Wishbone Suspension

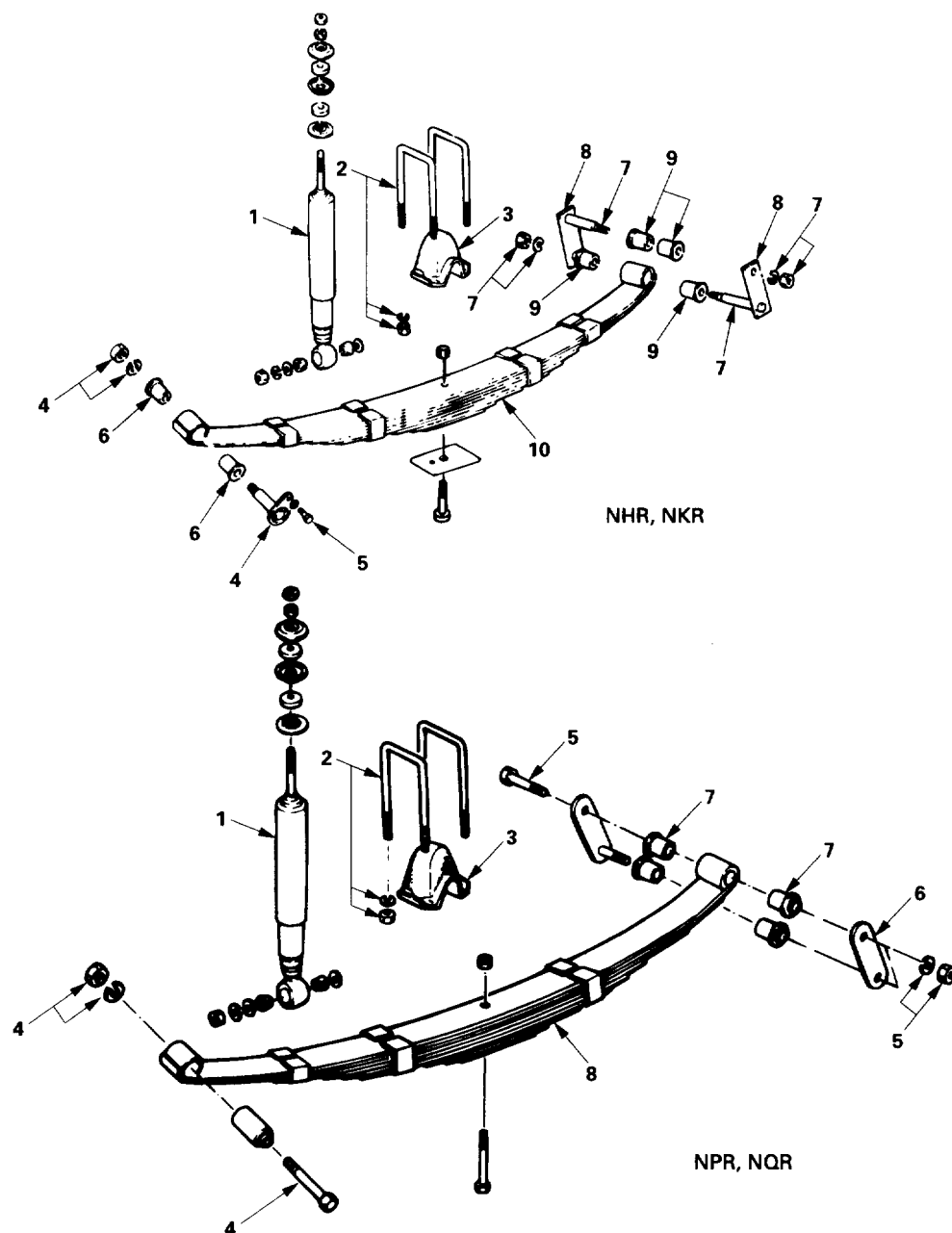




## ON-VEHICLE SERVICE

### FRONT SUSPENSION (RIGID SUSPENSION)

#### LEAF SPRING





## Removal Steps

### NHR and NKR

1. Shock absorber
2. U-bolt and nut
3. Helper rubber
4. Spring pin, nut and washer
5. Bolt
6. Rubber bushing
7. Shackle pin, nut and washer
8. Shackle
9. Rubber Bushing
10. Leaf Spring

### NPR, NQR and NPS

1. Shock absorber
2. U-bolt and nut
3. Helper rubber
4. Spring pin, nut and washer
5. Shackle pin, nut and washer
6. Shackle
7. Rubber bushing
8. Leaf spring

## Installation Steps

### NHR and NKR

10. Leaf spring
3. Helper rubber
2. U-bolt and nut
6. Rubber bushing
4. Spring pin, nut and washer
5. Bolt
9. Rubber bushing
8. Shackle
7. Shackle pin, nut and washer
1. Shock absorber

### NPR, NQR and NPS

8. Leaf spring
3. Helper rubber
2. U-bolt and nut
4. Spring pin, nut and washer
7. Rubber bushing
6. Shackle
5. Shackle pin, nut and washer
1. Shock absorber

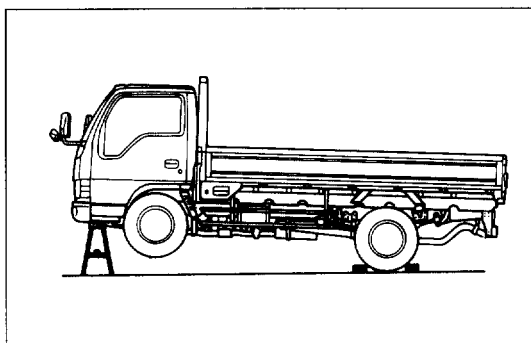


## REMOVAL

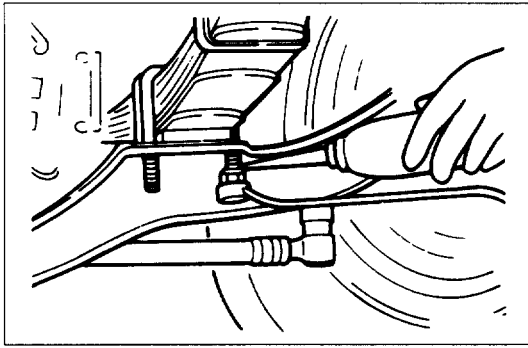
### Preparation

Make the following preparation before removing the leaf spring.

- 1) Brace the rear wheels.
- 2) Jack up the front axle until the front wheels are lifted off the ground and position safety stand under the chassis frame.  
Refer to "LIFTING INSTRUCTION" in SECTION 0 for acceptable lifting point and supportable point location.
- 3) Position a garage jack under the front axle.
- 4) For the vehicle model with a stabilizer, remove the mounting portion on the axle side of the stabilizer in advance before removing the leaf spring. (Refer to the removal procedure of the stabilizer.)



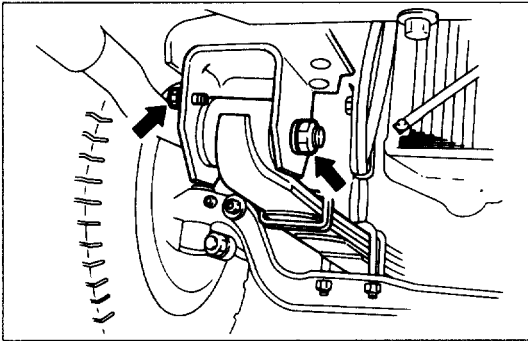




### NHR and NKR

1. Shock Absorber
2. U-bolt and Nut
3. Helper Rubber

If the U-bolts are heavily rusted, apply a generous amount of oil to the threads before loosening them to prevent seizure.



4. Spring Pin, Nut and Washer
5. Bolt
6. Rubber Bushing

Take out the rubber bushings after removal of the spring pin.

7. Shackle Pin, Nut and Washer
8. Shackle
9. Rubber Bushing

Take out the rubber bushings after removal of the shackle.

### 10. Leaf Spring

Lower the garage jack slowly and remove the front spring assembly. When removing the front spring assembly, exercise care not to cause damage to the brake flexible hoses and drag link. Also, exercise care not to cause the spring to come down.



**NPR, NQR and NPS**

1. **Shock Absorber**
2. **U-bolt and Nut**

Refer to page 3C-5.

3. **Helper Rubber**
4. **Spring Pin, Nut and Washer**

Drive out the spring pin with a hammer using a brass bar after removal of the spring pin nut.

5. **Shackle Pin, Nut and Washer**
6. **Shackle**

Drive out the shackle pin with a hammer using a brass bar after removal of the shackle pin nut.

7. **Rubber Bushing**
8. **Leaf Spring**

Refer to page 3C-6.

## INSPECTION AND REPAIR

Make the necessary adjustments, repairs and part replacements if excessive wear or damage is discovered during inspection.

- Leaf spring assembly
- Clip
- Center bolt
- U-bolt
- Spring pin
- Shackle pin
- Helper rubber
- Rubber bushing

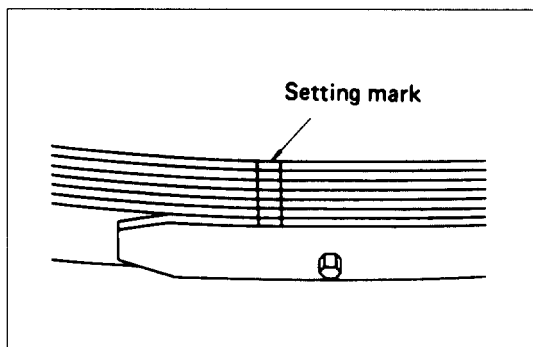
**Visual Check**

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

**Shock Absorber**

1. Inspect for extreme oil leakage.  
Slight oil leakage is allowed.
2. Inspect for temperature after running.  
Unchanged temperature indicates deteriorated function.
3. Inspect if large resistance is felt when the shock absorber is expanded and contracted by holding either end, or if play is eliminated after several times of expansion and contraction.  
The function has deteriorated if the above condition is not observed.
4. Inspect the bushing for wear or deterioration.  
Replace if abnormality is found.



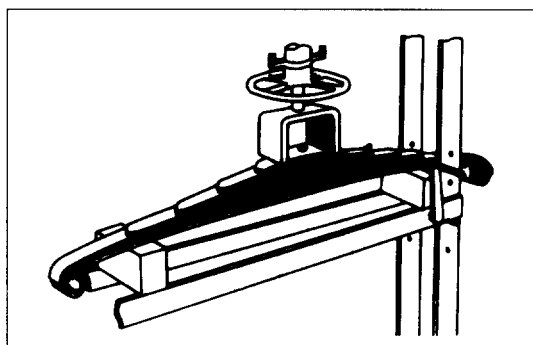


### Leaf Spring Assembly Replacement



- Apply a setting mark across the springs before disassembly the leaf spring assembly.
- Apply grease to both faces of each leaf spring at reassembly.
- Use a bench press for disassembly and reassembly.
- Discard center bolt removed and install a new one.

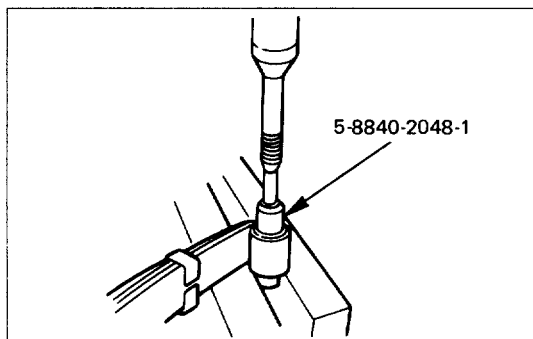
When replacing the leaf spring assembly, use the leaf spring with the same camber represented by "+, -, l" on both right and left sides.



### Center Bolt

Tighten the center bolt nut to the specified torque.

Center Bolt Torque	N•m (kg•m / lb•ft)
NHR, NKR, NPR, NQR	39 ( 4 / 29)
NPS	314 (32 / 232)



### Bushing Replacement

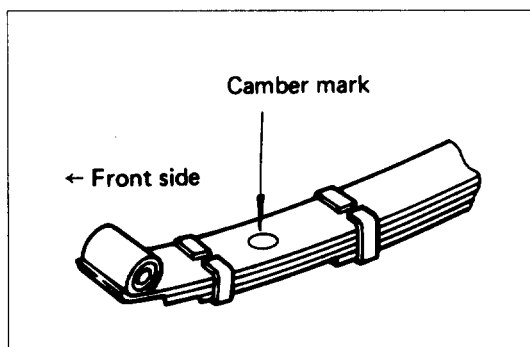
When replacing bushing, drive out the bushing using a bench press.

Leaf Spring Rubber Bush Remover & Installer :  
5-8840-2048-1

Leaf Spring Metal Bush Remover & Installer :  
5-8840-2049-1



## INSTALLATION



### NHR, NKR

#### 10. Leaf Spring

Install the leaf spring assembly with the camber mark turned to front side on the front axle.

#### 3. Helper Rubber

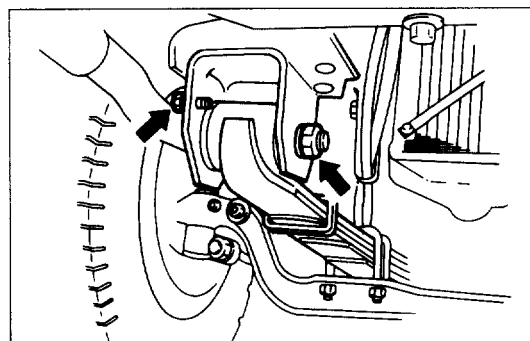
#### 2. U-Bolt and Nut

Position the U-bolts and helper rubber on the leaf spring assemblies and jack up the front axle.

When tightening the nuts apply oil as necessary to prevent damaging the threads.



U-Bolt Nut Torque	N•m (kg•m / lb•ft)
	127 (13 / 94)



#### 6. Rubber Bushing

#### 4. Spring Pin, Nut and Washer

#### 5. Bolt

Finger tighten first, and tighten to specified torque after lowering the vehicle to ground.



Spring Pin Nut Torque	N•m (kg•m / lb•ft)
Bolt	27 (2.8 / 20)
Nut	177 (18 / 130)

#### 9. Rubber Bushing

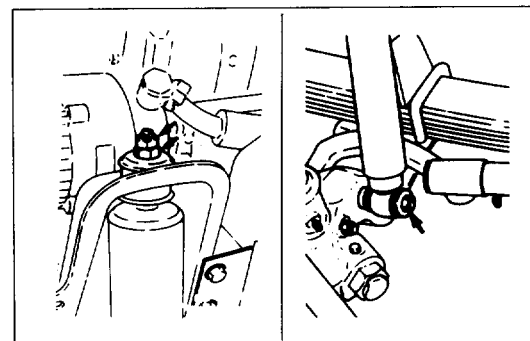
#### 8. Shackle

#### 7. Shackle Pin, Nut and Washer

Finger tighten first, and tighten to specified torque after lowering the vehicle to ground.



Shackle Pin Nut Torque	N•m (kg•m / lb•ft)
	137 (14 / 101)



#### 1. Shock Absorber



Shock Absorber Nut Torque	N•m (kg•m / lb•ft)
Upper Nut	20 (2.0 / 15)
Upper Safety Nut	40 (4.1 / 30)
Lower Nut	61 (6.2 / 45)



**NPR, NQR and NPS****8. Leaf Spring**

Refer to page 3C- 9.

**3. Helper Rubber****2. U-Bolt and Nut**

U-bolt Nut Torque	N•m (kg•m / lb•ft)
NPR, NPS	127 (13 / 94)
NQR	196 (20 / 145)

**4. Spring Pin, Nut and Washer**

Refer to page 3C- 9.



Spring Pin Nut Torque	N•m (kg•m / lb•ft)
	219 (21.3 / 154)

**7. Rubber Bushing****6. Shackle****5. Shackle Pin, Nut and Washer**

Refer to page 3C- 9.



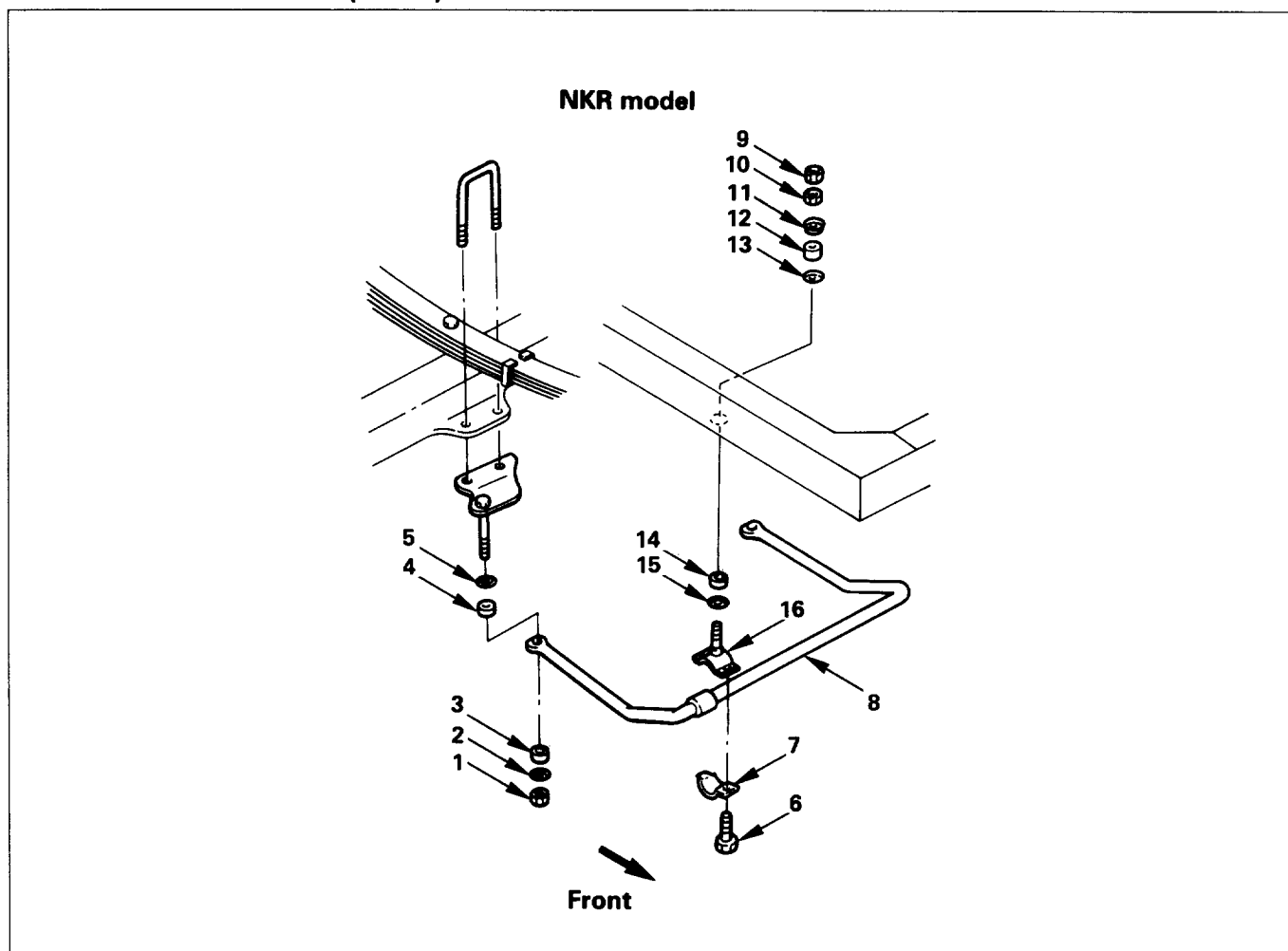
Shackle Pin Nut Torque	N•m (kg•m / lb•ft)
	219 (21.3 / 154)

**1. Shock Absorber**

Shock Absorber Nut Torque	N•m (kg•m / lb•ft)
Upper Nut	20 (2.0 / 15)
Upper Safety Nut	40 (4.1 / 30)
Lower Nut	95 (9.7 / 70)



## FRONT STABILIZER (NKR)



### Removal Steps

1. Nut
2. Washer
3. Rubber bushing
4. Rubber bushing
5. Washer
6. Bolt
7. Rod link cap
8. Stabilizer bar
9. Nut
10. Nut
11. Washer
12. Rubber bushing
13. Washer
14. Rubber bushing
15. Washer
16. Rod link

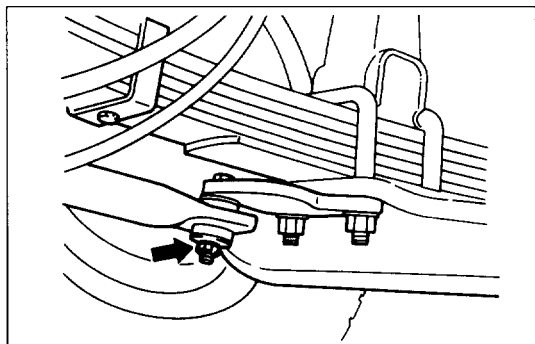
### Installation Steps

8. Stabilizer bar
16. Rod link
7. Rod link cap
6. Bolt
15. Washer
14. Rubber bushing
13. Washer
12. Rubber bushing
11. Washer
10. Nut
9. Nut
5. Washer
4. Rubber bushing
3. Rubber bushing
2. Washer
1. Nut

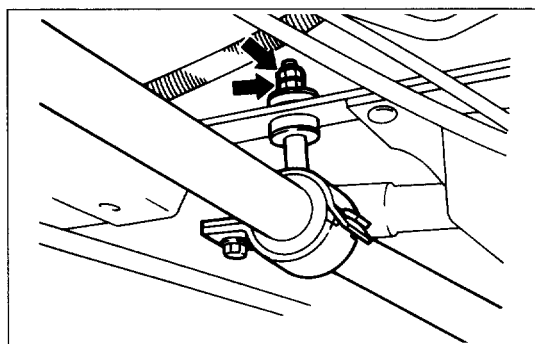




## REMOVAL



1. Nut
2. Washer
3. Rubber Bushing
4. Rubber Bushing
5. Washer



6. Bolt
7. Rod Link Cap
8. Stabilizer Bar
9. Nut
10. Nut
11. Washer
12. Rubber Bushing
13. Washer
14. Rubber Bushing
15. Washer
16. Rod Link

## INSPECTION AND REPAIR

Make the necessary adjustments, repairs and part replacements if excessive wear or damage is discovered during inspection.



### Stabilizer

Inspect the stabilizer bar and attachments for the following conditions:

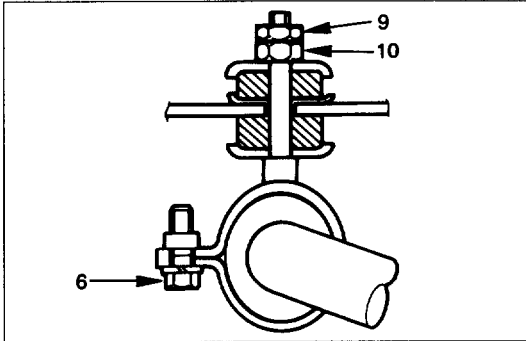
1. Cracks, bends or damage to the bar.
2. Worn bushings.
3. Damaged brackets.
  - Replace any worn or damaged parts.



## INSTALLATION

### NOTE:

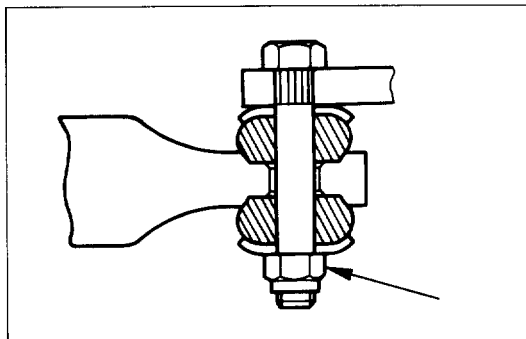
During installation, place the vehicle on flat ground and tighten each part to the specified torque.



- 8. Stabilizer Bar
- 16. Rod Link
- 7. Rod Link Cap
- 6. Bolt
- 15. Washer
- 14. Rubber Bushing
- 13. Washer
- 12. Rubber Bushing
- 11. Washer
- 10. Nut
- 9. Nut



Rod Link Bolt and Nut Torque		N•m (kg•m / lb•ft)
6. Bolt		27 (2.8 / 20)
10. Nut		20 (2.0 / 14)
9. Nut		40 (4.1 / 30)

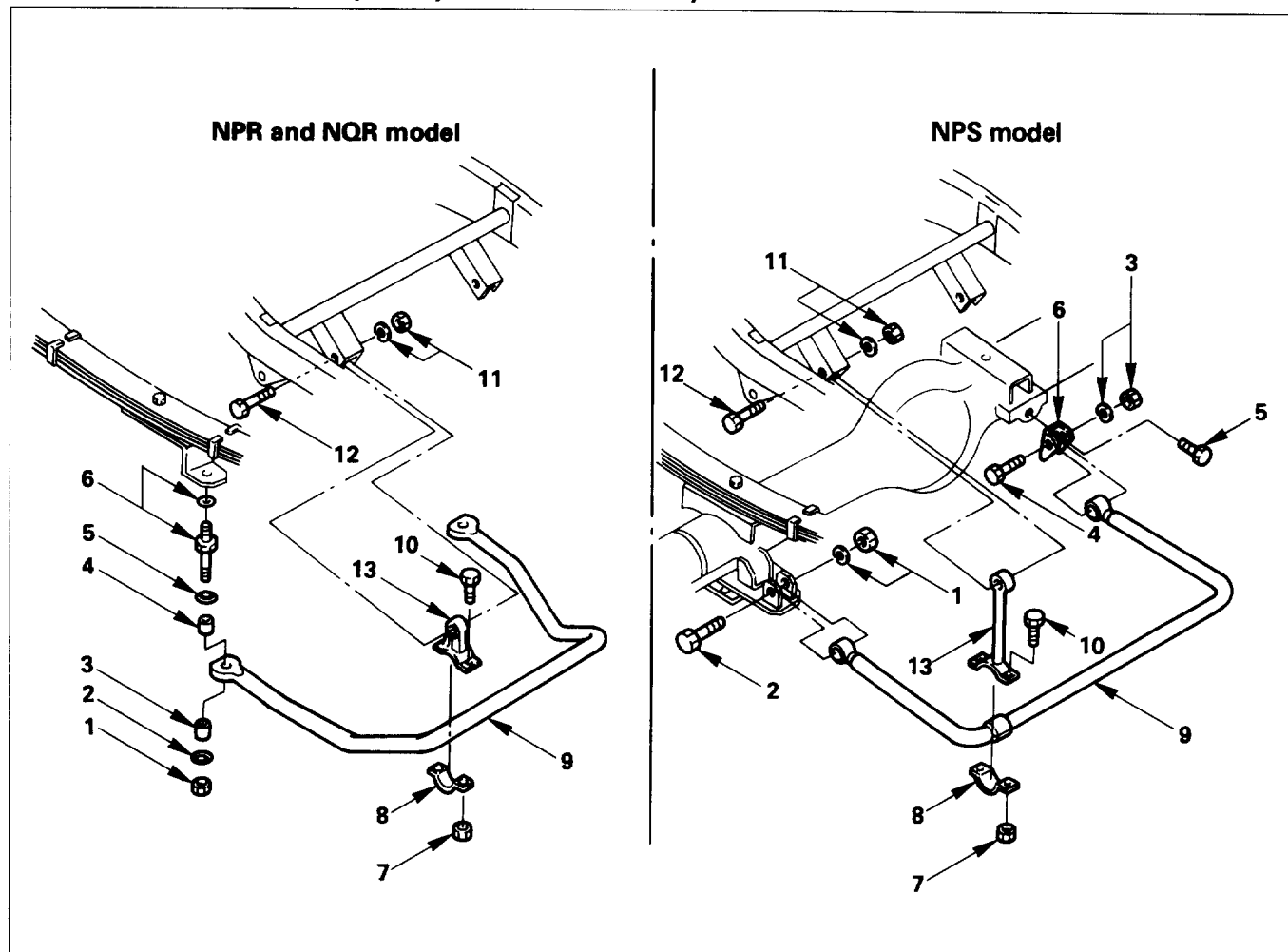


- 5. Washer
- 4. Rubber Bushing
- 3. Rubber Bushing
- 2. Washer
- 1. Nut

Nut Torque		N•m (kg•m / lb•ft)
		25 (2.5 / 18)



## FRONT STABILIZER (NPR, NQR and NPS)



### Removal Steps

#### NPR and NQR

1. Nut
2. Washer
3. Rubber bushing
4. Rubber bushing
5. Washer
6. Stud bolt and spring washer
7. Nut
8. Rod link cap
9. Stabilizer bar
10. Bolt
11. Nut and spring washer
12. Bolt
13. Rod link

### Installation Steps

#### NPR and NQR

9. Stabilizer bar
13. Rod link
8. Rod link cap
10. Bolt
7. Nut
12. Bolt
11. Nut and spring washer
6. Stud bolt and spring washer
5. Washer
4. Rubber bushing
3. Rubber bushing
2. Washer
1. Nut



## Removal Steps

### NPS

1. Nut and spring washer
2. Bolt
3. Nut and spring washer
4. Bolt
5. Bolt
6. Stabilizer bracket
7. Nut
8. Rod link cap
9. Stabilizer bar
10. Bolt
11. Nut and spring washer
12. Bolt
13. Rod link

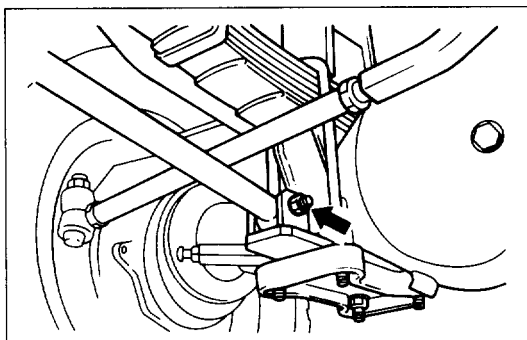
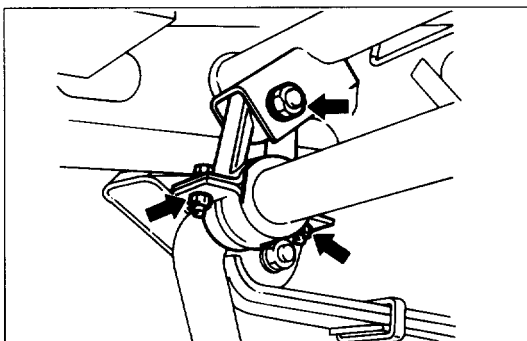
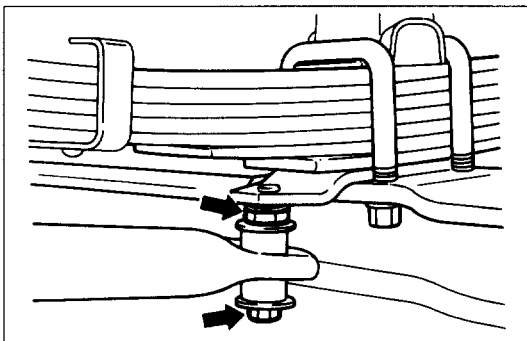
## Installation Steps

### NPS

9. Stabilizer bar
13. Rod link
8. Rod link cap
10. Bolt
7. Nut
12. Bolt
11. Nut and spring washer
6. Stabilizer bracket
5. Bolt
4. Bolt
3. Nut and spring washer
2. Bolt
1. Nut and spring washer



## REMOVAL



### NPR and NQR

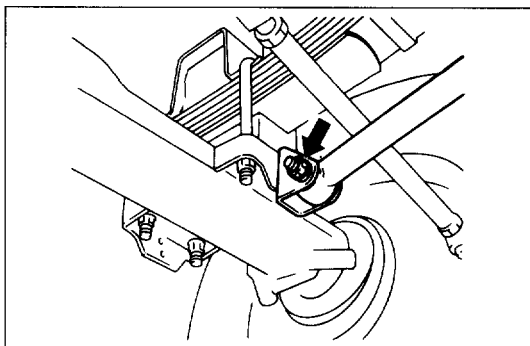
1. Nut
2. Washer
3. Rubber Bushing
4. Rubber Bushing
5. Washer
6. Stud Bolt and Spring Washer

7. Nut
8. Rod Link Cap
9. Stabilizer Bar
10. Bolt
11. Nut and Spring Washer
12. Bolt
13. Rod Link

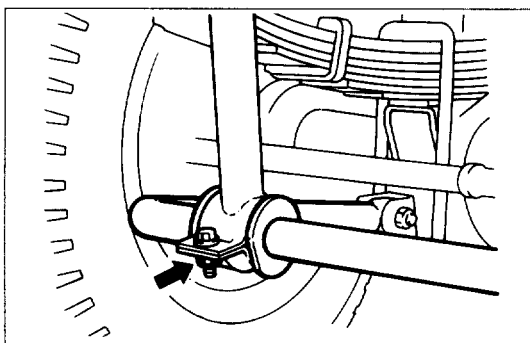
### NPS

1. Nut and Spring Washer
2. Bolt

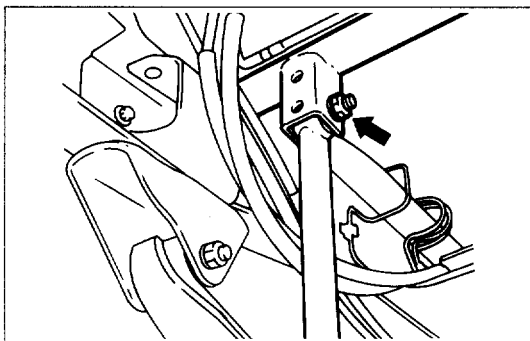




3. Nut and Spring Washer
4. Bolt
5. Bolt
6. Stabilizer Bracket



7. Nut
8. Rod Link Cap
9. Stabilizer Bar
10. Bolt



11. Nut and Spring Washer
12. Bolt
13. Rod Link

## **INSPECTION AND REPAIR**

Make the necessary adjustments, repairs and part replacements if excessive wear or damage is discovered during inspection.



### **Stabilizer**

Inspect the stabilizer bar and attachments for the following conditions:

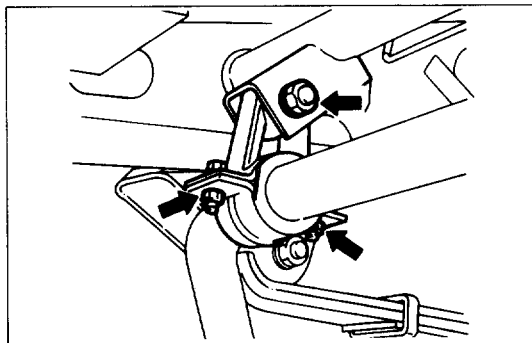
1. Cracks, bends or damage to the bar.
2. Worn bushings.
3. Damaged brackets.
  - Replace any worn or damaged parts.



## INSTALLATION

### NOTE:

During installation, place the vehicle on flat ground and tighten each part to the specified torque.

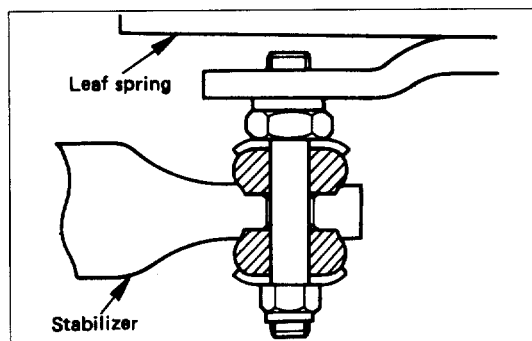


### NPR and NQR

9. Stabilizer Bar
13. Rod Link
8. Rod Link Cap
10. Bolt
7. Nut
12. Bolt
11. Nut and Spring Washer

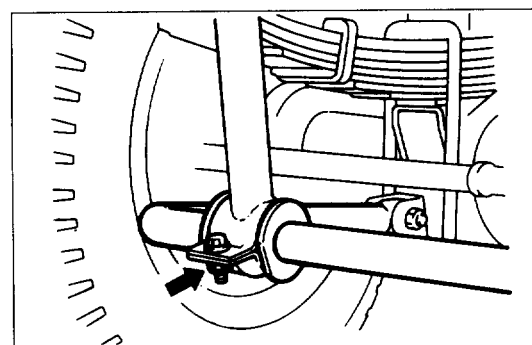


Rod Link Nut Torque	N•m (kg•m / lb•ft)
Rod Link Cap Nut	27 ( 2.8 / 20)
Rod Link Bracket Nut	117 (11.9 / 86)



6. Stud Bolt and Spring Washer
5. Washer
4. Rubber Bushing
3. Rubber Bushing
2. Washer
1. Nut

Stud Bolt and Nut Torque	N•m (kg•m / lb•ft)
Stud Bolt	117 (11.9 / 86)
Nut	29 ( 3.0 / 22)

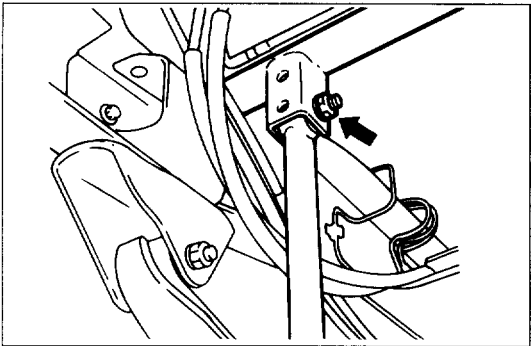


### NPS

9. Stabilizer Bar
13. Rod Link
8. Rod Link Cap
10. Bolt
7. Nut

Nut Torque	N•m (kg•m / lb•ft)
	27 (2.8 / 20)

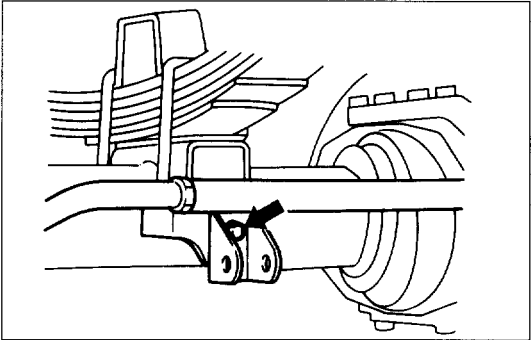




- 12. Bolt
- 11. Nut and Spring Washer



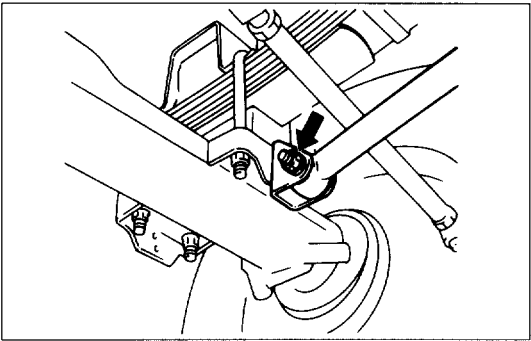
Nut Torque	N•m (kg•m / lb•ft)
127 (13 / 94)	



- 6. Stabilizer Bracket
- 5. Bolt



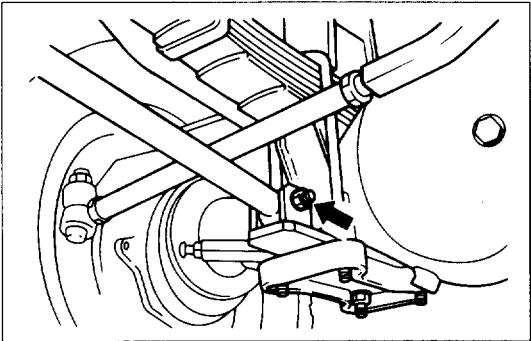
Bolt Torque	N•m (kg•m / lb•ft)
19 (1.9 / 14)	



- 4. Bolt
- 3. Nut and Spring Washer



Nut Torque	N•m (kg•m / lb•ft)
40 (4.1 / 30)	



- 2. Bolt
- 1. Nut and Spring Washer



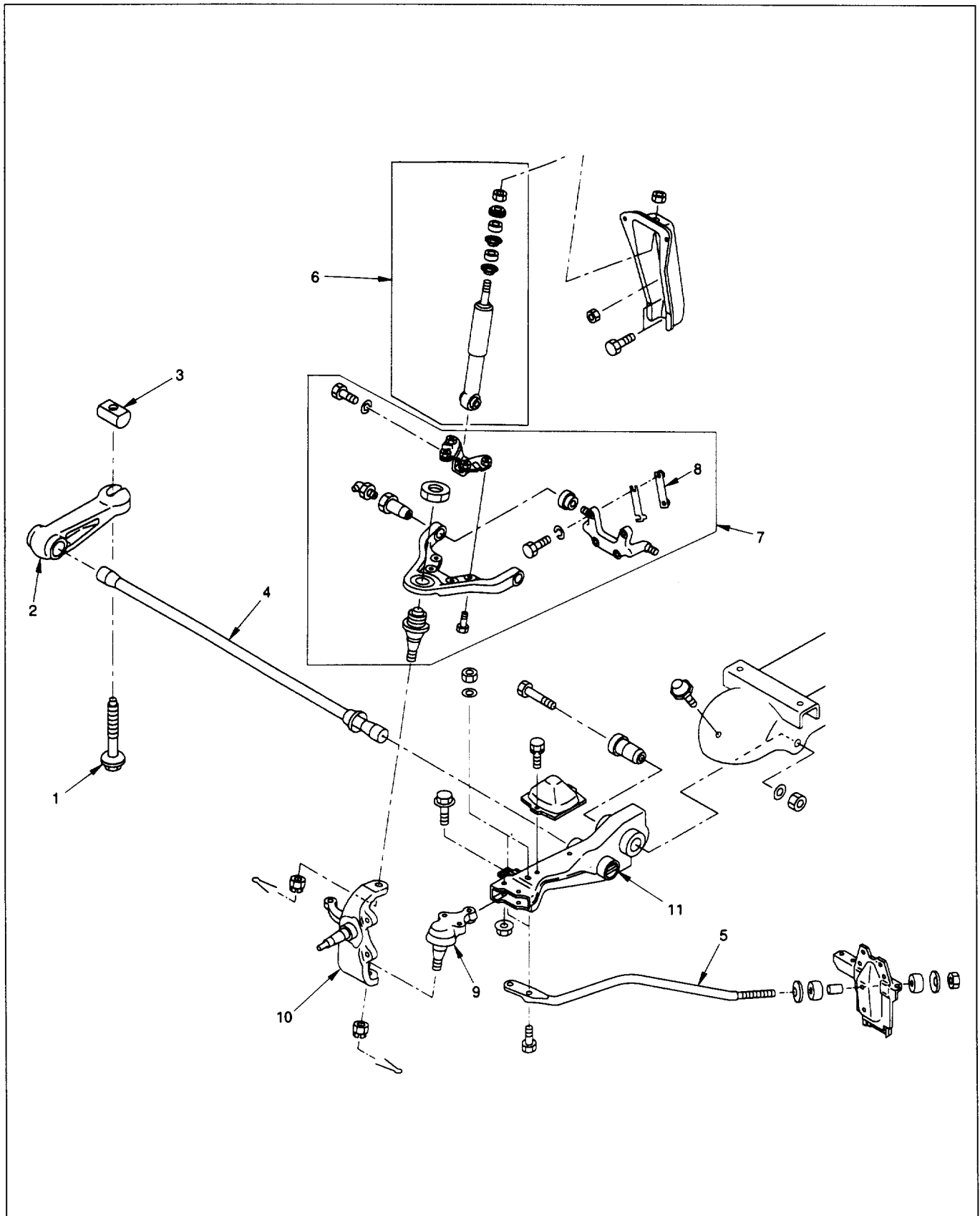
Nut Torque	N•m (kg•m / lb•ft)
40 (4.1 / 30)	







## FRONT SUSPENSION (WISHBONE SUSPENSION)





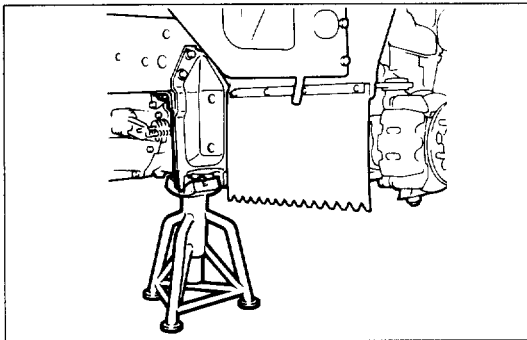
## Removal Steps

1. Adjusting bolt
2. Height Control arm
3. End piece
4. Torsion bar
5. Strut bar assembly
6. Shock absorber assembly
7. Upper link assembly
8. Adjusting shim
9. Lower link ball joint
10. Knuckle
11. Lower link

## Installation Steps

11. Lower link
9. Lower link ball joint
8. Adjusting shim
7. Upper link assembly
10. Knuckle
6. Shock absorber assembly
5. Strut bar assembly
4. Torsion bar
3. End piece
2. Height Control arm
1. Adjusting bolt

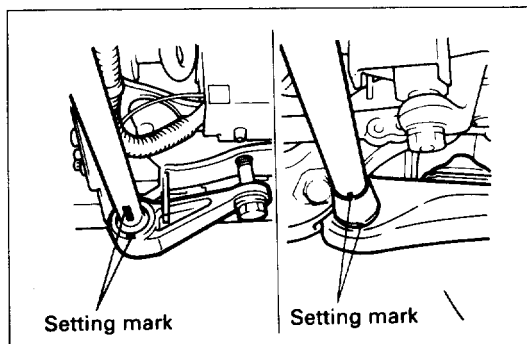
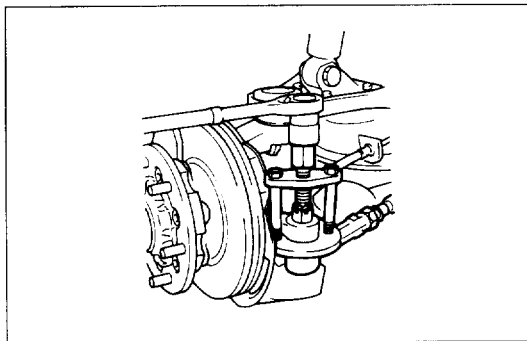
## REMOVAL



### Preparations

- Raise the vehicle and support the jack up point with suitable safety stands. Refer to "Jack Up Point" in Section 00.
- Remove front tire and wheels. Refer to "Wheels and Tires" in Section 3E.
- Remove brake caliper assembly. Refer to "Disc and Drum Brake" in Section 5A2.
- Remove hub and rotor assembly. Refer to "Front Axle" in Section 4C.
- Disconnect the outer track rod ball joint from the knuckle.

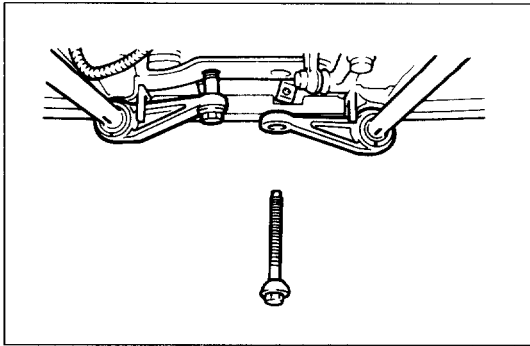
Remover: 5-8840-2017-0



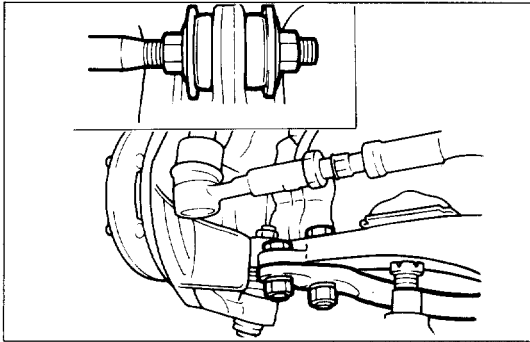
1. Adjusting Bolt
2. Height Control Arm
3. End Piece
4. Torsion Bar

- Apply setting marks to torsion bar, height control arm and lower link to ensure installation of the parts in their original position.



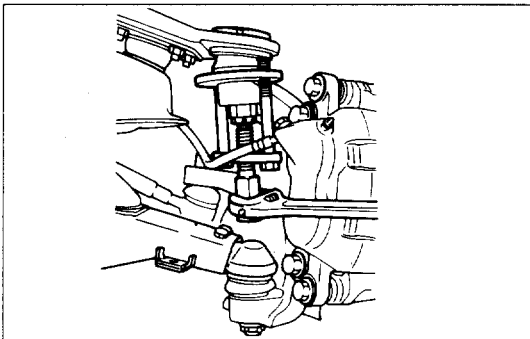


Apply setting marks to adjusting bolt threads to ensure installation of the parts in their original position.



#### 5. Strut Bar Assembly

- Raise and support the lower link with a jack.
- Loosen the rear side nut, and remove the nut, washer and rubber bushing.
- Loosen two fixing bolts of lower link side and remove the strut bar to front side.



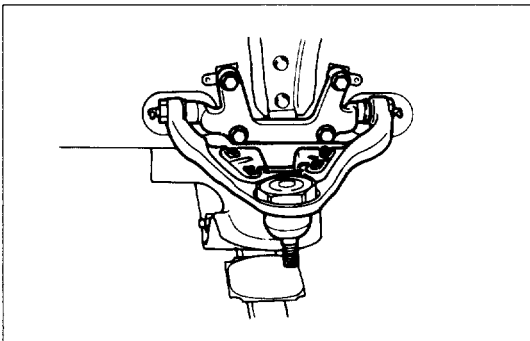
#### 6. Shock Absorber

#### 7. Upper Link Assembly

#### 8. Adjusting Shim

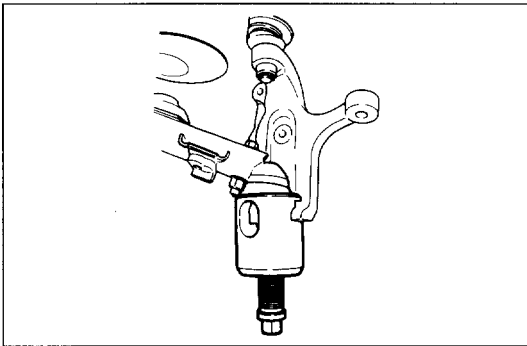
Disconnect upper link joint ball at the knuckle.

Remover: 5-8840-2017-0



- Remove the fulcrum pin fixing bolt.
- Note the thickness and number of shims.



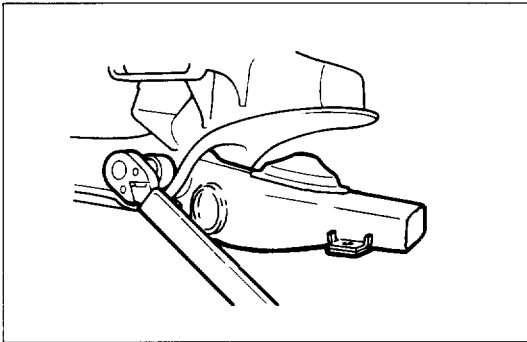


### 9. Lower Link Ball joint

### 10 Knuckle



- Disconnect the lower link ball joint at the knuckle.  
Remover: 5-8840-2366-0
- Remove two fixing bolts and the ball joint from lower link.



### 11. Lower Link

## INSPECTION AND REPAIR

Make necessary correction or parts replacements if excessive wear, damage, corrosion or any other abnormal condition are found through inspection.

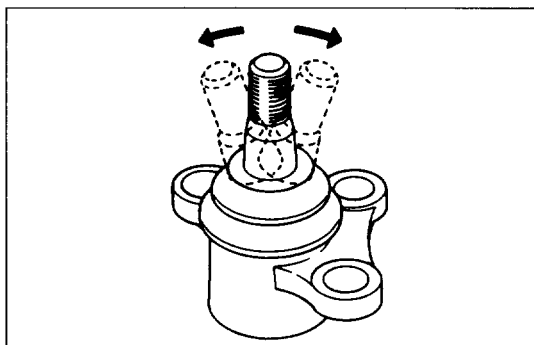
- Torsion Bar
- End Piece
- Height Control Arm
- Rubber Bushings
- Strut Bar
- Shock Absorber



### Visual Check

Inspect the following parts for excessive wear, damage, bending, oil leak or any other abnormal conditions.

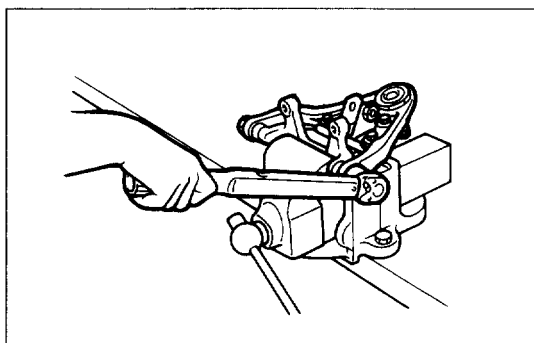




### Ball Joint

- Inspect the ball joint boot for damage or grease leak.
- Move the ball joint to confirm its normal movement.
- Inspect screw / taper area of ball for flaws.

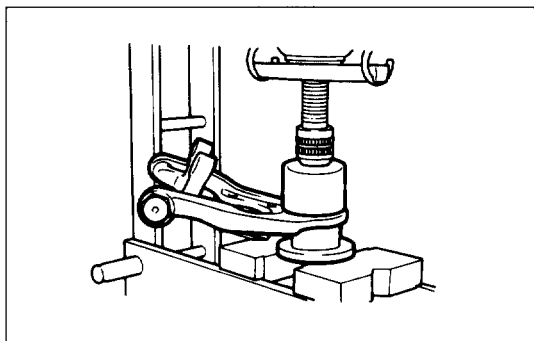
If any defects are found by the above inspections, replace the ball joint with new one.



### Upper Ball Joint Replacement

- Remove the ball joint fixing nut (Hex. 63mm).
- Remove the ball joint from the upper link using a special tool.

Remover: 5-8840-2364-0



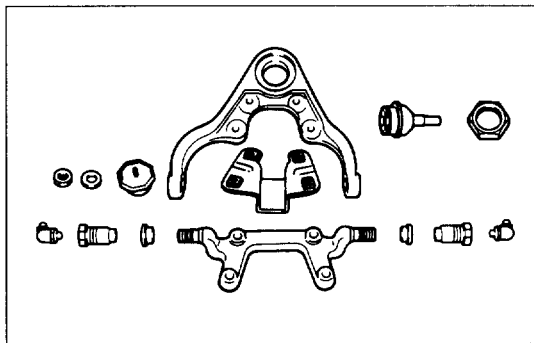
- Install the ball joint to the upper link using a bench press and special tool.

Installer: 5-8840-2365-0

- Tighten nut to specified torque

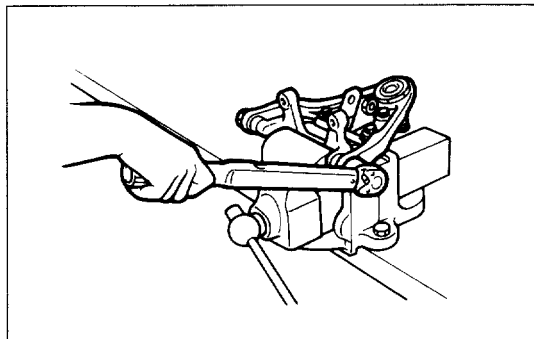


Joint Ball Nut Torque	N•m (kg•m/lb•ft)
211 (21.5 / 156)	



### Upper Link Assembly

- Disassemble the upper link assembly.
- Inspect the following parts as shown in the figure for wear, damage, bending or any other abnormal conditions.

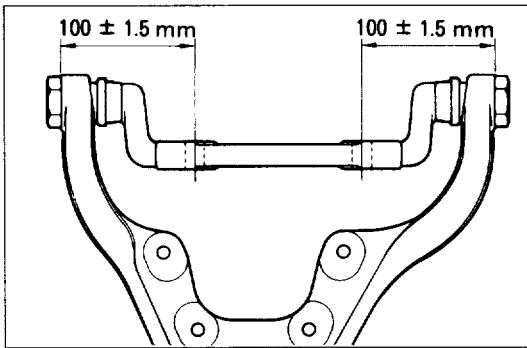


- Reassemble the upper link assembly.
- Apply multi-purpose with MoS<sub>2</sub> grease to the fulcrum pin threads.
- Fill multi-purpose with MoS<sub>2</sub> grease to bushings.
- Install the fulcrum pin to the upper link and tighten bushings to specified torque.

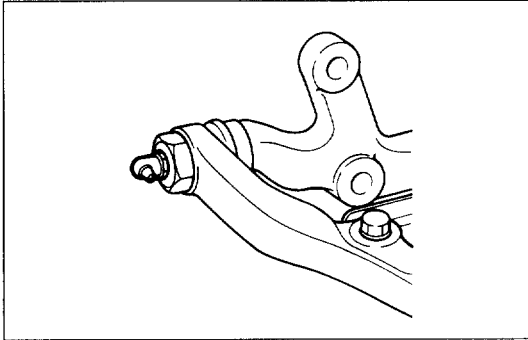


Bushing Torque	N•m (kg•m/lb•ft)
294 (30 / 217)	





- Adjust the fulcrum pin as shown in the figure.



- Install grease fitting to upper link in parallel with upper link.

#### Lower Link Bushing Replacement



- Remove the lower link bushing using a bench press and special tool.

Remover: 5-8840-2367-0



- Inspect the bushing for wear, damage or any other abnormal condition.

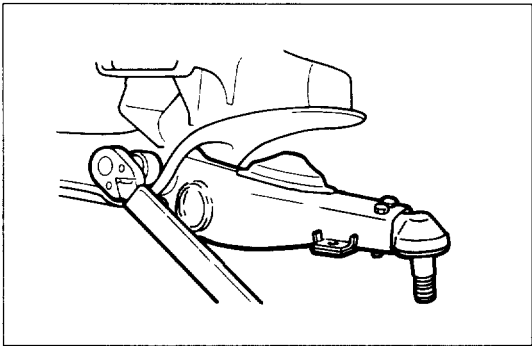
- Install the bushing to the lower link from vehicle forward direction.

Installer: 5-8840-2367-0





**⇄ INSTALLATION**



**11. Lower Link**

- Install the lower link fixing bolt from the vehicle forward direction and set the bolt head to the bolt stopper completely.
- Tighten the nut temporarily.

**NOTE:**

**Tighten nuts to specified torque after following steps;**

- **Park the vehicle on a level ground.**
- **Move the front of the vehicle up and down several times to settle the suspension.**



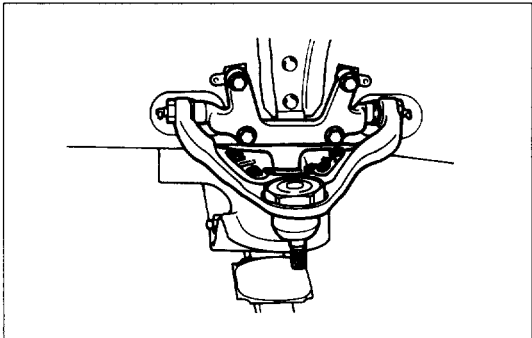
Lower Link Nut Torque	N•m (kg•m/lb•ft)
584 (59.5 / 430)	

**9. Lower Link Joint Ball**

Install the lower link ball joint to specified torque.



Lower Link Ball Joint Nut Torque	N•m (kg•m/lb•ft)
167 (17 / 123)	



**8. Shim**

**7. Upper Link Assembly**

- Install shims and upper link assembly
- Tighten fixing bolts to specified torque.

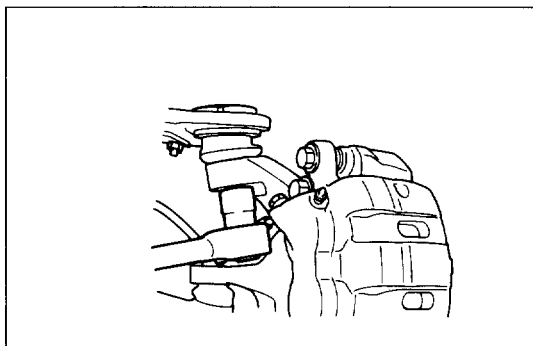
Thickness of Shims Available	(mm)
0.8, 1.6, 3.2	



Upper Link Bolt Torque	N•m (kg•m/lb•ft)
152 (15.5 / 112)	

For adjustment of camber and caster angle, refer to "Front End Alignment" in Section 3A.



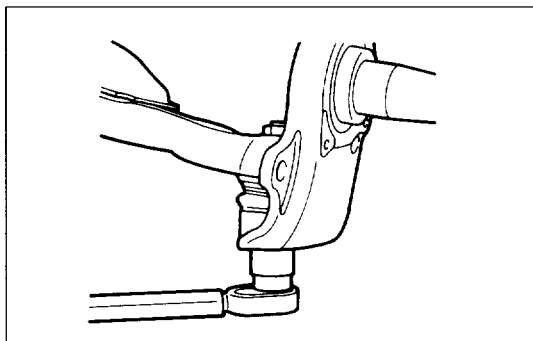


## 10. Knuckle

- Connect the upper ball joint, lower ball joint to the knuckle.
  - Tighten fixing nuts temporarily.
  - After installation of tie rod end and strut bar assembly, tighten fixing nuts to specified torque, with just enough additional torque to align cotter pin holes.
- Install new cotter pin.



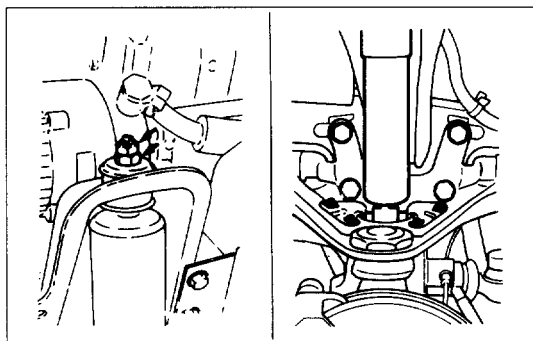
Ball Joint Nut Torque	N•m (kg•m/lb•ft)
Upper	206 (21.0 / 152)
Lower	377 (38.4 / 278)



## 6. Shock Absorber Assembly



Shock Absorber Bolt and Nut Torque	N•m (kg•m/lb•ft)
Upper	40 ( 4.1 / 30)
Lower	267 (27.2 / 197)



## 5. Strut Bar Assembly



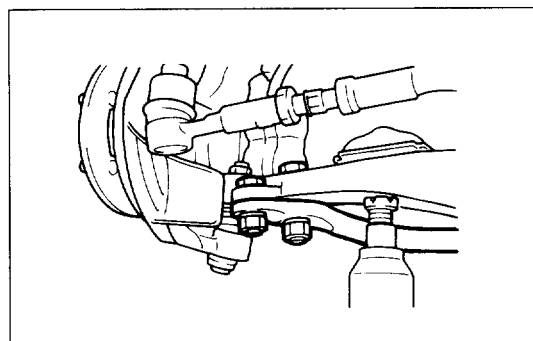
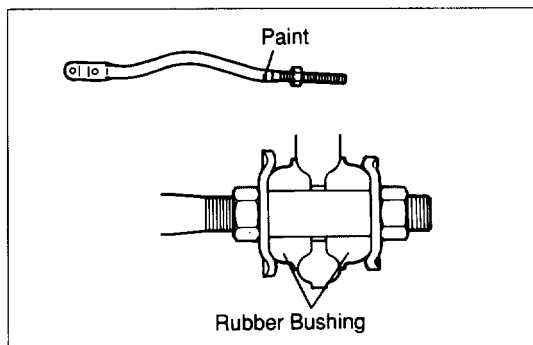
- Install strut bar assembly.
- White paint is aligned to right side strut bar. Be careful not to install to the opposite side.
- Apply a thin coat of rubber grease to inside of the rubber bushing.
- Tighten rear side fixing nuts temporarily.



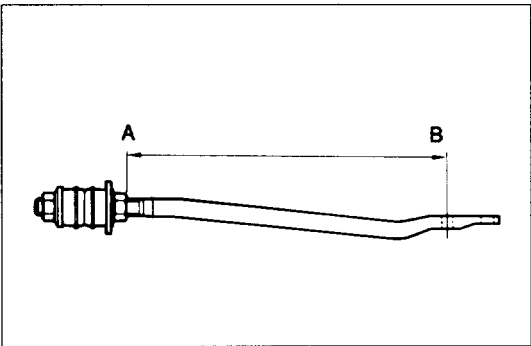
- Tighten lower link side fixing bolts to specified torque.



Strut Bar Bolt and Nut Torque	N•m (kg•m/lb•ft)
219 (22.3 / 161)	

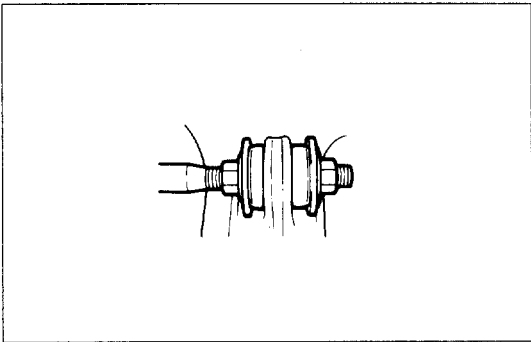






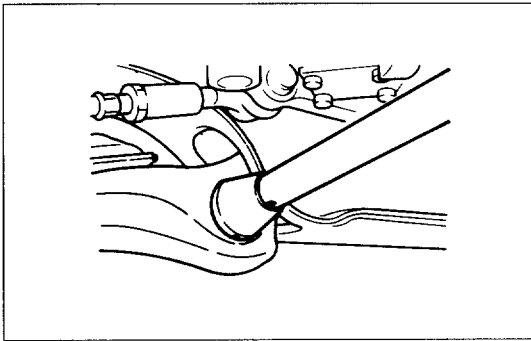
- Adjust the strut bar length (L) after Installation.

Strut Bar Length (L)	mm(in)
485.0(19.095)	



- NOTE:**
- Tighten nuts to specified torque after following steps;**
- **Park the vehicle on a level ground.**
  - **Move the front of the vehicle up and down several times to settle the suspension.**

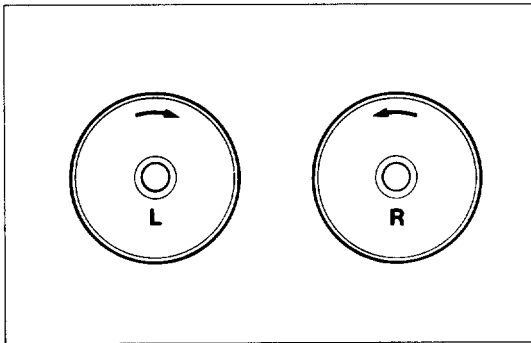
Strut Bar Nut Torque (Rear Side)	N•m (kg•m/lb•ft)
235 (24 / 174)	



- 4. **Torsion Bar**
- 3. **End Piece**
- 2. **Height Control Arm**
- 1. **Adjusting Bolt**



- Apply chassis type grease to serrated portions of torsion bar, lower arms, threaded portion of end piece.
- Make sure the bars are on their correct respective sides.



- Align the setting marks applied at removal.
- Tighten adjusting bolts to the original portion temporarily.
- Install the outer track rod end to the knuckle. Tighten nuts to specified torque, with just enough additional torque to align cotter pin holes. Install new cotter pin.



Strut Bar Nut Torque (Rear Side)	N•m (kg•m/lb•ft)
108 (11 / 80)	



- Park the vehicle on a level ground.
- Move the front of the vehicle up and down several times to settle the suspension.
- Tighten temporarily tightening bolts and nuts to specified torque.
- Install the hub and rotor assembly. Refer to "Front Axle" in Section 4C.



- Install the brake caliper assembly. Refer to "Disc and Drum Brake " in Section 5A2.



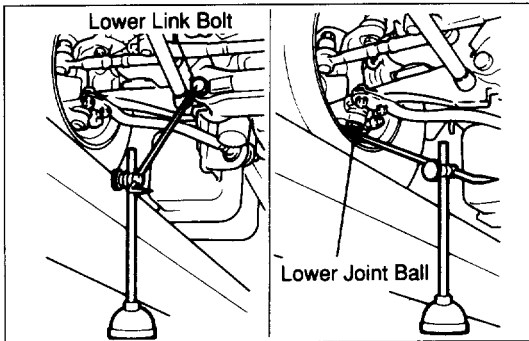
Brake Caliper Bolt Torque	N•m (kg•m/lb•ft)
219 (22.3 / 161)	

- Install front wheel and tire assembly. Refer to "Wheels and Tires" in Section 3E.
- Adjust the trim height.

**NOTE:**

**Adjust the front end alignment. Refer to "Front End Alignment" in Section 3A.**

**Bleed brakes. Refer to "Hydraulic Brakes" in Section 5A.**



**Adjustment of Trim Height**

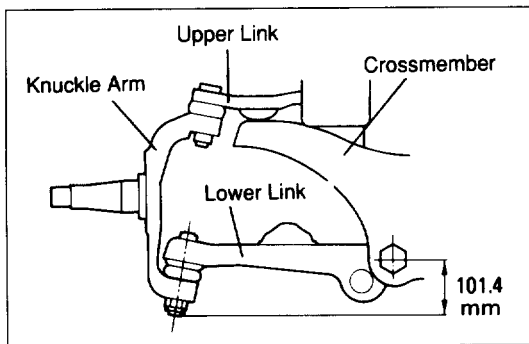
Adjust the trim height by means of adjusting bolt on the height control arms.



**CAUTION:**

**When adjusting front end alignment, be sure to begin with trim height as trim height adjustment may change other adjusted alignments.**

1. Check and adjust the tire inflation pressures.
2. Park the vehicle on a level ground and move the front of the vehicle up and down several times to settle the suspension.
3. Make necessary adjustment with the adjusting bolt on the height control arms.



Trim Height	mm(in)
101.4±5 (3.992±0.197)	



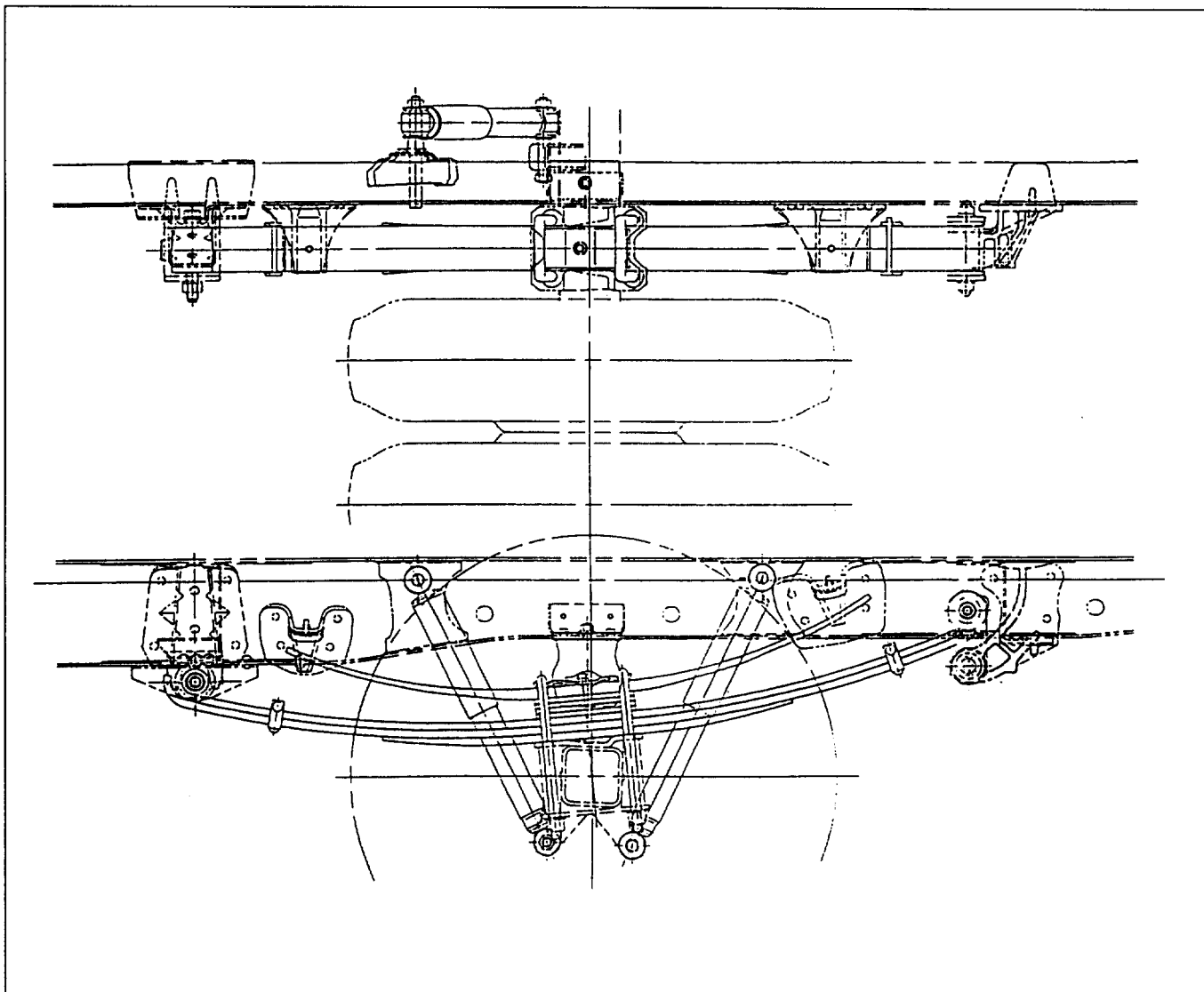
**SECTION 3D**  
**REAR SUSPENSION**

**CONTENTS**

	<b>PAGE</b>
<b>General Description .....</b>	<b>3D– 2</b>
<b>On-Vehicle Service.....</b>	<b>3D– 3</b>
<b>Rear Suspension.....</b>	<b>3D– 3</b>



## GENERAL DESCRIPTION

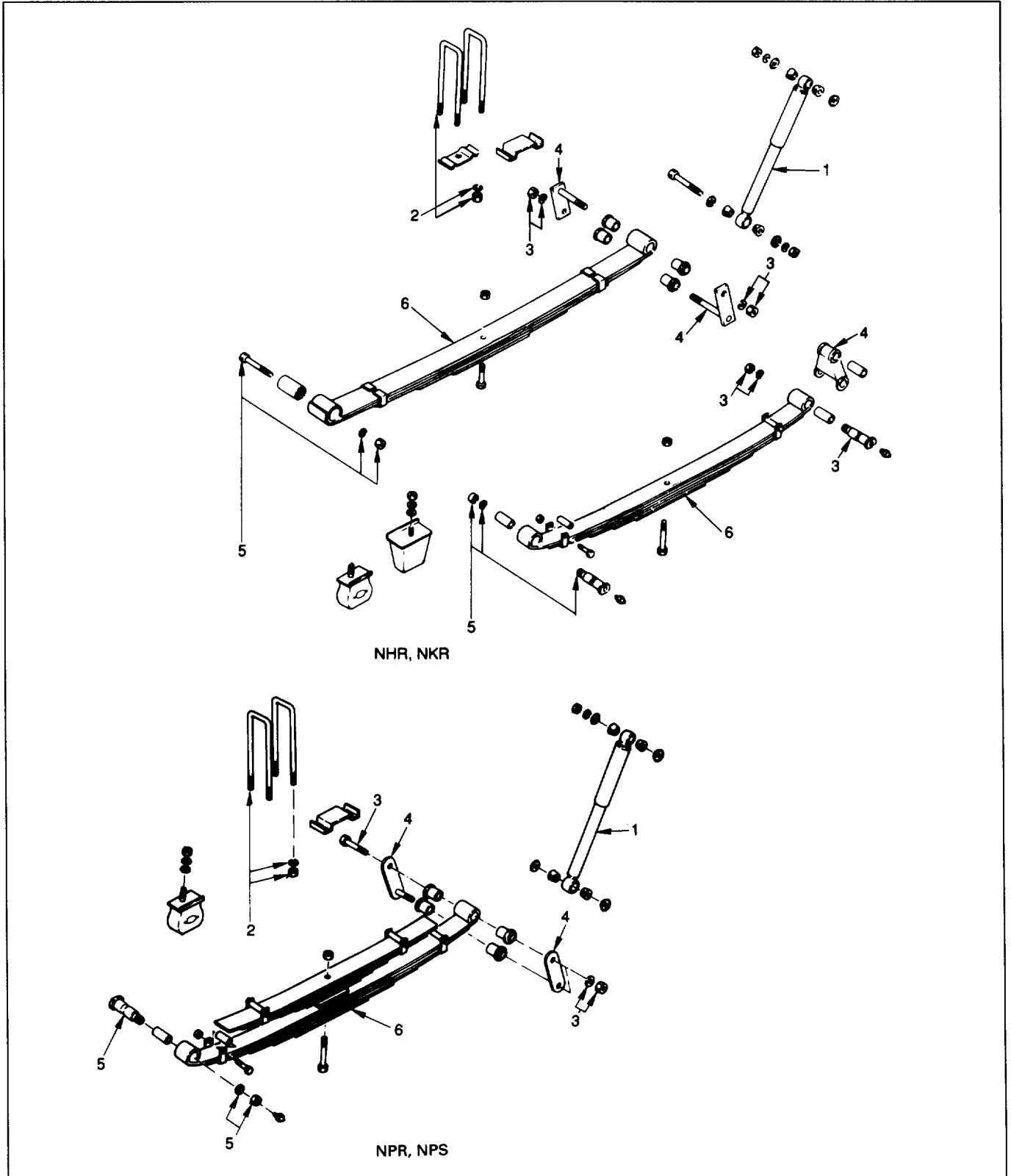




# ON-VEHICLE SERVICE

## REAR SUSPENSION

### LEAF SPRING





## Removal Steps

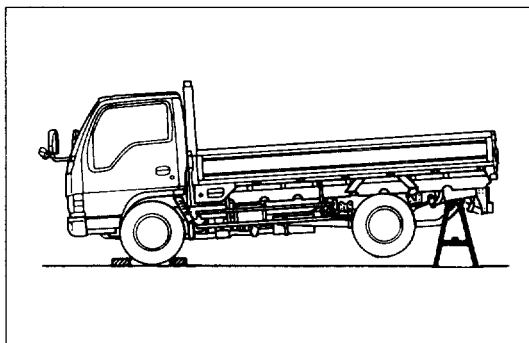
1. Shock absorber
2. U-bolt, nut and washer
3. Shackle pin, nut and washer
4. Shackle
5. Spring pin, nut and washer
6. Leaf spring

## Installation Steps

6. Leaf spring
2. U-bolt, nut and washer
5. Spring pin, nut and washer
4. Shackle
3. Shackle pin, nut and washer
1. Shock absorber



## REMOVAL



### Preparation

Make the following preparation before removing the leaf spring.

- 1) Brace the front wheels.
- 2) Jack up the rear axle until the rear wheels are lifted off the ground and position safety stand under the chassis frame.

Refer to "Lifting Instruction" in Section 0 for acceptable lifting point and supportable point location.

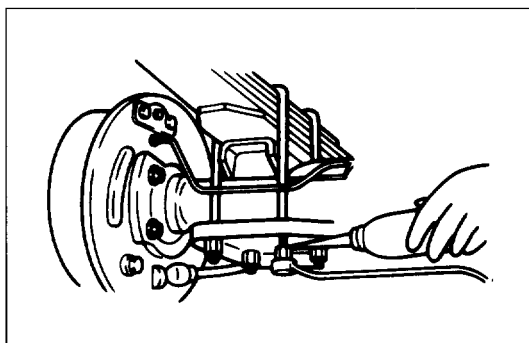
- 3) Position a garage jack under the rear axle.
- 4) For the vehicle model with a stabilizer, remove the mounting portion on the axle side of the stabilizer in advance before removing the leaf spring. (Refer to the removal procedure of the stabilizer.)

### 1. Shock Absorber

### 2. U-bolt, Nut and Washer



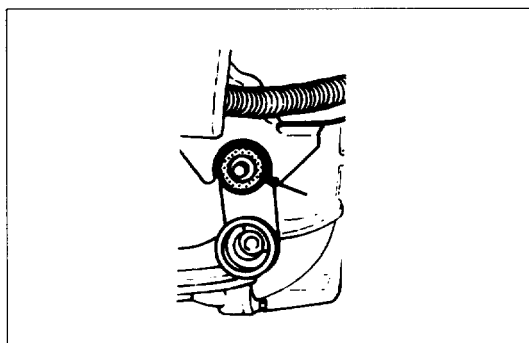
If the U-bolt are heavily rusted, apply a generous amount of oil to the threads before loosening them to prevent seizure.



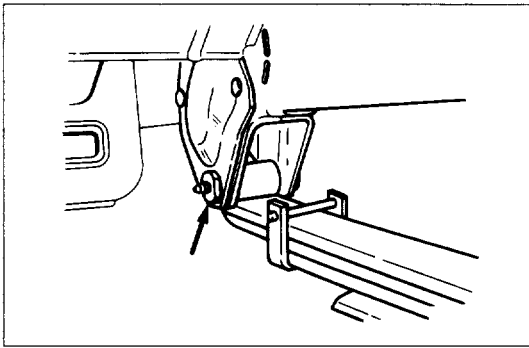
### 3. Shackle Pin, Nut and Washer

### 4. Shackle

Take out the rubber bushings after removal of the shackle.







### 5. Spring Pin, Nut and Washer

Drive out the shackle pin with a hammer using a brass bar after removal of the shackle pin nut.

### 6. Leaf Spring

Lower the garage jack slowly and remove the rear spring assembly. When removing the rear spring assembly, exercise care not to cause damage to the brake flexible hoses. Also, exercise care not to cause the spring to come down.

## INSPECTION AND REPAIR

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

- Leaf spring assembly
- Clip
- Center bolt
- U-bolt
- Spring pin
- Shackle pin
- Shock absorber
- Helper rubber
- Rubber bushing
- Sub spring stopper rubber
- Helper rubber seat



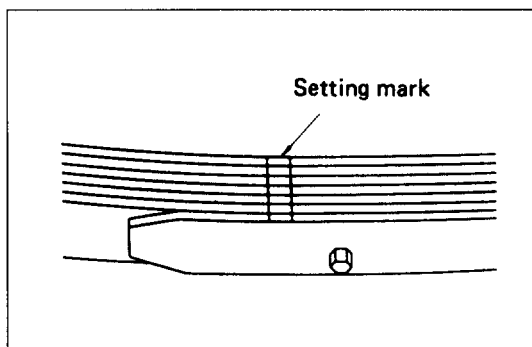
### Visual Check

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

### Shock Absorber

1. Inspect for extreme oil leakage. Slight oil leakage is allowed.
2. Inspect for temperature after running. Unchanged temperature indicates deteriorated function.
3. Inspect if large resistance is felt when the shock absorber is expanded and contracted by holding either end, or if play is eliminated after several times of expansion and contraction. The function has deteriorated if the above condition is not observed.
4. Inspect the bushing for wear or deterioration. Replace if abnormality is found.



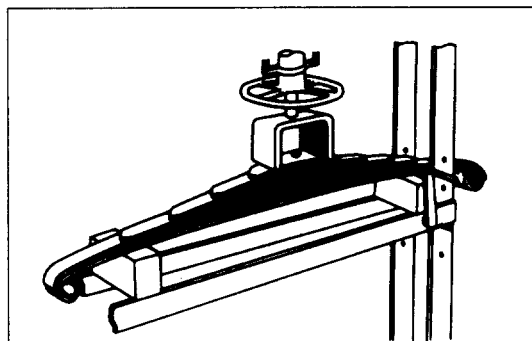


### Leaf Spring Assembly Replacement



- Apply a setting mark across the springs before disassembling the leaf spring assembly.
- Apply grease to both faces of each leaf spring at reassembly.
- Use a bench press for disassembly and reassembly.
- Discard center bolt removed and install a new one.

When replacing the leaf spring assembly, use the leaf spring with the same camber represented by "+, -, ○" on both right and left sides.



### Center Bolt

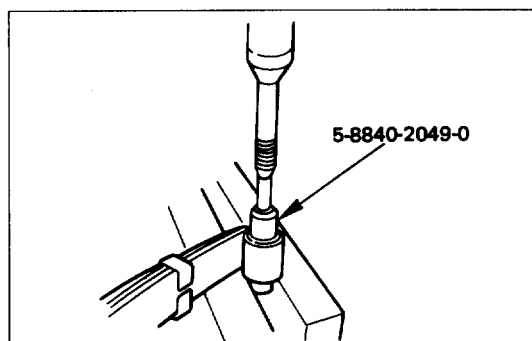


Center Bolt Torque	N•m (kg•m / lb•ft)
98 (10 / 72)	

### Clip Bolt



Clip Bolt Torque	N•m (kg•m / lb•ft)
20 (2 / 14)	

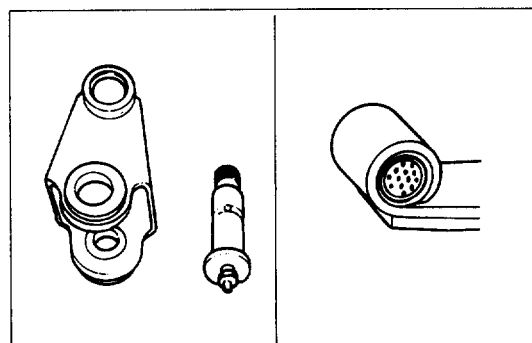


### Bushing Replacement

When replacing bushing, drive out the bushing using a bench press.



Remover and Installer : 5-8840-2049-0



### Measurement of Outer Diameter of Spring Pin

mm (in.)

Standard	Limit
25 (0.98)	24.7 (0.97)

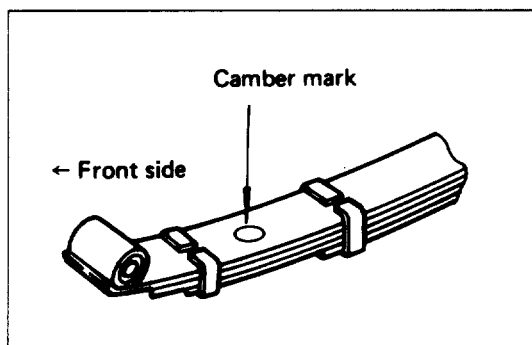
### Clearance between Shackle Pin and Bushing

mm (in.)

Standard	Limit
0.1 (0.0039)	0.5 (0.019)

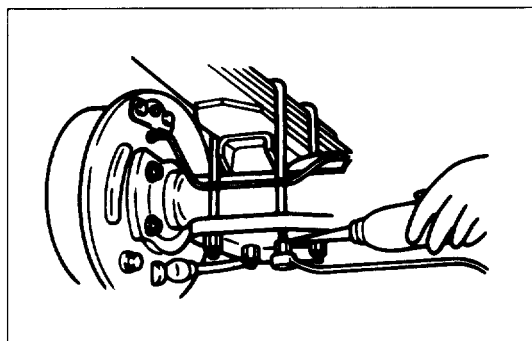


## INSTALLATION



### 6. Leaf Spring

Install the leaf spring assembly with the camber mark turned to front side on the rear axle.

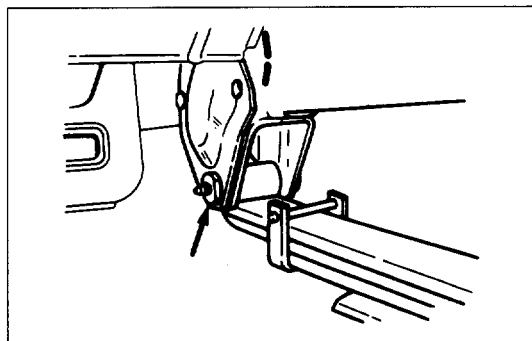


### 2. U-bolt, Nut and Washer

Position the U-bolts and clamp on the leaf spring assemblies and jack up the rear axle.

When tightening the nuts apply oil as necessary to prevent damaging the threads.

U-Bolt Nut Torque	N•m (kg•m / lb•ft)
NQR	294 (30 / 217)
except NQR	177 (18 / 130)

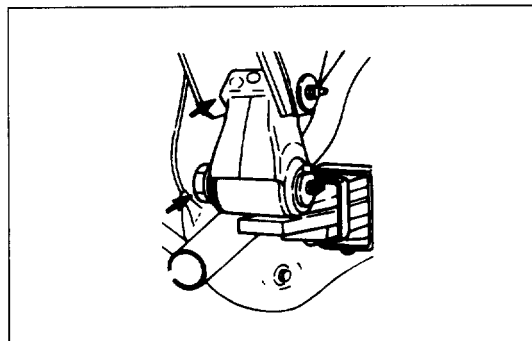


### 5. Spring Pin, Nut and Washer

#### 4. Shackle

Finger tighten first, and tighten to specified torque after lowering the vehicle to ground.

Shackle Pin Nut Torque	N•m (kg•m / lb•ft)
NHR, NKR Single Tire, Flat Low	219 (22.3 / 161)
NKR Dual tire, NPR, NQR, NPS	332 (33.8 / 244)



### 3. Shackle Pin Nut and Washer

Finger tighten first, and tighten to specified torque after lowering the vehicle to ground.

Spring Pin Nut Torque	N•m (kg•m / lb•ft)
NHR	137 (14 / 101)
NKR, NPR, NQR	196 (20 / 145)
NPS	177 (18 / 130)



**1. Shock Absorber**

Shock Absorber Upper Nut Torque    N•m (kg•m / lb•ft)

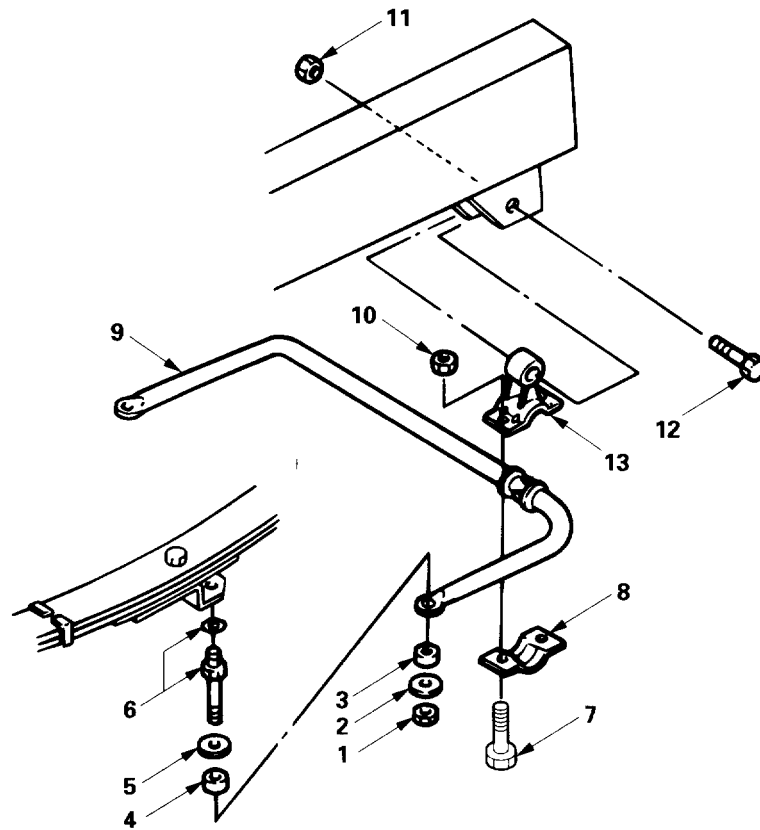
NHR, NKR Single Tire	61 (6.2 / 45)
except above models	95 (9.7 / 70)

Shock Absorber Lower Nut Torque    N•m (kg•m / lb•ft)

NHR, NKR Single Tire	61 (6.2 / 45)
NKR Dual Tire	95 (9.7 / 70)
NPR, NPS, NQR	40 (4.1 / 30)



# STABILIZER



460LY00001

## Removal Steps

1. Nut
2. Washer
3. Rubber bushing
4. Rubber bushing
5. Washer
6. Stud bolt and spring washer
7. Bolt
8. Rod link cap
9. Stabilizer bar
10. Nut
11. Nut
12. Bolt
13. Rod link

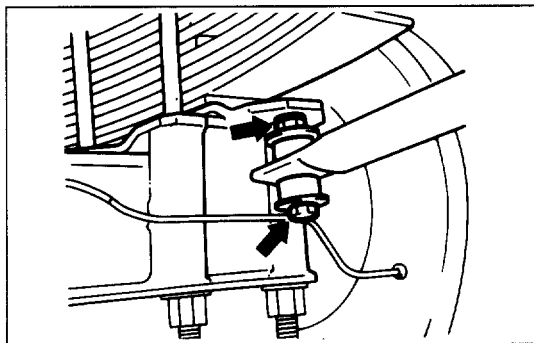
## Installation Steps

9. Stabilizer bar
13. Rod link
8. Rod link cap
10. Nut
7. Bolt
12. Bolt
11. Nut
6. Stud bolt and spring washer
5. Washer
4. Rubber bushing
3. Rubber bushing
2. Washer
1. Nut

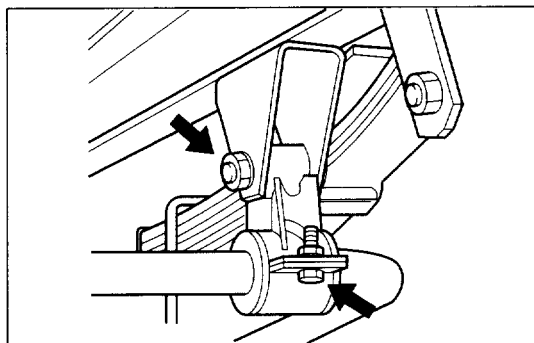




## REMOVAL



1. Nut
2. Washer
3. Rubber Bushing
4. Rubber Bushing
5. Washer
6. Stud Bolt and Spring Washer



7. Bolt
8. Rod Link Cap
9. Stabilizer Bar
10. Nut
11. Nut
12. Bolt
13. Rod Link

460LY00002

## INSPECTION AND REPAIR

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



### Stabilizer

Inspect the stabilizer bar and attachments for the following conditions:

1. Cracks, bends or damage to the bar.
2. Worn bushings.
3. Damaged brackets.
  - Replace any worn or damaged parts.

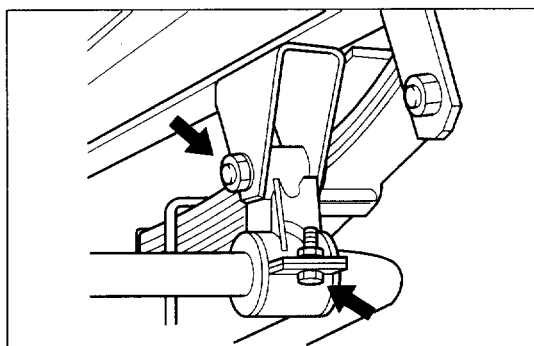




## INSTALLATION

### NOTE:

During installation, place the vehicle on flat ground and tighten each part to the specified torque.



460LY00002



9. Stabilizer Bar
13. Rod Link
8. Rod Link Cap
7. Bolt
10. Nut
12. Bolt
11. Nut

Nut Torque	N•m (kg•m / lb•ft)
Rod Link Cap Nut	27 ( 2.8 / 20)
Rod Link Bracket Nut	117 (11.9 / 86)

6. Stud Bolt and Spring Washer
5. Washer
4. Rubber Bushing
3. Rubber Bushing
2. Washer
1. Nut



Stud Bolt and Nut Torque	N•m (kg•m / lb•ft)
Stud Bolt	117 (11.9 / 86)
Nut	61 ( 6.2 / 45)

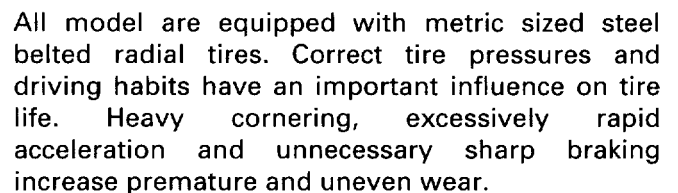


**SECTION 3E**  
**WHEELS AND TIRES**

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<b>General Balancing Procedure .....</b>	<b>3E- 8</b>
<b>Balancing Wheel and Tire .....</b>	<b>3E- 9</b>





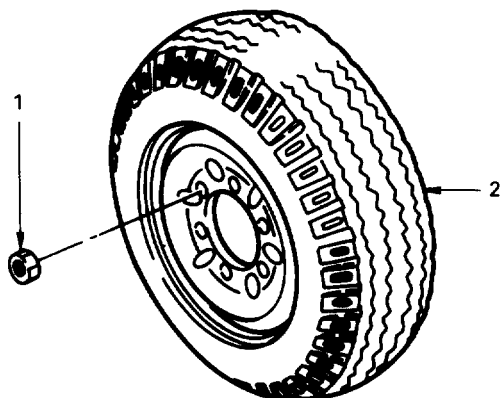


# ON-VEHICLE SERVICE

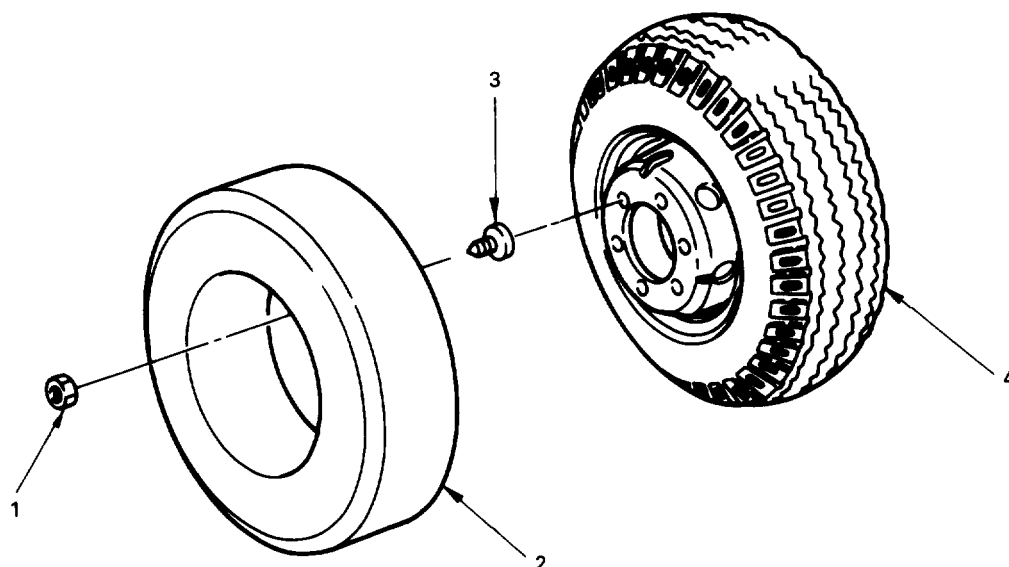
## WHEEL AND TIRE ASSEMBLY

Front Tire

Rear Single Tire



Rear Dual Tire



### Removal Steps

1. Wheel nut (outer)
2. Wheel and tire assembly (front or outer)
3. Wheel nut (inner)
4. Wheel and tire assembly (inner)

### Installation Steps

4. Wheel and tire assembly (inner)
3. Wheel nut (inner)
2. Wheel and tire assembly (front or outer)
1. Wheel nut (outer)

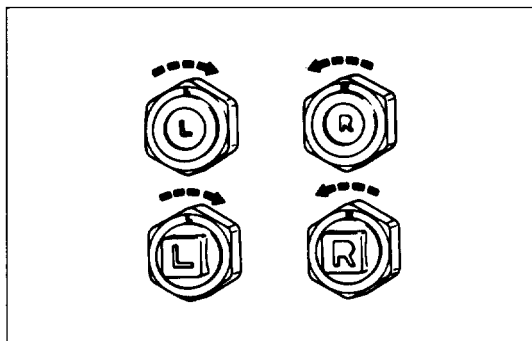
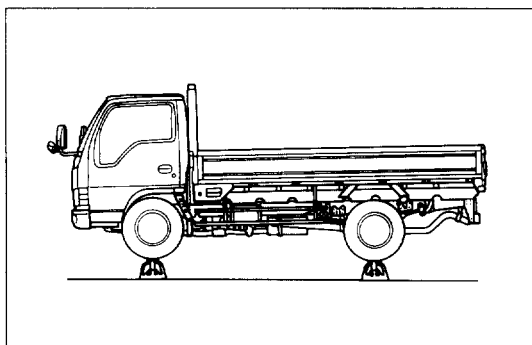




## Removal Steps

### Preparations

- Raise the vehicle and support jack up point with suitable safety stands. Refer to “Jack Up Point” in Section 0A.

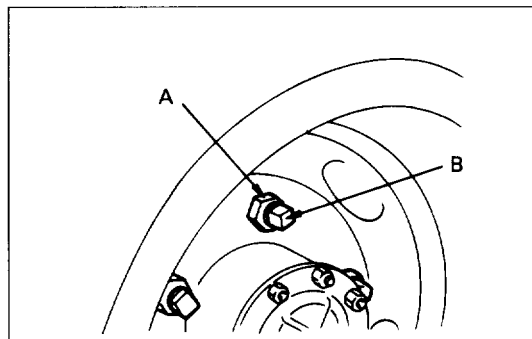


1. **Wheel Nut (Outer)**
2. **Wheel and Tire Assembly (Front or Outer)**
3. **Wheel Nut (Inner)**
4. **Wheel and Tire Assembly (Inner)**

Loosen the wheel nuts with the wheel nut wrench. The wheel nuts on the right side wheels have right-hand threads and the wheel nuts on the left side wheels have left-hand threads.

To change the inner wheel on either side of the rear of the vehicle:

1. Completely loosen the six-sided outer wheel nut (A) with the wheel wrench.
2. Using the opposite side of the wheel wrench, unscrew the four-sided inner wheel nut (B) approximately one full turn.
3. Repeat this procedure with the remaining outer and inner wheel nuts.

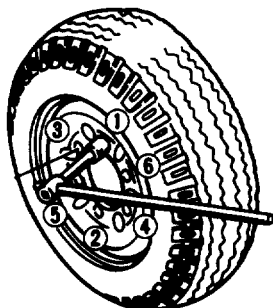




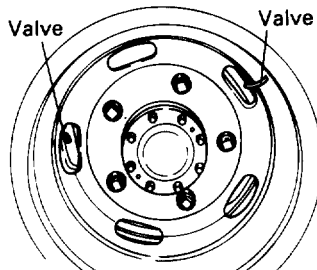
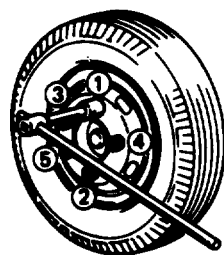


## Installation Steps

6 studs



5 studs



4. Wheel and Tire Assembly (Inner)
3. Wheel Nut (Inner)
2. Wheel and Tire Assembly (Front or Outer)
1. Wheel Nut (Outer)

Tighten wheel nuts in numerical sequence.



Front Wheel Nut Torque	N·m (kg·m/lb·ft)
NHR / NKR Single Tire, NKR Flat Low	167 (17 / 123)
except above models	441 (45 / 325)



Rear Wheel Nut Torque	N·m (kg·m/lb·ft)
NHR / NKR Single Tire,	167 (17 / 123)
NHR Dual Tire, NKR Flat Low	294 (30 / 217)
except above models	441 (45 / 325)

### NOTE:

When installing the rear wheels, take care so that the dual tires' valves are dislocated or that the inner valve will not be hidden.



# UNIT REPAIR

## TIRES

### REPLACEMENT

When replacement is necessary, the original metric the size should be used. Most metric tire sizes do not have exact corresponding alphanumeric tire sizes. It is recommended that new tires be installed in pairs on the same axle. If necessary to replace only one tire, it should be paired with tire having the most tread, to equalize braking traction.



#### CAUTION:

**Do not mix different types of tires such as radial, bias and bias-belted tires except in emergencies, because car handling may be seriously affected and may result in loss of control.**

### TIRE MOUNTING

Remove valve cap on valve stem and deflate the air. Then use a tire changing machine to mount or dismount tires. Follow the equipment manufacturer's instruction. Do not use hand tools or tire lever alone to change tires as they may damage the tire beads or wheel rim.

### TIRE DISMOUNTING

Rim bead seats should be cleaned with a wire brush or coarse steel wool to remove lubricants, and light rust. Before mounting a tire, the bead area should be well lubricated with an approved tire lubricant.

After moving, inflate the tire to 196kPa (28 psi) so that beads are completely seated. Inflate the air to specified pressure and install valve cap to the stem.



#### WARNING:

**NEVER STAND OVER TIRE WHEN INFLATING. BEAD MAY BREAK WHEN BEAD SNAPS OVER RIM'S SAFETY HUMP AND CAUSE SERIOUS PERSONAL INJURY.**

**NEVER EXCEED SPECIFIED PRESSURE WHEN INFLATING. IF SPECIFIED PRESSURE WILL NOT SEAT BEADS, DEFLATE, RE-LUBRICATE AND RE-INFLATE. OVER INFLATION MAY CAUSE THE BEAD TO BREAK AND CAUSE SERIOUS PERSONAL INJURY.**

### TIRE REPAIR

There are many different materials on the market used to repair tires.

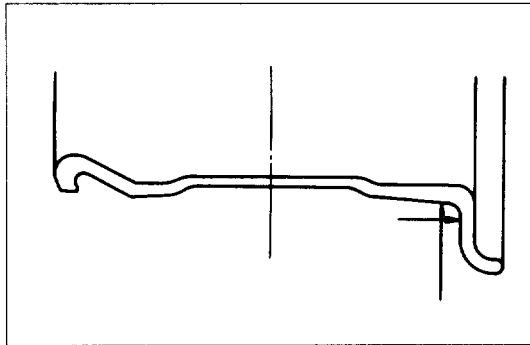
Manufacturers have published detailed instructions on how and when to repair tires. These instructions can be obtained from the tire manufacturer if they are not included with the repair kit.





Tire Inflation Pressure		kPa (kg/cm <sup>2</sup> / psi)
Tire Size	Inflation Pressure	
6.50-15-6PR	319 (3.25 / 46)	
7.00-15-6PR		
7.50-16-6PR		
5.00-12-8PR	392 (4.00 / 57)	
5.50-13-8PR		
6.00-13-8PR	417 (4.25 / 60)	
6.00-14-8PR		
6.00-15-8PR		
7.00-15-8PR		
7.00-16-8PR		
7.50-15-8PR		
7.50-16-8PR	441 (4.50 / 64)	
6.00R15-8PR		
7.00R15-8PR		
7.00R16-8PR		
155R13-8		
205R16C8PR	466 (4.75 / 68)	
7.50R16-8PR		
195/75R16C		
6.50-15-10PR	490 (5.00 / 71)	
6.50-16-10PR		
7.00-15-10PR		
7.00-16-10PR		
8.25-16-12PR		
7.50-15-10PR	515 (5.25 / 75)	
7.50-16-10PR		
7.00R15-10PR		
7.00R16-10PR		
215/75R16C		
6.50R16-10PR	540 (5.50 / 78)	
7.00-15-12PR	564 (5.75 / 82)	
7.00-16-12PR		
7.50R16-10PR		
8.25-16-14PR		
7.50-15-12PR	588 (6.00 / 85)	
7.50-16-12PR		
7.00R15-12PR		
7.00R16-12PR		
215/75R-17.5		
7.50-15-14PR	637 (6.50 / 92)	
7.50-16-14PR		
7.50R16-12PR		
7.00-16-14PR	711 (7.25 / 103)	





## WHEELS

### REPLACEMENT

Damaged wheels and wheels with excessive run-out must be replaced.



Wheel Run-out at Rim

mm (in)

1.5 (0.059) or less



#### CAUTION:

Wheel repairs that use welding, heating or preening are not permitted. Replace wheel lug nuts if they are bent, dented, have excessive lateral or radial run-out, leak air through welds, have elongated bolt holes, will not stay tight, or if they are heavily rusted.

### GENERAL BALANCE PROCEDURE

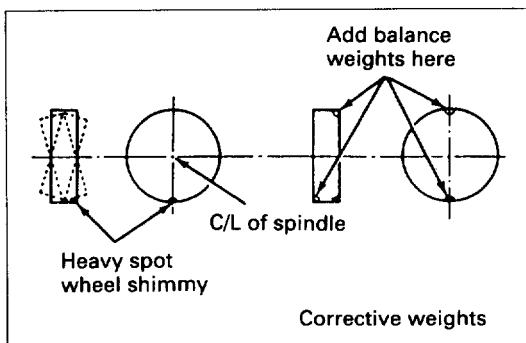
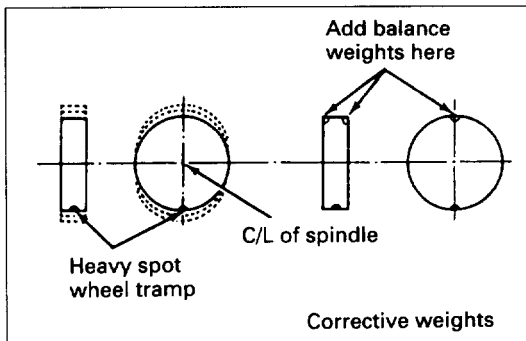
Deposits of mud, etc. must be cleaned from the inside of the rim.

The tire should be inspected for the following: match mount paint marks, bent rims, bulges, irregular tire wear, proper wheel size and inflation pressure. Then balance according to the equipment manufacturer's recommendations.

There are two types of wheel and tire balance.

Static balance is the equal distribution of weight around the wheel.

Assemblies that are statically unbalanced cause a bouncing action called tramp. This condition will eventually cause uneven tire wear.



Dynamic balance is the equal distribution of weight on each side of the wheel center-line so that when the tire spins there is no tendency for the assembly to move from side to side. Assemblies that are dynamically unbalanced may cause shimmy.



#### WARNING:

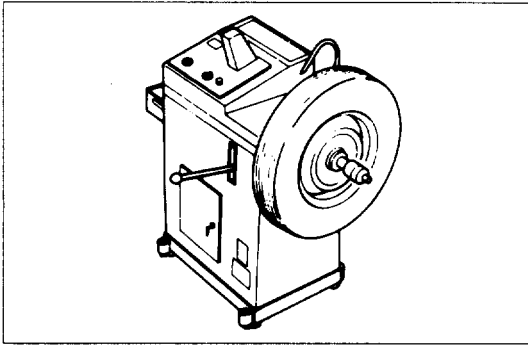
**STONES SHOULD BE REMOVED FROM THE TREAD TO AVOID OPERATOR INJURY DURING SPIN BALANCING AND TO OBTAIN A GOOD BALANCE.**



## BALANCING WHEEL AND TIRE

### ON-VEHICLE BALANCING

On-Vehicle balancing methods vary with equipment and tool manufacturers. Be sure to follow each manufacturer's instructions during balancing operation.



### OFF-VEHICLE BALANCING

Most electronic off-vehicle balancers are more accurate than the on-vehicle spin balancers. They are easy to use and give a dynamic balance. Although they do not correct for drum or disc unbalance (as on-vehicle spin balancing does), they are very accurate.



## **LGSTG-WE-0091**

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

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