General Information

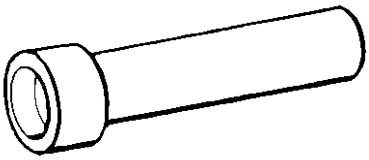
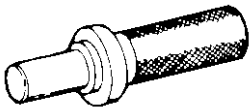
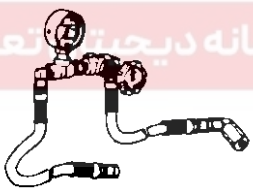
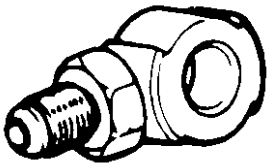
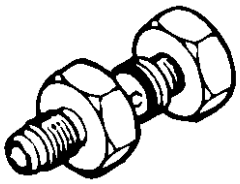
SPECIFICATIONS

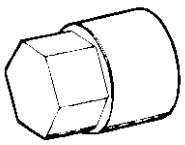
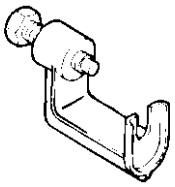
Items	Specifications
Steering wheel diameter (Outer)	386mm
Power steering gear box Steering gear type Steering gear ratio Rack stroke	 Rack and pinion ∞ 81mm x 2
Oil pump Oil pump type	 Vane type
Displacement	9.6 cc/rev

SERVICE SPECIFICATIONS

Items		Specifications
Steering wheel free play Steering gear angle Inner wheel Outer wheel	mm	30 37.15˚ ± 2˚ 32.05˚ ± 2˚
Stationary steering effort	kg (lbs)	3.3 (7.3)
Drive belt tension	mm (in)	6-7 (0.236-0.275)
Oil pump pressure Gauge hose valve closed-General Gauge hose valve closed-EPS Gauge hose valve opened	kg/cm² (psi)	 89-95 (1,265-1,351) 79-85 (1,123-1,208) 4-6 (56-85)
Power steering oil	liter	PSF-3 (0.85-0.9)

SPECIAL SERVICE TOOLS

Tool (Number and name)	Illustration	Use
Valve stem oil seal installer (09222 - 21100)		Installation of the pinion gear bearing
Front oil seal installer (09431 - 11000)		Installation of the pinion gear oil seal
Bearing installer (09432 - 21601)		Installation of the pinion gear bearing
Oil pressure gauge (09572-21000)		Measurement of the oil pump pressure
Power steering oil pressure gauge adapter (Pump side) (09572-33100)		
Power steering oil pressure gauge adapter (Hose side) (09572-21200)		

Tool (Number and name)	Illustration	Use
Yoke plug torque wrench socket (09565 - 31300)		Removal, installation and adjustment of steering gear yoke plug
Ball joint remover (0K670 - 321 - 019)		Separation of the tie rod end ball joint

TROUBLESHOOTING

Symptom	Probable cause	Remedy
Steering wheel return malfunction	Incorrect tire pressure	Adjust the tire pressure
Steering operation is "hard"	Incorrect tire pressure	Adjust the tire pressure
	Loose belt	Adjust the belt tension
	Damaged belt	Replace the belt
	Low fluid level	Refill fluid
	Air in fluid line	Bleed the system
Steering wheel pulls to one side	Twisted hose	Correct the hose routing or replace the hoses
	Incorrect mounting of the steering gear box on the crossmember	Retighten
	Fluid leakage	Check the fluid leakage and retighten or replace
	Incorrect wheel alignment (especially caster)	Adjust the wheel alignment
	Malfunction of gear box	Check and replace the gear box if necessary
	Malfunction of oil pump	Check the oil pump pressure and repair oil pump
	Excessive steering wheel play	Adjust the steering wheel play
	Insufficient tire inflation pressure	Adjust the tire pressure
	Unevenly worn or deformed tire	Rotate the wheel or replace the tire
	Dragging brake	Adjust
	Deteriorated or broken front spring	Replace
	Deformed knuckle arm	Replace
	Poor wheel alignment	Adjust the wheel alignment
	Damaged wheel bearing	Replace
	Deformed or loose lower arm	Retighten or replace
	Loose linkage joints	Retighten
	Malfunction of ball joints (Too small ball joint starting torque)	Replace
	Deteriorated or broken lower arm bushing	Replace
	Incorrect installation or internal damage in gear	Correct or replace
	Malfunction of shock absorber	Replace

Symptom	Probable cause	Remedy
Steering wheel vibrates	Insufficient tire inflation pressure	Adjust the tire pressure
	Unevenly worn or deformed tire(s)	Rotate the wheels or replace the tire(s)
	Loose hub nut	Retighten
	Excessive runout, or unbalance of tire a-nd wheel	Adjust the wheel balance or replace
	Poor wheel alignment	Adjust the wheel alignment
	Damaged wheel bearing	Replace
	Deformed or loose lower arm	Retighten or replace
	Deformed linkage	Repair or replace
	Loose linkage joints	Retighten
	Malfunction of ball joints (Too small ball j oint starting torque)	Replace
	Malfunction of front suspension	Check and adjust; replace the parts if ne-cessary
	Incorrect installation or internal damage in gear box	Correct or replace
	Malfunctioning of shock absorber	Replace
Road shock is felt in steering whe-el	Insufficient steering wheel play	Adjust the steering wheel play
	Insufficient tire inflation pressure	Adjust the tire pressure
	Unevenly worn or deformed tire(s)	Rotate the wheels or replace the tire(s)
	Malfunction of shock absorber	Replace
Poor recovery of steering wheel to straight ahead position	Insufficient tire inflation pressure	Adjust the tire pressure
	Stuck or damaged ball joint	Replace
	Improper wheel alignment angles	Adjust the wheel alignment
Rattling noise	Loose installation of oil pump or gear bo-x	Retighten the oil pump and gear box
	Steering linkage looseness or play	Retighten or replace the steering linkage
	Loose oil pump pulley nut	Retighten the oil pump pulley nut
	Interference around column or between pressure hose and other parts	Correct or replace the pressure hose an-d the parts around the column
	Abnormal noise inside the gear box and oil pump	Replace the gear box or oil pump
Strident noise	Air sucked into oil pump	Check the oil level and hose clips; bleed the system or replace the oil pump
	Seizure inside oil pump	Replace the oil pump
Squealing noise 1)	Loose belt	Adjust the belt tension
	Seizure inside oil pump	Replace the oil pump

Symptom	Probable cause	Remedy
Hissing noise	Air sucked into oil pump	Check the oil level and hose clips; bleed the system
	Damage to the gear box port section	Replace the gear box
	Malfunction of return hose	Replace the hose
Whistling noise	Malfunction of gear box port section	Replace the gear box
Droning noise	Loose mounting bolt on oil pump or oil p-ump bracket	Retighten the pump bracket and pump i-nstalling bolt
	Poor condition of oil pump body 2)	Replace the oil pump
Squealing noise 2)	Malfunction of steering stopper contact	Check and adjust the steering stopper
	Interference of wheel with vehicle body	Adjust the steering angle
	Interference of steering shaft and joint a-ssembly with other parts	Reposition the interfering parts
	Malfunction of gear box	Replace the gear box
Shuddering vibration 3)	Air suction	Bleed the system
	Malfunction of gear box	Replace the gear box
Oil leakage from hose connection	Improperly tightened flare nut	Check, repair or replace
	Incorrectly inserted hose	
	Improperly clamped hose	
Oil leakage from hose assembly	Damaged or clogged hose	Replace
	Hose connector malfunction	
Oil leakage from oil reservoir	Leaking reservoir	Replace
	Overflow	Bleed the system or adjust the oil level
Oil leakage from oil pump	Malfunction of oil pump housing	Replace the oil pump
	Malfunction of O-ring and/or oil seal	Replace the O-ring and oil seal
Oil leakage from gear box	Malfunction of gear box housing (includi-ng leakage from air hole)	Replace the gear box
	Malfunction of O-ring and/or oil seal	Replace the O-ring and oil seal

NOTICE

1. *A squealing noise may be heard just after very cold engine start (-20˚C or less), caused by fluid characteristics at extreme low temperatures. This is not a malfunction.*
2. *A slight "beat noise" is produced by the oil pump; this is not a malfunction. (This noise occurs particularly when a stationary steering effort is made.)*
3. *A slight vibration may be felt when a stationary steering effort is made due to the condition of the road surface. To check whether the vibration actually exists or not, test-drive the vehicle on a dry concrete or asphalt surface. A very slight amount of vibration is not a malfunction.*

DTC LIST (EPS)

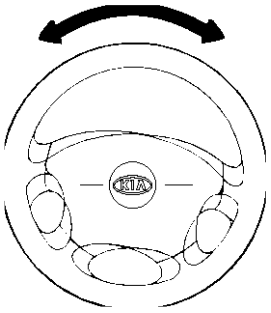
DTC	PROBABLE CAUSE	REMEDY
C1001	EPS ECU failure	Replace EPS ECU
C1017	Solenoid short to ground	Check connection condition of solenoid or harness
	Solenoid short to battery	Check connection condition of solenoid or harness
	Solenoid short or open	Check or replace solenoid
C1012	Vehicle acceleration or deceleration excess	Check vehicle sensor
C1011	Battery voltage under 10V	Check battery voltage or charge
C1014	Lamp short or open circuit	Check lamp short or open circuit

SERVICE ADJUSTMENT PROCEDURES

STEERING WHEEL FREE PLAY CHECK

1. With the engine stationary and the steering wheel in the straight-ahead position, apply a force of 0.5 kg (1.1 lbs.) to the steering wheel in the peripheral direction.

Standard value : 30 mm or less



APAC006A

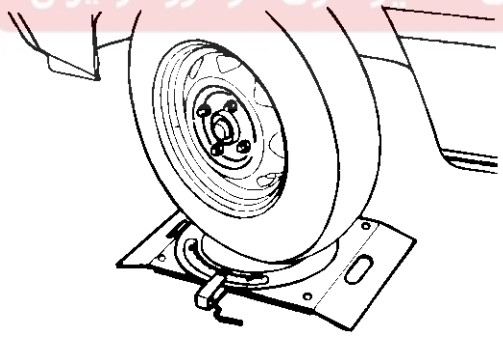
2. If the measured value exceeds the standard value. Inspect contact of the steering shaft and tie rod ball joints.

STEERING ANGLE CHECK

1. Place the front wheel on a turning radius gauge and measure the steering angle.

STANDARD VALUE

Inner wheel	37.15° ± 2°
Outer wheel	32.05° ± 2°



APAC006B

1. If the measured value is not within the standard value, adjust the toe-in and inspect again.

NOTICE

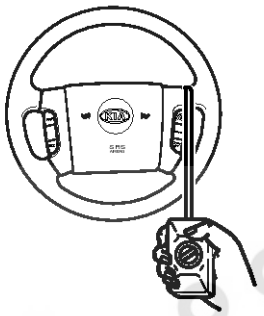
After adjusting the tie rod, assemble the bellows so they are not twisted.

STATIONARY STEERING EFFORT CHECK (POWER STEERING)

1. Place the vehicle on a level surface and place the steering wheel in the straight-ahead position.
2. Set the engine speed to 1,000 rpm.
3. Measure the tangential force with a spring balance by turning the steering wheel clockwise and counterclockwise one and a half turns.

Standard value : 3.3 kg (7.31 lbs) or less

4. If the stationary steering effort exceeds the standard value, check for belt slackness, damage, insufficient oil, air mixed into oil, collapsed or twisted hoses, etc., and repair if found.



LPAC006C

CHECKING OF THE STEERING WHEEL RETURN TO CENTER (POWER STEERING)

To check for the return of steering wheel to Center, carry out drive test and check the following points.

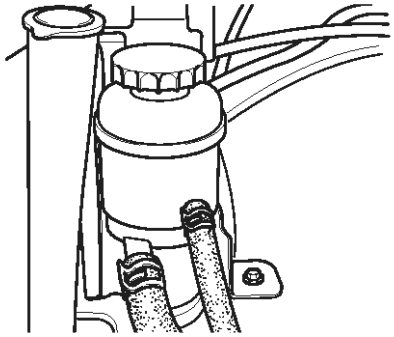
1. Make gentle and sharp turns and check to get a feel for that there is no appreciable difference in steering effort and return to Center between right and left turns.
2. Drive at a speed of about 35 km/h turn the steering wheel 90° clockwise or counterclockwise, and release the wheel a second or two later, if the wheel returns more than 70°, the return may be considered good.

NOTICE

When the steering wheel is turned abruptly, momentary hard steering might result, but this does not mean any problem. It is caused by low oil pump delivery during idling.

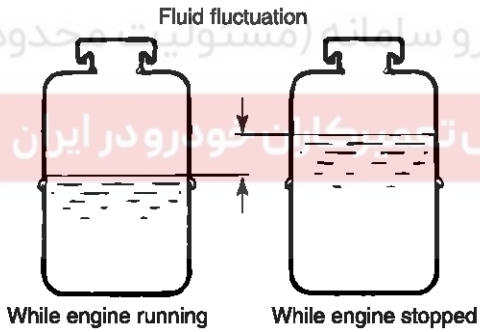
FLUID LEVEL CHECK (POWER STEERING)

1. Park the vehicle on a flat, level surface, start the engine, and then turn the steering wheel several times to raise the temperature of the fluid to approximately 50˚ - 60˚ C.



APAC006E

2. With the engine running, turn the wheel all the way to the left and right several times.
3. Check the fluid in the oil reservoir for foaming or milkiness.
4. Check the difference of the fluid level when the engine is stopped, and while it is running. If the fluid level changes considerably, air bleeding should be done.



LPAC006D

FLUID REPLACEMENT (POWER STEERING)

1. Raise the front wheels on a jack, and then support them with rigid racks.
2. Disconnect the return hose connection.
3. Connect a vinyl hose to the return hose, and drain the oil into a container.
4. On vehicles with a patrol engine, disconnect the high tension cable. On vehicles with a diesel engine, remove the fuel cut valve connector attached to the injection pump.

   While operating the starter motor intermittently, turn the steering wheel all the way to the left and right several times to drain all of the fluid.
5. Connect the return hoses securely, and then secure it with the clip.
6. Fill the oil reservoir with the specified fluid up to the lower position of the filter, and then bleed the air.

Specified fluid : PSF-3

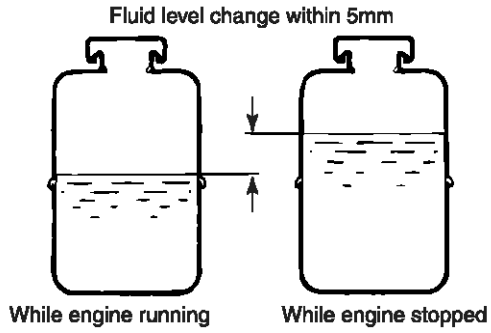
BLEEDING

1. Jack up the front wheels and support them by using a rigid rack.
2. Manually turn the oil pump pulley a few times.
3. Turn the steering wheel all the way to the left and to the right five or six times.
4. On vehicles with a patrol engine, disconnect the high tension cable. On vehicles with a diesel engine, remove the fuel cut valve connector attached to the injection pump.

   While operating the starter motor intermittently, turn the steering wheel all the way to the left and right five or six times (for 15 to 20 seconds).

   ⚠CAUTION
   - **During air bleeding, replenish the fluid supply so that the level never falls below the lower position of the filter.**
   - **If air bleeding is done while engine is running, the air will be broken up and absorbed into the fluid; be sure to do the bleeding only while cranking.**
5. On vehicles with a patrol engine, connect the ignition cable. On vehicles with a diesel engine, connect the fuel cut valve connector attached to the injection pump. Start the engine (idling).
6. Turn the steering wheel to the left and right until there are no air bubbles in the oil reservoir.
7. Confirm that the fluid is not milky, and that the level is up to the specified position on the level gauge.

8. Confirm that there is very little change in the fluid level when the steering wheel is turned left and right.
9. Check whether or not the change in the fluid level is within 5 mm (0.20 in.) when the engine is stopped and when it is running.



LPAC007A

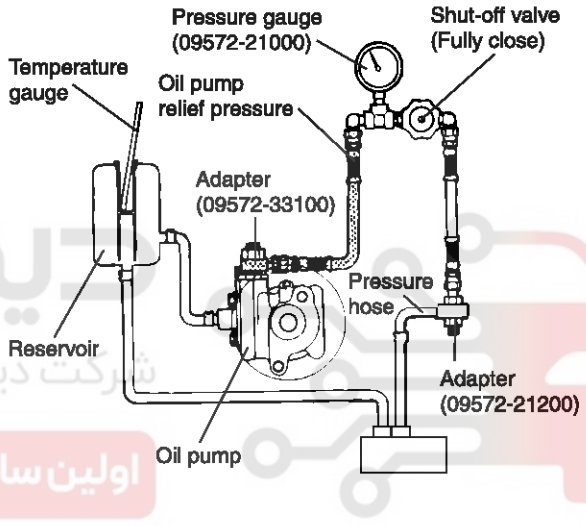
⚠CAUTION

- **If the change of the fluid level is 5 mm (0.20 in.) or more, the air has not been completely bled from the system, and thus must be bled completely.**
- **If the fluid level rises suddenly after the engine is stopped, the air has not been completely bled.**
- **If air bleeding is not complete, there will be abnormal noises from the pump and the flow-control valve, and this condition could cause a lessening of the life of the pump, etc.**

OIL PUMP PRESSURE TEST CHECKING THE OIL PUMP RELIEF PRESSURE

1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50-60˚ C (122-140˚ F).
3. Start the engine and idle it at 1,000 ± 100 rpm.
4. Fully close the shut-off valve of the pressure gauge and measure the oil pump relief pressure to confirm that it is within the standard value range.

Standard value : 89 - 95 kg/cm²(1,265 - 1,351 psi)



LPAC008A

⚠CAUTION

Pressure gauge shut off valve must not remain closed for more than 10 seconds.

5. If it is not within the standard value, replace the oil pump.
6. Remove the special tools, and then tighten the pressure hose to the specified torque.

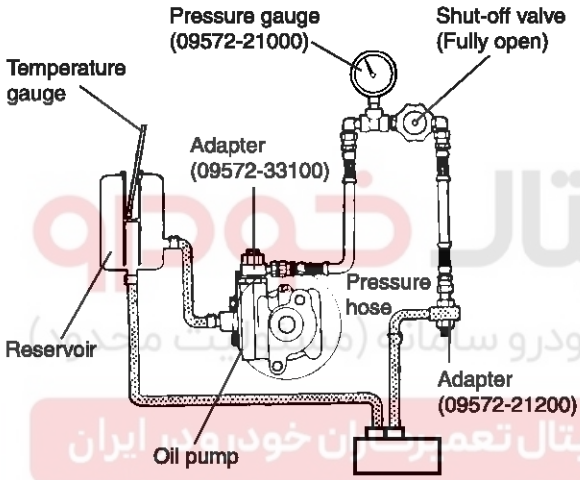
Tightening torque :
55-65 N·m (5.5- 6.5 kg-m, 39 - 47 lb-ft)

7. Bleed the system.

CHECKING THE PRESSURE UNDER NO-LOAD CONDITIONS

1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid raise to approximately 50-60˚ C (122-140˚ F).
3. Start the engine and idle it at 1,000 ± 100 rpm.
4. Check whether or not the hydraulic pressure is the standard value when no-load conditions are created by fully opening the shut-off valve of the pressure gauge.

Standard value : 4 - 6 kg/cm² (56 - 85 psi)



LPAC008B

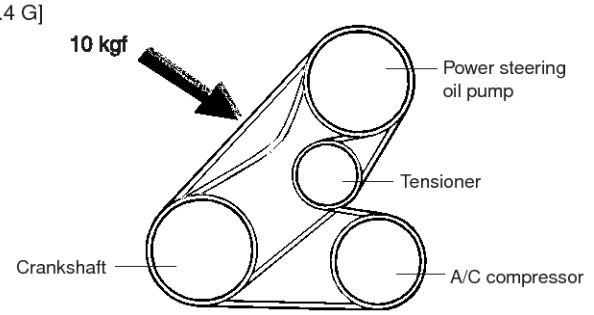
5. If it is not within the standard value, the probable cause is a malfunction of the oil line or steering gear box, so check these parts and repair as necessary.
6. Remove the special tools, and then tighten the pressure hose to the specified torque.
7. Bleed the system.

CHECKING POWER STEERING BELT TENSION

1. Press the V-belt, applying a pressure of 98 N (10 kg, 22 lb) at the specified point, and measure the deflection to confirm that it is within the standard value range.

V-belt deflection [Standard value]
6-7 mm (0.236 - 0.275 in.)

[2.4 G]



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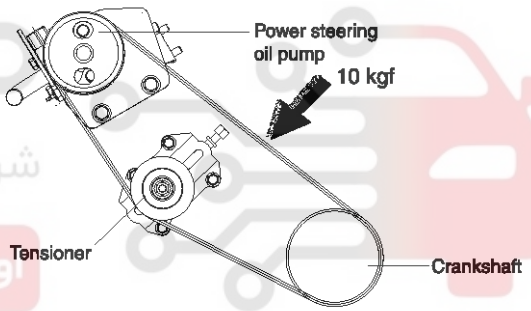
[3.5G]



LPAC009C

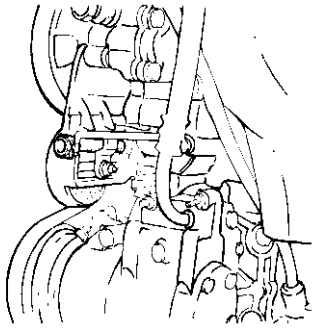
2. Install the belt. Loosen the adjusting bolt A or flange nut and then adjust the tension of the belt with adjusting bolt B.

   After that, tighten the adjusting bolt or flange nut to the specified value.

NOTICE

- *When adjusting tension of the belt, tighten the adjusting bolt and flange nut temporarily so that the pulley does not lean to one side, then adjust the tension.*

[2.4 G]



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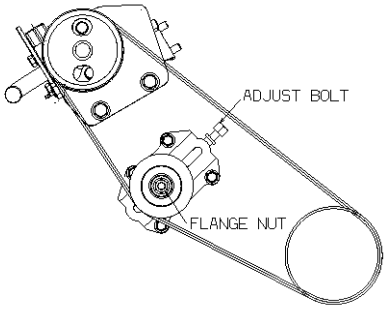
[3.5G]



LPAC009D

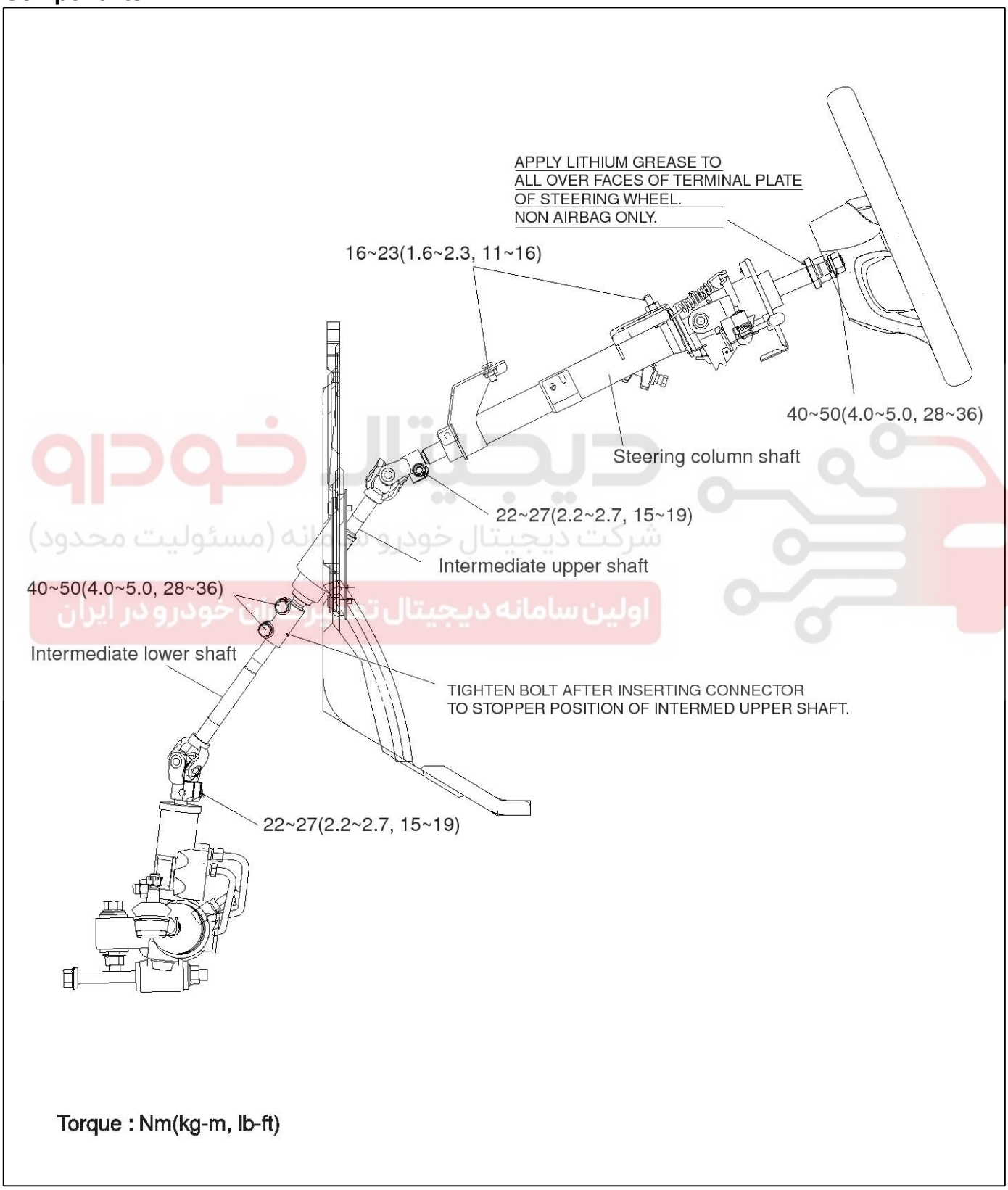
NOTICE

- *It is not necessary in case of 2.5D engine to adjust belt tension. (Refer to EM Group).*

Steering Column & Shaft

Steering Column-Shaft

Components



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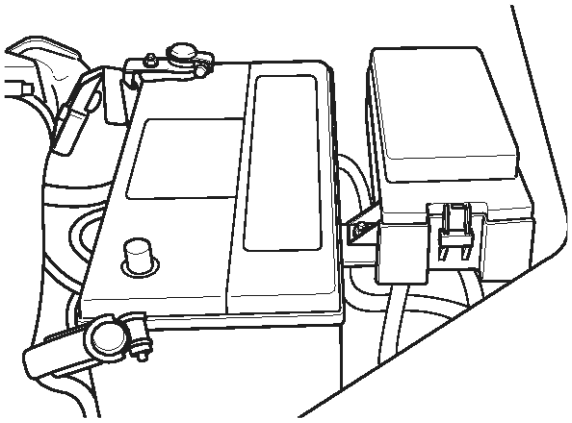
Removal

1. Disconnect the negative (-) terminal from the battery.



LPAC005C

2. After removing the two hexagon-bolts in the illustration, remove the driver' s airbag module.

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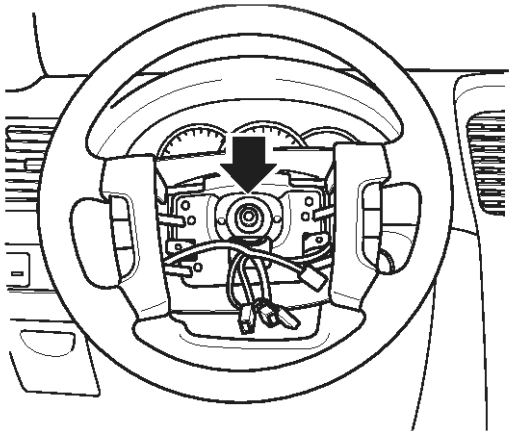
3. Remove the steering wheel lock nut.

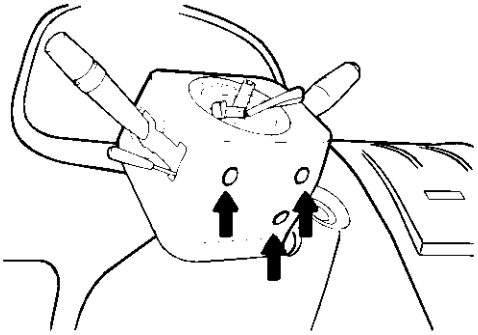


APAC011C

4. After aligning the marks on the steering shaft and wheel, remove the steering wheel.

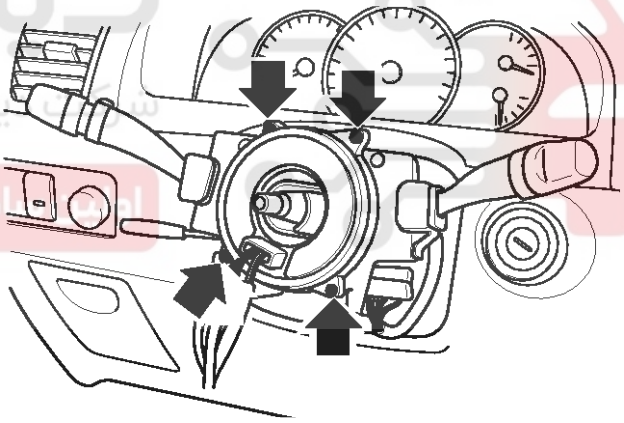
⚠CAUTION
Do not hammer on the steering wheel to remove it; it may damage the steering column.

5. After removing the three screws in the illustration, remove the steering column upper and lower shrouds.



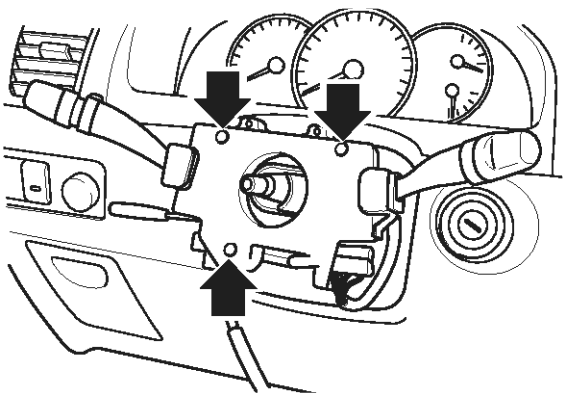
APAC011E

6. After removing the screws in the illustration, remove the clock spring.



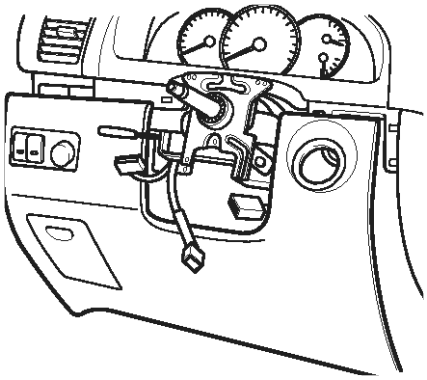
APAC011Z

7. Remove the connectors from the multifunction switch and the multifunction switch.



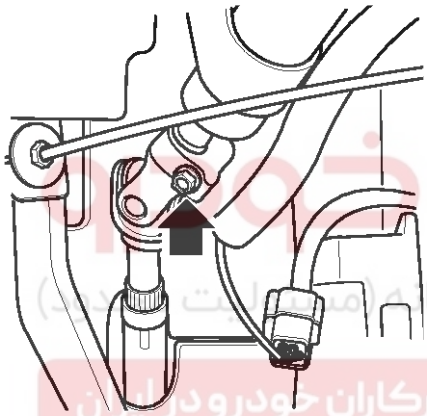
APAC011F

8. Remove the lower crash pad.



APAC011H

9. Remove the bolt connecting the steering column shaft assembly with the intermediate upper shaft, and then separate them apart.



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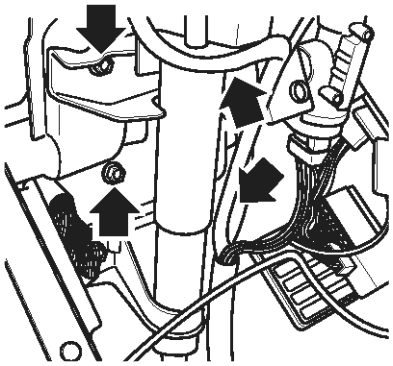
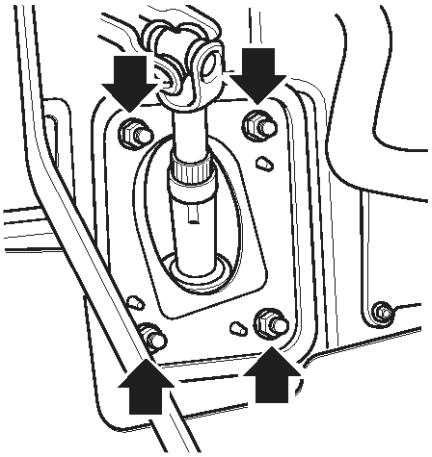
10. After removing the four mounting bolts, remove the steering column shaft assembly.



APAC011K

11. Remove the four mounting bolts in the dust cover assembly.



APAC011I

12. Remove the bolt tightening the intermediate upper shaft and intermediate lower shaft, and then separate them apart.
13. After removing the bolt connecting the steering gear box with the intermediate lower shaft, separate the intermediate lower shaft from the gear box.

APAC011M

⚠CAUTION

Keep the neutral-range to prevent the damage of the clock spring inner cable when you handlethe steering wheel.

Inspection

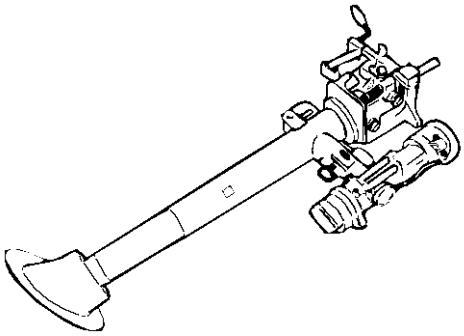
1. Check the steering column shaft for damage and deformation.
2. Check the connections for play, damage and smooth operation.
3. Check the ball joint bearing for wear and damage.

Assembly

Assembly is the reverse of removal.

Disassembly and reassembly

1. If it is necessary to remove the key lock assembly, use a pinch to make a groove on the head of the special bolt, and then use a screwdriver to remove the key lock assembly mounting bracket.



APAC013A

2. Disassemble the key lock assembly from the steering column shaft.

APAC013B

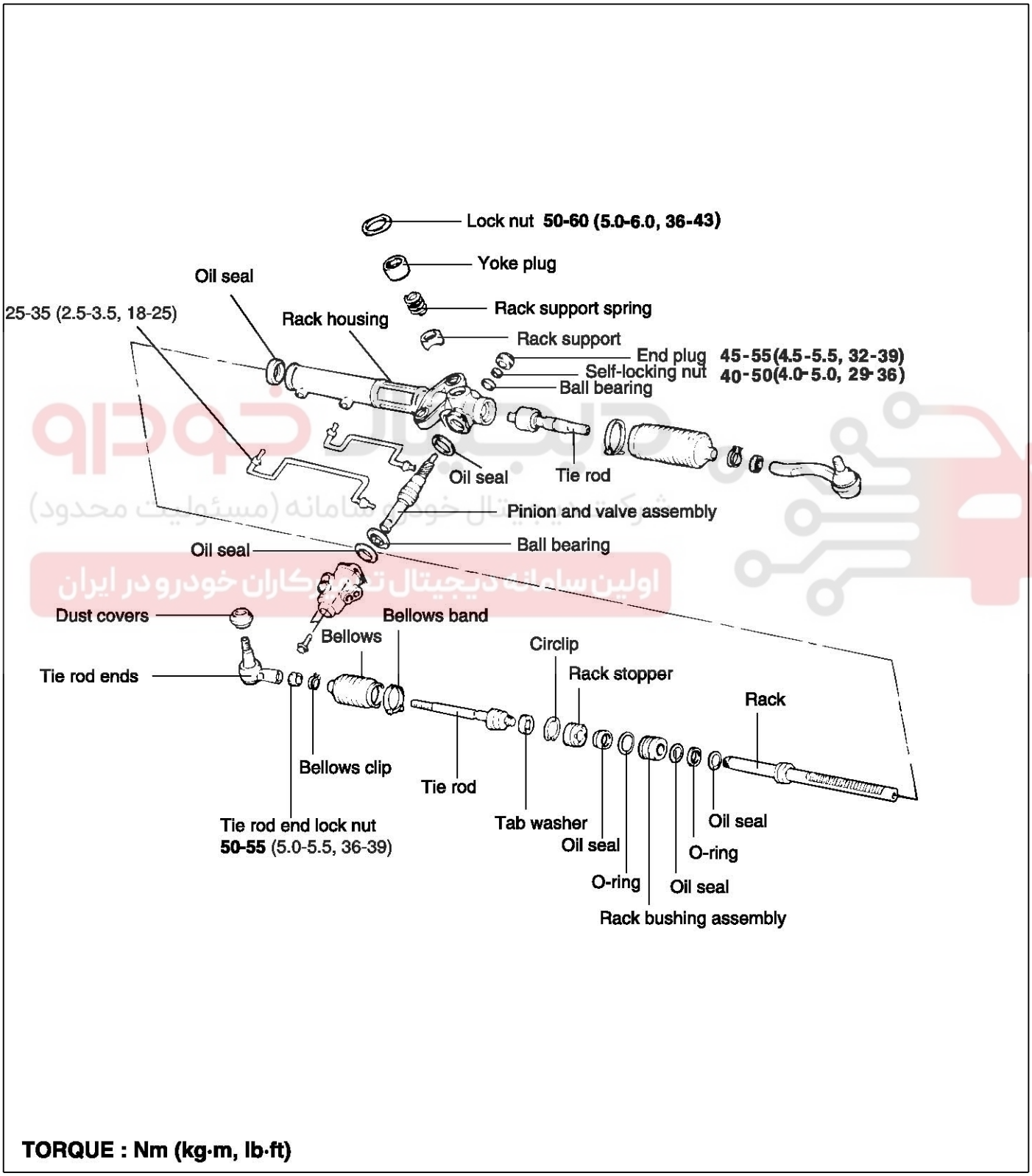
3. Reassembly is the reverse of disassembly.

Hydraulic Power Steering System

Power Steering Gear Box

POWER STEERING GEAR BOX

COMPONENTS



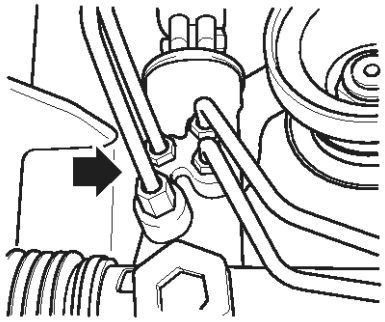
TORQUE : Nm (kg·m, lb·ft)

LPAC014A

REMOVAL

1. Drain the power steering fluid.
2. Disconnect the pressure tube and return tube.

Tightening torque :
32- 48 N·m (3.2 - 4.8 kg-m, 23 - 34 lb-ft)



APAC015E

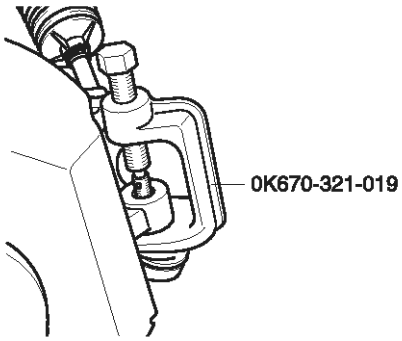
3. Remove the joint assembly connecting bolt.

APAC011M

⚠CAUTION
Keep the neutral-range to prevent the damage of the clock spring inner cable when you handlethe steering wheel.

4. Using the special tool (0K670-321-019), disconnect the tie rod end from the knuckle arm.

Tightening torque :
70 - 80 N·m (7.0 - 8.0 kg-m, 50 - 57 lb-ft)

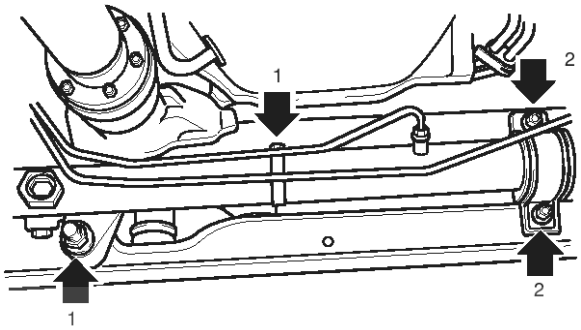


APAC015B

5. Remove the steering gear box mounting bolts and remove the steering gear box assembly together with mounting rubber.

⚠CAUTION
When removing the gear box, pull it out carefully and slowly to avoid damaging the boot.

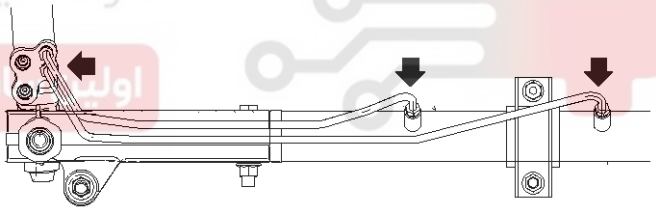
Tightening torque :
1) 122 - 158 N·m (12.2 - 15.8 kg-m, 88 - 114 lb-ft)
2) 75 - 95 N·m (7.5 - 9.5 kg-m, 54 - 68 lb-ft)



LHAC010D

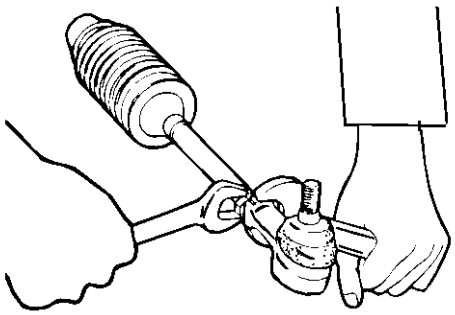
DISASSEMBLY

1. Remove the feed tube.



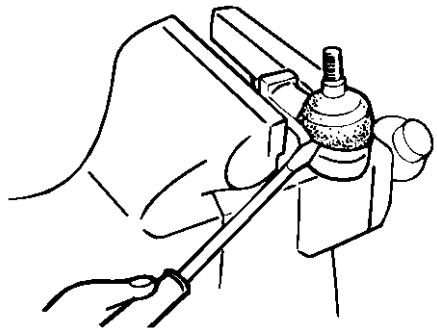
APAC015C

2. Remove the tie rod end from the tie rod.



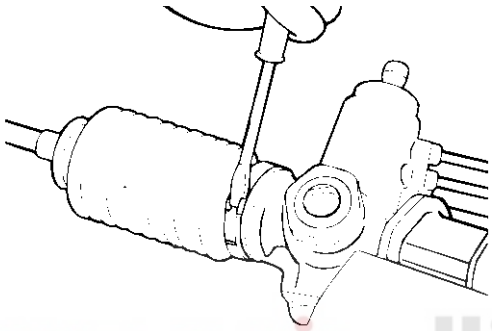
APAC016A

3. Remove the dust cover from the ball joint.



APAC016B

4. Remove the bellows band.



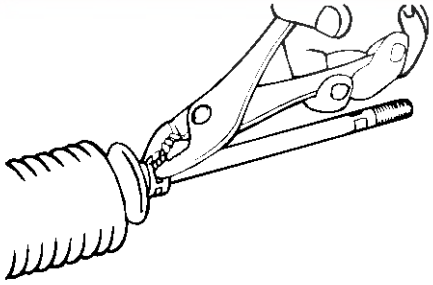
APAC016C

5. Remove the bellows clip. Pull the bellows out toward the tie rod.

NOTICE

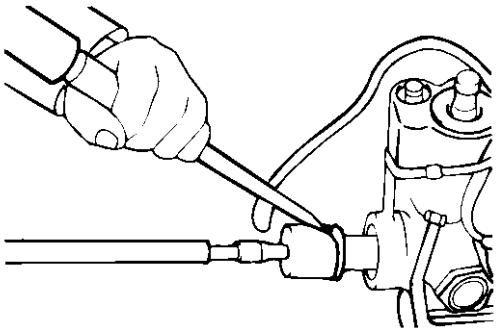
Check for rust on the rack when the bellows are replaced.

6. Remove the feed tube from the rack housing.



APAC016D

7. While moving the rack slowly, drain the fluid from the rack housing.
8. Unstake the tab washer which fixes the tie rod and rack with a chisel.

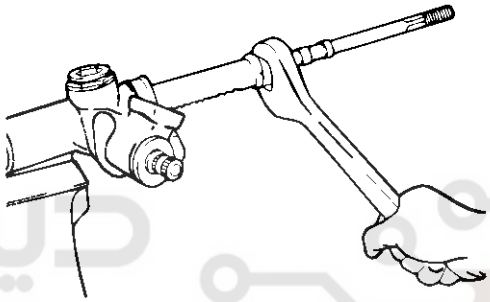


APAC016E

9. Remove the tie rod from the rack.

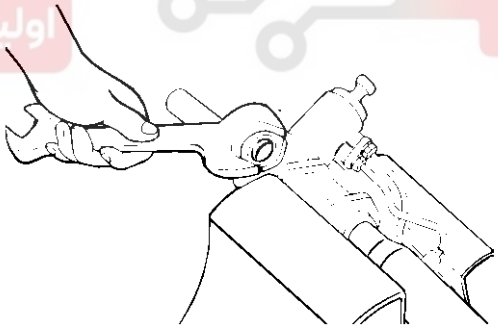
CAUTION

Remove the tie rod from the rack, taking care not to twist the rack.



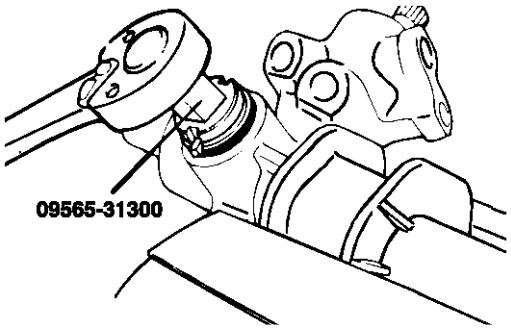
APAC016F

10. Remove the yoke plug lock nut.



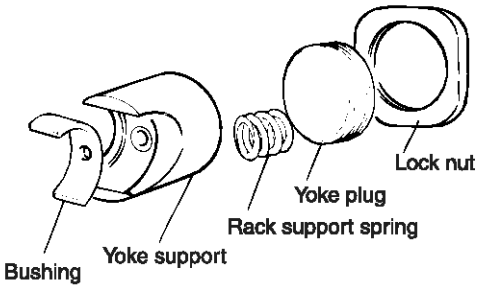
APAC016G

11. Using the special tool (09565-31300), remove the yoke plug.



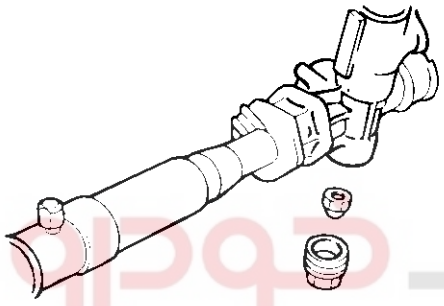
APAC016H

12. Remove the rack support spring, yoke support and bushing from the gear box.



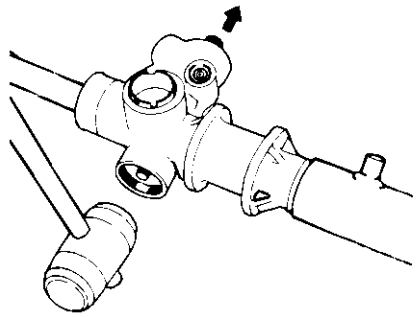
LPAC016I

13. Remove the end plug and self-locking nut.



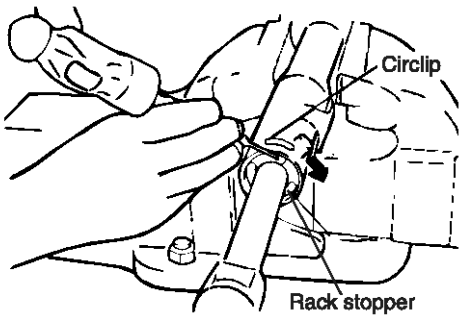
APAC016J

14. Detach the dust seal.
15. Remove the snap ring with snap ring pliers.
16. Remove bolts mounting the valve assembly to the rack housing.
17. Remove the pinion and valve assembly together with the oil seal (upper) using a soft hammer.



APAC016K

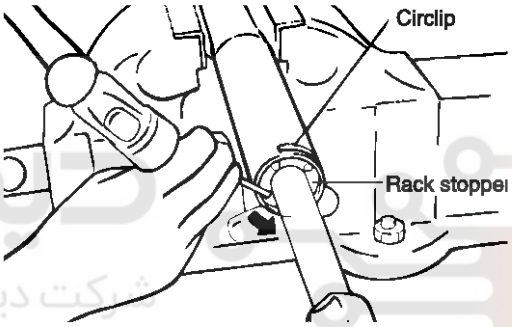
18. Turn the rack stopper clockwise until the end of the circlip comes out of the slot in the gear housing.



LPAC016L

19. When the end of the circlip comes out from the notched hole of the housing rack cylinder, turn the rack stopper counter clockwise and remove the circlip.

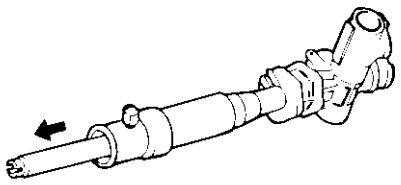
⚠CAUTION
Do not damage the rack when disassembling.



LPAC016M

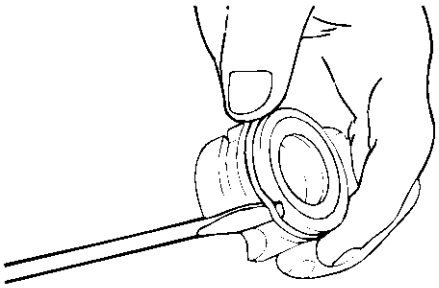
20. Remove the rack stopper, rack bushing and rack from the rack housing by moving it toward the piston side.

⚠CAUTION
When the rack has been removed, be sure to replace the housing side oil seal with a new one.



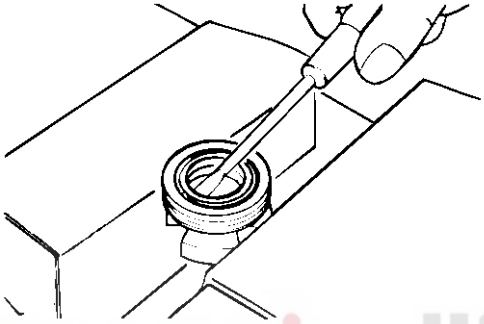
APAC016N

21. Remove the O-ring from the rack bushing.



APAC016O

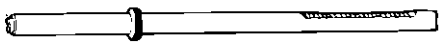
22. Remove the oil seal from the rack bushing.



APAC016P

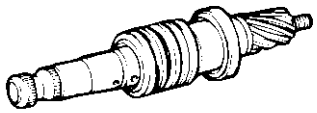
INSPECTION

1. **Rack**
   1) Check for rack tooth face damage or wear
   2) Check for oil seal contact surface damage or wear
   3) Check for bending or twisting of rack
   4) Check for oil seal ring damage or wear
   5) Check for oil seal damage or wear



APAC017B

2. **Pinion valve**
   1) Check for pinion gear tooth face damage or wear
   2) Check for oil seal contact surface damage
   3) Check for seal ring damage or wear
   4) Check for oil seal damage or wear



APAC017A

3. **Bearing**
   1) Check for seizure or abnormal noise during bearing rotation
   2) Check for excessive play
   3) Check for missing needle bearing rollers
4. **Others**
   1) Check for damage of the rack housing cylinder bore
   2) Check for boot damage, cracking or ageing

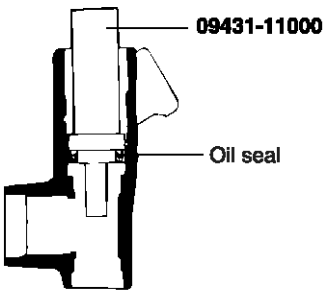
ASSEMBLY

1. Apply the specified fluid to the entire surface of the oil seal.

Recommended fluid : Power steering fluid (PSF-3)

2. Using the special tool (09431-11000), install the oil seal to the specified position in the rack housing.

⚠CAUTION
1. **Note the direction of the oil seal.**
2. **Use a new oil seal.**

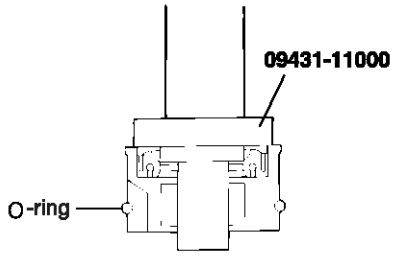


LPAC018A

3. Apply the specified fluid to the entire surface of the rack bushing oil seal.

Recommended fluid : Power steering fluid (PSF-3)

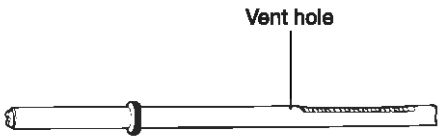
4. Install the oil seal in the rack bushing.
5. Apply the specified fluid to the entire surface of the O-ring and install the rack bushing using the special tool (09431-11000).



LPAC018B

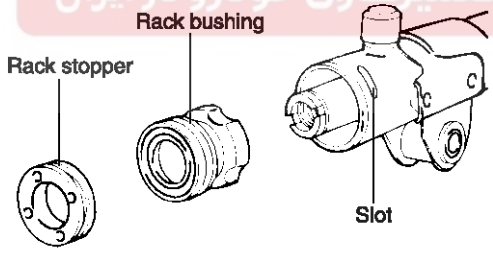
6. Apply the specified grease to the rack teeth.

⚠CAUTION
Do not plug the vent hole in the rack with grease.



LPAC018C

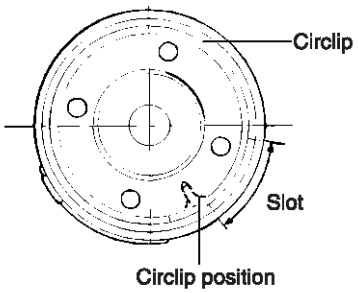
7. Insert the rack into the rack housing. Install the rack bushing and rack stopper.



LPAC018D

8. Push the rack stopper until the circlip groove of the rack stopper is aligned with the notched hole of the rack housing and then install the circlip while turning the rack stopper.

⚠CAUTION
The circlip end should not be visible through the notched hole of the rack housing.

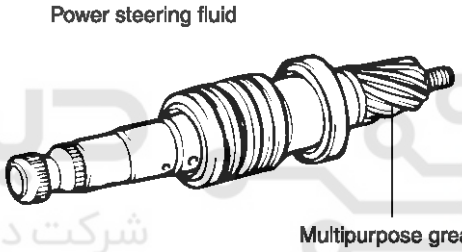


LPAC018E

9. Apply the specified fluid and grease to the pinion valve assembly and install the rack housing assembly.

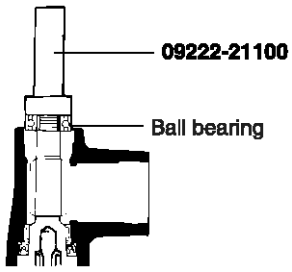
Recommended fluid : Power steering fluid (PSF-3)

Recommended grease :
Multipurpose grease SAE J310a, NLGI #2 EP



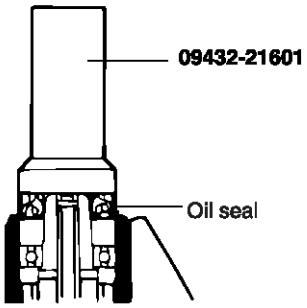
LPAC018F

10. Install the ball bearing using the special tool (09222-21100).
11. Install the pinion and valve assembly to the valve housing.



LPAC018G

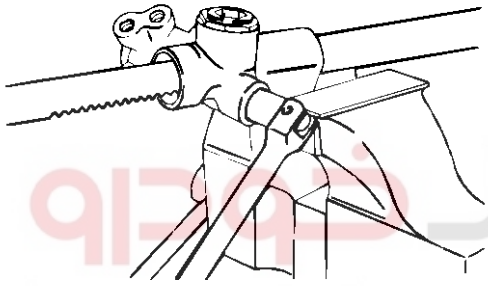
12. Install the oil seal using the special tool (09432-21601).
13. Install the snap ring with snap ring pliers.



LPAC018H

14. With the pinion turned completely clockwise, tighten the self-locking nut.

⚠CAUTION
Always replace the self-locking nut with a new one.

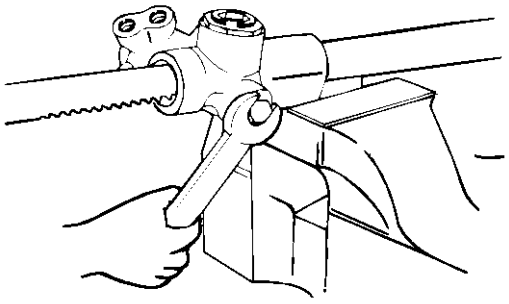


APAC018I

15. Apply semi-drying sealant to the threaded section of the end plug and tighten to the specified torque.

Tightening torque :
44 - 55 Nm (4.5 - 5.5kg-m, 32-39 lb-ft)

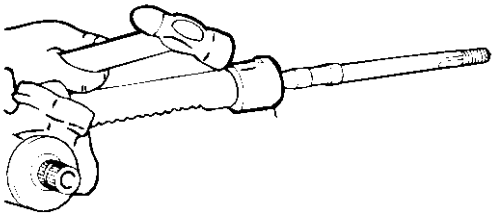
16. Stake the end plug at two points on its circumference with a punch.



APAC018K

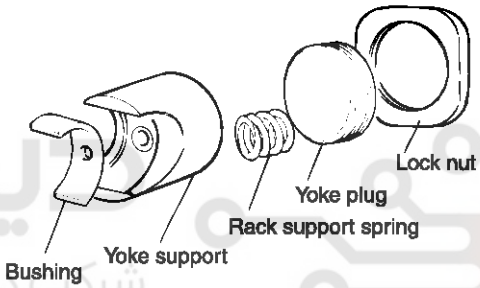
17. Install the tab washer and then the tie rod and hammer the tab washer end at two points lightly to the tie rod.

⚠CAUTION
1. Align the tab washer pawls with the rack grooves.
2. Use a new tab washer.



APAC018L

18. Install the bushing, rack support yoke, rack support spring and yoke plug in the order shown. Apply semi-drying sealant to the threaded section of the yoke plug before installation.



LPAC016I

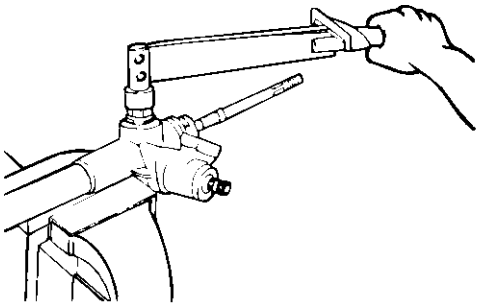
19. With the rack placed at the center position, attach the yoke plug to the rack housing. Tighten the yoke plug within the range of 20-25 Nm (200-250 kg.cm, 14.5-18 lb.ft), using the special tool. Loosen the yoke plug for approximately 20° and tighten the locking nut to the standard value.

Tightening torque :
50-60 N·m (500-600 kg·cm, 36-43 lb·ft)

20. After adjusting, install the yoke plug with a lock nut.

NOTICE
When it cannot be adjusted within the specified return angle, check the rack support plug components or replace.

21. Tighten the feed tube to the specified torque and install the mounting rubber with adhesive.



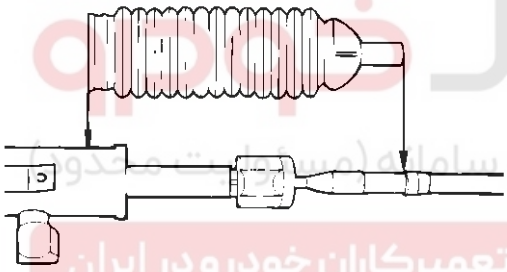
APAC018N

22. Apply the specified grease to the bellows mounting position (fitting groove) of the tie rod.

Recommended grease
Multipurpose grease SAE J310a, NLGI # EP

23. Install the new attaching band to the bellows.

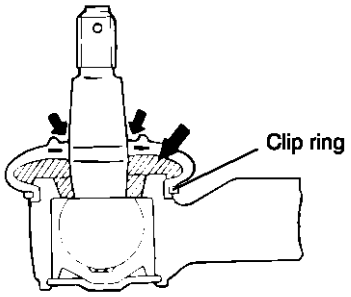
⚠CAUTION
When the bellows are installed, a new band must be used.



APAC018O

24. Install the bellows in position, taking care not to twist it.
25. Fill the dust cover inner side and lip with the specified multipurpose grease, and place the dust cover in position with the clip ring attached in the groove of the tie rod end.

Recommended grease
Multipurpose grease SAE J310a, NLGI #2 EP



LPAC018P

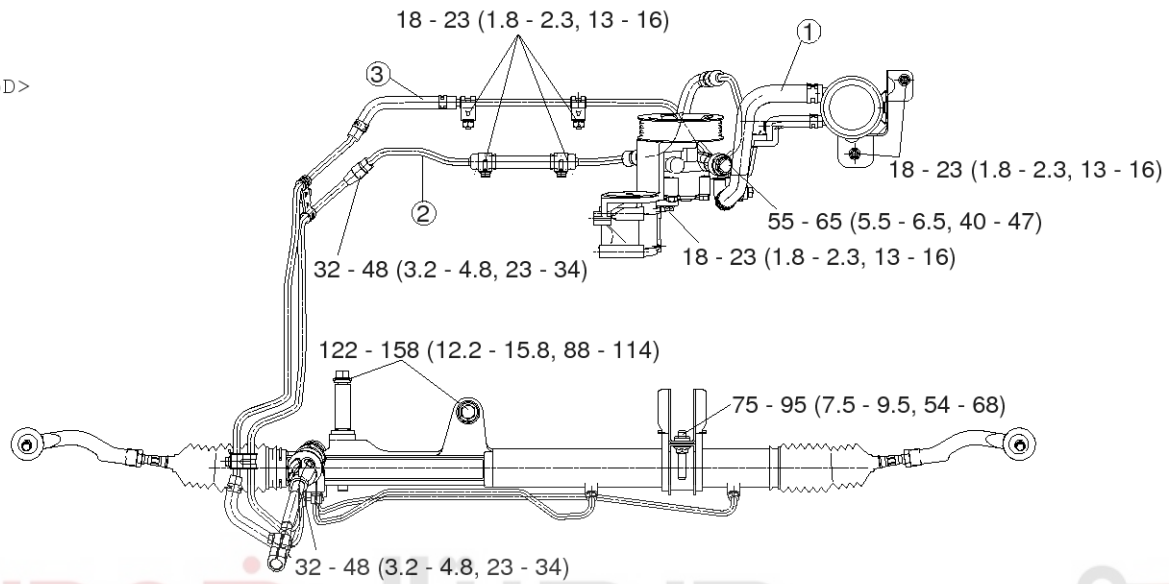
26. Install the tie rods.
27. Install the power steering gear box assembly to the vehicle.

Power Steering Hoses

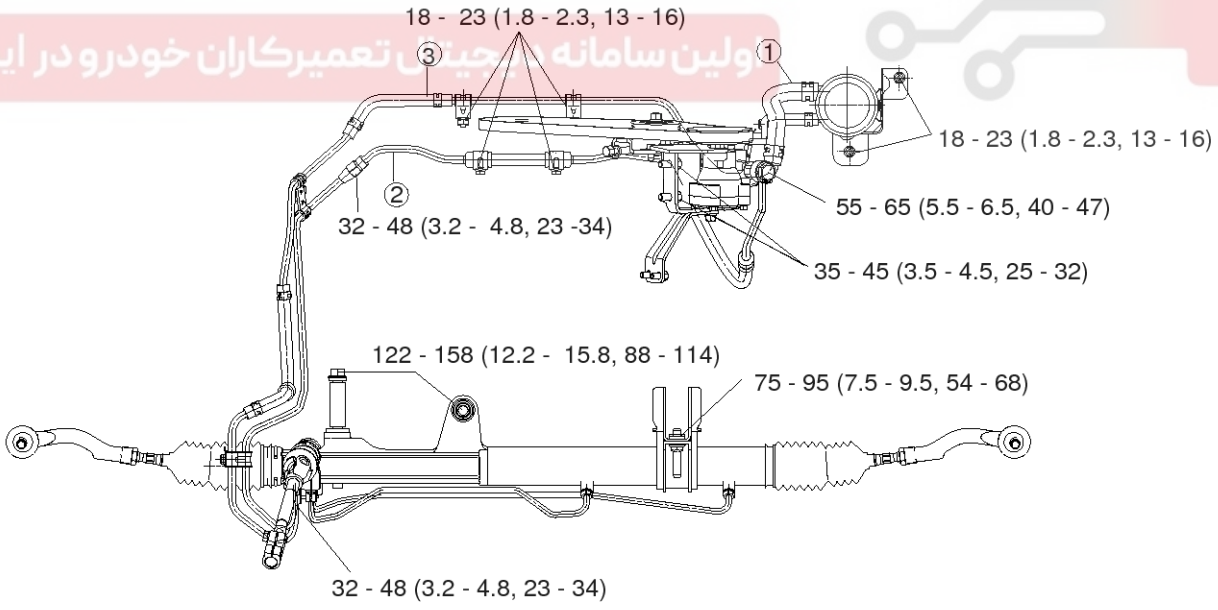
POWER STEERING HOSES

COMPONENT

<2.5D>



<3.5G>



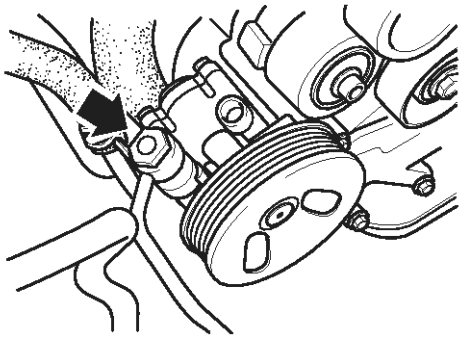
Torque : N·m (kg-m, lb-ft)

1. Suction hose
2. Pressure hose & tube
3. Return hose & tube

LPAC019A

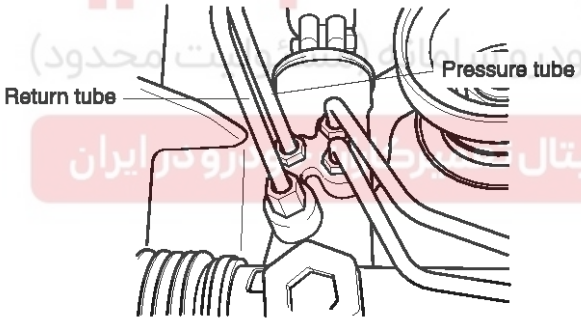
REMOVAL

1. Removal of pressure hose and tube.
   1) Disconnect the pressure hose from the steering oil pump.



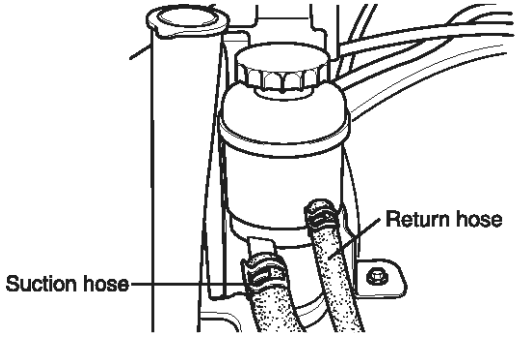
APAC020A

   2) Loosen the bolt of pressure hose mounting clamp.
   3) Remove the pressure/return tube clip mounting bolt.
   4) Disconnect the pressure tube from the steering gear box, and then disconnect the pressure hose and the tube.



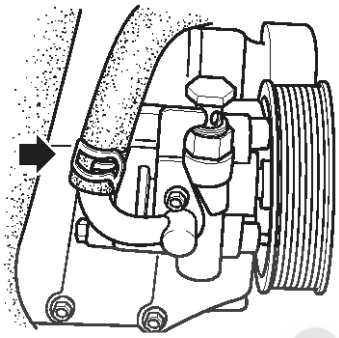
LPAC020A

2. Removal of return hose and tube.
   1) Disconnect the return hose from the oil reservoir.



LPAC020B

   2) Loosen the return tube clip mounting bolt.
   3) Remove the return/pressure tube clip mounting bolt.
   4) Disconnect the return tube from the steering gear box, and then disconnect the return hose and the tube.
3. Removal of suction hose.
   1) Disconnect the suction hose from the steering oil reservoir.
   2) Disconnect the suction hose.



APAC020B

INSTALLATION

⚠CAUTION

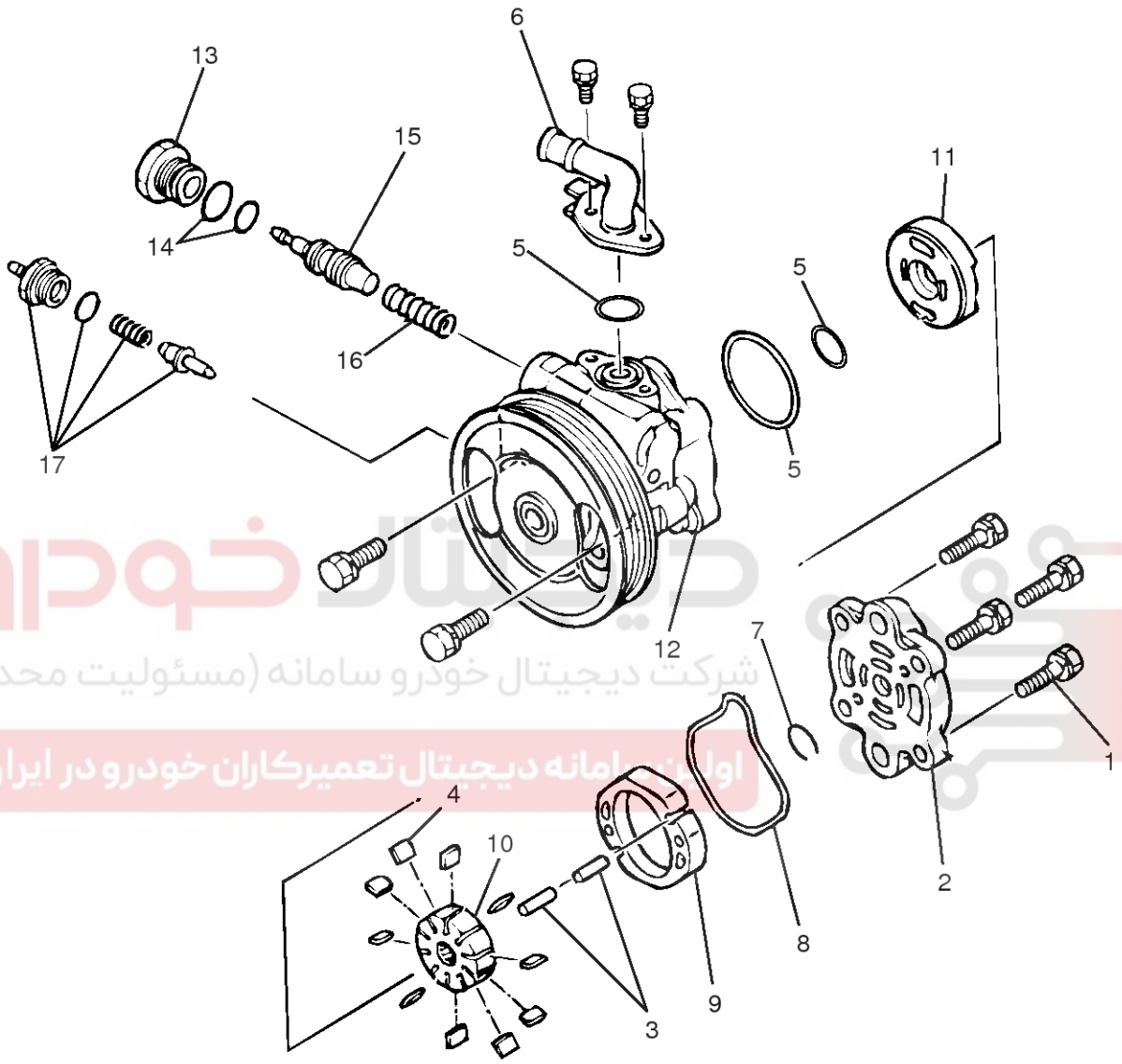
- **Install the hose lest they should be twisted and come in contact with any other parts.**
- **After installation, bleed the air.**

INSPECTION

1. Inspect the hose for cracks by twisting it by hand.
2. Check for interference between hose and the other parts.

Power Steering Oil Pump

COMPONETS

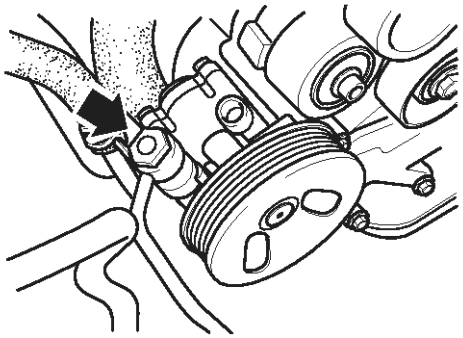


1. Bolt
2. Rear cover
3. Pin
4. Vane
5. O-ring
6. Suction pipe
7. Snap ring
8. O-ring
9. Cam ring
10. Rotor
11. Front side plate
12. Front housing
13. Connector
14. O-ring
15. Control valve
16. Spring
17. Pressure switch assembly (2.4G, 3.5G)

LPAC022A

REMOVAL

1. Disconnect the pressure hose from the oil pump, disconnect the suction hose from the suction pipe, and drain the oil.

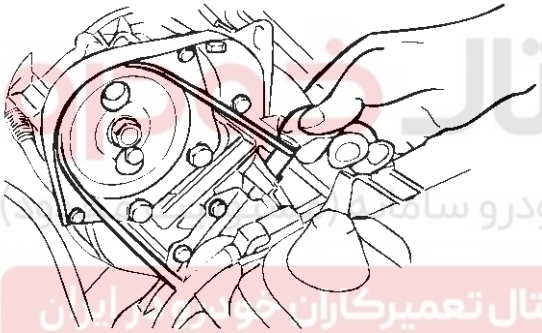


APAC020A

2. Loosen the power steering tension adjusting bolt or flange nut.

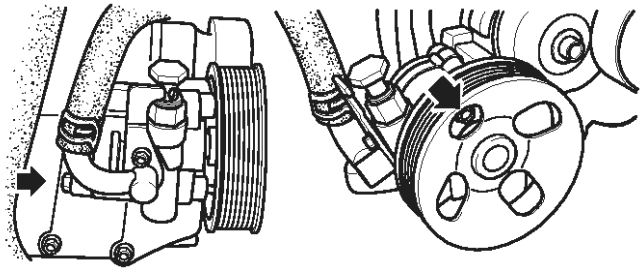
NOTICE

Refer to EM group in case of 2.5D Engine.



APAC023B

3. Separate the belt from the power steering oil pump pulley.
4. Loosen the power steering oil pump mounting bolt, and then remove the power steering oil pump assembly.



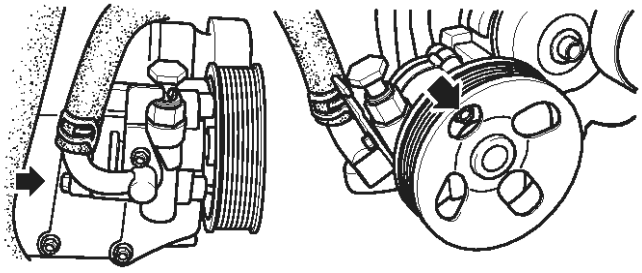
APAC023C

5. Remove the power steering oil pump mounting bracket.

INSTALLATION

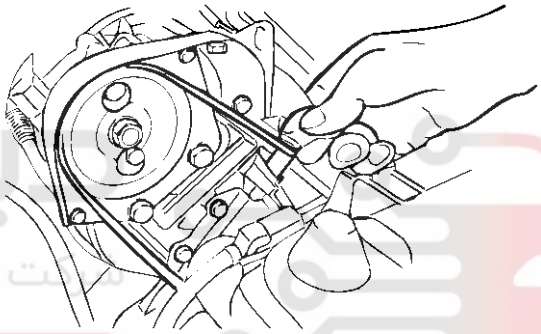
1. After installing the oil pump to the oil pump bracket.

Tightening torque :
18 - 23 N·m (1.8 - 2.3 kg-m, 13 - 16 lb-ft)



APAC023C

2. Install the belt and tighten the bolt adjusting tension to the specified torque.



APAC023B

3. Install the suction hose.

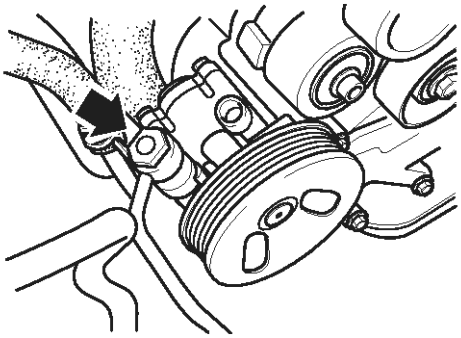
CAUTION

Install the pressure hose to the oil pump.

4. Install the pressure hose to the oil pump.

NOTICE

Install the pressure hose being careful so that it does not twist and come in contact with other components.



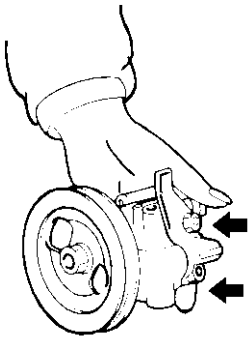
APAC020A

5. Add power steering fluid (PSF-3).

6. Air bleed the system.
7. Check the oil pump pressure.

DISASSEMBLY

1. Remove the two bolts (12 mm) from oil pump body, and then remove the suction pipe and O-ring.



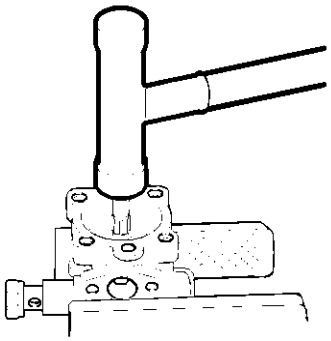
APAC024A

2. Remove the four bolts (14 mm), and then remove the rear cover assembly.
3. Remove the snap ring.
4. Remove the rotor and the vane.
5. Remove the oil pump side plate.
6. Remove the inner and outer O-ring.

NOTICE
When assembling, use an O-ring.

APAC024C

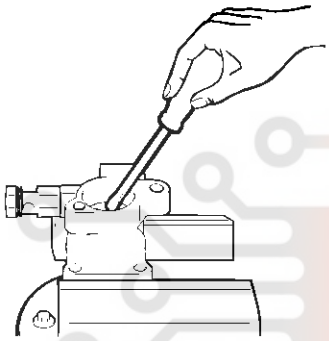
7. Tap the rotor side of the shaft slightly with a plastic hammer to remove the shaft.



APAC024F

8. Remove the oil seal from the oil pump body.

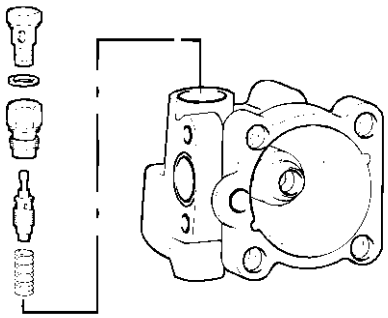
NOTICE
When assembling, use a new oil seal.



APAC024G

9. Remove the connector from the oil pump body, and take out the flow control valve and the flow control spring.
10. Remove the O-ring from the connector.

CAUTION
Do not disassemble the flow control valve.



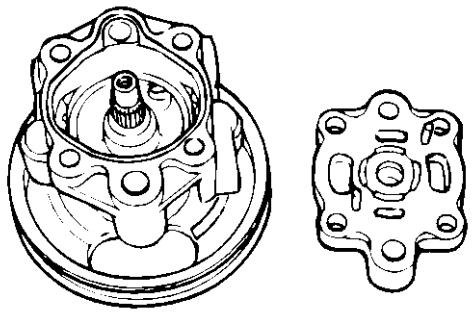
APAC024H

INSPECTION

NOTICE

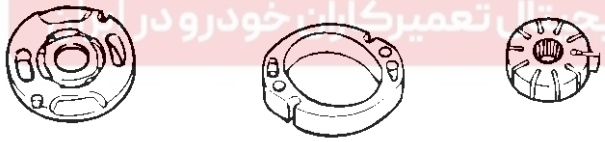
Replace the pump assembly if necessary.

1. Check the front and rear pump bodies for cracking or other damage and for abnormal wear of the moving surface of the rotor.



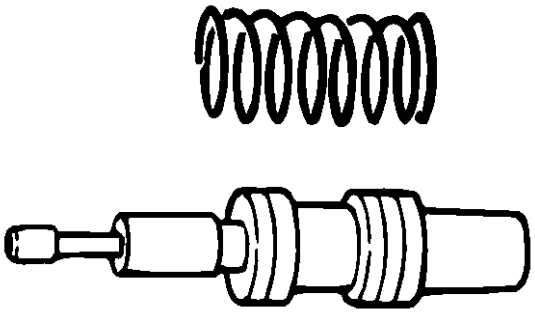
AP2A032A

2. Check the moving surface of the cam ring's vanes for abnormal wear.
3. Check the moving surface of the side plate and the pump bodies for abnormal wear.
4. Check the moving surface of the vane cam ring for abnormal wear.
5. Check the clearance of the rotor and vanes.



AP2A032B

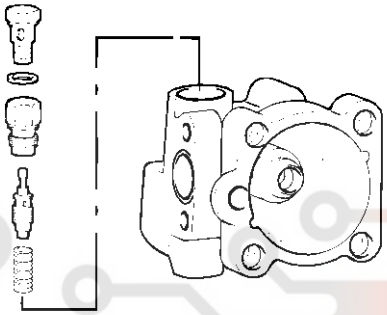
6. Check the control valve for cracking and other damage, for clogging, and for abnormal wear of the moving part.
7. Check the spring for damage.



AP2A032C

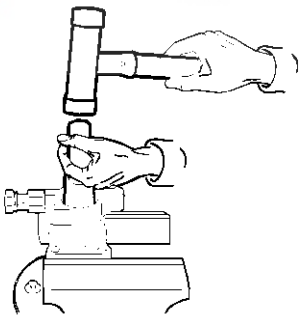
REASSEMBLY

1. Install the flow control spring the flow control valve and the connector in to the pump body.



APAC024H

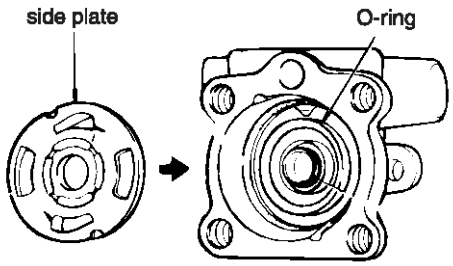
2. Install the oil seal in the pump body by using the special tool.



APAC026B

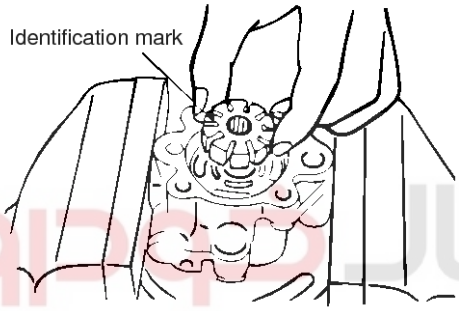
3. After inserting the shaft assembly into the pump body.
4. Install the outer and inner O-ring in the pump body.

5. Insert the oil pump side plate in the pump body.



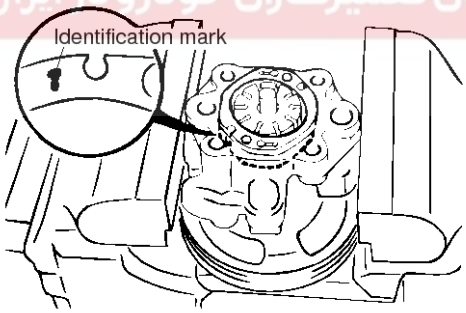
LPAC026F

6. Install the rotor to the shaft with the rotor's identification mark facing upward.



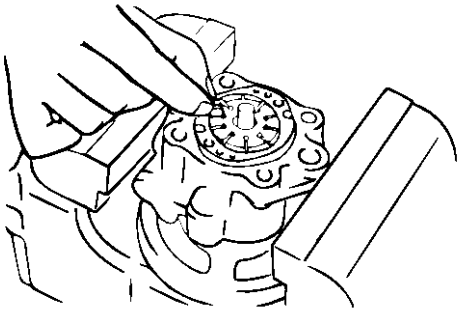
BP2C030A

7. Install the cam ring so that its identification mark is facing downward.



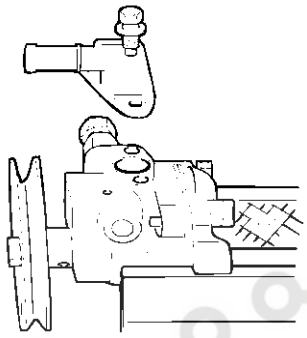
BP2C030B

8. Install the vanes (10 pieces) to the rotor, with the R part of the vanes facing outward.



AP2A031C

9. Install the O-ring and oil pump cover assembly.
10. Install the suction pipe and O-ring.



APAC024I

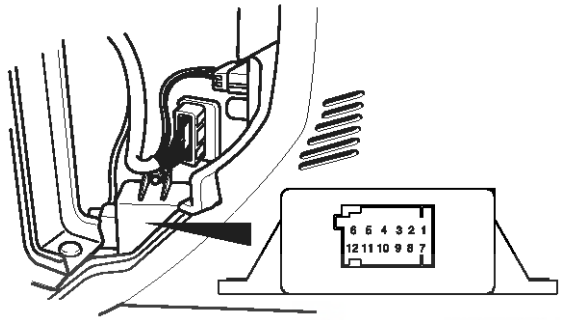
Electronic Power Steering System

GENERAL

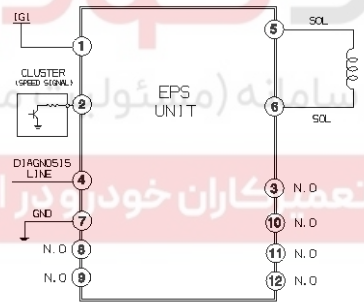
EPS performs the conventional power steering function in case a fail has occurred in the system.

EPS electronically controls the current to the solenoid of by-pass valve by input sensor's signal to control the hydraulic amount in cylinder chamber thereby varying the steering effort versus the hydraulic pressure according to vehicle speed.

ELECTRONIC POWER STEERING UNIT



LPAC030A



LPAC030C

EPS SOLENOID

SOLENOID VALVE

The input current is varying from 0A to 1A according to the vehicle speed and is controlled by EPS unit.

When the ignition switch is turned on, current is sent to the solenoid valve to push up the plunger and accordingly the piston contacting the plunger is pushed up while overcoming the spring force. As the vehicle speed increasing the current flow to the solenoid decreased pulling down the piston bottom by the releasing spring force.

When the piston is pushed up, it closes the oil passing hole, therefore the power steering oil pressure is delivered into the cylinder without any interruption. But when the hole is opened as the piston is pulling down, some of the oil coming from the rotary valve is drained into reservoir via the hole inside the rotary valve.

NOTICE

When it is necessary to remove the EPS gear box, be sure to disconnect the connector to avoid damage.

LPAC030B