

ST-2

Steering System

General Information

Specifications

Item			Specification
Type			Manual Steering System
			Electric Power Steering System
Steering gear	Type		Rack & Pinion
	Rack stroke	Non 215 Tire	140mm
		215 Tire	134mm
Steering angle (Max.)	Inner	Non 215 Tire	$40.96^{\circ} \pm 2^{\circ}$
		215 Tire	$38.38^{\circ} \pm 2^{\circ}$
	Outer	Non 215 Tire	32.33°
		215 Tire	30.90°
Power steering pump	Type		Vane
	Relief pressure		85 ~ 90 Kgf/cm
Power steering oil			PSF-3

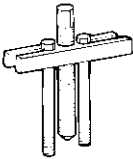
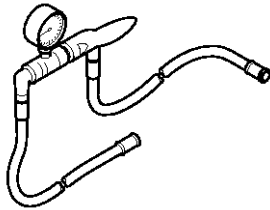
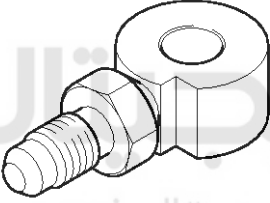
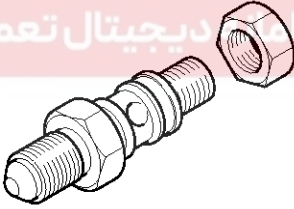
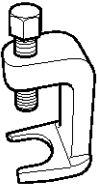
Tightening Torques

Item	Tightening torque (kgf.m)		
	Nm	Kgf.m	lb-ft
Hub nuts	90 ~ 110	9.0 ~ 11.0	65 ~ 80
Steering column mounting bolts and nuts	13 ~ 18	1.3 ~ 1.8	9.4 ~ 13.0
Bolt connecting steering column to universal joint	30 ~ 35	3.0 ~ 3.5	22 ~ 25
Tie rod end castle nut	24 ~ 34	2.4 ~ 3.4	17 ~ 25
Steering gear box mounting bolts	60 ~ 80	6.0 ~ 8.0	43 ~ 58

General Information

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Special Service Tools

Tool (Number and Name)	Illustration	Use
09561-11001 Steering wheel puller	 KPRE103G	Removal of steering wheel
09572-21000 Oil pressure gauge	 EPRF001F	Measurement of oil pressure (Use with 09572-22100, 09572-21200)
09572-22100 Oil pressure gauge adaptor	 EPRF001H	Measurement of oil pressure (Use with 09572-21000, 09572-21200)
09572-21200 Oil pressure gauge adaptor	 EPRF001G	Measurement of oil pressure (Use with 09572-22100, 09572-21200)
09568-2J100 Ball joint puller	 SBHSS8062D	Separation of tie-rod end ball joint

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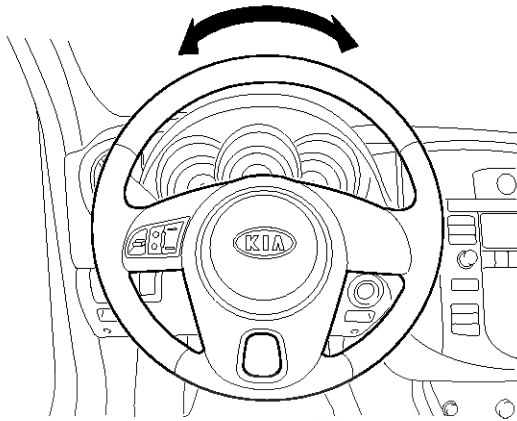
Steering System

Inspection

Steering Wheel Play Inspection

1. Turn the steering wheel so that the front wheels can face straight ahead.
2. Measure the distance the steering wheel can be turned without moving the front wheels.

Standard value: 30mm (1.18in.) or less



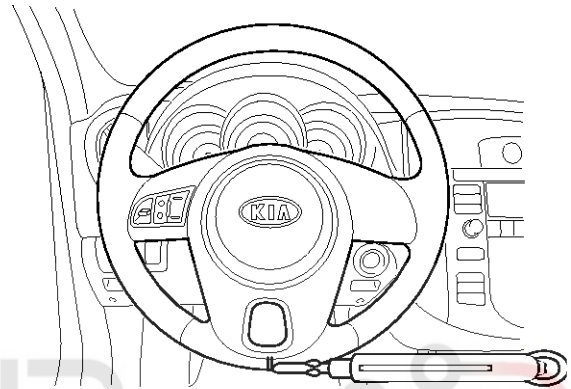
STDST9019L

3. If the play exceeds standard value, inspect the steering column, shaft, and linkages.

Checking stationary steering effort

1. Position the vehicle on a level surface and place the steering wheel in the straight ahead position.
2. Start the engine and turn the steering wheel from lock to lock several times to warm up the power steering fluid.
3. Attach a spring scale to the steering wheel. With the engine speed 900 ~ 1100rpm, pull the scale and read it as soon as the tires begin to turn.

Standard value: 3.0kgf or less



STDST9506L

4. If the measured value exceeds standard value, inspect the power steering gear box and pump.

General Information

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Power steering fluid replacement

⚠CAUTION

Always use genuine power steering fluid. Using other type of power steering fluid or ATF can cause increased wear and poor steering in cold weather.

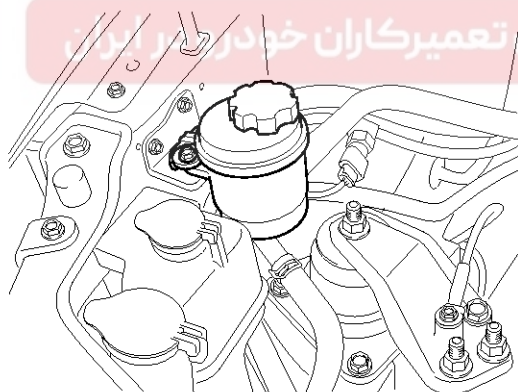
1. Raise the reservoir and then disconnect the return hose to drain the reservoir. Take care not to spill the fluid on the body and parts. Wipe off any spilled fluid at once.
2. Connect a tube of suitable diameter to the disconnected return hose, and put the hose end in a suitable container.
3. Jack up the front wheels and turn the steering wheel from the lock to lock until fluid stops running out of the tube.
4. Reconnect the return hose to reservoir
5. Fill the reservoir with the power steering fluid and then bleed the power steering system.

Air bleeding

⚠CAUTION

Always use genuine power steering fluid. Using other type of power steering fluid or ATF can cause increased wear and poor steering in cold weather.

1. Fill the reservoir with the power steering fluid up to the level of 'COLD MAX' marked on the reservoir.



STDST9017D

ⓘNOTICE

While conducting the following operations, keep replenishing the reservoir so that the fluid level can be always between the 'COLD MAX' and the 'COLD MIN' marked on the reservoir.

2. Jack up the front wheels.
3. Crank the engine 1 ~ 2 times by turning the ignition key very quickly from the 'On' position to the 'Start' position, but do not start the engine.

⚠CAUTION

Be careful not to start the engine. If starting the engine before performing the steps 3 through 4, it may cause an abnormal noise during power steering pump operation.

4. Turn the steering wheel from lock to lock 5 ~ 6 times for 15 ~ 20 seconds.
5. Start the engine and keep turning the steering wheel from lock to lock until air bubbles stop appearing in the reservoir with the engine idle.
6. Check the color and level of the power steering fluid in the reservoir and then replenish the reservoir up to the 'COLD MAX' level as required.

ⓘNOTICE

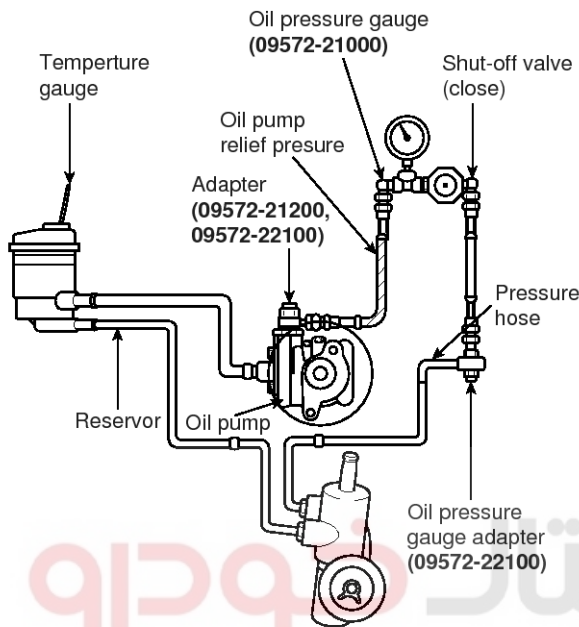
If the fluid level moves up and down when turning the steering wheel, the fluid overflows out of the reservoir when the turning off the engine or the fluid has white color, it indicates that air bubbles have not been removed sufficiently from the power steering system. Therefore, repeat the steps 5 through 6 as required.

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Steering System

Oil pump relief pressure test

1. Disconnect the pressure tube from the power steering pump and then install the special tools between the pump and the pressure tube as illustration below.



2. Start the engine and turn the steering wheel several times so that the fluid temperature can rise to approx. 50 ~ 60 C (122 F).
3. Set the engine speed to approx. 1000rpm.
4. Close the shut-off valve of the special tools and measure the fluid pressure.

Relief pressure:

85 ~ 90kgf/cm² (1209 ~ 1280psi, 8.3 ~ 8.8Mpa)

CAUTION

Do not keep the shut-off valve on the pressure gauge closed for longer than 10 seconds.

5. Remove the special tools, and then connect the pressure tube to the pump by tightening the eye bolt.
6. Bleed the power steering system.

Electric Power Steering

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Electric Power Steering

Description

EPS (Electric power steering, Column assist type) system uses an electric motor to assist the steering force and it is an engine operation independent steering system.

EPS control module controls the motor operation according to information received from the each sensor and resulting in a more precise and timely control of steering assist than conventional engine-driven hydraulic systems.

Components (Torque Sensor, Fail-safe relay, etc.) of the EPS system are located inside the steering column & EPS unit assembly and the steering column & EPS unit assembly must not be disassemble to inspect or replace them.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



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Steering System

Notes With Regard To Diagnosis

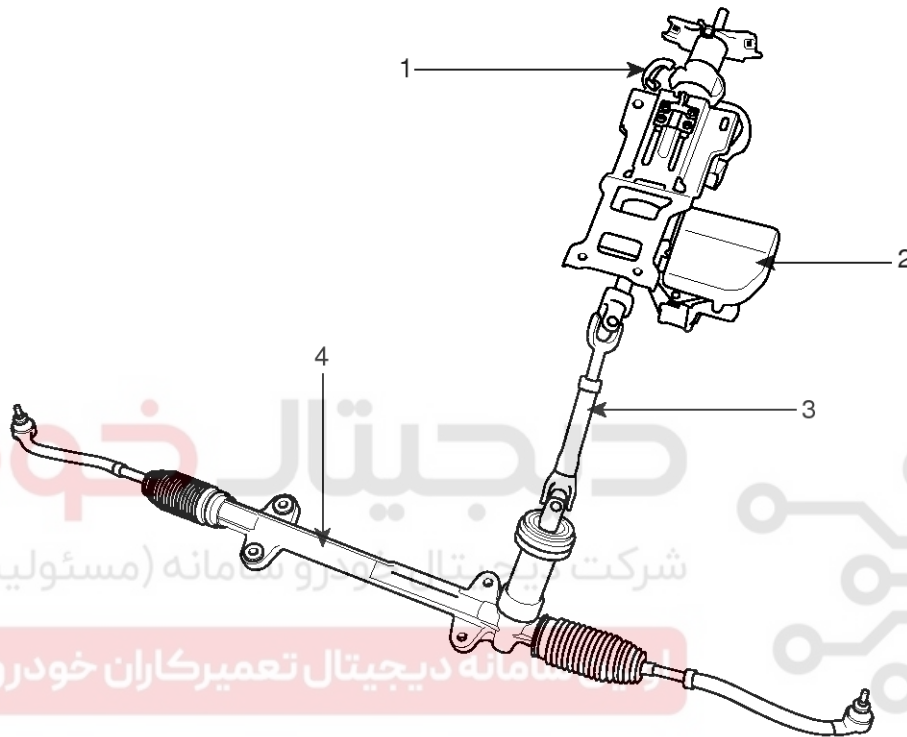
Trouble factor	Check item	Trouble symptom	Explanation	Note
Drop, impact, and overload	Motor	Abnormal noise	<ul style="list-style-type: none"> - Visible or unvisible damage can occur. - The steering wheel could pull to one side by using the dropped parts. - Precise parts of motor/ECU are sensitive to vibration and impact. - Overload can cause unexpected damage 	<ul style="list-style-type: none"> - Do not use the impacted EPS. - Do not overload each parts.
	ECU	Circuit damage <ul style="list-style-type: none"> - Wrong welding point - Broken PCB - Damaged precise parts 		
	Torque sensor	Insufficient steering effort	Overload to INPUT shaft can cause malfunction of the torque sensor	<ul style="list-style-type: none"> - Do not impact the connecting parts (When inserting and torquing) - Use the specified tool to remove the steering wheel. (Do not hammer on it) - Do not use the impacted EPS
	Shaft	Insufficient steering effort (Uneven between LH and RH)		Do not use the impacted EPS
Pull/Dent	Harness	<ul style="list-style-type: none"> - Malfunction-impossible power operation - Malfunction of EPS 	Disconnection between harness connecting portion and harness	Do not overload the harness
Abnormal storage temperature	Motor/ECU	Abnormal steering effort by improper operation of the motor/ECU	<ul style="list-style-type: none"> - Waterproof at the normal condition - Even a little moisture can cause malfunction of the precise parts of the motor/ECU 	<ul style="list-style-type: none"> - Keep the normal temperature and proper moisture, while storing - Avoid drowning

1. Do not impact the electronic parts, if they are dropped or impacted, replace them with new ones.
2. Avoid heat and moisture to the electronic parts.
3. Do not contact the connect terminal to avoid deformation and static electricity.
4. Do not impact the motor and torque sensor parts, if they are dropped or impacted, replace them with new ones.
5. The connector should be disconnected or connected with IG OFF.

Electric Power Steering

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Components



STDST9300D

- 1. Key lock assembly
- 2. Steering Column & EPS unit assembly

- 3. Universal joint assembly
- 4. Steering gear box

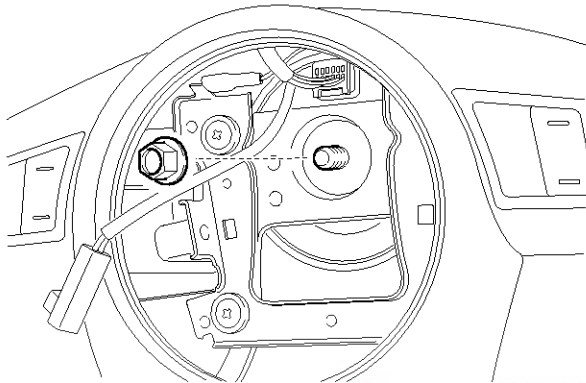
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Steering System

Steering Column and Shaft

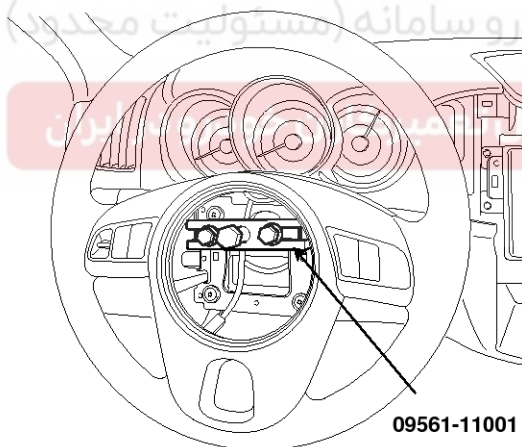
Replacement

1. Disconnect the battery negative cable from the battery and then wait for at least 30 seconds.
2. Turn the steering wheel so that the front wheels can face straight ahead.
3. Remove the airbag module. (Refer to RT group)
4. Loosen the steering wheel lock nut.



STDST9002D

5. Remove the steering wheel from the steering column shaft by using a SST (09561-11001).



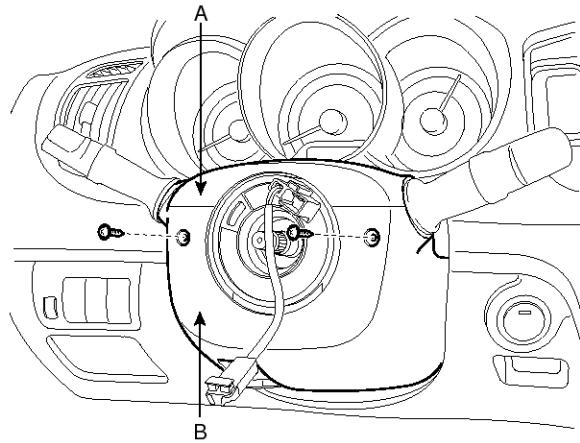
09561-11001

STDST9003D

⚠ CAUTION

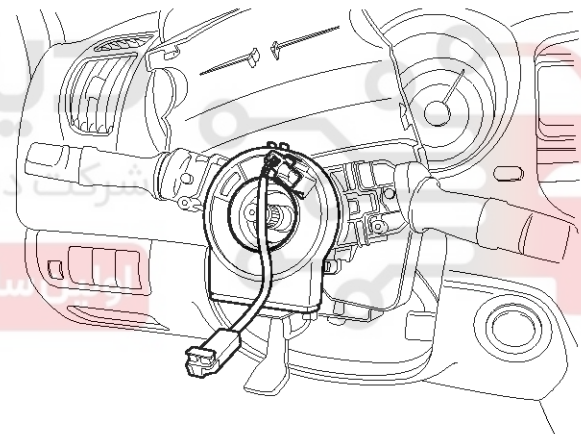
- Do not hammer on the steering wheel to remove it; it may damage the steering column.

6. Remove the steering column upper (A) and lower shroud (B).



STDST9004D

7. Remove the clock spring.

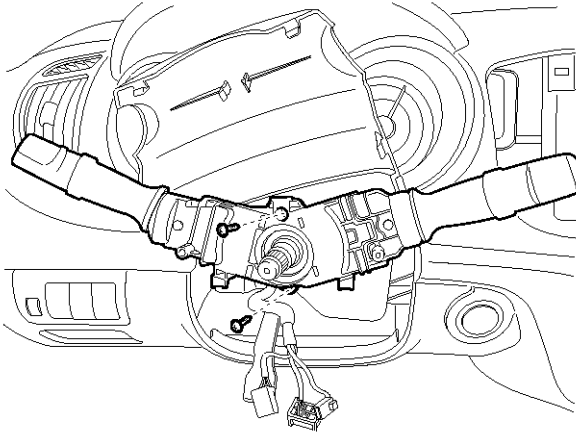


STDST9005D

Electric Power Steering

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8. Loosen the screw and then remove the multifunction switches.

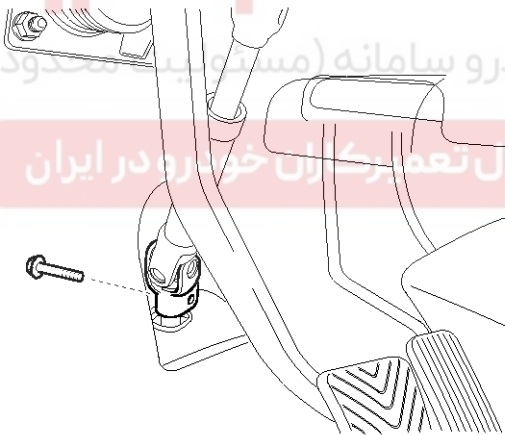


STDST9006D

9. Remove the lower crash pad. (Refer to BD group)
10. Loosen the bolt and then disconnect the universal joint assembly from the pinion of the steering gear box.

Tightening torque :

30 ~ 35N.m (3.0 ~ 3.5kgf.m, 22 ~ 25lb-ft)



STDSS9007D

⚠ CAUTION

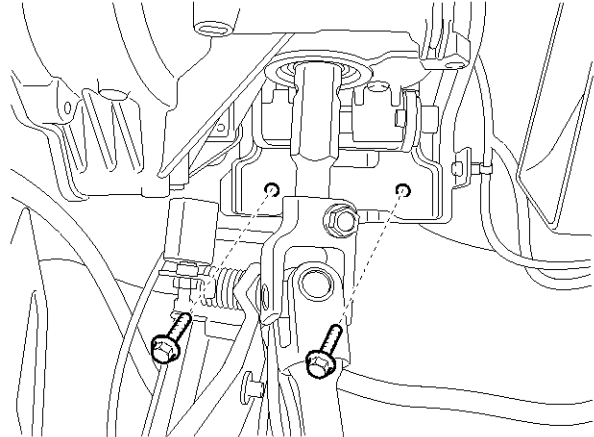
Keep the neutral-range to prevent the damage of the clock spring inner cable when you handle the steering wheel.

11. Disconnect all connectors connected to the steering column.

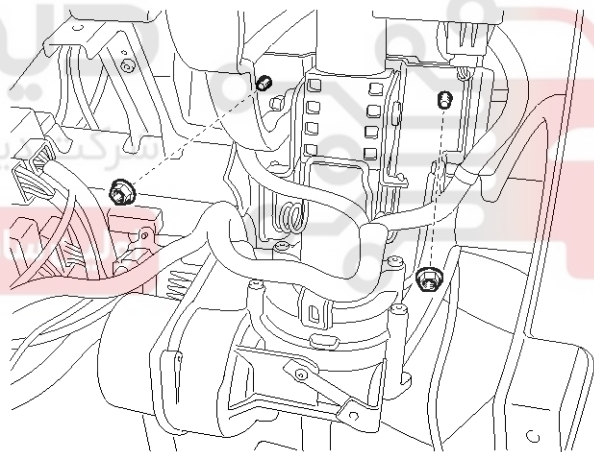
12. Remove the steering column & EPS unit assembly by loosening the mounting bolts and nuts.

Tightening torque :

13 ~ 18N.m (1.3 ~ 1.8kgf.m, 9 ~ 13lb-ft)



STDST9008D



STDST9009D

13. Installation is the reverse of the removal.

⚠ CAUTION

When installing the clock spring, refer to the RT group to prevent the damage of clock spring inner cable.

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Steering System

Inspection

1. Check the steering column for damage and deformation.
2. Check the steering column for damage and deformation.
3. Check the join bearing for damage and wear.
4. Check the tilt bracket for damage and cracks.
5. Check the key lock assembly for proper operation and replace it if necessary.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

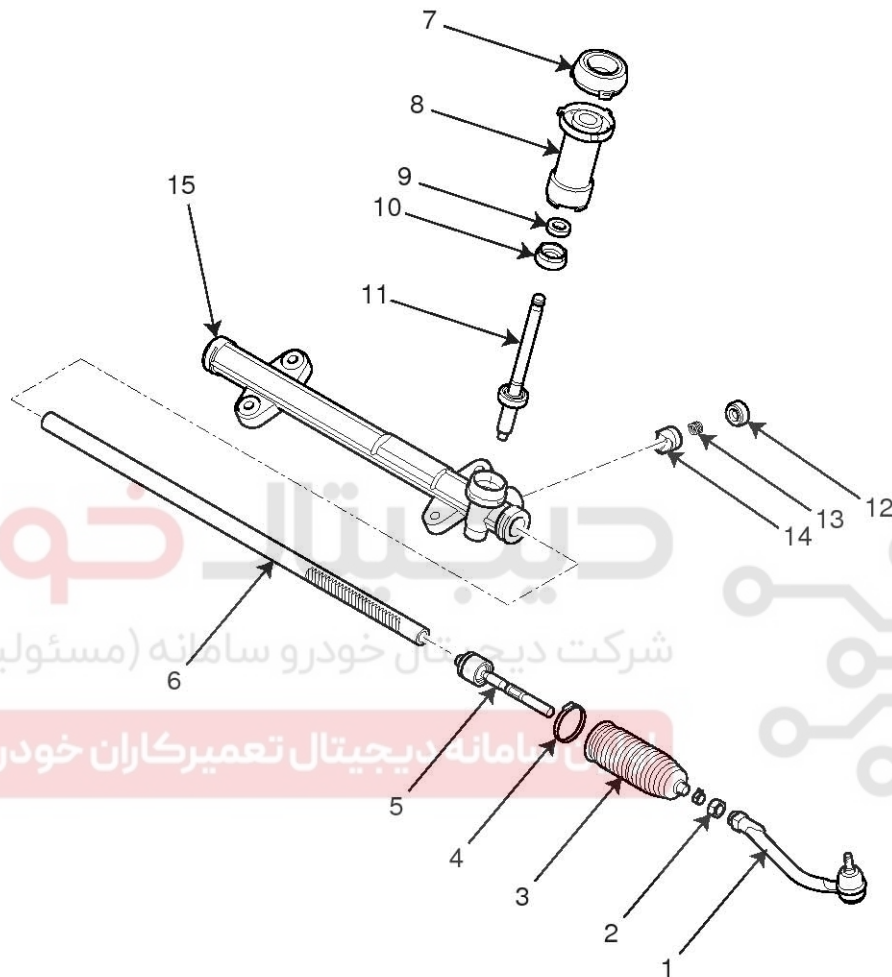


Electric Power Steering

ST-13

Steering Gear box

Components



STDST9301D

- | | | |
|-----------------|-----------------|---------------------------|
| 1. Tie rod end | 6. Rack bar | 11. Pinion assembly |
| 2. Lock nut | 7. Dust packing | 12. Yoke plug |
| 3. Bellows | 8. Dust cap | 13. Yoke spring |
| 4. Bellows band | 9. Oil seal | 14. Support yoke assembly |
| 5. Tie rod | 10. Pinion plug | 15. Rack housing |

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Steering System

Replacement

1. Remove the front wheel & tire.

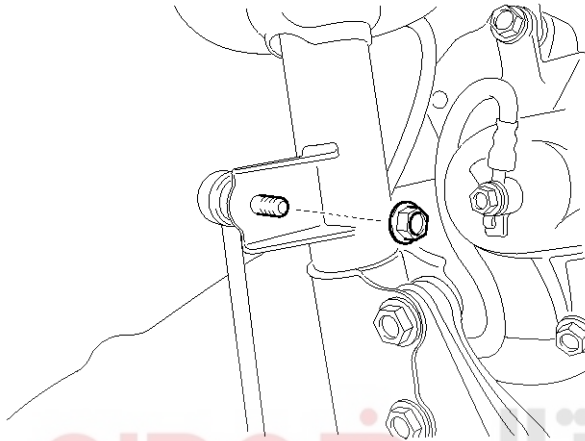
Tightening torque Nm (kgf.m, lb-ft):

90 ~ 110 (9.0 ~ 11.0, 65 ~ 80)

2. Disconnect the stabilizer link with the front strut assembly after loosening the nut.

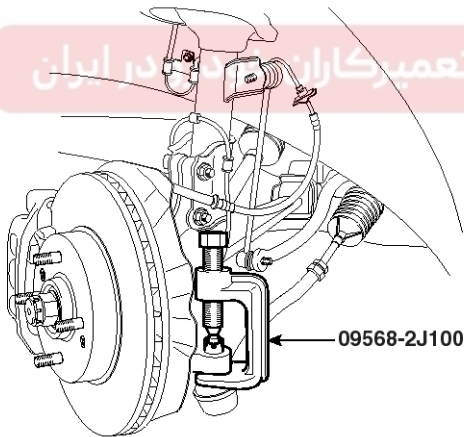
Tightening torque Nm (kgf.m, lb-ft):

100 ~ 120 (10.0 ~ 12.0, 72 ~ 87)



STDSS9002D

3. Disconnect the tie-rod end with the knuckle using a SST (09568-2J200).

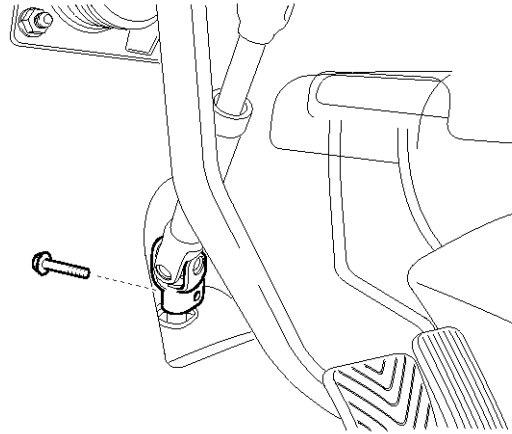


STDSS9312D

4. Loosen the bolt and then disconnect the universal joint assembly from the pinion of the steering gear box.

Tightening torque Nm (kgf.m, lb-ft):

30 ~ 35 (3.0 ~ 3.5, 22 ~ 25)



STDSS9007D

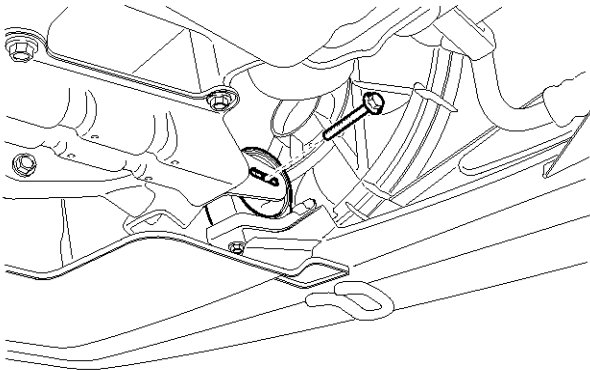
CAUTION

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

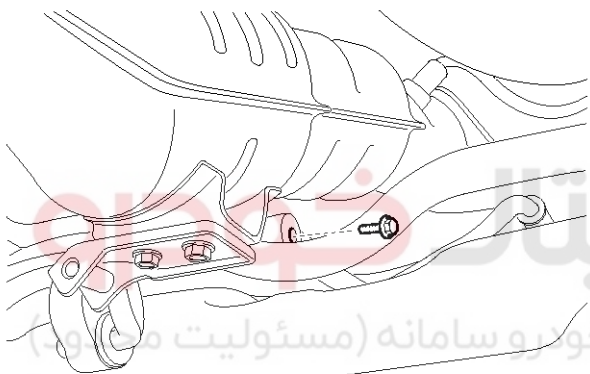
Electric Power Steering

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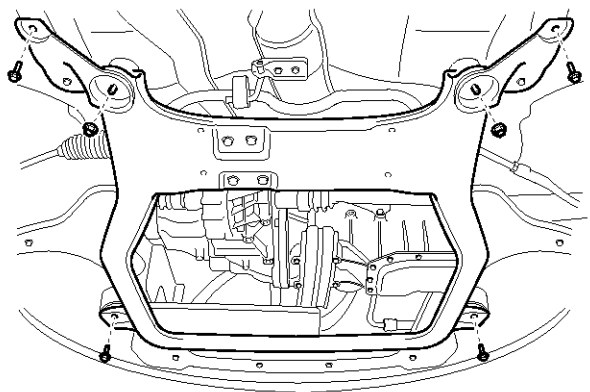
5. Remove the cross member from the body by loosening the mounting bolts and nuts.



STDSS9008D

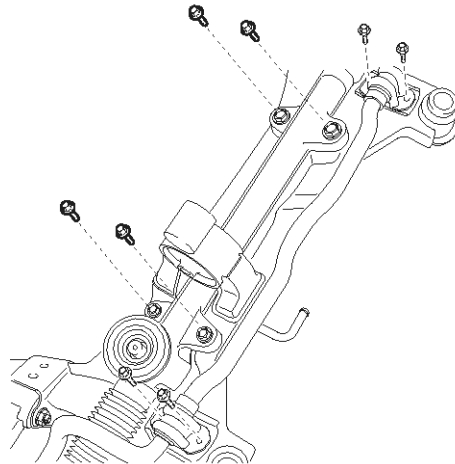


STDSS9009D



STDSS9010D

6. Remove steering gearbox from the cross member by loosening the bracket mounting bolts.



STDSS9011L

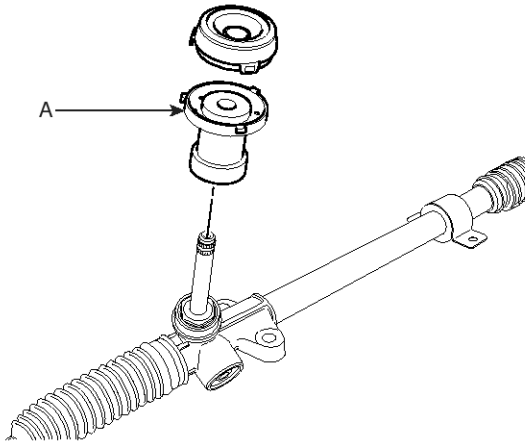
7. Installation is the reverse of the removal.

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Steering System

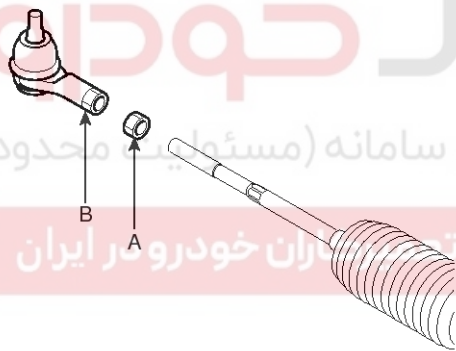
Disassembly

1. Remove the dust packing & cap (A) from the pinion housing.



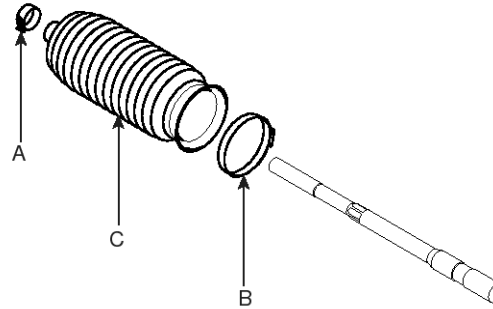
SSAST8311L

2. Loosen the lock nut and then remove the tie rod end (B) and lock nut (A) from the tie rod.



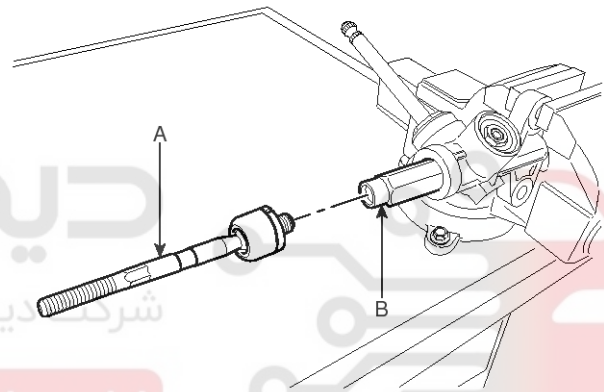
SSAST8312L

3. Remove the bellows clip (A) and band (B) and then pull the bellows (C) away from the end of the tie rod.



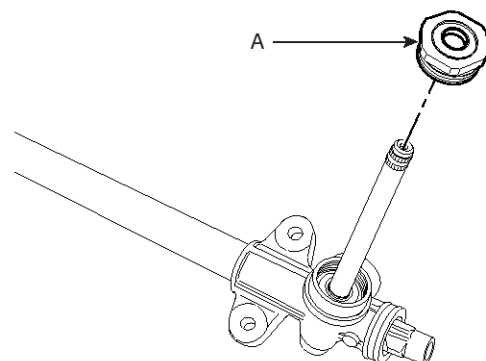
SSAST8313L

4. Remove the tie rod (B) from the rack bar (A) by unscrewing the tie rod inner ball joint.



SHDST6028D

5. Remove the plug (A) from the pinion housing.

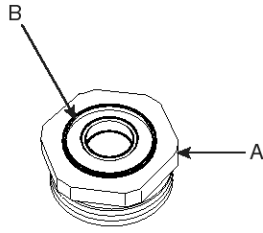


SSAST8314L

Electric Power Steering

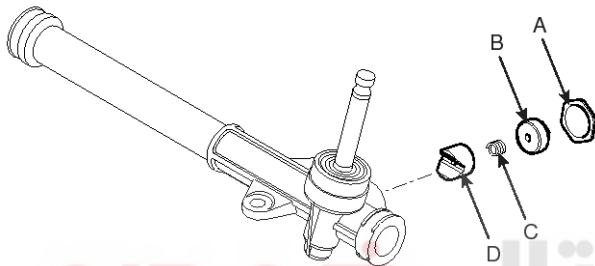
ST-17

6. Remove the oil seal (B) from the plug (A).



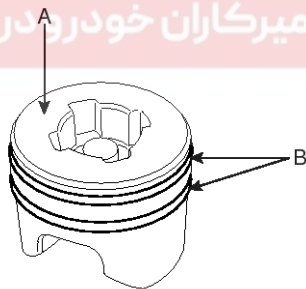
SSAST8315L

7. Remove the lock nut (A), yoke plug (B), spring (C) and support yoke (D).



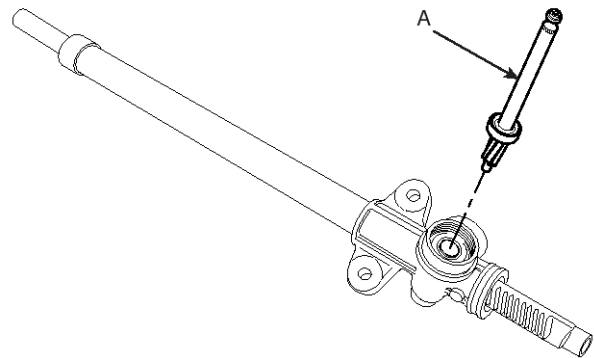
SSAST8316L

8. Remove the O-rings (B) from the support yoke assembly (A).



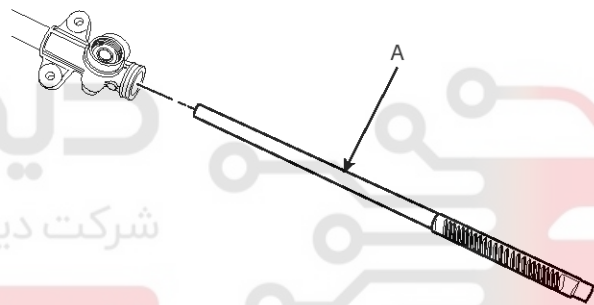
SHDST6032D

9. Pull the pinion assembly (A) out of the pinion housing.



SHDST6033D

10. Pull the rack bar (A) out of the rack housing.



SHDST6034D

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Steering System

Inspection

1. Rack bar
 - Check the rack gear for damage.
 - Check the rack bar for bend and deformation.
2. Pinion assembly
 - Check the pinion gear for damage.
 - Check the surface contacting the oil seal for damage.
 - Check the oil seal for damage.
3. Check the inside of rack housing for damage.
4. Check the bellows for being torn.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



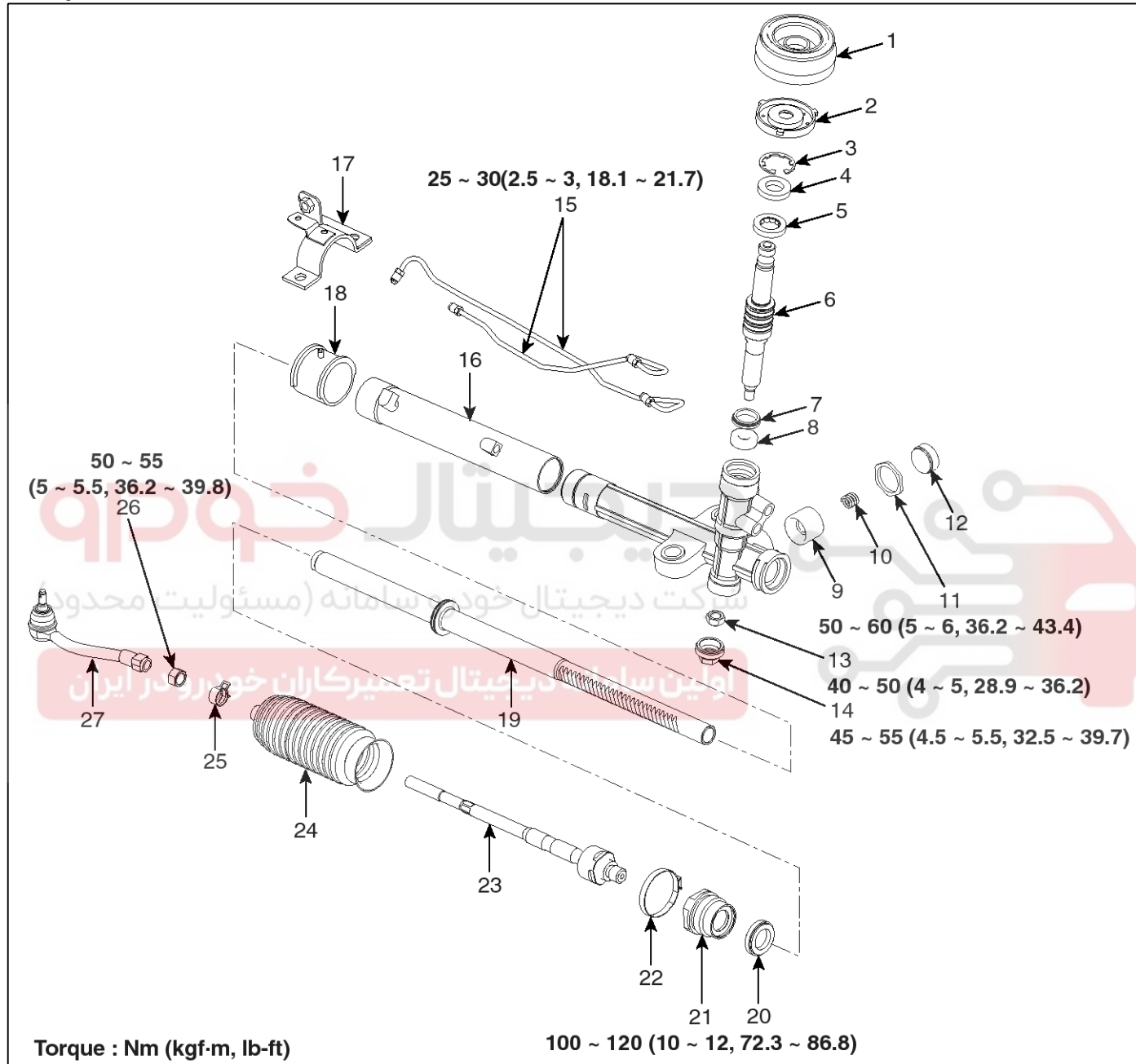
Hydraulic Power Steering System

ST-19

Hydraulic Power Steering System

Power Steering Gear Box

Components



STDST9305L

- | | | | |
|--------------------------|-------------------------|-----------------------|------------------|
| 1. Protector rubber | 8. Needle bearing | 15. Feed tube | 22. Bellows band |
| 2. Dust cap | 9. Rack support yoke | 16. Rack housing | 23. Tie rod |
| 3. Snap ring | 10. Rack support spring | 17. Mounting bracket | 24. Bellows |
| 4. Input shaft seal | 11. Lock nut | 18. Mounting isolator | 25. Bellows clip |
| 5. Input shaft bearing | 12. Yoke plug | 19. Rack | 26. Lock nut |
| 6. Pinion valve assembly | 13. Pinion locking nut | 20. Oil seal | 27. Tie rod end |
| 7. Pinion seal | 14. Pinion plug | 21. Rack stopper | |

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Steering System

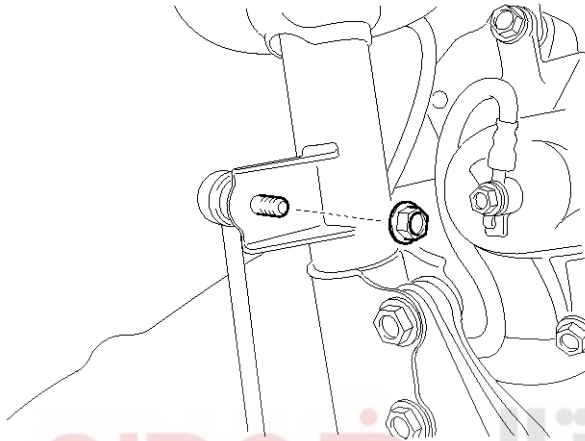
Replacement

1. Remove the front wheel & tire.

Tightening torque Nm (kgf.m, lb-ft):
90 ~ 110 (9.0 ~ 11.0, 65 ~ 80)

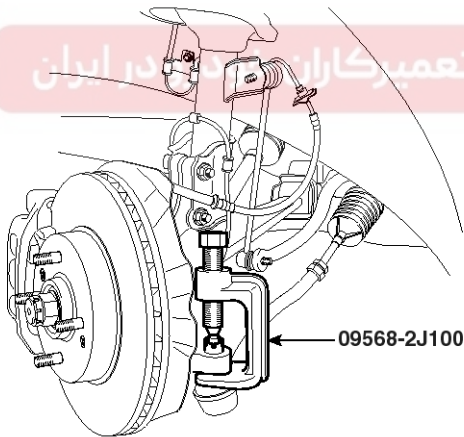
2. Disconnect the stabilizer link with the front strut assembly after loosening the nut.

Tightening torque Nm (kgf.m, lb-ft):
100 ~ 120 (10.0 ~ 12.0, 72 ~ 87)



STDSS9002D

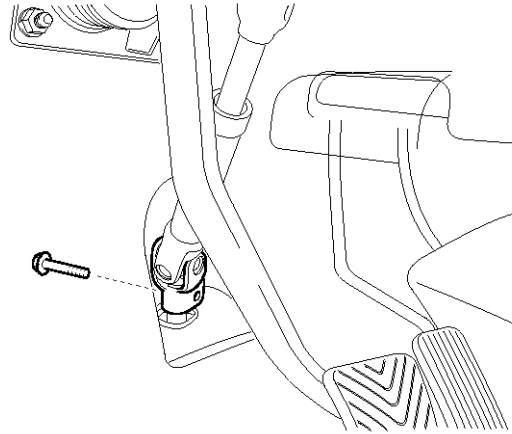
3. Disconnect the tie-rod end with the knuckle using a SST (09568-2J100).



STDSS9312D

4. Loosen the bolt and then disconnect the universal joint assembly from the pinion of the steering gear box.

Tightening torque Nm (kgf.m, lb-ft):
30 ~ 35 (3.0 ~ 3.5, 22 ~ 25)



STDSS9007D

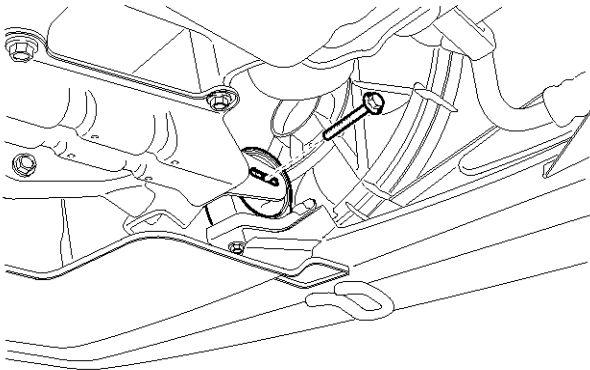
CAUTION

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

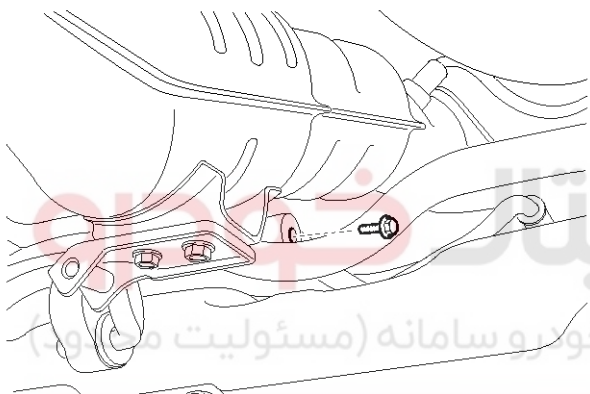
Hydraulic Power Steering System

ST-21

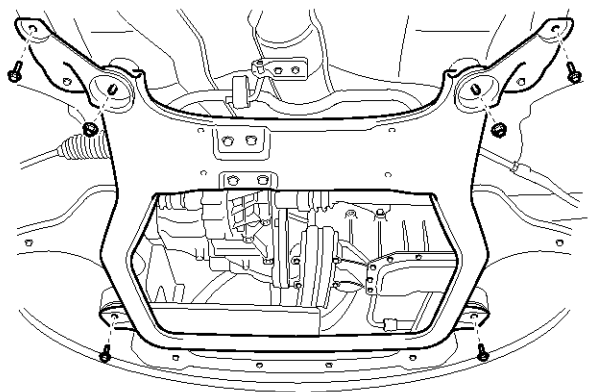
5. Remove the cross member from the body by loosening the mounting bolts and nuts.



STDSS9008D



STDSS9009D



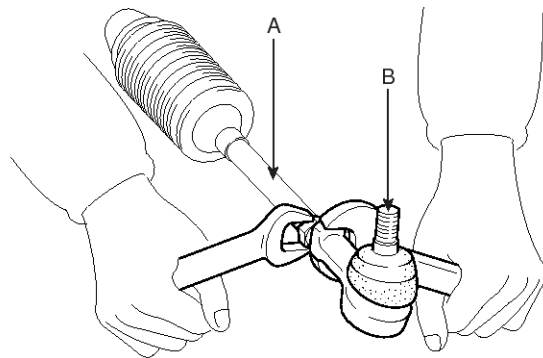
STDSS9010D

6. Remove steering gearbox from the cross member by loosening the bracket mounting bolts.

7. Installation is the reverse of the removal.

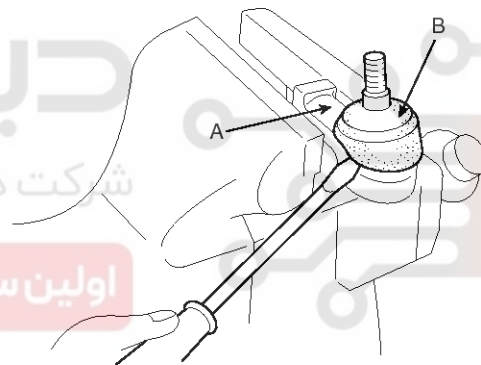
Disassembly

1. Remove the tie rod end(B) from the tie rod(A).



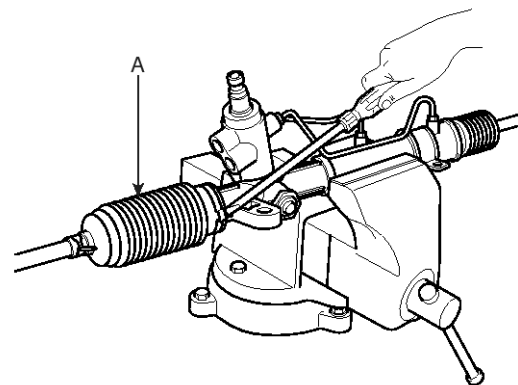
EPKE013F

2. After mounting the tie rod end(A) in a vise, remove the dust cover(B) from the ball joint.



EPKE013G

3. Remove the bellows band(A).

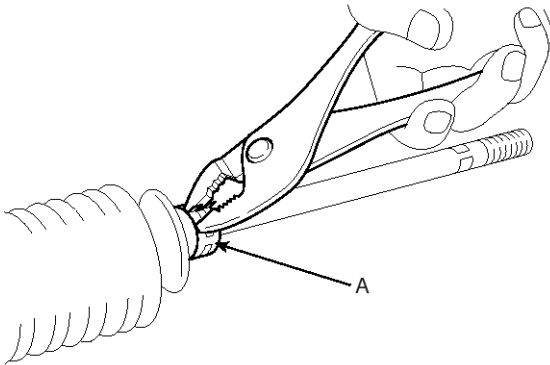


LPJF006F

ST-22

Steering System

4. Remove the bellows clip(A).



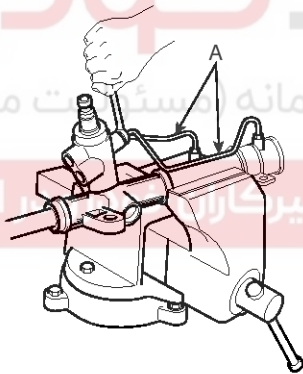
EPKE013I

5. Pull the bellows out toward the tie rod.

NOTICE

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

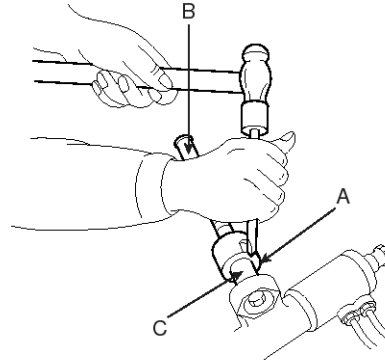
6. Remove the feed tube(A) from the rack housing.



LPJF006H

7. While moving the rack slowly, drain the fluid from the rack housing.

8. Unstake the tab washer(A) which fixes the tie rod(B) and rack(C) with a chisel.

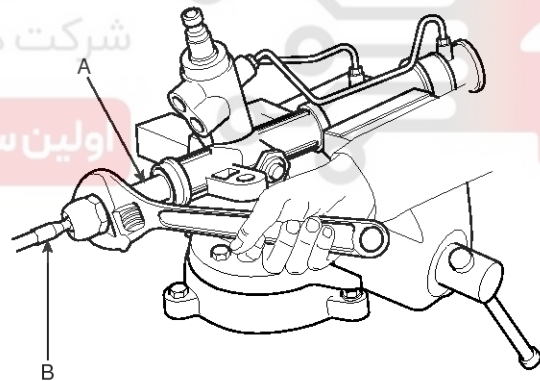


EPKE037A

9. Remove the tie rod(B) from the rack(A).

CAUTION

Remove the tie rod(B) from the rack(A), taking care not to twist the rack.

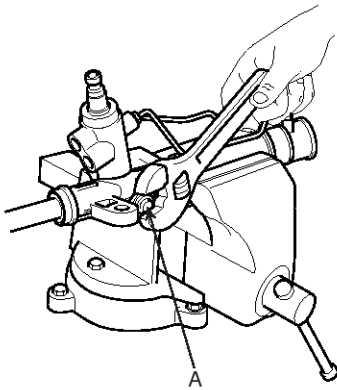


LPJF006J

Hydraulic Power Steering System

ST-23

10. Remove the yoke plug locking nut(A).



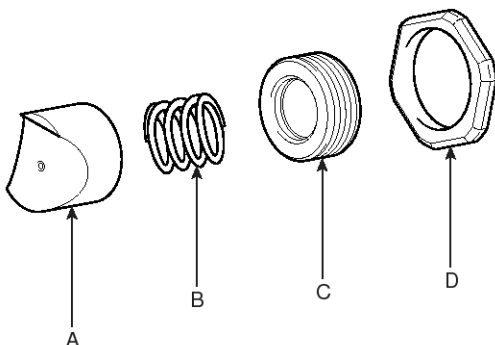
LPJF006K

11. Remove the yoke plug(B) with a 14mm socket(A).



LPJF006L

12. Remove the lock nut(D), yoke plug(C), rack support spring(B) and rack support yoke(A) from the gear box.

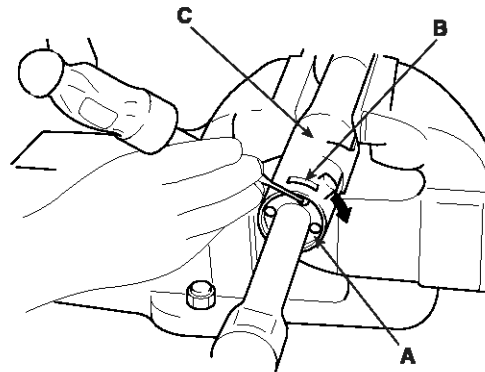


LPJF007H

13. When the end of the circlip comes out of the notched hole of the housing rack cylinder, turn the rack stopper counterclockwise and remove the circlip.

CAUTION

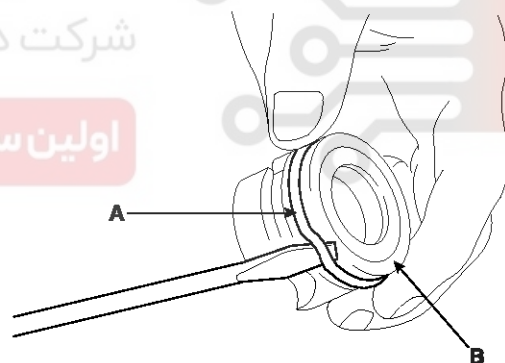
Be careful not to damage the rack.



EPKE013Q

14. Remove the rack bushing and rack from the rack housing.

15. Remove the O-ring(A) from the rack bushing(B).

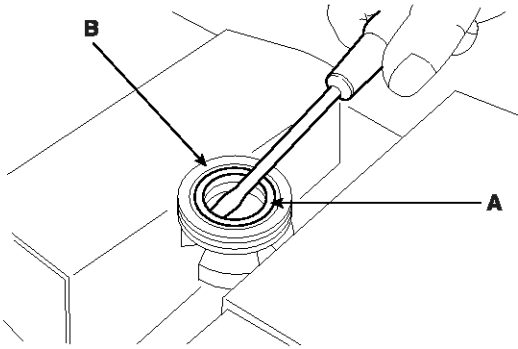


EPKE013T

ST-24

Steering System

16. Remove the oil seal(B) from the rack bushing(A).



EPKE013U

17. Remove the valve body from the valve body housing with a soft hammer.

18. Using the special tool, remove the oil seal and ball bearing from the valve body housing.

19. Remove the oil seal and O-ring from the rack housing.

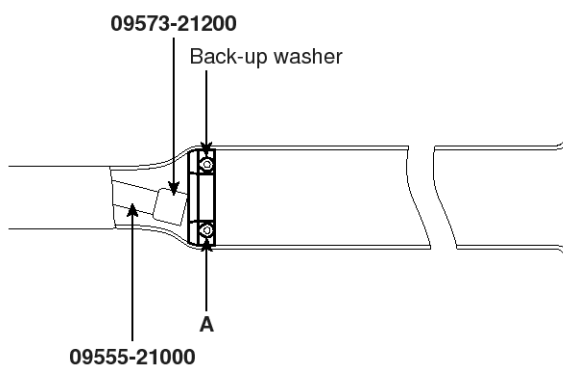
CAUTION

Be careful not to damage the pinion valve cylinder inside of the rack housing.

20. Using the special tool(09573-21200, 09555-21000), remove the oil seal(A) from the rack housing.

CAUTION

Be careful not to damage the rack cylinder inside of the rack housing.



LPJF210B

Inspection

1. Rack

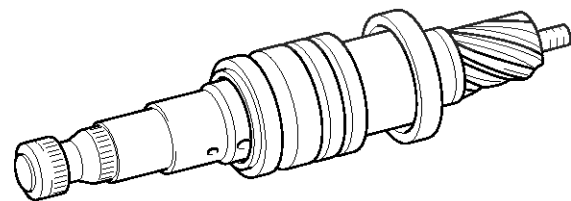
- 1) Check for rack tooth face damage or wear
- 2) Check for oil seal contact surface damage
- 3) Check for rack bending or twisting
- 4) Check for oil seal ring damage or wear
- 5) Check for oil seal damage or wear



LPJF006C

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



APJF013Z

Hydraulic Power Steering System

ST-25

3. Bearing

- 1) Check for seizure or abnormal noise during a 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 aging

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



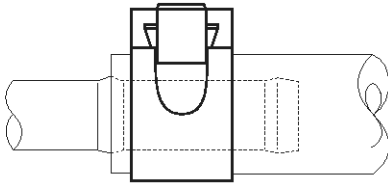
ST-26

Steering System

Power Steering Hoses

Replacement

- Refer to the components illustration during removal or installation.
- When installing, be sure to connect between hose to tube using a clamp as shown in the illustration.



SUNST6512D

- Check all clamps for deterioration or deformation; replace with the clamps new one if necessary.
- Add the recommended power steering fluid and bleed the power steering system.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

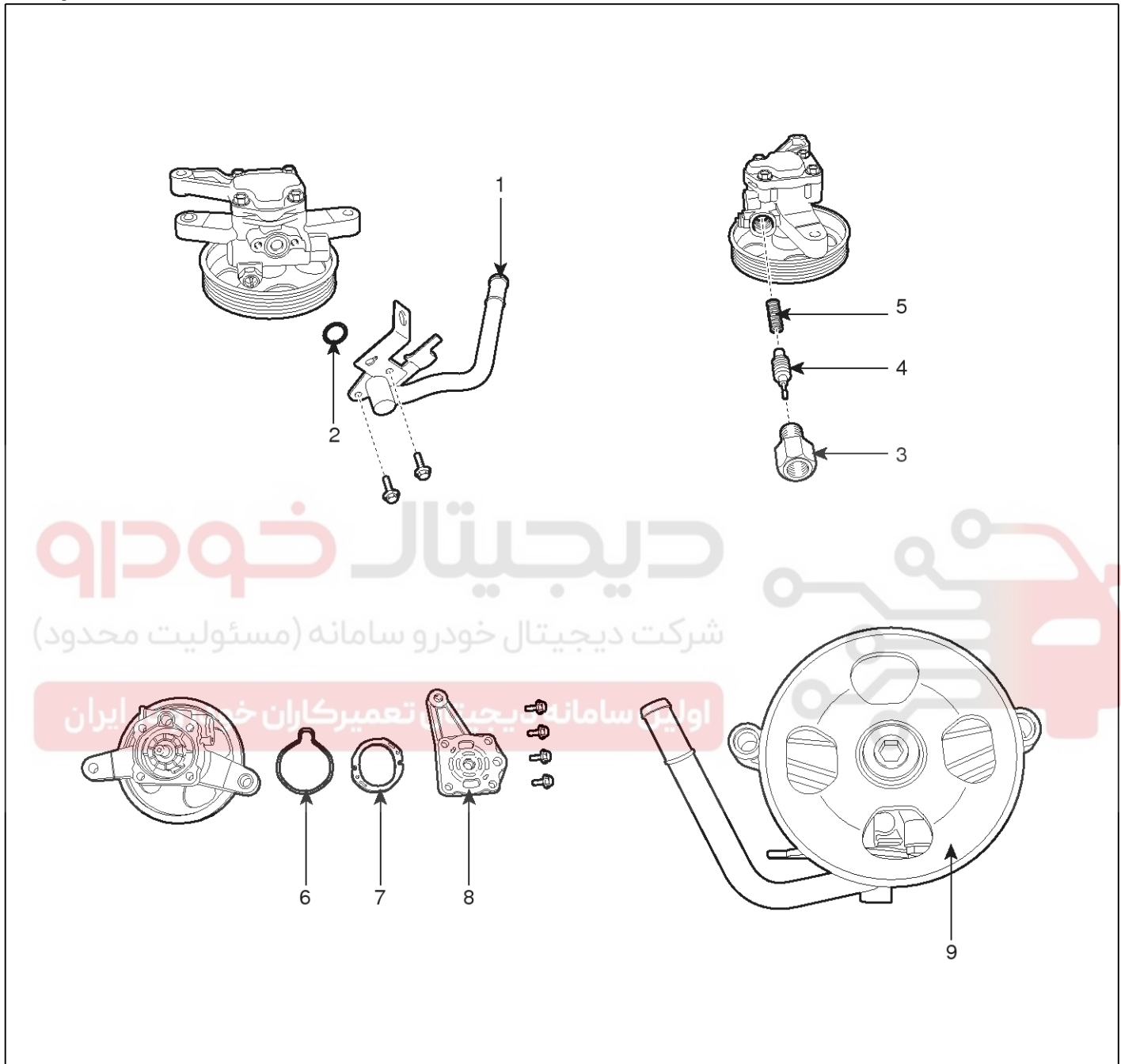


Hydraulic Power Steering System

ST-27

Power Steering Oil Pump

Components



STDST9011D

1. Suction pipe
2. O-ring
3. Flow control spring

4. Flow control valve
5. Connector
6. O-ring

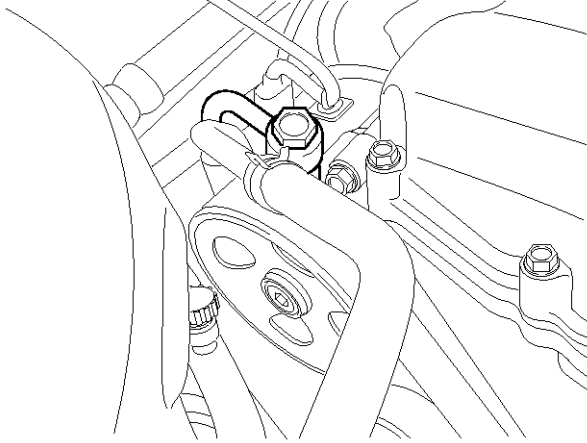
7. Cam ring
8. Oil pump cover assembly
9. Pulley

ST-28

Steering System

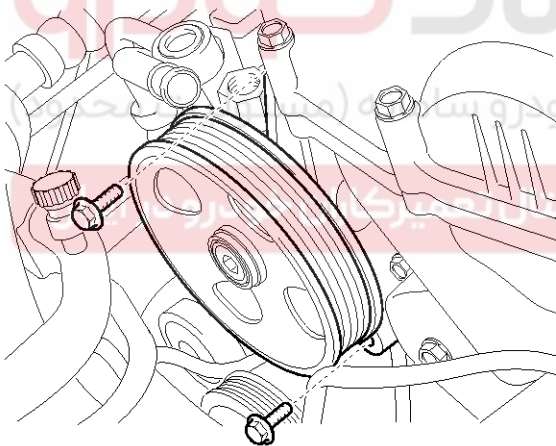
Replacement

1. Drain the power steering fluid.
2. Remove the drive belt.
3. Remove the pressure hose from the oil pump and the suction hose from the suction pipe.



STDST9012D

4. Loosen the mounting bolts and then remove the power steering pump.

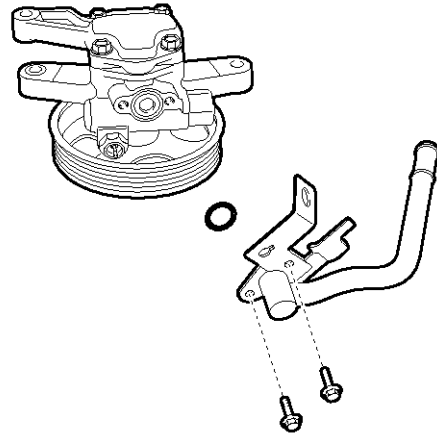


STDST9013D

5. Installation is the reverse of the removal.

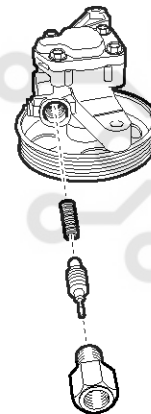
Disassembly

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



STDST9014D

2. Remove the connector from the oil pump body, and take out the flow control valve and the flow control spring.

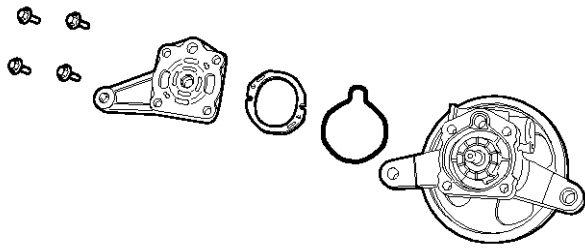


STDST9015D

Hydraulic Power Steering System

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3. Remove the pump cover and rotor & vanes O-ring, side plate.



STDST9016D

4. Installation is the reverse of the removal.

Inspection

1. Check that the flow control valve is not bent.
2. Check the shaft for wear and damage.
3. Check the grooves of the rotor and vanes for stratified abrasion.
4. Check the contact surface of the cam ring and vanes for stratified abrasion.
5. Check vanes for damage.
6. Check that there is no striped wear in the side plate or contacting part between the shaft and the pump cover surface.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

