

ST-2

Steering System

General Information

Specification

Items		Specification
Steering gear	Type	Rack & Pinion
	Rack stroke	168mm
Power steering pump	Type	Vane
	Relief pressure	90 ~ 95kgf/cm ² (1280 ~ 1351 psi, 8.8 ~ 9.3MPa)
Steering angle	Inner	39.75° ± 1°30'
	Outer	34.30°
Power steering oil		PSF-3



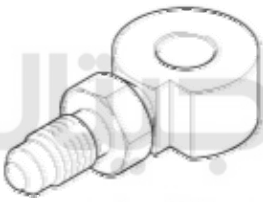
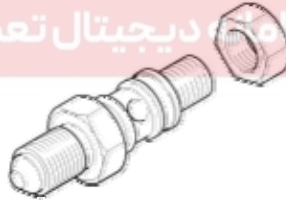
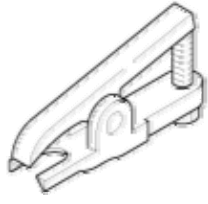
Tightening Torques

Items		Tightening torque		
		N.m	kgf.m	lb-ft
Drive shaft nuts		245 ~ 275	24.5 ~ 27.5	177 ~ 199
Wheel nuts		90 ~ 110	9.0 ~ 11.0	65 ~ 80
Steering wheel and column shaft		40 ~ 50	4.0 ~ 5.0	29 ~ 36
Steering column assembly mounting bolts and nuts		13 ~ 18	1.3 ~ 1.8	9 ~ 13
Steering column assembly & universal joint		22 ~ 27	2.2 ~ 2.7	16 ~ 20
Bolt connecting universal joint to steering gear pinion		30 ~ 35	3.0 ~ 3.5	22 ~ 25
Tie-rod end and knuckle		60 ~ 80	6.0 ~ 8.0	43 ~ 58
Power steering gear box and frame	RH	90 ~ 110	9.0 ~ 11.0	72 ~ 87
	LH	122 ~ 158	12.2 ~ 15.8	88 ~ 114
Pressure tube eye bolt and Power steering pump		55 ~ 65	5.5 ~ 6.5	40 ~ 47
Power steering pump and Pump bracket		20 ~ 27	2.0 ~ 2.7	14 ~ 20

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)
09568-34000 Ball joint puller	 E6834000	Separation of tie-rod end ball joint

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Steering System

Troubleshooting

Symptom	Probable cause	Remedy
Excessive play in steering	Loose yoke plug	Retighten
	Loose steering gear mounting bolts	Retighten
	Loose or worn tie rod end	Retighten or replace as necessary
Steering wheel operation is not smooth (Insufficient power assist)	V-belt slippage	Readjust
	Damaged V-belt	Replace
	Low fluid level	Replenish
	Air in the fluid	Bleed air
	Twisted or damaged hoses	Correct the routing or replace
	Insufficient oil pump pressure	Repair or replace the oil pump
	Sticky flow control valve	Replace
	Excessive internal oil pump leakage	Replace the damaged parts
	Excessive oil leaks from rack and pinion in gear box	Replace the damaged parts
	Distorted or damaged gear box or valve body seals	Replace
Steering wheel does not return properly	Excessive turning resistance of tierod end	Replace
	Yoke plug excessively tight	Adjust
	Tie rod and/or ball joint cannot turn smoothly	Replace
	Loose mounting of gear box mounting bracket	Retighten
	Worn steering shaft joint and/or	
	Worn steering shaft joint and/or body grommet	Correct or replace
	Distorted rack	Replace
	Damaged pinion bearing	Replace
	Twisted or damaged hoses	Reposition or replace
	Damaged oil pressure control valve	Replace
	Damaged oil pump input shaft bearing	Replace
Noise	Hissing Noise in Steering Gear There is some noise with all power steering systems. One of the most common is a hissing sound when the steering wheel is turned and the car is not moving. This noise will be most evident when turning the wheel while the brakes are being applied. There is no relationship between this noise and steering performance. Do not replace the valve unless the "hissing" noise becomes extreme. A replaced valve will also make a slight noise, and is not always a solution for the condition.	
Rattling or chucking noise in the rack and pinion	Interference with hoses from vehicle body	Reposition
	Loose gear box bracket	Retighten
	Loose tie rod end and/or ball joint	Retighten
	Worn tie rod and/or ball joint	Replace

General Information

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Symptom	Probable cause	Remedy
Noise in the oil pump	Low fluid level	Replenish
	Air in the fluid	Bleed air
	Loose pump mounting bolts	Retighten

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



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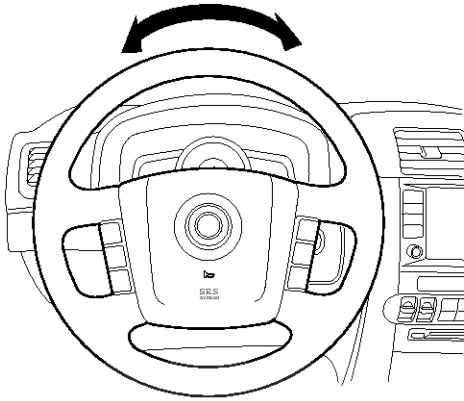
Steering System

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



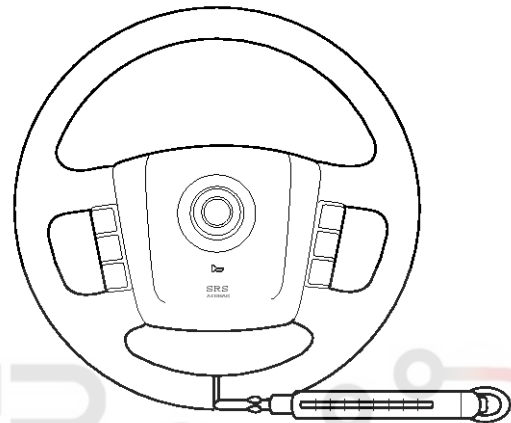
SHMST8123D

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: 3.5kgf or less



SHMST8124D

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.

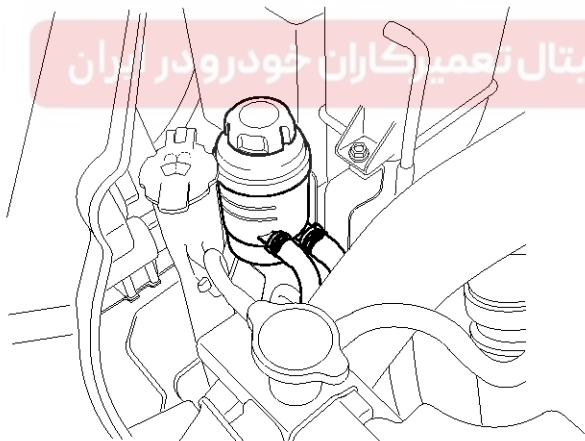
1. Raise the reservoir and then disconnect the return hose to drain the reservoir. Take care not to spill the fluid on the body and parts. Wipe off any spilled fluid at once.
2. Connect a tube of suitable diameter to the disconnected return hose, and put the hose end in a suitable container.
3. Jack 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.



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ⓘ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

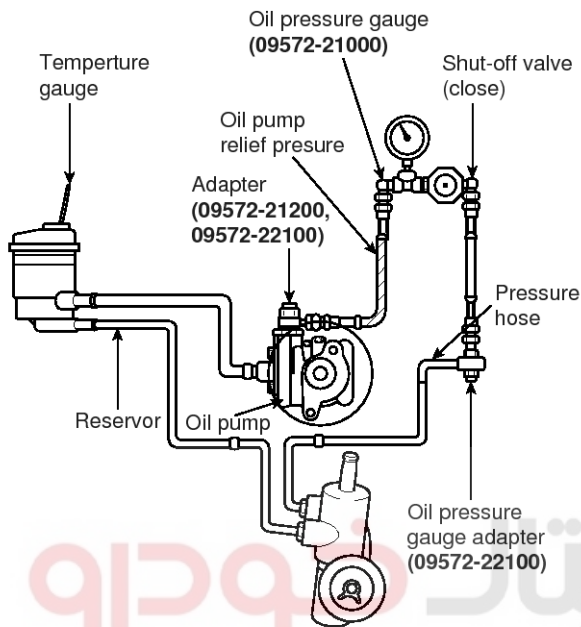
If the fluid level moves up and down when turning the steering wheel, the fluid overflows out of the reservoir when the turning off the engine or the fluid has white color, it indicates that air bubbles have not been removed sufficiently from the power steering system. Therefore, repeat the steps 5 through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

90 ~ 95kgf/cm² (1280 ~ 1351psi, 8.8 ~ 9.3Mpa)

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.

Steering Column & Shaft

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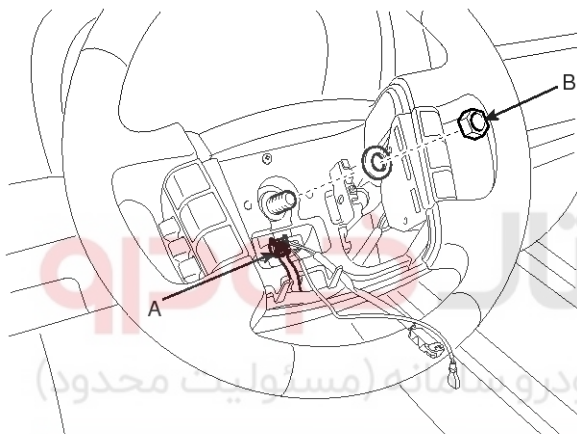
Steering Column & Shaft

Replacement

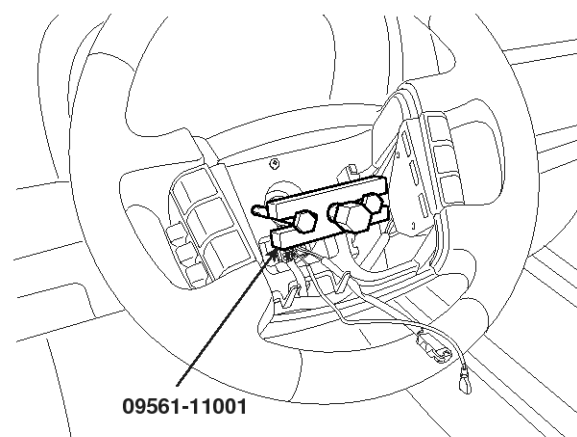
1. Disconnect the negative cable from the battery and then wait for at least 30 seconds.
2. Turn the steering wheel so that the front wheels can face straight ahead.
3. Remove the DAB module (or Horn pad). (Refer to RT group)
4. Disconnect the remote switch connector (A) and remove the dynamic damper (B) by loosening the bolts.

Tightening torque

40 ~ 50N.m (4.0 ~ 5.0kgf.m, 29 ~ 36lb-ft)



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

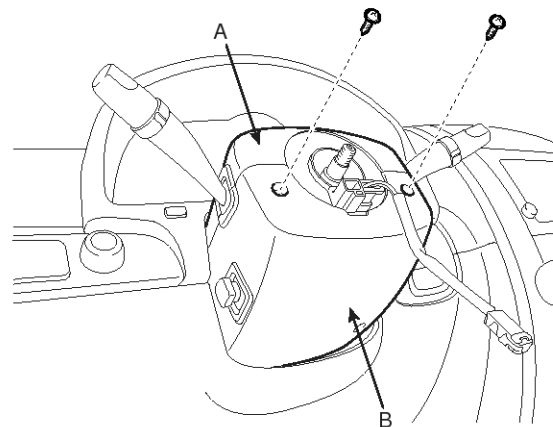


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CAUTION

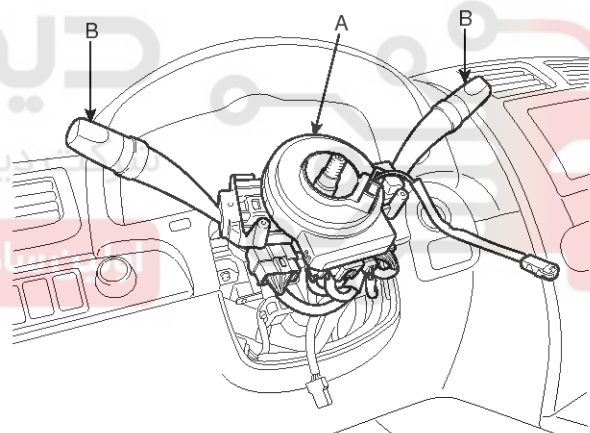
Do not hammer on the steering wheel to remove it; it may damage the steering column.

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



SHMST8103D

7. Remove the clock spring (A) and multifunction switch (B).

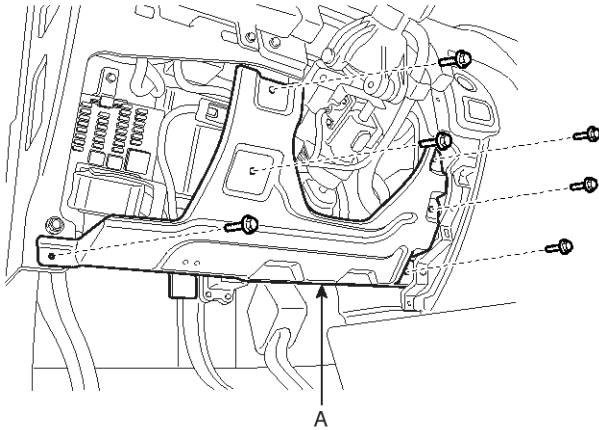


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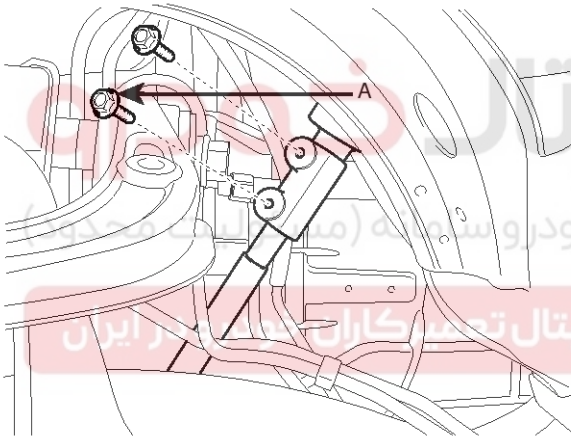
Steering System

8. Remove the reinforce panel (A) by loosening the mounting bolts.



SHMST8106D

9. Loosen the bolt (A) and then disconnect the universal joint assembly with the steering column assembly.

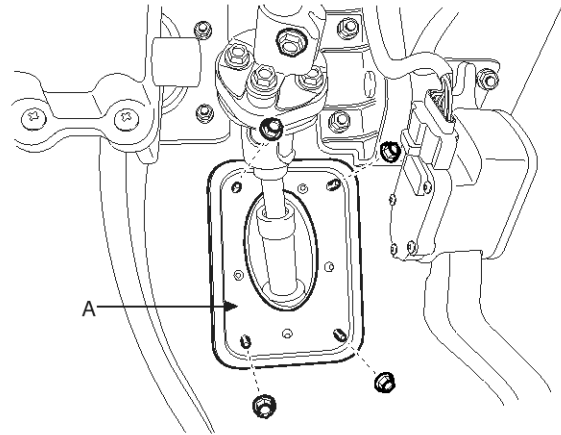


SHMST8113D

⚠ CAUTION

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

10. Remove the steering column dust cover (A) bolts.

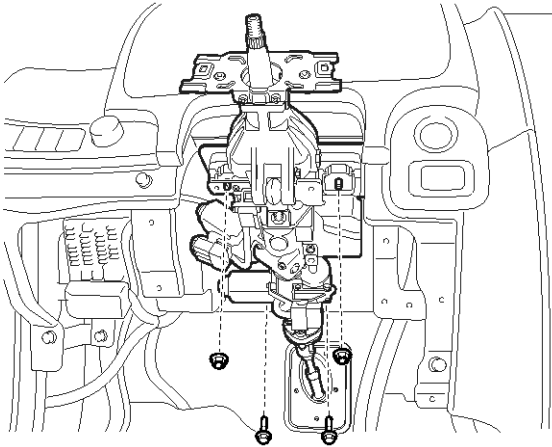


SHMST8115D

Steering Column & Shaft

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11. Disconnect all connectors connected to the steering column assembly.
12. Remove the steering column assembly by loosening the mounting bolts and nuts.



SHMST8114D

13. Installation is the reverse of removal.

⚠ CAUTION

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

شرکت دیجیتال خودرو (مسئولیت محدود)

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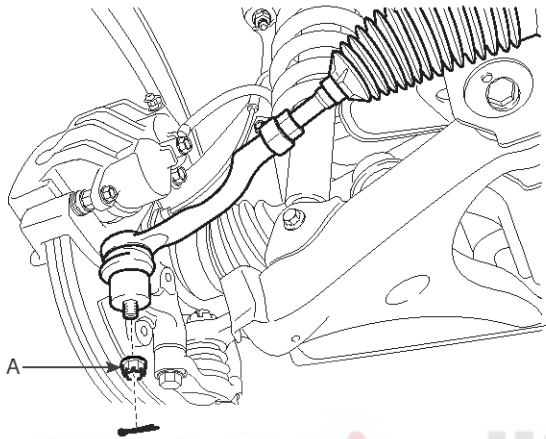
Steering System

Hydraulic Power Steering System

Power Steering Gear Box

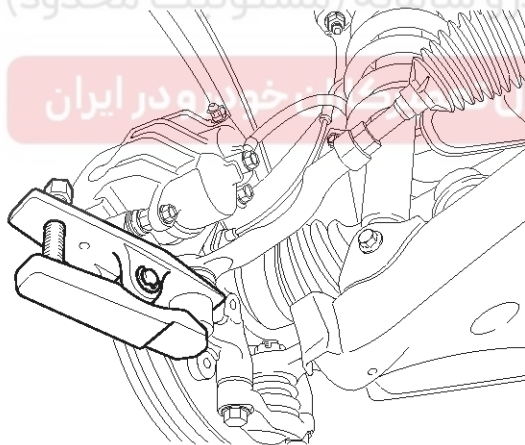
Replacement

1. Drain the power steering fluid.
2. Remove the both front wheels.
3. Remove the cotter pin and castle nut (A).



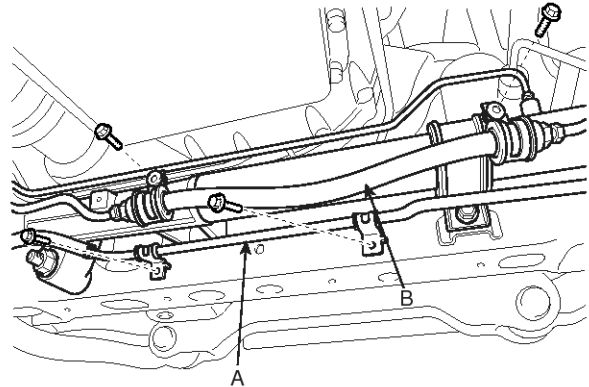
SHMST8107D

4. Disconnect the tie-rod end (A) with the knuckle using a SST (09568-4A000).



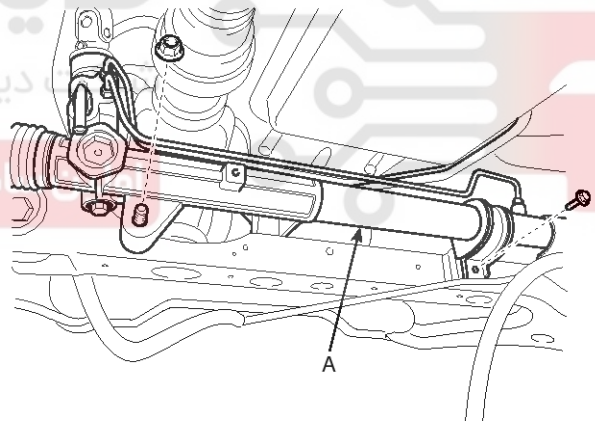
SHMST8108D

5. Loosen the tube bracket bolts and then disconnect the pressure (B) and return tube (A).



SHMST8110D

6. Remove the steering gear box (A) by loosening the bolts and nuts.



SHMST8111D

7. Installation is the reverse of the removal.

NOTICE

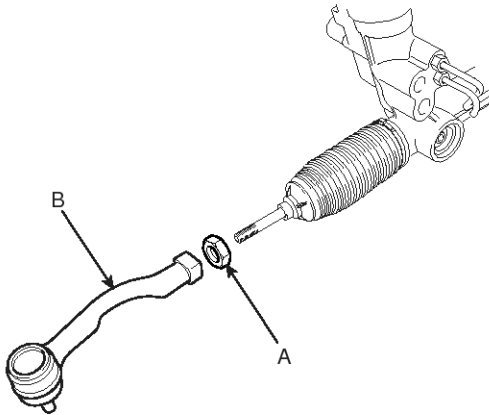
- Fill the reservoir with the power steering fluid and then bleed the power steering system.
- Inspect the front wheel alignment and adjust it if necessary.

Hydraulic Power Steering System

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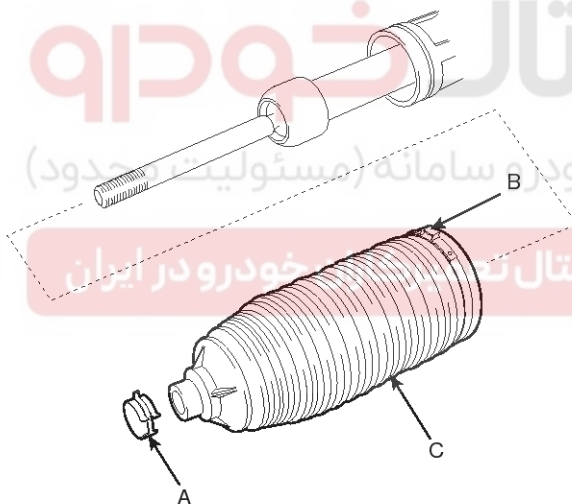
Disassembly

1. Loosen the lock nut (A) and then unscrew the tie-rod end (B) and lock nut from the tie-rod.



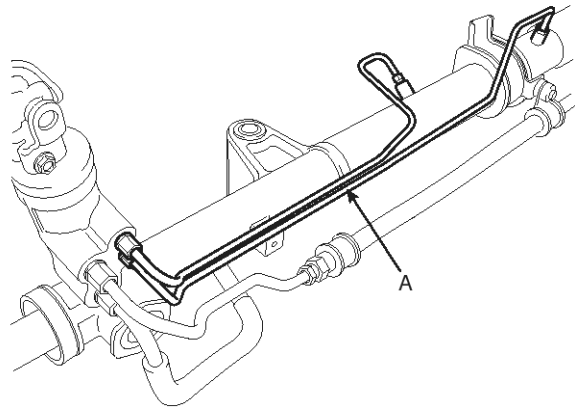
SHMST8116D

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



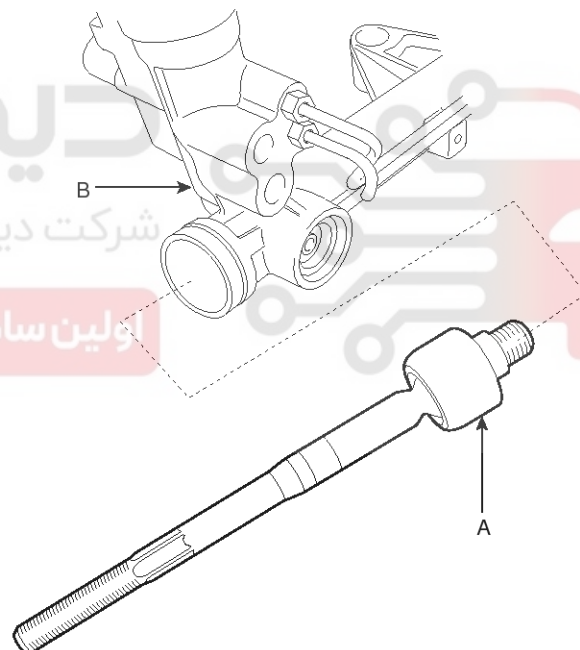
SHMST8117D

3. Remove the feed tubes (A) from the steering gear box.



SHMST8118D

4. Unscrew the tie-rod (A) from the rack bar (B).

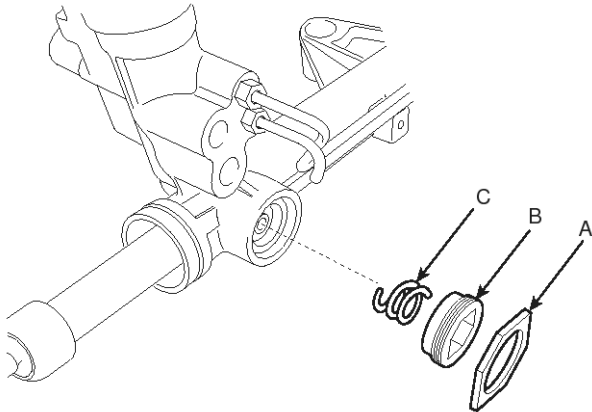


SHMST8121D

ST-14

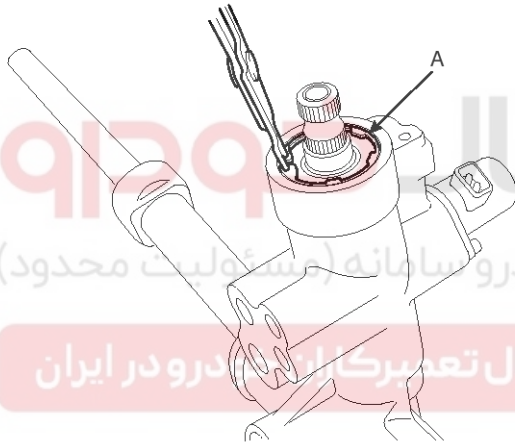
Steering System

5. Remove the lock nut (A) and yoke plug (B) and then pull out the yoke spring (C) and support yoke.



SHMST8119D

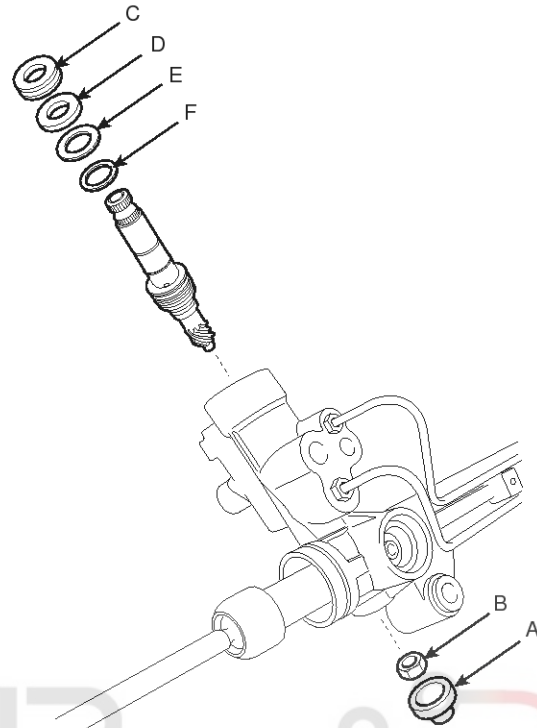
6. Remove the snap ring (A).



SHMST8120D

7. Remove the pinion plug (A) and lock nut (B).

8. Remove the valve assembly (C), oil seal (D), bearing (E) and snap ring (F).



SHMST8122D

CAUTION

Do not allow dust, dirt, or foreign materials to contact the disassembled parts and inside of the valve assembly housing.

9. Unscrew the rack bush and pull the rack bar out of the rack housing.
10. Reassembly is the reverse of the disassembly.

Inspection

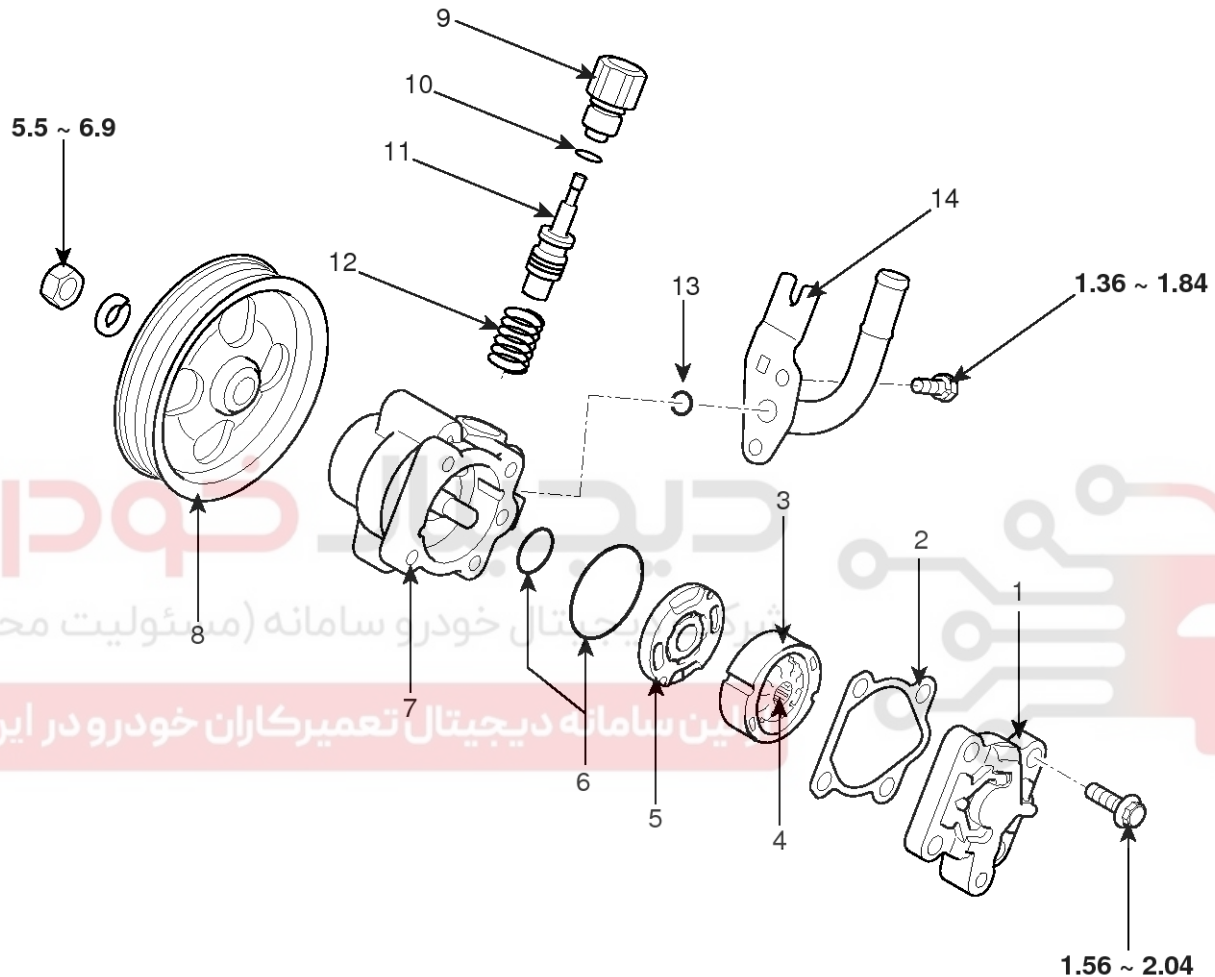
1. Rack bar
 - Check the rack gear for damage.
 - Check the rack bar for bend and deformation.
2. Valve assembly
 - Check the valve assembly for wear, burr, and damage.

Hydraulic Power Steering System

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Power Steering Oil Pump

Components



Torque : N.m (kgf.m, lb-ft)

SHMST8300L

- | | | |
|-----------------|-----------------------|------------------------|
| 1. Pump cover | 6. O-ring | 11. Flow control valve |
| 2. Gasket | 7. Pump body | 12. Spring |
| 3. Cam ring | 8. Pump pulley | 13. O-ring |
| 4. Rotor & vane | 9. Connector assembly | 14. Suction pipe |
| 5. Side plate | 10. O-ring | |

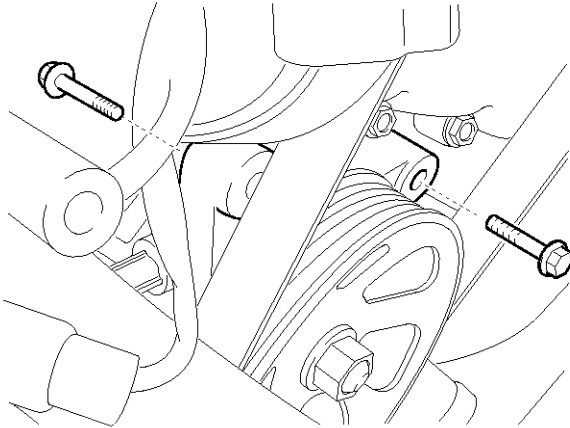
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Steering System

Replacement

[G 3.8 V6 DOHC]

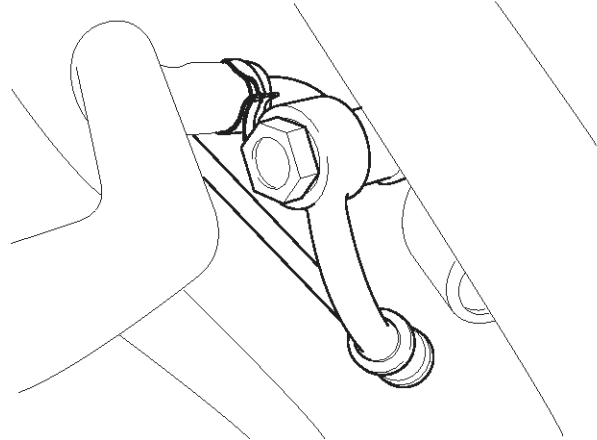
1. Disconnect the pressure tube and return hose from the power steering pump.
2. Remove the drive belt.
3. Loosen the mounting bolt.



SHMST9002L

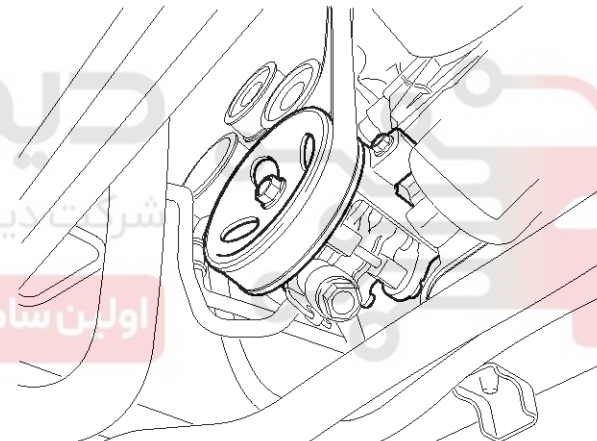
[G 4.6 V8 DOHC]

1. Disconnect the pressure tube and return hose.



SHMST9001L

2. Remove the drive belt.
3. Loosen the mounting bolt.



SHMST9003L

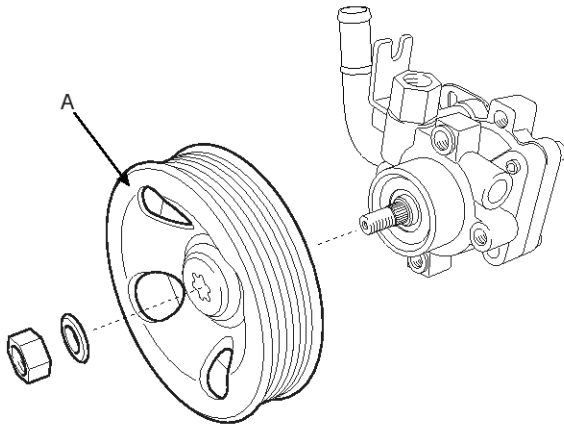
4. Installation is the reverse of removal.

Hydraulic Power Steering System

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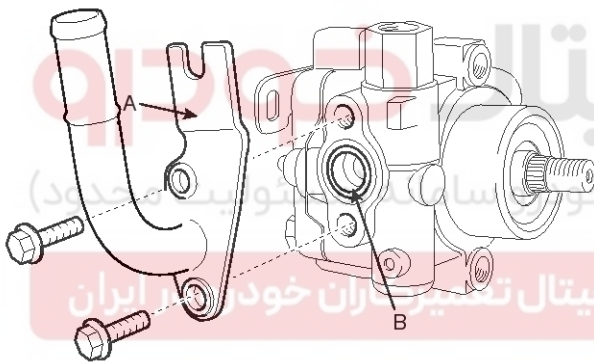
Disassembly

1. Remove the pump pulley (A) by loosening the lock nut.



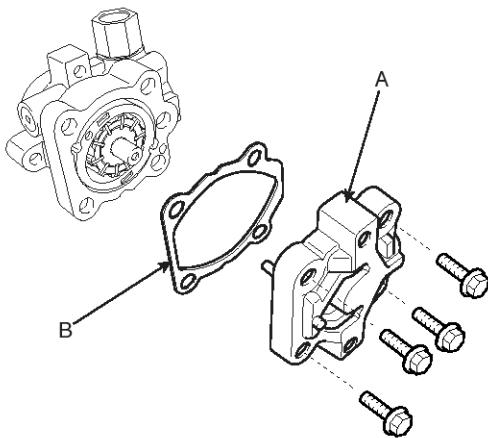
SHMST8303D

2. Remove the suction tube (A) and O-ring (B).



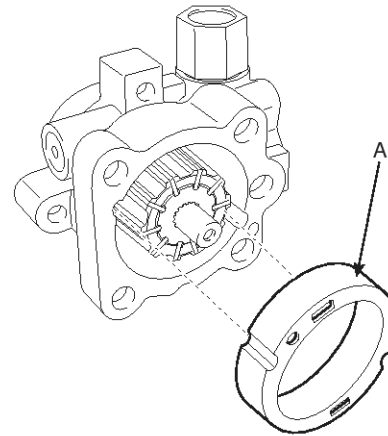
SHMST8304D

3. Remove the pump cover (A) and gasket (B).



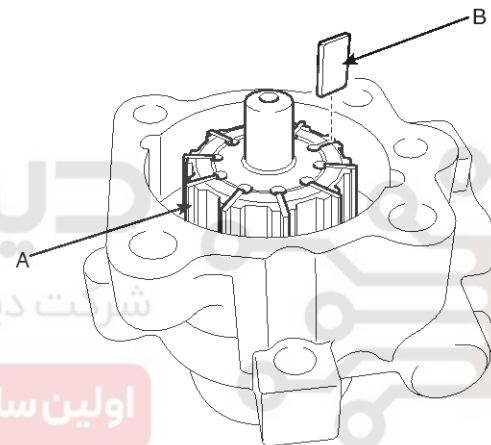
SENST7508D

4. Remove the cam ring (A).



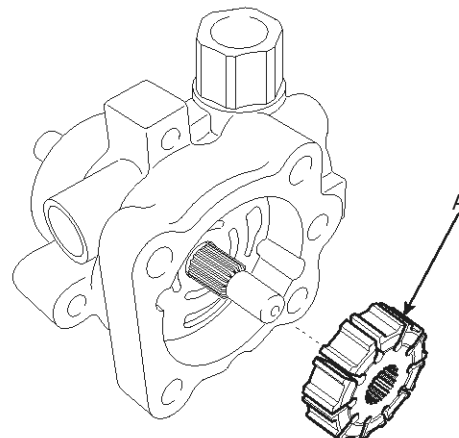
SENST7509D

5. Remove the vanes (B) from the rotor (A).



SENST7510D

6. Remove the rotor (A) from the pump.

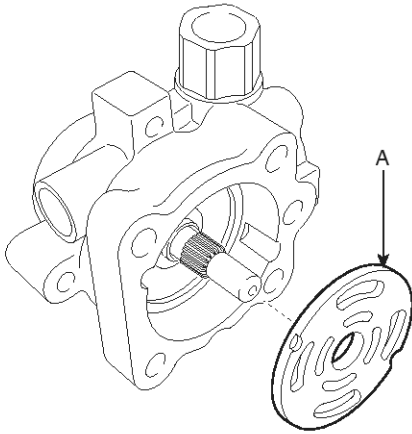


SENST7511D

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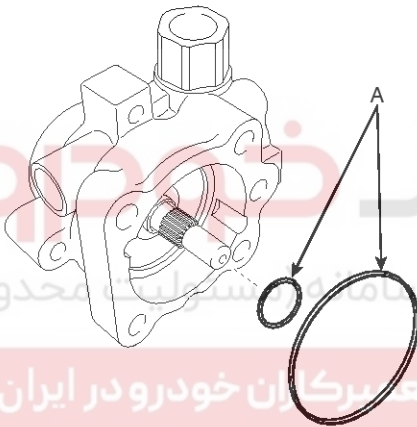
Steering System

7. Remove the side plate (A) from the pump.



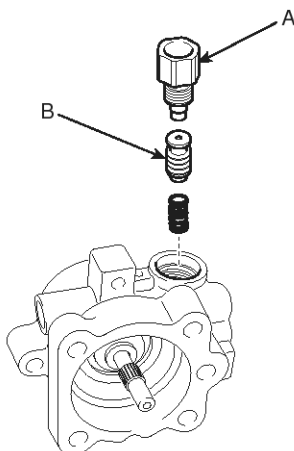
SENST7512D

8. Remove the O-rings (A).



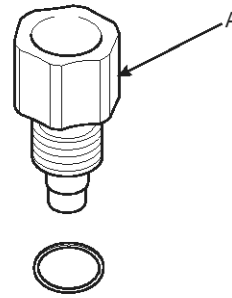
SENST7513D

9. Unscrew the connector assembly (A) and then pull the flow control valve (B) and spring out of the pump body.



SENST7514D

10. Remove the O-ring (A) from the connector assembly.



SENST7515D

Inspection

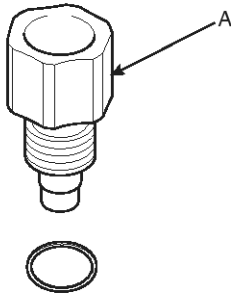
1. Check that the flow control valve is not bent.
2. Check the grooves of the rotor and vanes for stratified abrasion.
3. Check the contact surface of the cam ring and vanes for stratified abrasion.
4. Check vanes for damage.
5. Check that there is no striped wear in the side plate or contacting part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

Hydraulic Power Steering System

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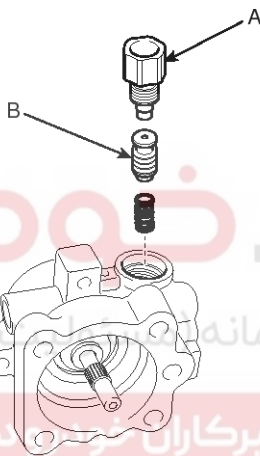
Installation

1. Assemble new O-rings (A) to the pump body.



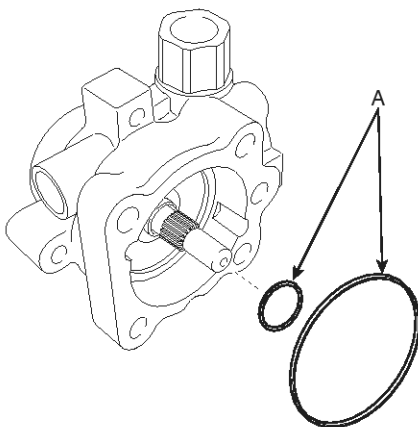
SENST7515D

2. Insert the spring and flow control valve (B) into the pump body and then tighten the connector assembly (A).



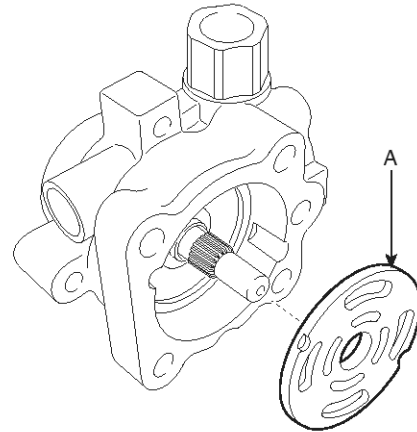
SENST7514D

3. Assemble a new O-ring to pump.



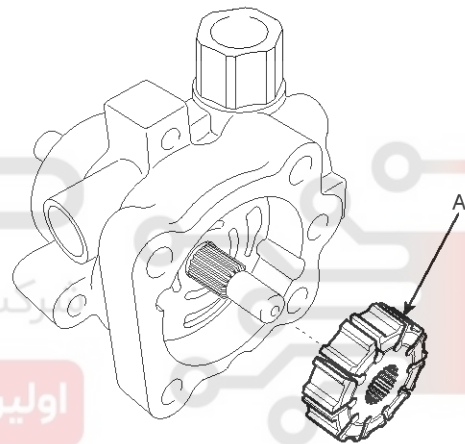
SENST7513D

4. Insert the side plate (A) into the pump body.



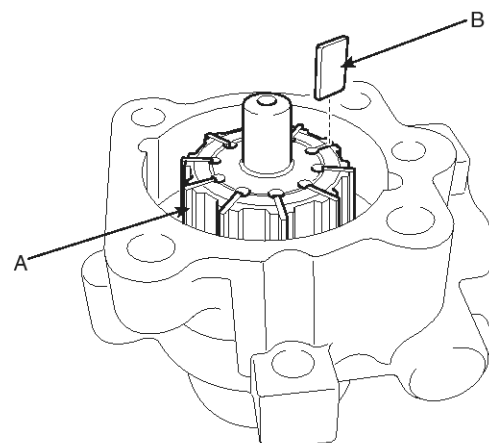
SENST7512D

5. Insert the rotor (A) into the pump body.



SENST7511D

6. Insert the vanes (A) into the rotor (B).

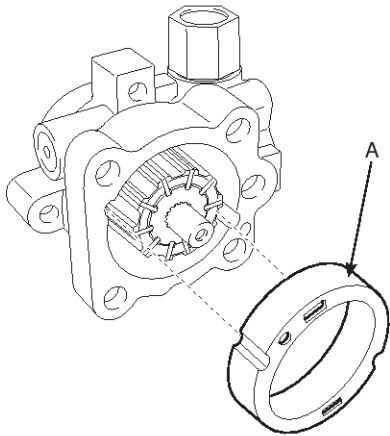


SENST7510D

ST-20

Steering System

7. Insert the cam ring (A) into the pump body.



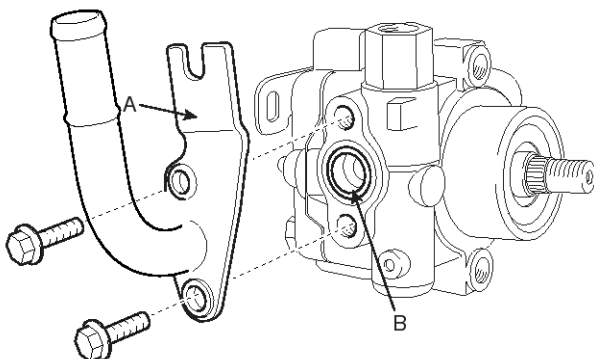
SENST7509D

8. Assemble a new gasket (B) and pump cover (A) to the pump body and then tighten the mounting bolts.



SENST7508D

9. Assemble a new O-ring (B) and suction pipe (A) and then tighten the mounting bolts.



SHMST8304D