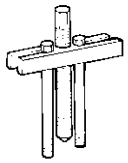
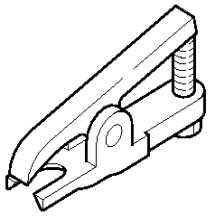
General Information

SPECIAL TOOLS

Tool (Number and Name)	Illustration	USE
09561-11001 Steering wheel puller		Removal of the steering wheel
09568-34000 Ball joint puller		Removal of the tie rod end ball joint

GENERAL

SPECIFICATIONS

Item		Specification
Type		EPS (Electric Power Steering) system
Steering wheel rotation (Lock to lock)	Vehicles with D2.0 engine or 225 tire	2.58 turns and over
	Others	2.69 turns and over
Steering gear (Rack stroke)	Type	Rack & Pinion
	Vehicles with D2.0 engine or 225 tire	134mm (5.28in.)
	Others	140mm (5.51in.)

TIGHTENING TORQUE

Items	Tightening torque		
	Nm	kgf.m	lb-ft
Hub nuts	90 ~ 110	9.0 ~ 11.0	65 ~ 80
Steering wheel lock nut	40 ~ 50	4.0 ~ 5.0	29 ~ 36
Steering column mounting bolts and nuts	13 ~ 18	1.3 ~ 1.8	9.4 ~ 13.0
Bolt connecting universal joint to pinion	30 ~ 35	3.0 ~ 3.5	22 ~ 25
Bolt connecting steering column to universal j-oint	30 ~ 35	3.0 ~ 3.5	22 ~ 25
Tie-rod end castle nut	24 ~ 34	2.4 ~ 3.4	17 ~ 25
Lower arm ball joint bolts	100 ~ 120	10.0 ~ 12.0	72 ~ 87
Steering gear box mounting bolts	60 ~ 80	6.0 ~ 8.0	43 ~ 58
Stabilizer link nut	100 ~ 120	10.0 ~ 12.0	72 ~ 87
Front and Rear roll stopper bolt & nut	50 ~ 65	5.0 ~ 6.5	36 ~ 47
Rear roll stopper mounting bolts	50 ~ 65	5.0 ~ 6.5	36 ~ 47
Sub frame stay mounting bolts & nuts	45 ~ 55	4.5 ~ 5.5	33 ~ 40
Sub frame mounting bolts & nuts	160~ 180	16.0 ~ 18.0	116 ~ 130

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 CAN (Controller Area Network), resulting in a more precise and timely control of steering assist than conventional engine-driven hydraulic systems.

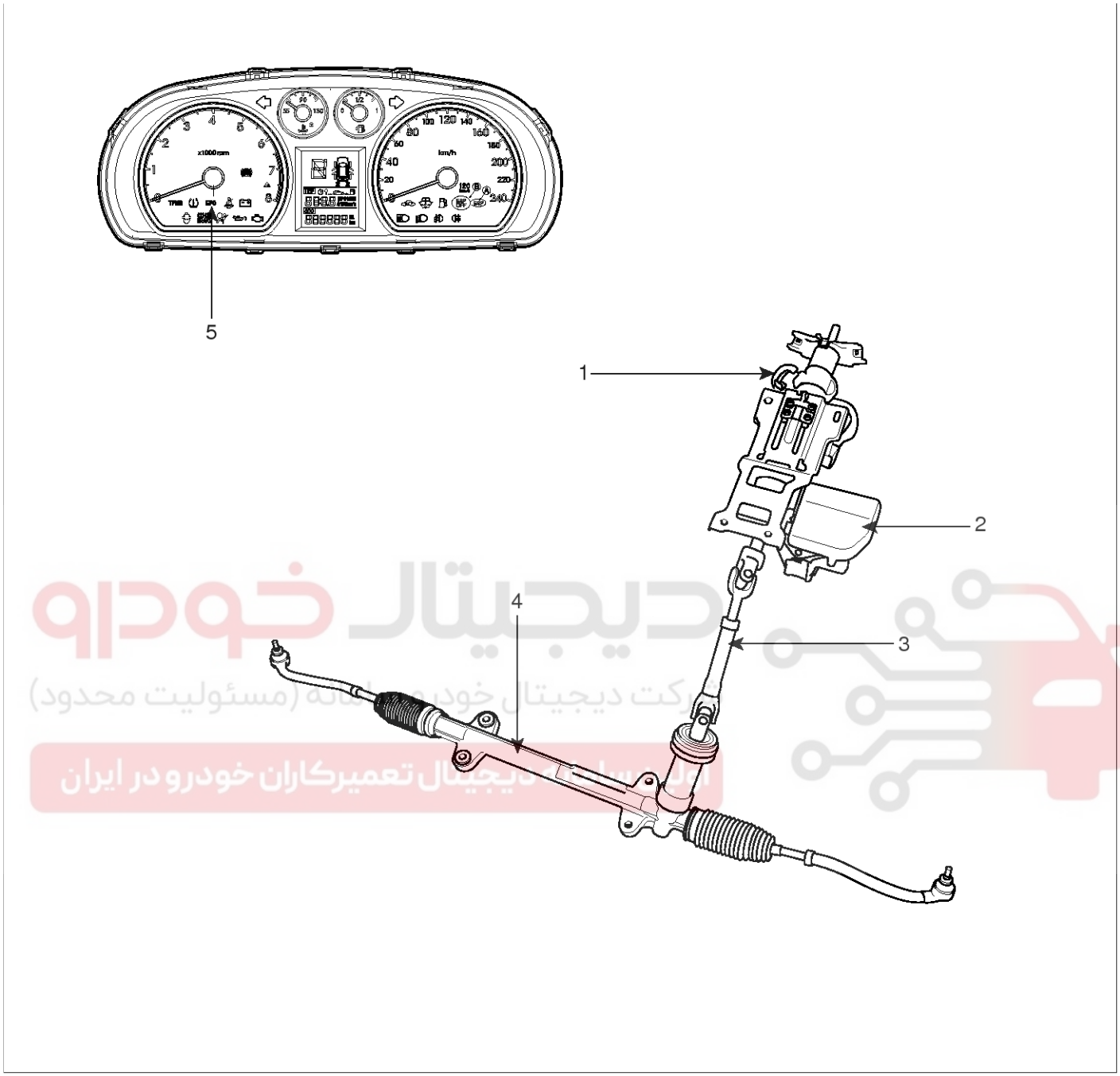
Components (Steering Angle Sensor, Torque Sensor, Fail-safe relay, etc.) of the EPS system are located inside the steering column & EPS unit assembly and the steering column & EPS unit assembly must not be disassemble to inspect or replace them.

NOTES WITH REGARD TO DIAGNOSIS

Trouble factor	Check item	Trouble symtom	Explanation	Note
Drop, impact, and overload	Motor	Abnormal noise	- Visable or unvisable 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	- Do not use the impacted EPS. - Do not overload each parts.
	ECU	Circuit damage - Wrong welding point - Broken PCB - Damaged precise parts		
	Torque sensor	Insufficient steering effort	Overload to INPUT shaft can cause malfunction of the torque sensor	- 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	- 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	- Waterproof at the normal condition - Even a little moisture can cause malfunction of the precise parts of the motor/ECU	- Keep the normal temperature and proper moisture, while storaging - 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.

COMPONENTS



1. Key lock assembly
2. Steering column & EPS unit assembly
3. Universal joint assembly
4. Steering gear box
5. EPS warning lamp

SFDST8303L

GENERAL INSPECTION

After or before servicing the EPS system, perform the troubleshooting and test procedure as follows. Compare the system condition with normal condition in the table below and if abnormal symptom is detected, perform necessary remedy and inspection.

Test condition	Normal condition: Motor must not supply steering assist.		
	Symptom	Possible cause	Remedy
IG Off	Motor supplies steering assist.	ASP is not calibrated.	Perform the ASP calibration using a scan tool.
		IG power supplies	Inspect the IG power supply line.

Test condition	Normal condition: Motor must not supply steering assist, Warning lamp is illuminated.		
	Symptom	Possible cause	Remedy
IG On/Engine Off	Motor supplies steering assist.	ASP is not calibrated.	Perform the ASP calibration using a scan tool.
		EMS CAN signal is not received.	Inspect the CAN line.
	Warning lamp is not illuminated.	Cluster fault	Inspect the cluster and cluster harness

Test condition	Normal condition: Motor supplies steering assist, Warning lamp is not illuminated.		
	Symptom	Possible cause	Remedy
IG On/Engine On	Warning lamp is illuminated and Motor dose not supply steering assist.	EPS (Hot at all times) and IG power supply fault	Inspect the connector and harness for EPS (Hot at all times) and IG power supply line.
		DTC is detected by system.	Perform the self test using a scan tool and repair or replace.
	Warning lamp is illuminated and Motor supplies steering assist.	ASP is not calibrated.	Perform the ASP calibration using a scan tool.
		CAN communication between EPS and cluster is fault.	Inspect the CAN line.

ASP: Absolute Steering Position

CAN: Controller Area Network

EMS: Engine Management System

⚠CAUTION

The following symptoms may be occurred during normal vehicle operation and if there is no EPS warning light illumination, it is not malfunction of EPS system.

- **After turning the ignition switch on, the steering wheel becomes heavier while it performs EPS system diagnostics, for about 2 seconds, then it becomes normal steering condition.**
- **After turning the ignition switch on or off, EPS relay noise may occur but it is normal.**
- **When it is steered, while the vehicle is stopped or in low driving speed, motor noise may occur but it is normal operating one.**

Caution when ASP (Absolute Steering Position) calibration or EPS type recognition

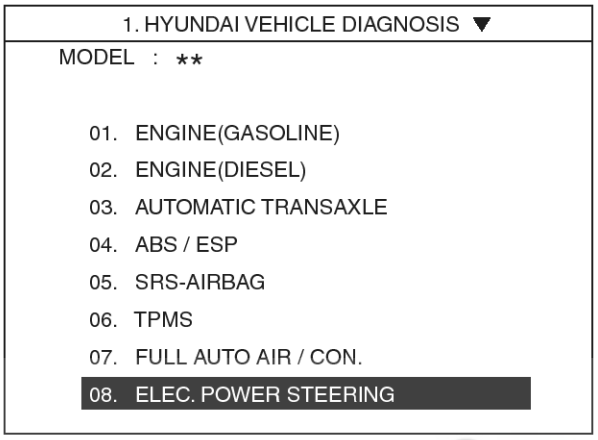
- Check if the battery is fully charged before ASP calibration or EPS type recognition.
- Be careful not to disconnect any cables connected to the vehicle or scan tool during ASP calibration or EPS type recognition.
- When the ASP calibration or EPS type recognition is completed, turn the ignition switch off and wait for several seconds, then start the engine to confirm normal operation of the vehicle.

Scan tool (Hi-Scan Pro) installation

1. Attach the CAN interface module to the Hi-Scan Pro main body and securely tighten the two bolts.
2. Install the CAN interface module to the Data Link Cable and securely tighten the two bolts.

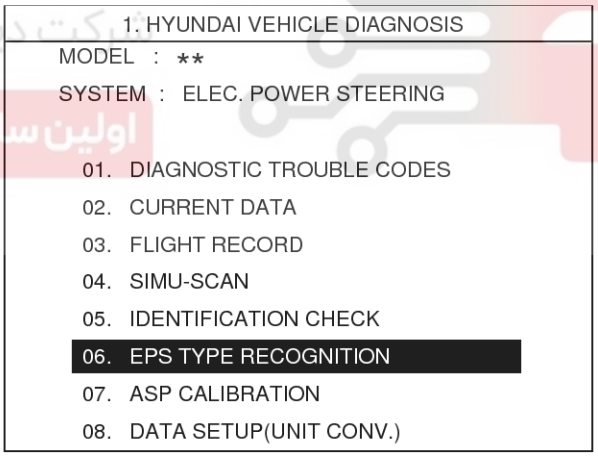
ASP calibration procedure

1. Plug DLC cable from a scan tool into the vehicle's data link connector located under the instrument panel on the driver's side.
2. Turn the ignition switch ON position.
3. Turn the steering wheel so that the front wheel can face straight ahead.
4. Select a model and ELECTRIC POWER STEERING.



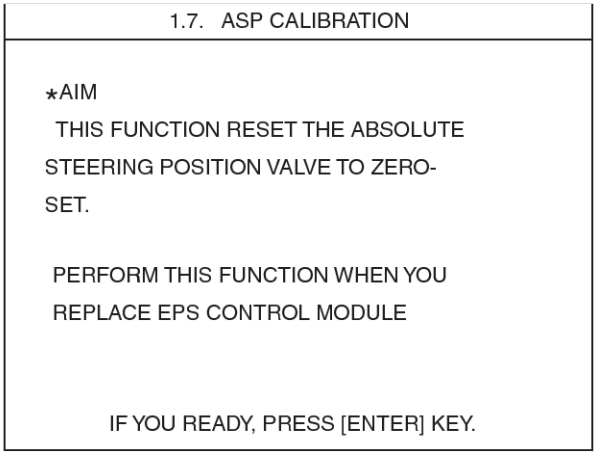
SEDST7500L

5. Select the ASP CALIBRATION and press ENTER.



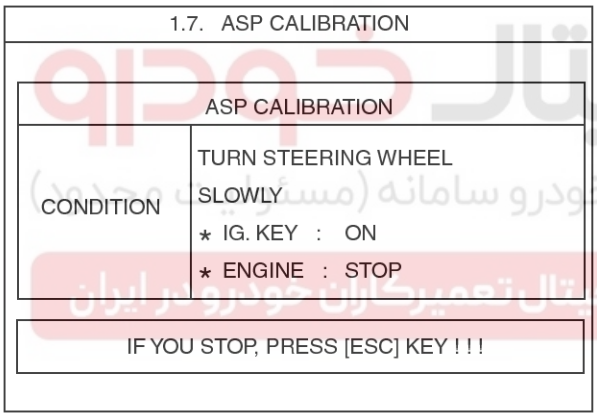
SFDST8307L

6. Check the massage on the screen and press ENTER'.



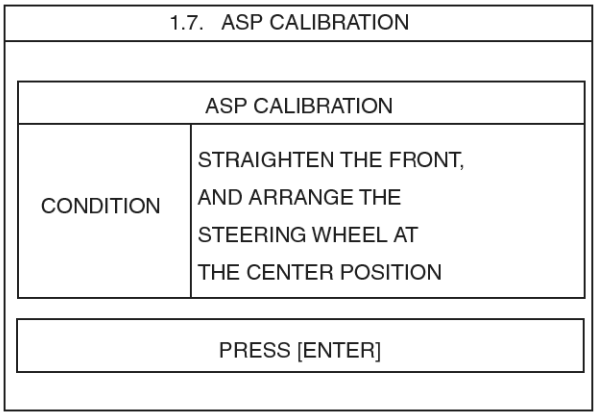
SHDST6506L

7. Confirm the vehicle condition (IG On) and then turn the steering wheel until massage changes to the next screen.



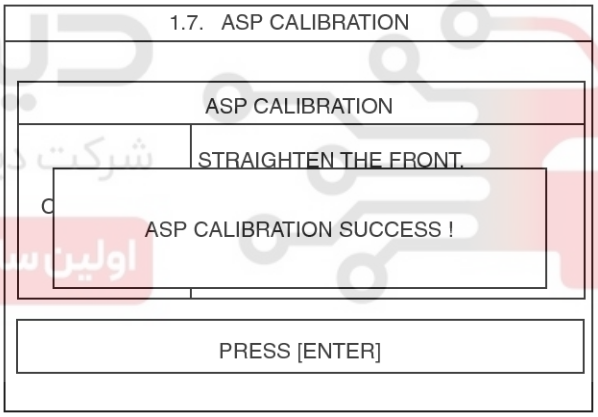
SHDST6507L

8. When the massage is displayed on the screen as follows, turn the steering wheel so that the front wheel can face straight ahead and then press ENTER.



SHDST6508L

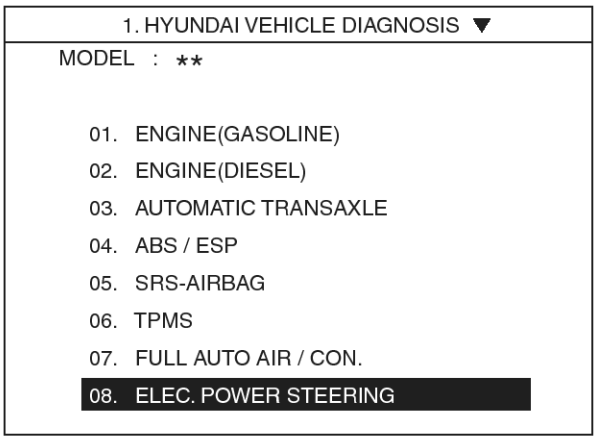
9. When the calibration is completed, the massage will be displayed on the screen as follows.



SHDST6509L

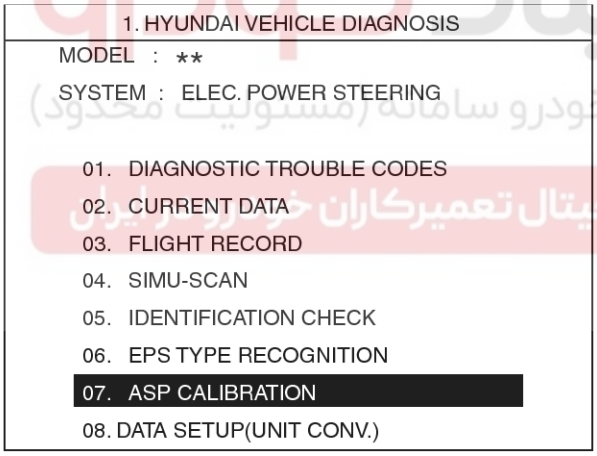
EPS type recognition procedure

1. Plug DLC cable from a scan tool into the vehicle's data link connector located under the instrument panel on the driver's side.
2. Turn the ignition switch ON position.
3. Select a model and ELECTRIC POWER STEERING.



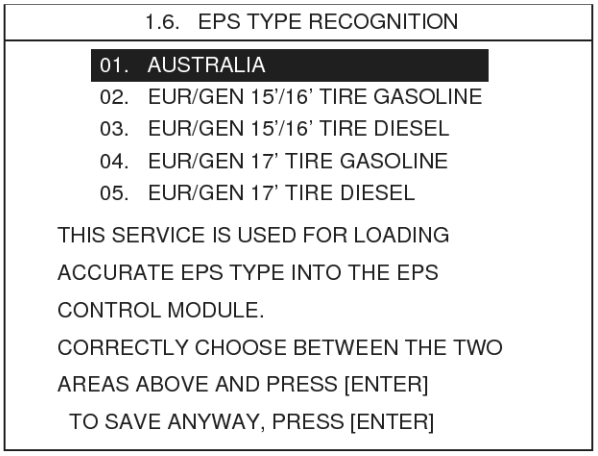
SEDST7500L

4. Select the EPS type recognition and press ENTER.



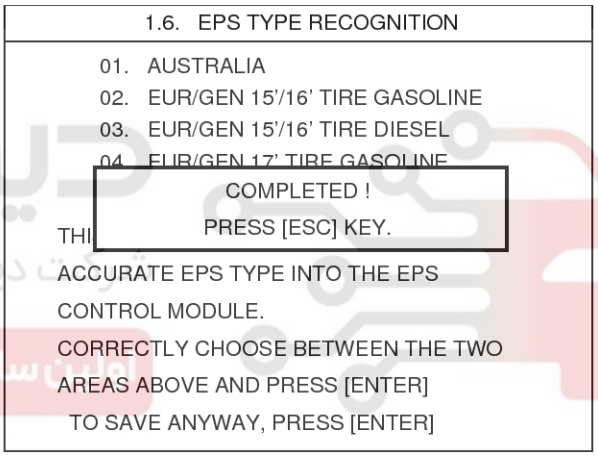
SEDST7501L

5. Select the affected area and press ENTER.



SFDST8300L

6. When the EPS type recognition is completed, the massage will be displayed on the screen as follows.

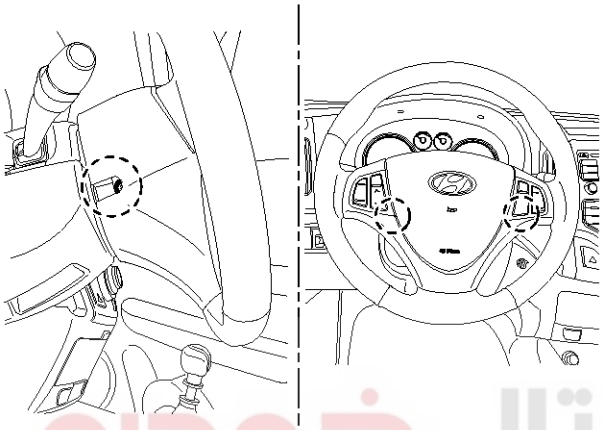


SFDST8301L

Steering Column and Shaft

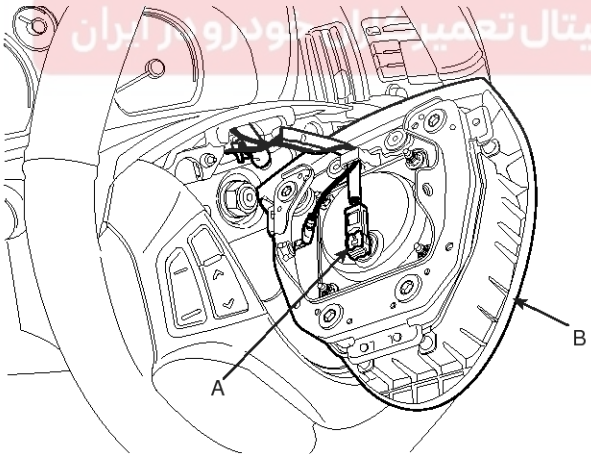
REMOVAL

1. Disconnect the battery negative cable from the battery and then wait for 30 seconds.
2. Turn the steering wheel so that the front wheels can face straight ahead.
3. Loosen the torx bolts which are located on the both side of the steering wheel.



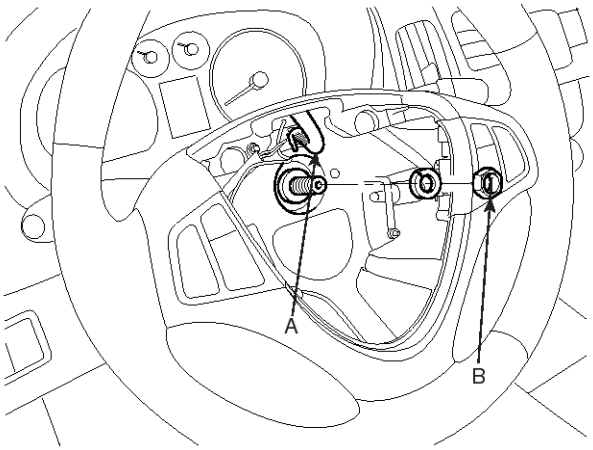
SFDST8304L

4. Disconnect the connector (A) from the airbag module and then remove the airbag module (B) from the steering wheel.



SFDST8305L

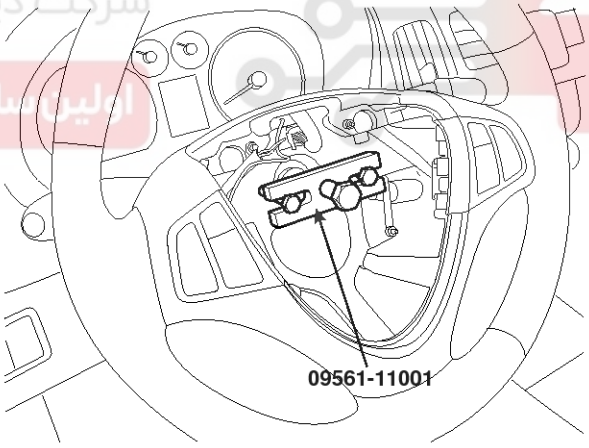
5. Disconnect the remote switch connector (A) and remove the steering wheel lock nut (B) and washer.



SFDST8002L

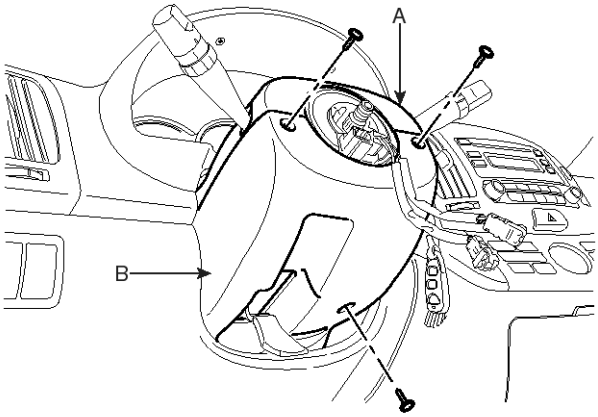
6. Remove the steering wheel from the steering column shaft by using a SST (09561-11001).

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



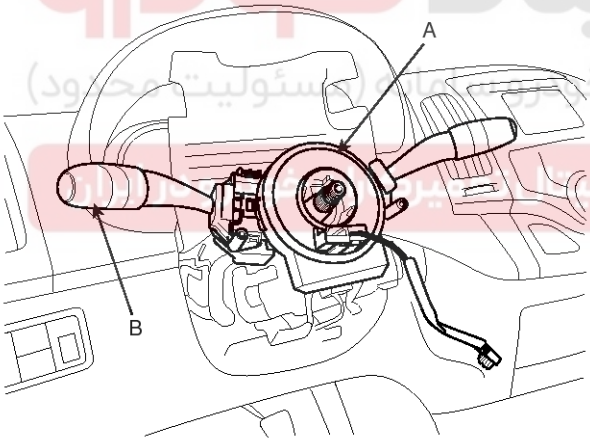
SFDST8003L

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



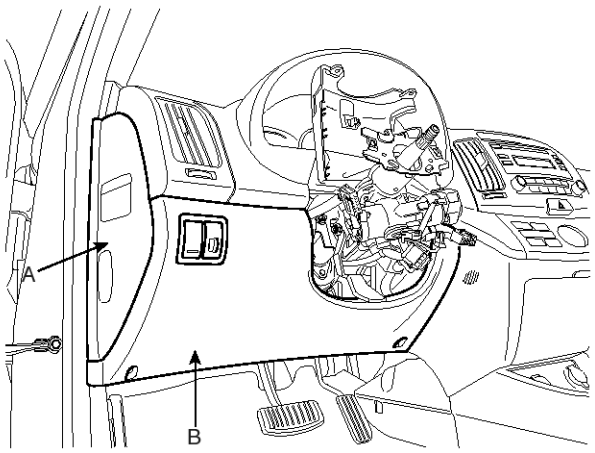
SHDST6006D

8. Disconnect the connectors from the lower portion of the clock spring and then remove the clock spring (A) from the steering column shaft.
9. Remove the multifunction switches (B) from the steering column with the portion indicated by the arrow pressed.



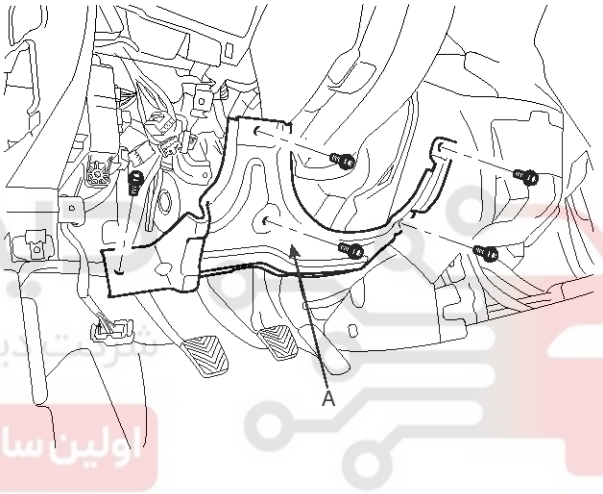
SFDST8004L

10. Remove the lower side panel (A) and crash pad (B).



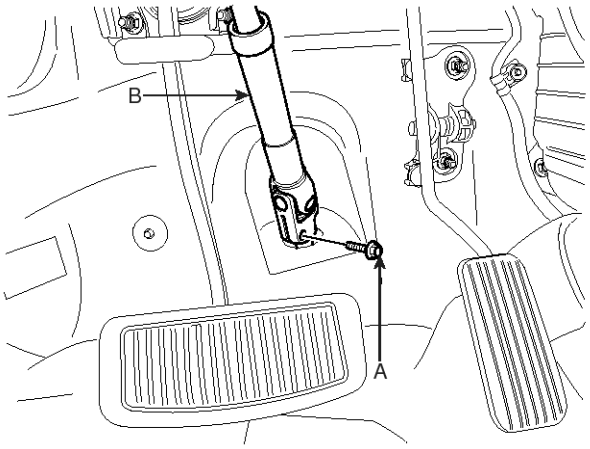
SHDST6009D

11. Remove the reinforce panel (A).



SFDST8005L

12. Loosen the bolt (A) and then disconnect the universal joint assembly (B) from the pinion of the steering gear box.

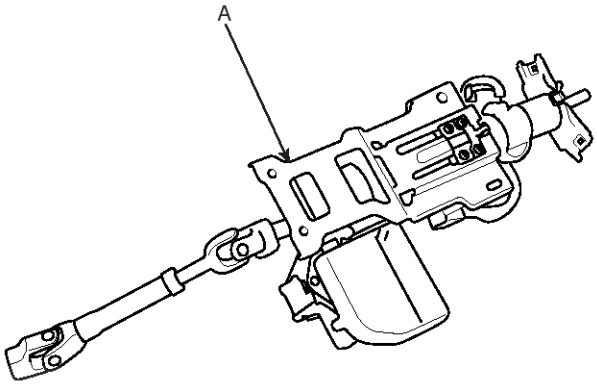


SHDST6011D

CAUTION

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

13. Disconnect all connectors connected to the steering column & EPS unit assembly.
14. Remove the steering column & EPS unit assembly (A) by loosening the mounting bolts and nuts.



SFDST8006L

INSTALLATION

CAUTION

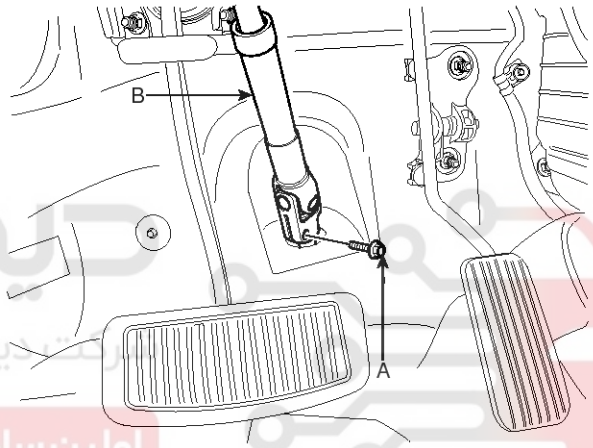
Apply the multipurpose grease to sliding surface of the each part before the installation.

1. Install the steering column & universal joint assembly by tightening the bolts and nuts.

Tightening torque Nm (kgf.m, lb-ft):
13 ~ 18 (1.3 ~ 1.8, 9.4 ~ 13.0)

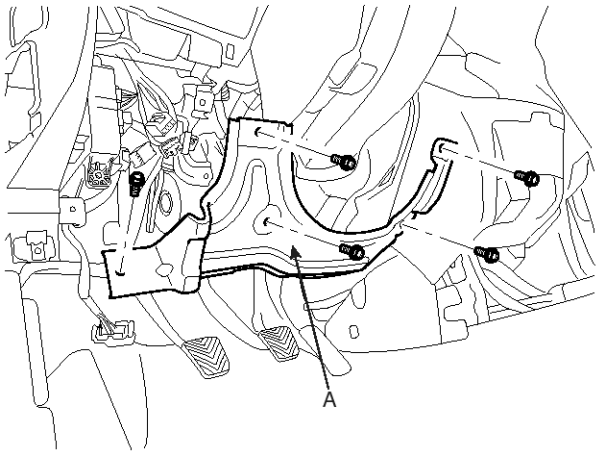
2. Connect all connectors connected to the steering column & EPS unit assembly.
3. Connect the universal joint assembly (B) to pinion of the steering gear box and then tighten the bolt (A).

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



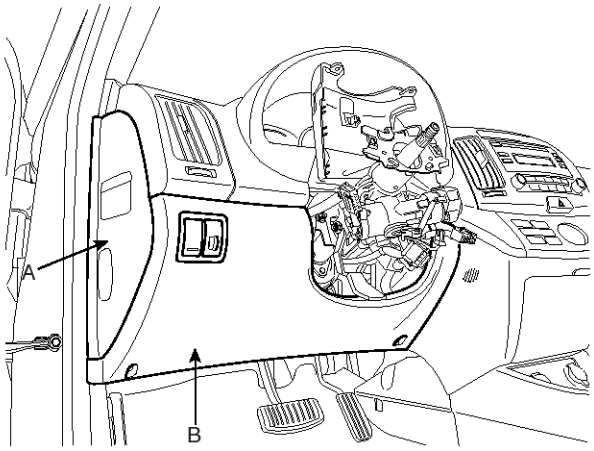
SHDST6011D

4. Install the reinforce panel (A).



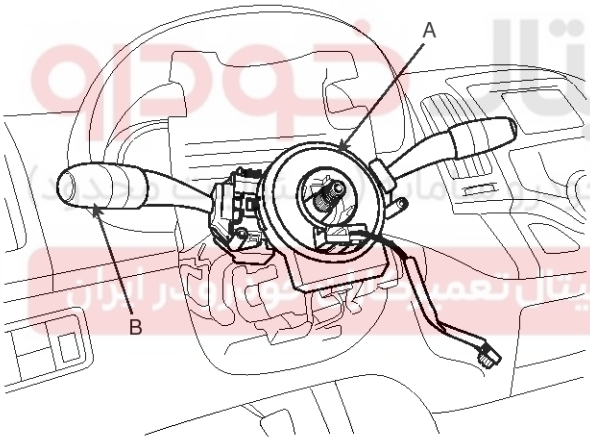
SFDST8005L

5. Install the lower crash pad (A) & side panel.



SHDST6009D

6. Install the multifunction switches (B) to steering column.
7. Install the clock spring (B) to steering column assembly and then connect the connectors (A).

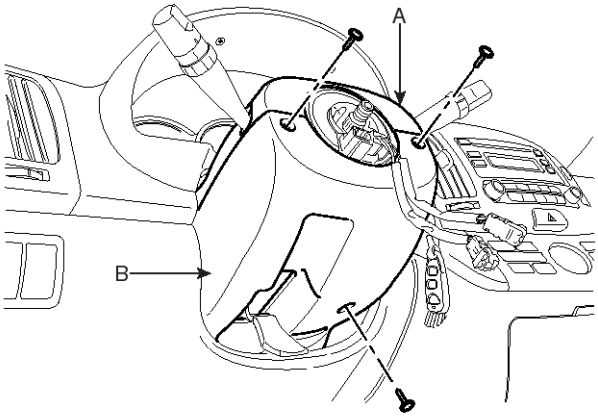


SFDST8004L

⚠CAUTION

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

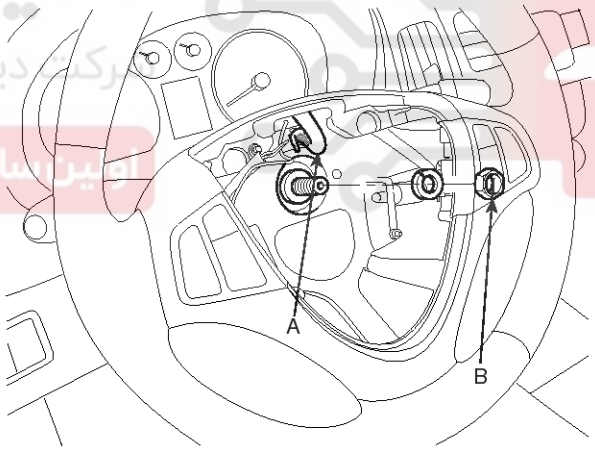
8. Install the steering column upper (A) and lower (B) shroud.



SHDST6006D

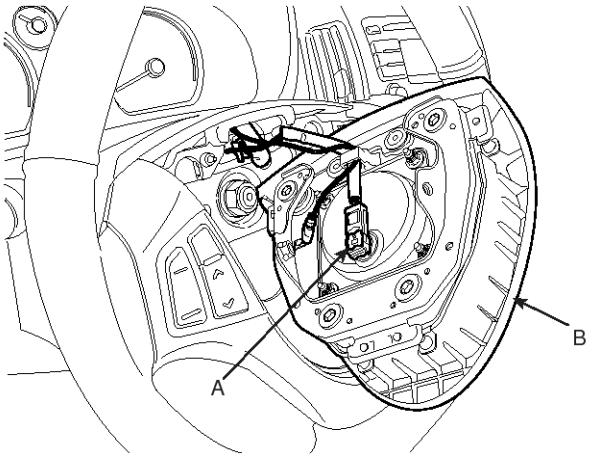
9. Connect the remote switch connector (A).
10. Install the steering wheel to the steering column shaft and then tighten the lock nut (B) and the washer together.

Tightening torque Nm (kgf.m, lb-ft):
40 ~ 50 (4.0 ~ 5.0, 29 ~ 36)



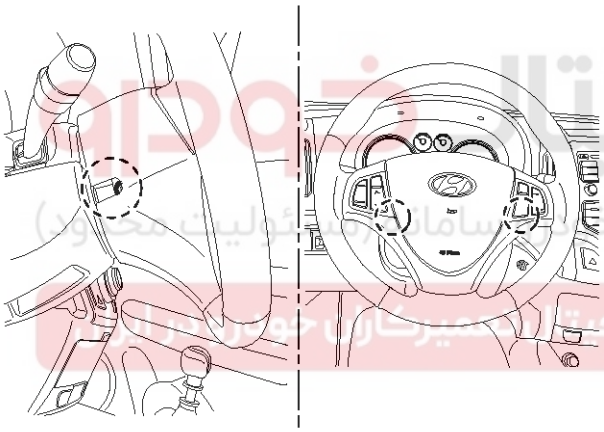
SFDST8002L

11. Connect the connector (A) to air bag module and then install the airbag module (B) to steering wheel.



SFDST8305L

12. Tighten the torx bolts which are located on the both side of the steering wheel.



SFDST8304L

13. Connect the battery negative cable to the battery.
14. Check and adjust the front wheel alignment. (Refer to SS group)
15. When the steering column & EPS unit assembly is replaced, perform EPS type recognition procedure using a scan tool. (Refer to EPS type recognition)
16. Perform the ASP (Absolute Steering Position) calibration procedure. (Refer to ASP calibration)

⚠CAUTION

If the ASP calibration procedure is not performed. EPS warning lamp will be turned on or flicker and vehicle may pull to the left or the right.

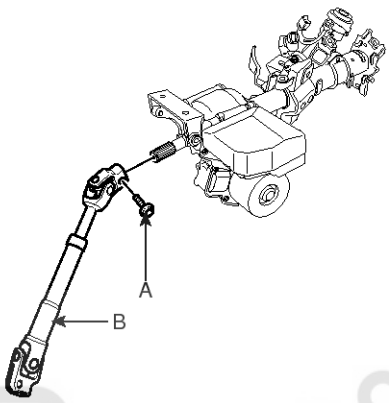
DISASSEMBLY AND REASSEMBLY

⚠CAUTION

Do not disassemble the steering column & EPS unit assembly.

1. Loosen the bolt (A) and then disconnect the universal joint assembly (B) from the steering column assembly.

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



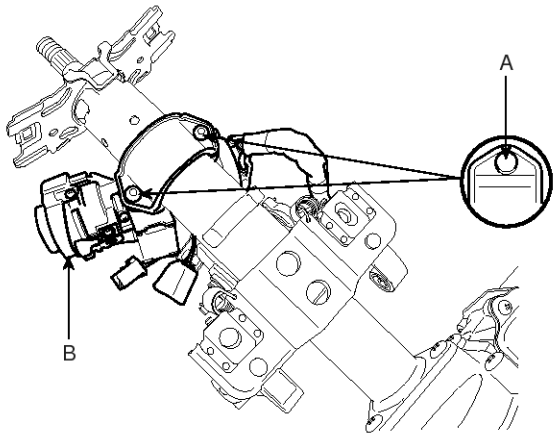
SHDST6017D

2. Make a groove the head of special bolts (A) by a punch.

⚠CAUTION

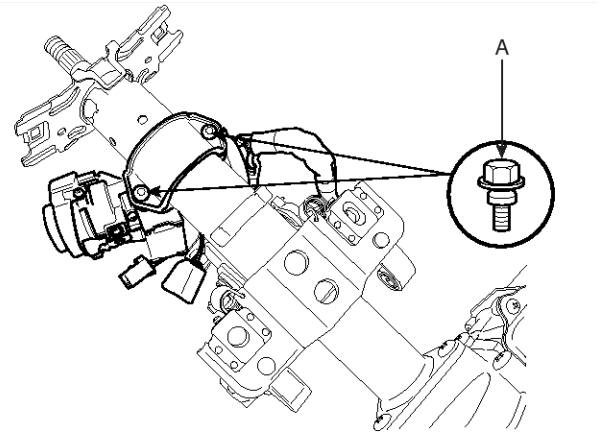
Do not impact the steering column mounting bracket and EPS unit.

3. Loosen the special bolts by using screw driver and than remove the key lock assembly (B) from the steering column assembly.



SHDST6500D

4. Reassembly is the reverse of the disassembly. When reassembling the key lock assembly, install the key lock assembly to the steering column and then tighten new special bolts until its head (A) is cut off.



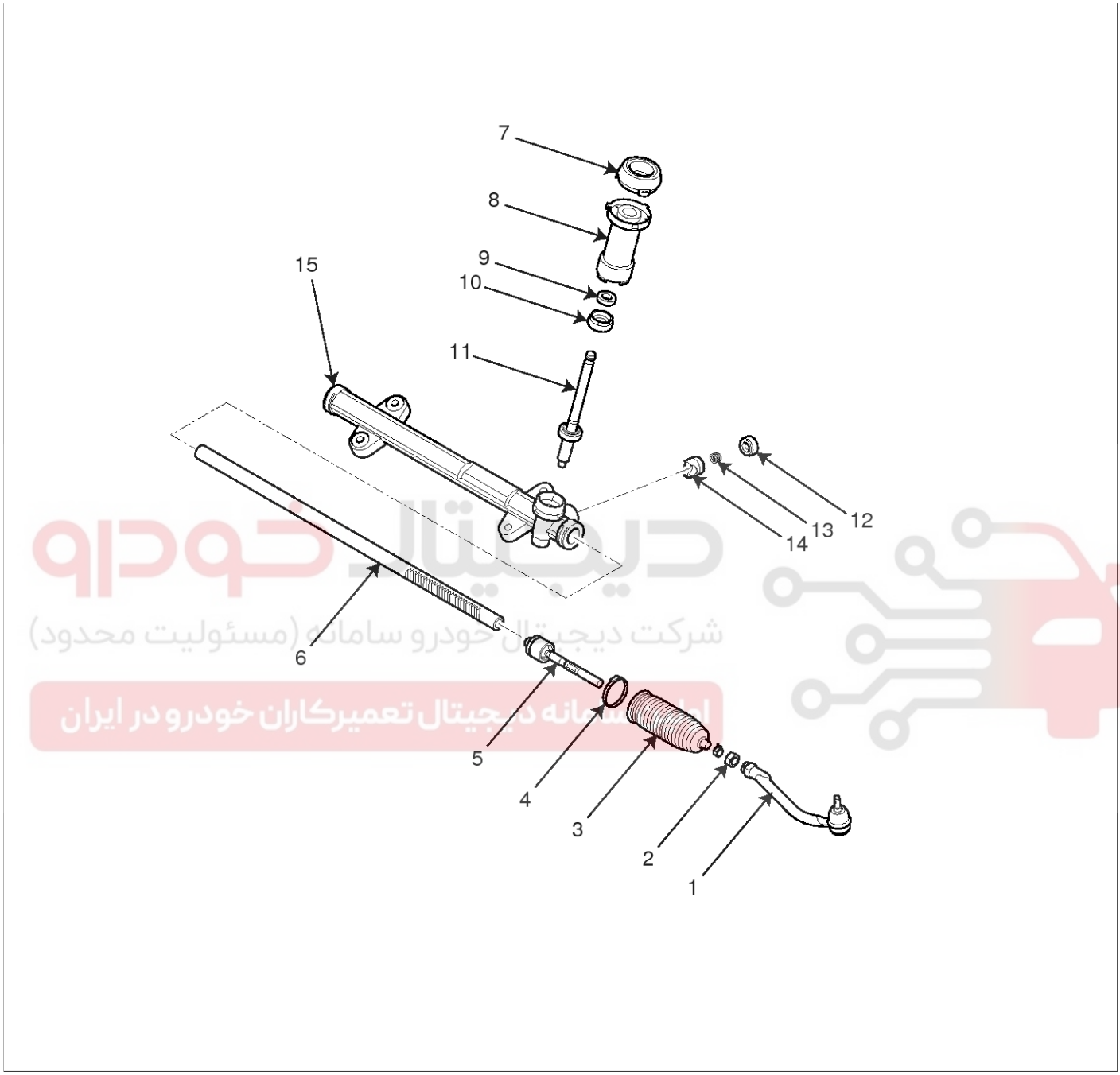
SHDST6501D

INSPECTION

1. Check the steering column for damage and deformation.
2. Check the connection for play, damage and smooth operation.
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.

Steering Gear box

STEERING GEAR BOX

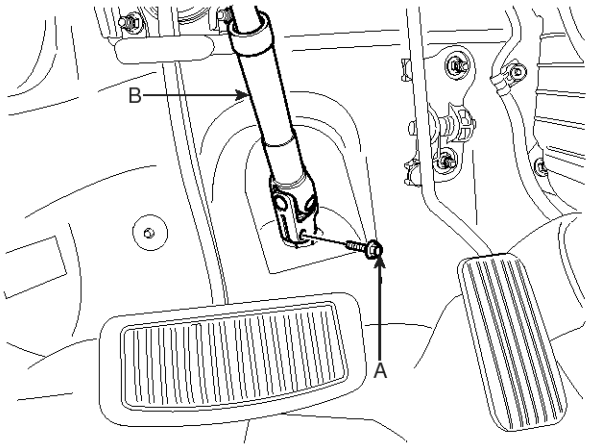


1. Tie rod end
2. Lock nut
3. Bellows band
4. Bellows
5. Tie rod
6. Rack bar
7. Dust packing
8. Dust cap
9. Oil seal
10. Pinion plug
11. Pinion assembly
12. Yoke plug
13. Yoke spring
14. Support yoke assembly
15. Rack housing

SFDST8306L

REMOVAL

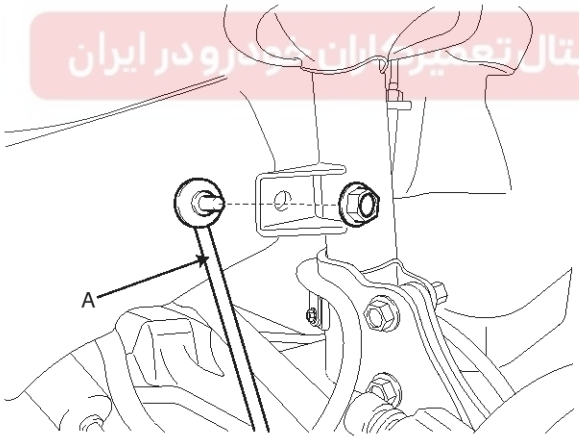
1. Remove the front wheel & tire.
2. Loosen the bolt (A) and then disconnect the universal joint assembly (B) with the pinion of the steering gear box.



SHDST6011D

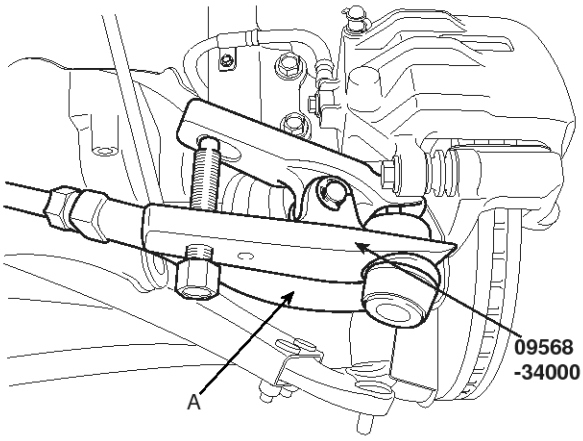
⚠CAUTION
Keep the neutral-range to prevent the damage of the clock spring inner cable when you handlethe steering wheel.

3. Disconnect the stabilizer link (A) from the front strut assembly by loosening the nut.



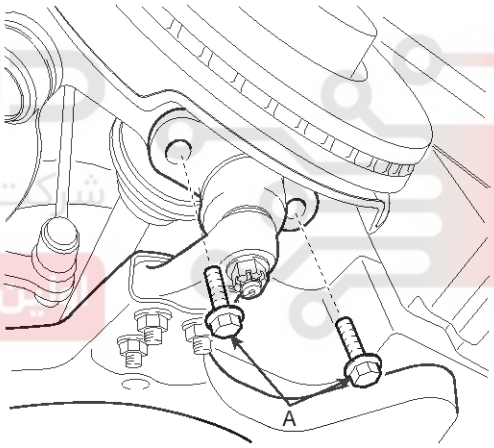
SUNST6020D

4. Remove the split pin and castle nut and then disconnect the tie rod end (A) with the knuckle by using a SST (09568-34000).



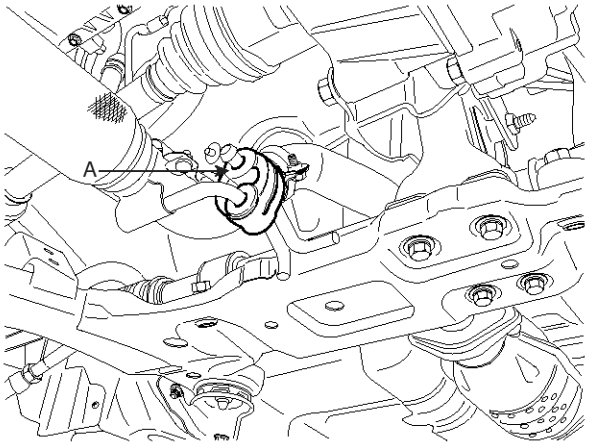
SUNST6021D

5. Disconnect the front lower arm with the knuckle by loosening the mounting bolts (A).



SUNST6510D

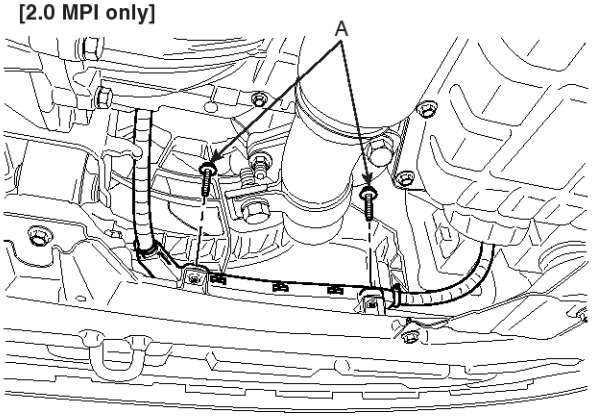
6. Remove the muffler rubber hanger (A).



SHDST6020D

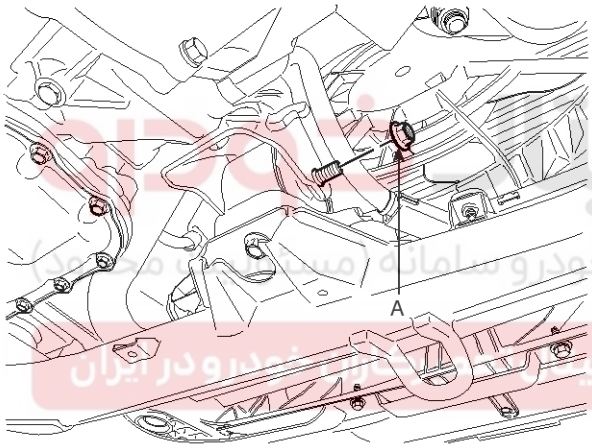
7. Loosen the wiring harness protector bolts (A).

[2.0 MPI only]

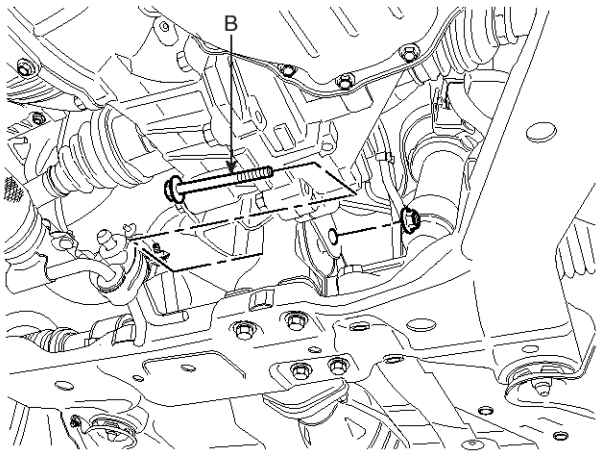


SHDSS6519D

8. Remove the front and rear roll stopper bolt and nut (A, B).

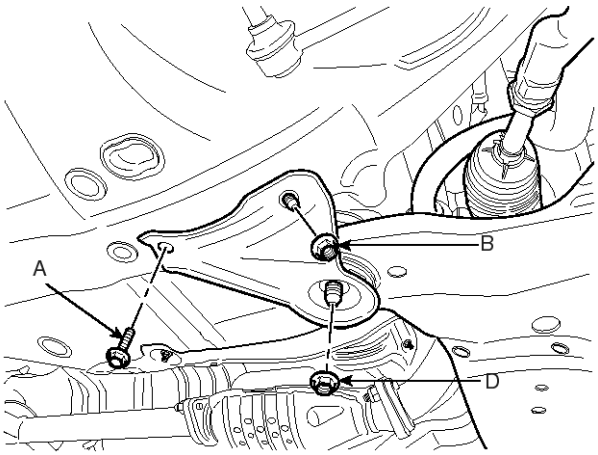


SHDST6021D

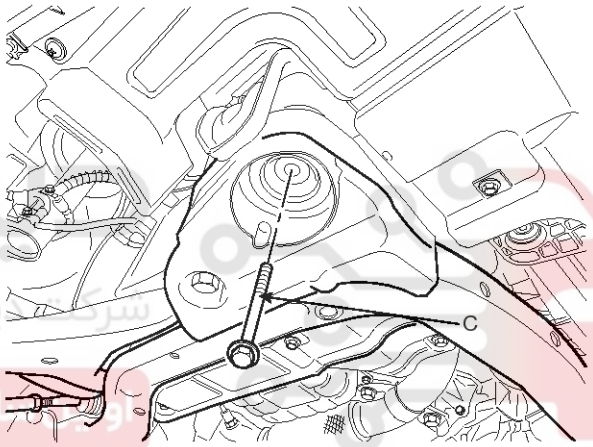


SEDST7504L

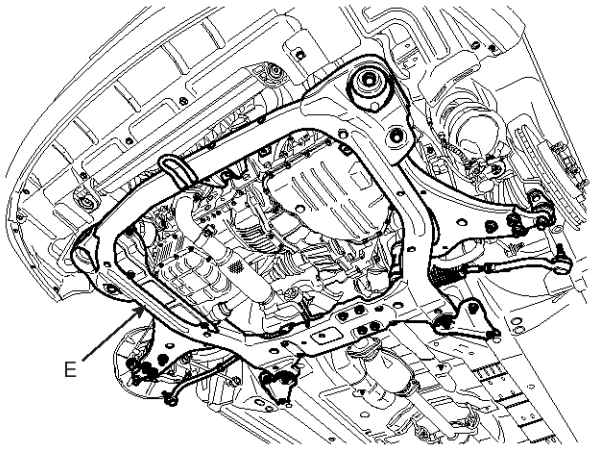
9. Remove the sub frame (E) and sub frame stay by loosening the mounting bolts (A, C) and nuts (B, D).



SHDST6038D

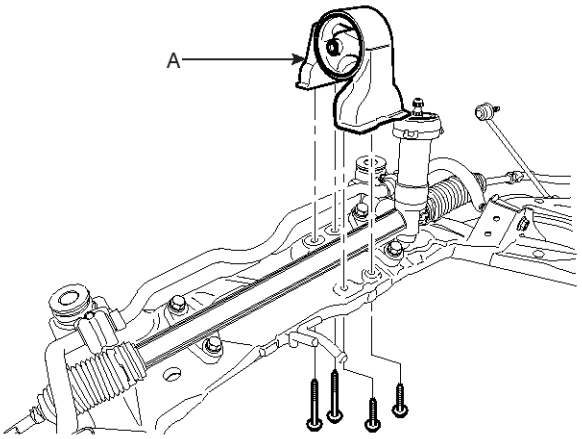


SHDST6039D



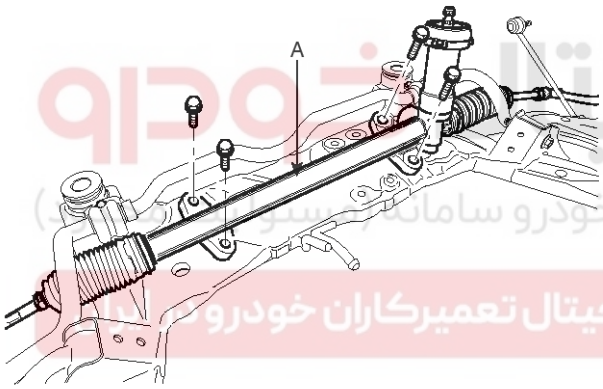
SHDST6023D

10. Remove the rear roll stopper (A) from the sub frame by loosening mounting bolts.



SEDST7506L

11. Remove the steering gear box (A) from the sub frame by loosening the mounting bolts.

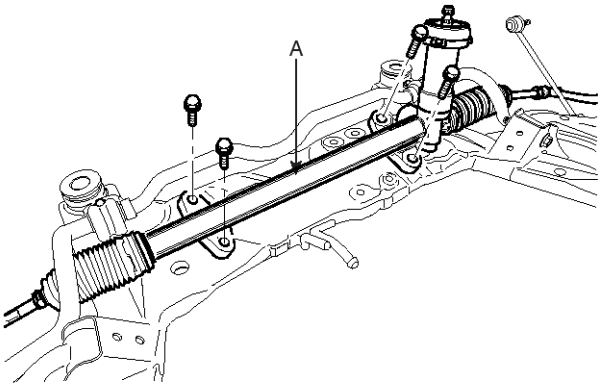


SEDST7507L

INSTALLATION

1. Install the steering gear box (A) to the sub frame by tightening the mounting bolts.

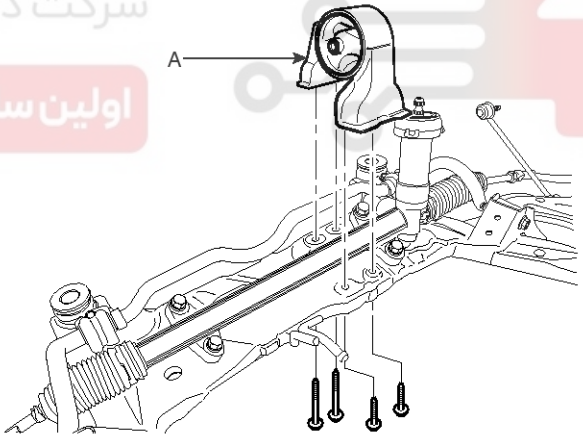
Tightening torque Nm (kgf.m, lb-ft):
60 ~ 80 (6.0 ~ 8.0, 43 ~ 58)



SEDST7507L

2. Install the rear roll stopper (A) to the sub frame by tightening the mounting bolts.

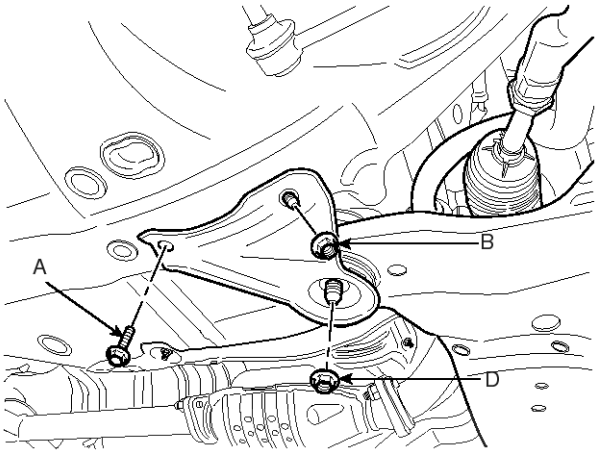
Tightening torque Nm (kgf.m, lb-ft):
50 ~ 65 (5.0 ~ 6.5, 36 ~ 47)



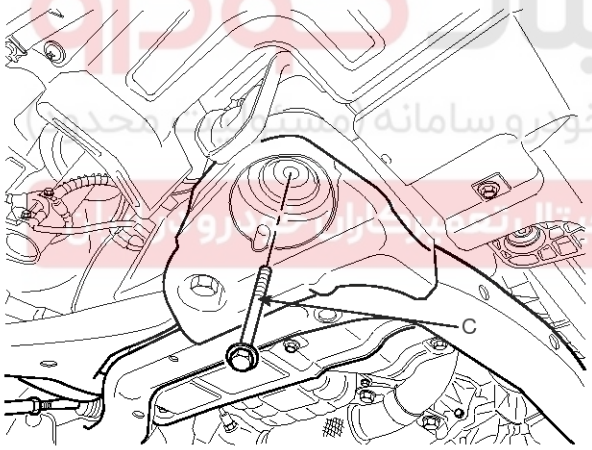
SEDST7506L

3. Install the sub frame (E) and sub frame stay by tightening the mounting bolts (A, C) and nuts (B, D).

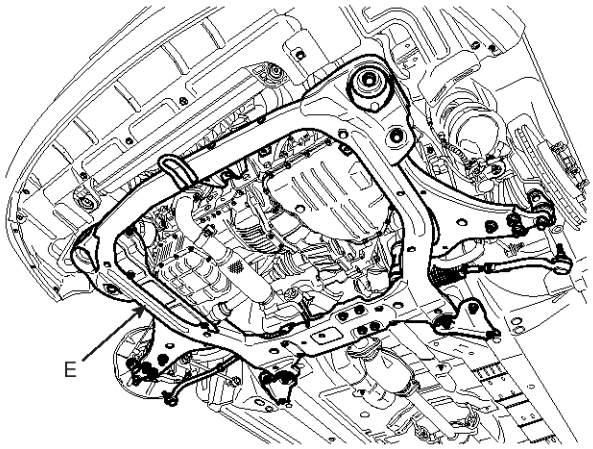
Tightening torque Nm (kgf.m, lb-ft)
Sub frame mounting bolts (C) and nuts (D):
160 ~ 180 (16.0 ~ 18.0, 116 ~ 130)
Sub frame stay mounting bolt (A) and nut (B):
45 ~ 55 (4.5 ~ 5.5, 33 ~ 40)



SHDST6038D



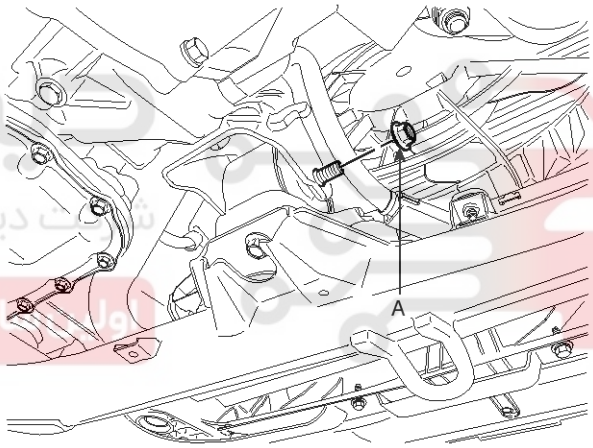
SHDST6039D



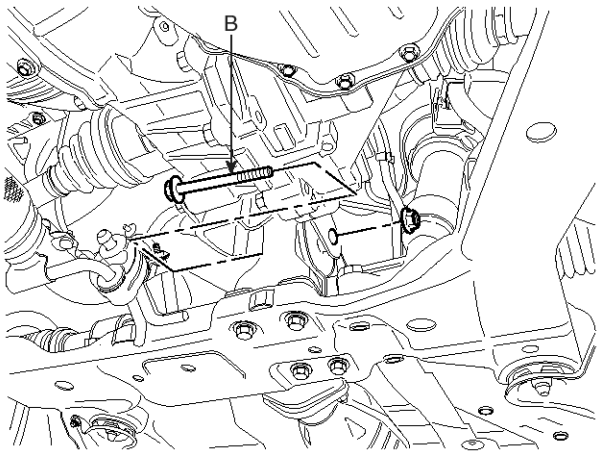
SHDST6023D

4. Tighten the front and rear roll stopper bolt and nut (A, B).

Tightening torque Nm (kgf.m, lb-ft):
50 ~ 65 (5.0 ~ 6.5, 36 ~ 47)



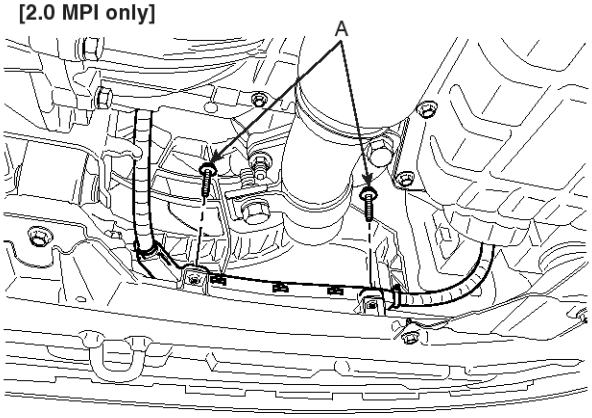
SHDST6021D



SEDST7504L

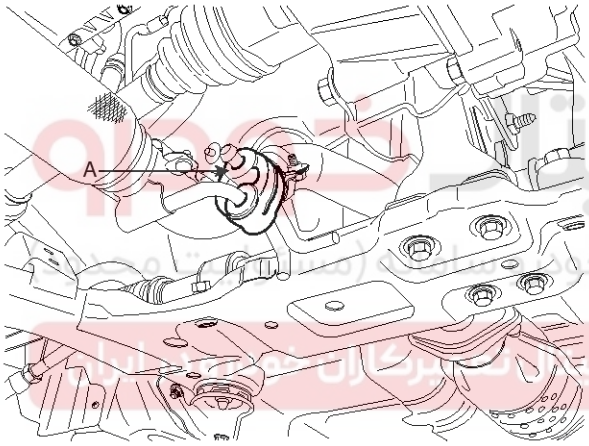
5. Install the wiring harness protector to the sub-frame by tightening the bolts (A).

[2.0 MPI only]



SHDSS6519D

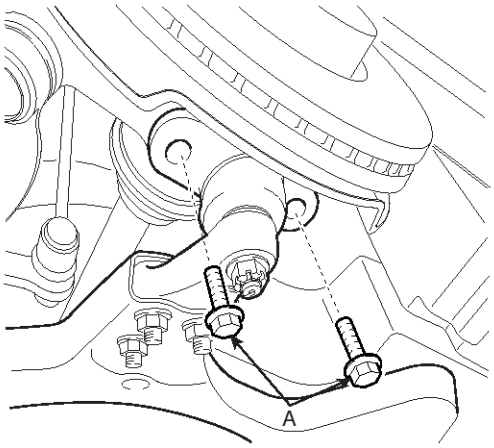
6. Install the muffler rubber hanger (A).



SHDST6020D

7. Connect the lower arm with the knuckle by tightening the bolts (A).

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



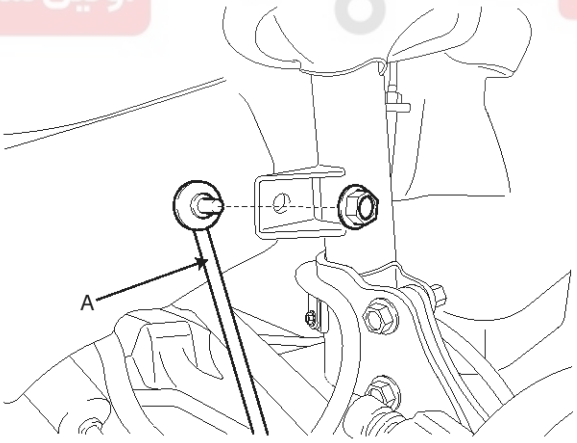
SUNST6510D

8. Connect the tie rod end with the knuckle and then install the castle nut and split pin.

Tightening torque Nm (kgf.m, lb-ft):
24 ~ 34 (2.4 ~3.4, 17 ~ 25)

9. Connect the stabilizer link (A) with the front strut assembly and than tighten the nut.

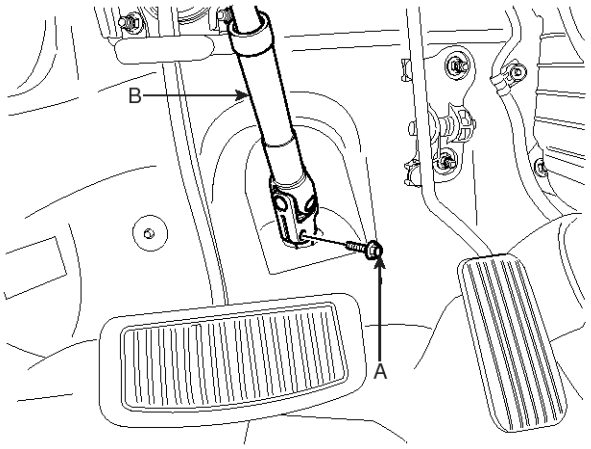
Tightening torque Nm (kgf.m, lb-ft):
100 ~ 120 (10.0 ~ 12.0, 72 ~ 87)



SUNST6020D

10. Connect the universal joint assembly (B) with the pinion of the steering gear box and then tighten the bolt (A).

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



SHDST6011D

11. Install the front wheel & tire.

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

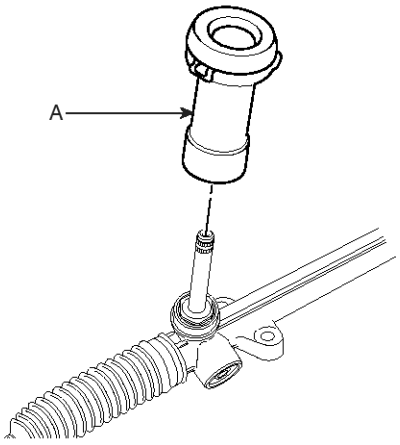
12. Check and adjust the front wheel alignment. (Refer to SS group)
13. Perform the ASP (Absoulte Steering Position) calibration procedure. (Refer to ASP calibration)

⚠CAUTION

If the ASP calibration procedure is not performed, EPS warning lamp will be turned on or flicker and behicle may pull to the left or the right.

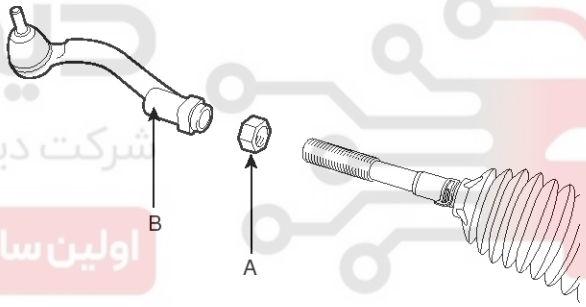
DISASSEMBLY

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



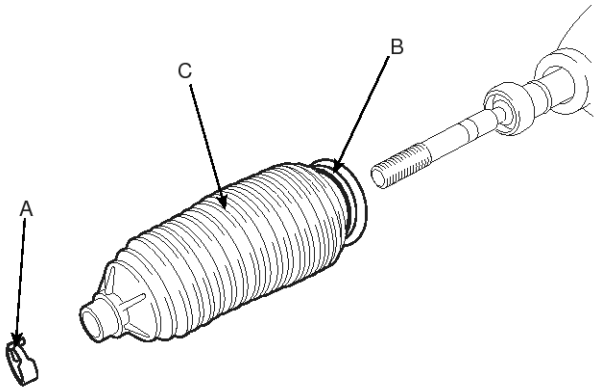
SEDST7508L

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



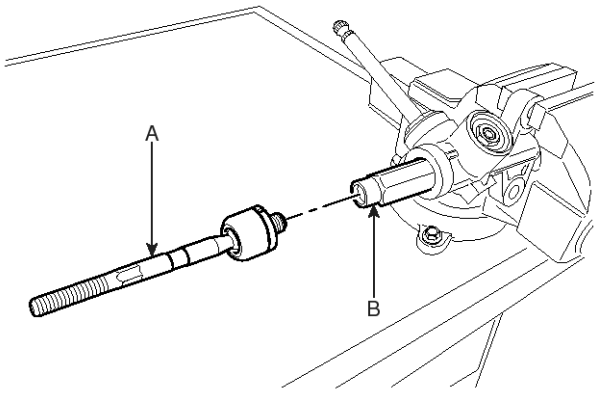
SUNST6032D

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



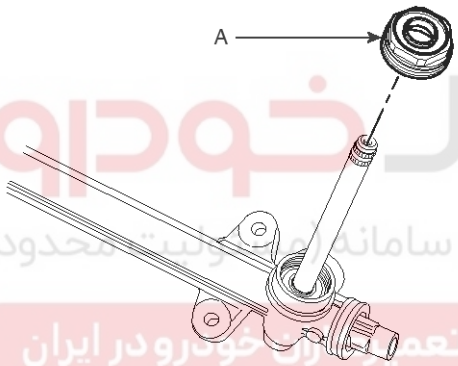
SUNST6033D

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



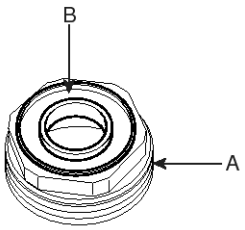
SHDST6028D

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



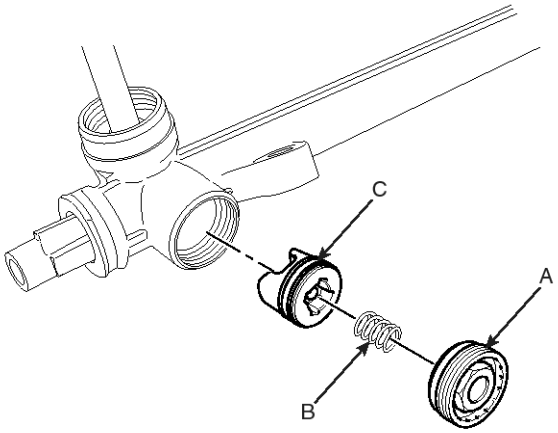
SEDST7509L

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



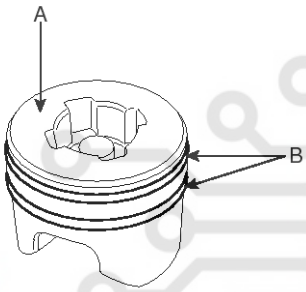
SHDST6030D

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



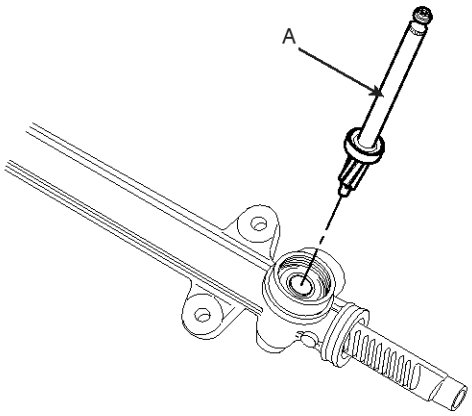
SEDST7510L

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



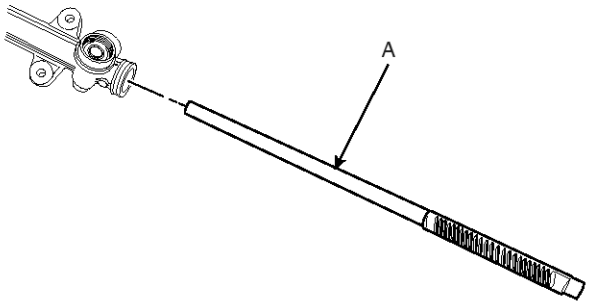
SHDST6032D

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



SEDST7511L

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



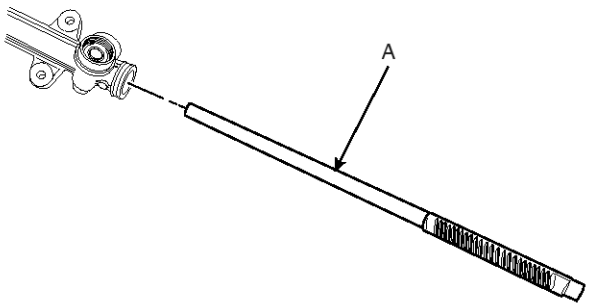
SEDST7512L

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.

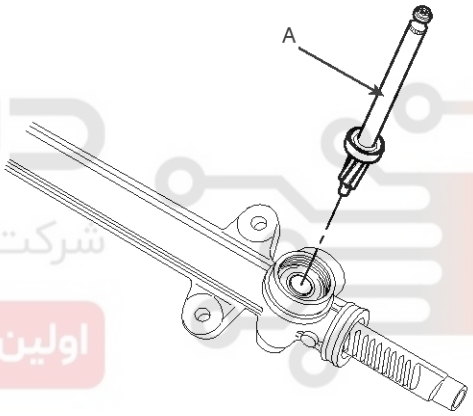
REASSEMBLY

1. Apply the grease to rack gear teeth and then insert the rack bar (A) into the rack hosing.



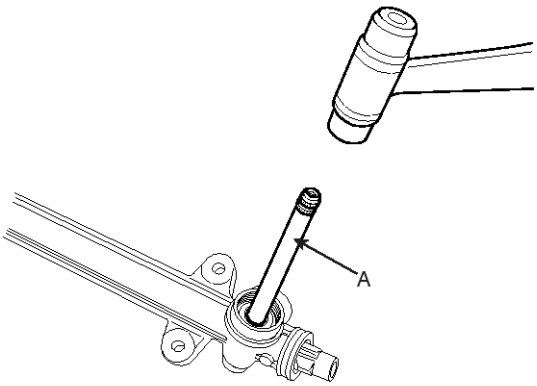
SEDST7512L

2. Insert the pinion assembly (A) into the pinion housing.



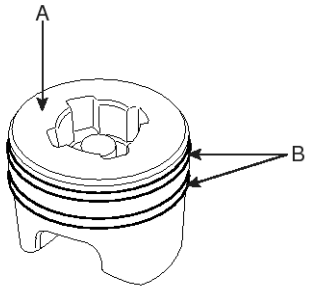
SEDST7511L

3. Tap the top of the pinion assembly with a plastic hammer to seat the pinion assembly thoroughly.



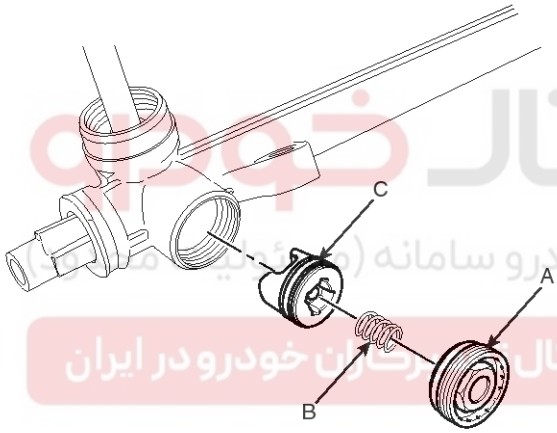
SEDST7513L

4. Assemble new O-rings (B) to support yoke (A).



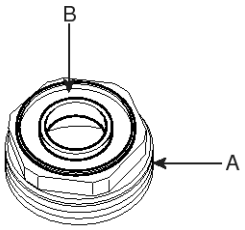
SHDST6032D

5. Insert the support yoke assembly (C) into the housing.
6. Apply the sealant to the thread of the yoke plug and then assemble the yoke plug (A) and the yoke spring (B) together.



SEDST7510L

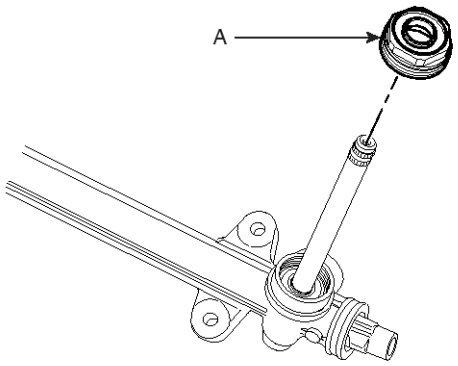
7. Apply the grease to the edge of the new oil seal (B) and then assemble it to the pinion plug (A).



SHDST6030D

8. Apply the sealant to the thread of the plug and then assemble the pinion plug (A) to the housing.

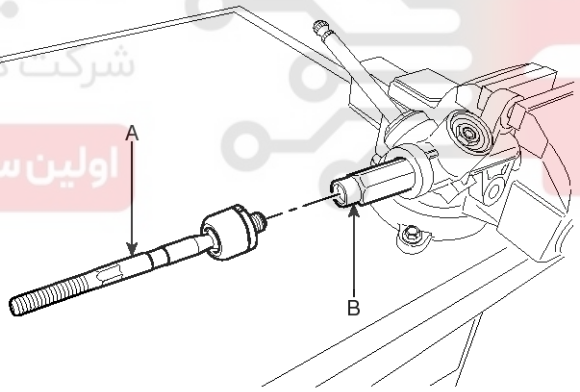
Tightening torque Nm (kgf.m, lb-ft):
60 ~ 80 (6.0 ~ 8.0, 43 ~ 58)



SEDST7509L

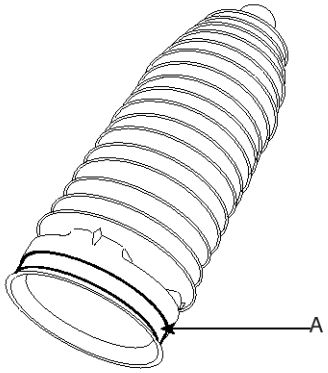
9. Apply loctite (Three bond-1374) to the thread of the tie rod inner ball joint and then assemble the tie rod (A) to the rack bar (B).

Tightening torque Nm (kgf.m, lb-ft):
110 ~ 130 (11.0 ~ 13.0, 65 ~ 94)



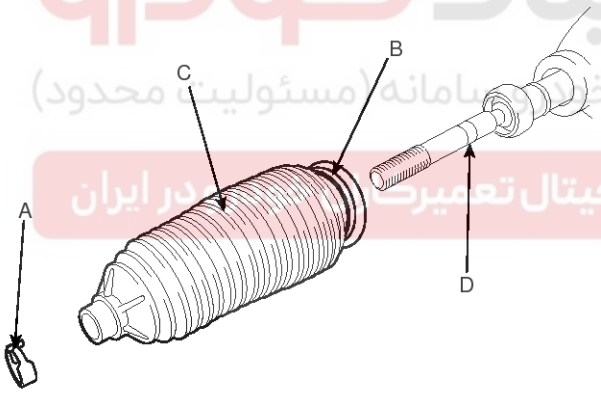
SHDST6028D

10. Assemble new bellows band (A) to the bellows.



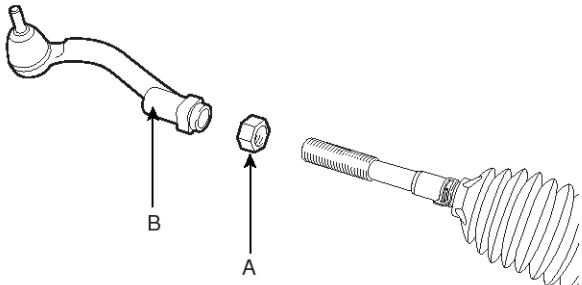
SHDST6036D

11. Apply the grease (Kyoto Yushi-One Luber2128 to the portion (D) of the tie-rod.
12. Apply the sealant (Three bond-1141E) to the bellows mating surface of therack housing.
13. Assemble the bellows (C) to rack housing and then tighten the bellows clip (A) and band (B).



SHDST6504D

14. Assemble the lock nut (A) and tie rod end (B) to tie rod.



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