

VELOSTER(FS) > 2013 > G 1.6 T-GDI > Steering System

Steering System > General Information > Specifications

Specifications

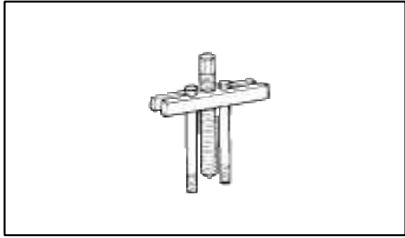
Item		Specification
Type		Electronic Power Steering System
Steering gear	Type	Rack & Pinion
	Rack stroke	144mm (5.6693 in.)
Steering angle (Max.)	Inner	39° ± 1.5°
	Outer	32.8°

Tightening Torques

Item	Tightening torque (kgf.m)		
	Nm	kgf.m	lb-ft
Wheel Hub nuts	88.3 ~ 107.9	9.0 ~ 11.0	65.1 ~ 79.6
Steering wheel lock nut	39.2 ~ 49.0	4.0 ~ 5.0	28.9 ~ 36.2
Steering column & universal joint	53.9 ~ 63.7	5.5 ~ 6.5	39.8 ~ 47.0
Steering column mounting nuts	12.7 ~ 17.7	1.3 ~ 1.8	9.4 ~ 13.0
Steering column mounting bolt	44.1 ~ 49.0	4.5 ~ 5.0	32.5 ~ 36.2
Universal joint to pinion	32.4 ~ 38.3	3.3 ~ 3.8	23.9 ~ 27.5
Tie rod end castle nut	23.5 ~ 33.3	2.4 ~ 3.4	19.4 ~ 24.6
Lower arm to front axle	78.5 ~ 88.8	8.0 ~ 9.0	57.9 ~ 65.1
Steering gear box to sub frame	58.8 ~ 78.8	6.0 ~ 8.0	43.4 ~ 57.9
Stabilizer link nut	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Sub frame mounting bolts & nuts	156.9 ~ 176.5	16.0 ~ 18.0	115.7 ~ 130.2
Sub frame stay bolts	44.1 ~ 53.9	4.5 ~ 5.5	32.5 ~ 39.8

Steering System > General Information > Special Service Tools

Special Service Tools

Tool (Number and Name)	Illustration	Use
09561-11001 Steering wheel puller		Remove the steering wheel from the column shaft.

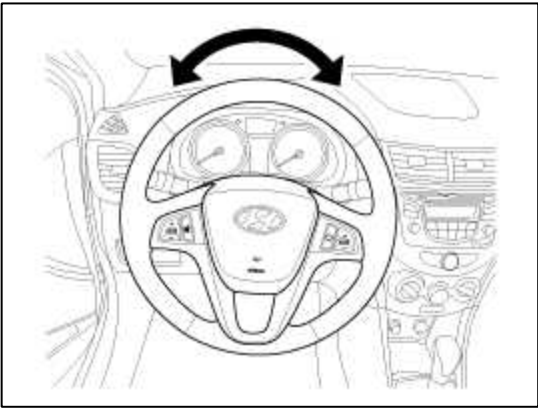
Steering System > General Information > Repair procedures

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

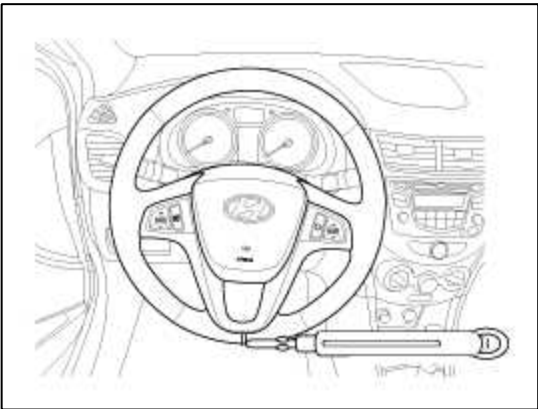


- 3. If the play exceeds standard value, inspect the steering column, shaft, and linkages.

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.

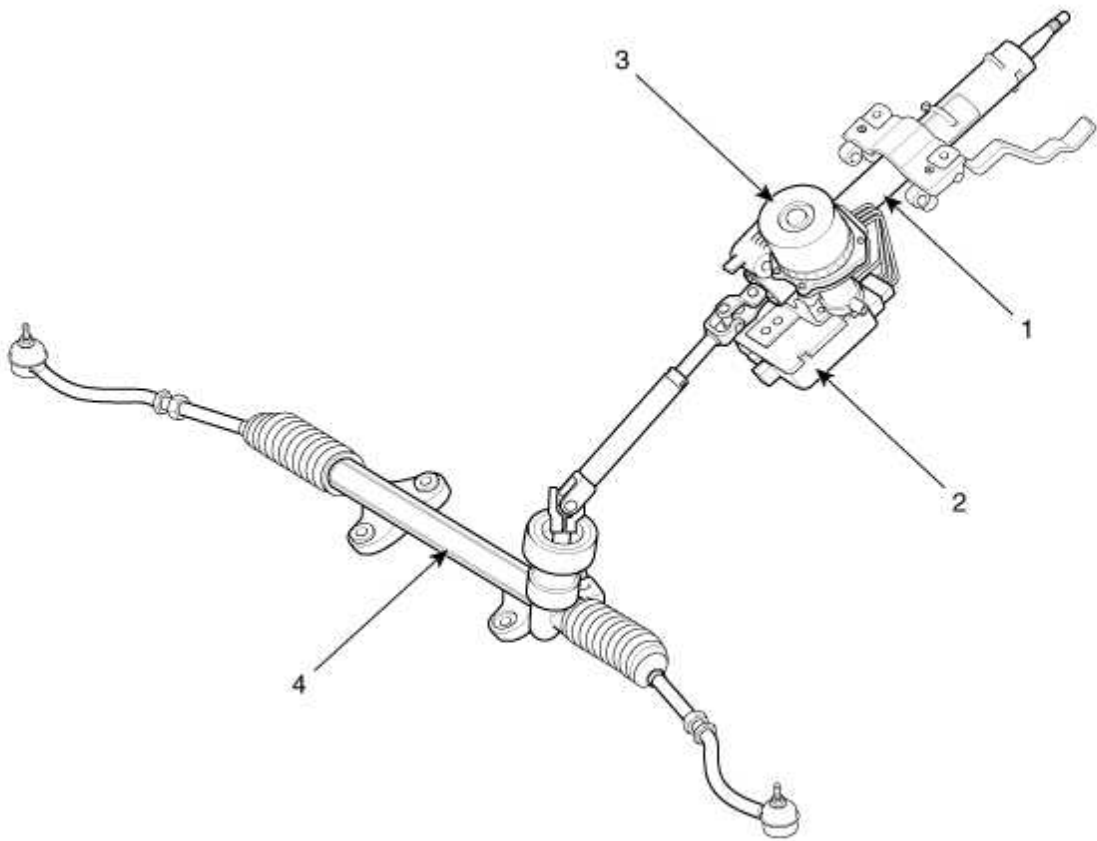
Standard value: 3.0kgf or less



- 4. If the measured value exceeds standard value, inspect the power steering gear box and EPS system.

Steering System > Electric Power Steering > Components and Components Location

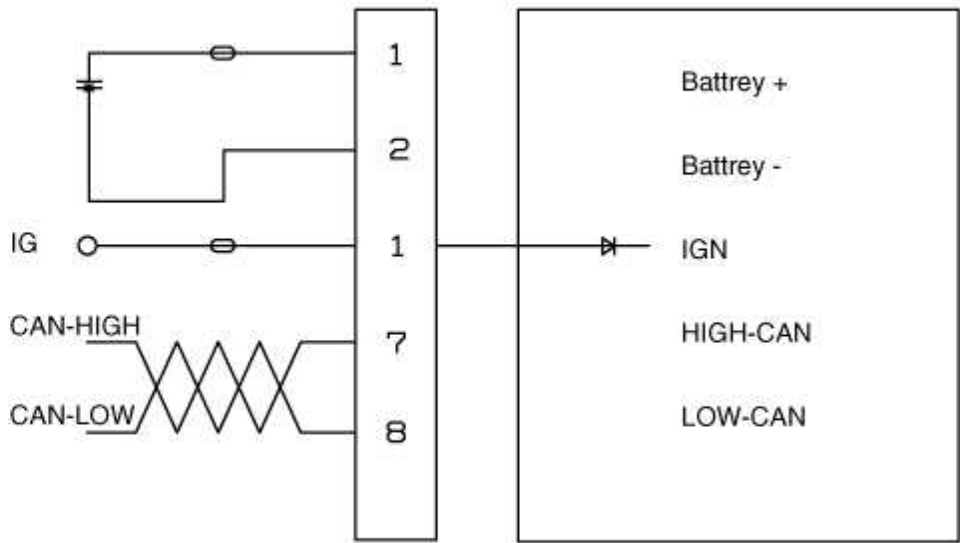
Componets



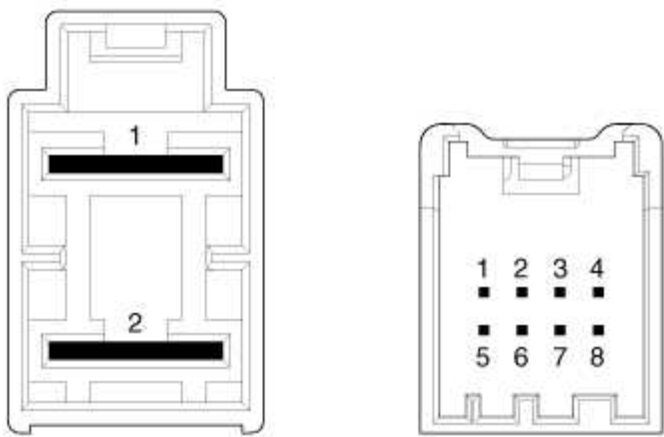
- | | |
|--------------------|----------------------|
| 1. Steering column | 3. Motor |
| 2. ECU | 4. Steering gear box |

Steering System > Electric Power Steering > Schematic Diagrams

MDPS Circuit Diagram



Harness Connector



Type	Pin NO	Description
Battery	1	Battery +
	2	Battery -
VSS	1	IGN
	2	-
	3	-
	4	-
	5	-
	6	
	7	High CAN
	8	Low CAN

Steering System > Electric Power Steering > Description and Operation

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.

Note 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 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.

Steering System > Electric Power Steering > Repair procedures

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 occur 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.

ASP Calibration

1. Select "Steering Angle Sensor".

2. Proceed with the test according to the screen introductions.



EPS Type Recognition Procedure

- 1. Select "EPS Variant Coding".
- 2. Proceed with the test according to the screen introductions.

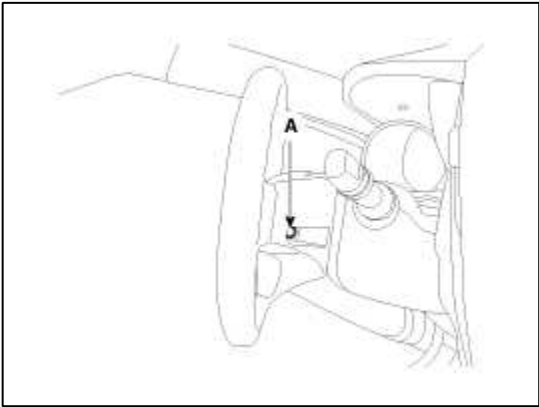
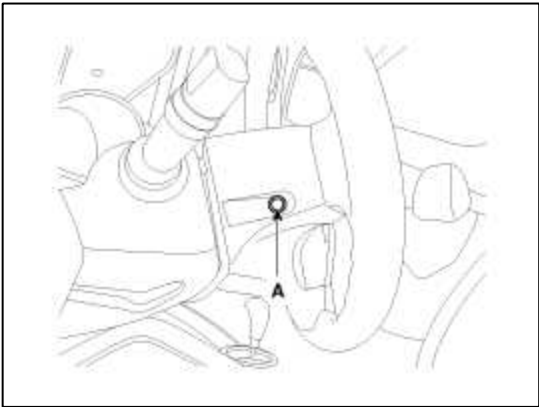


Steering System > Electric Power Steering > Steering Column and Shaft > Repair procedures

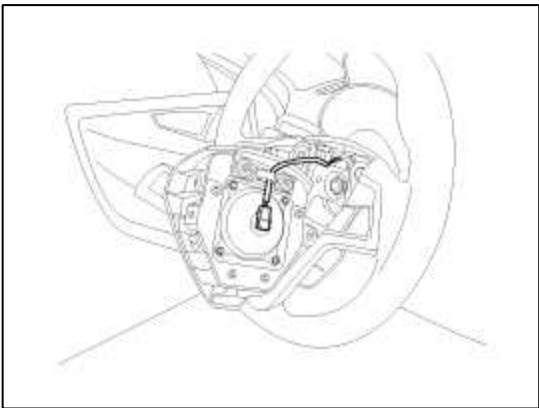
Replacement

- 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. Rmove the airbag module.
- 3-a. Loosen the bolts (A).

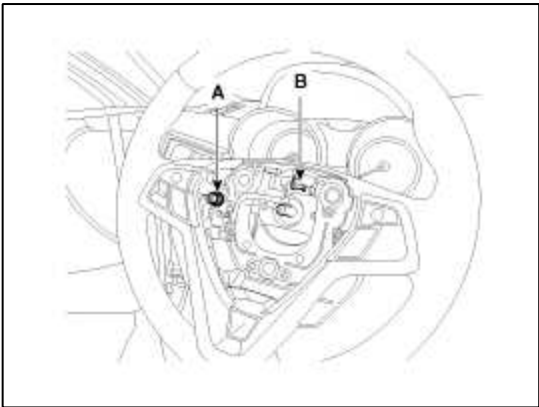


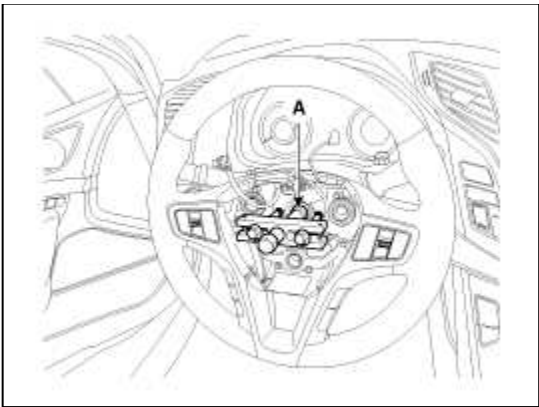
- 3-b. Disconnet the horn connector.



- 4. Loosen the lock nut (A), disconnect the connector (B) and then remove the steering wheel by using SST(09561-11001).

Tightening torque :
39.2 ~ 49.0N.m(4.0 ~ 5.0kgf.m, 28.9 ~ 36.2lb-ft)

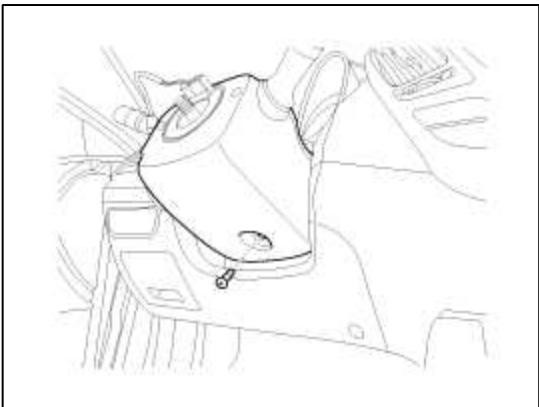
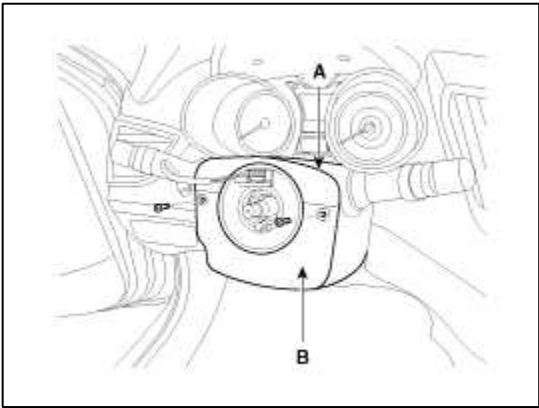




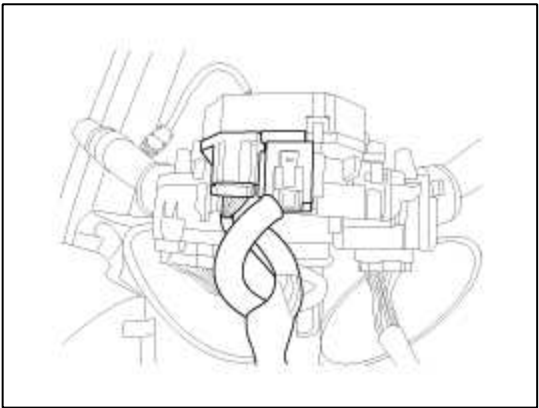
CAUTION

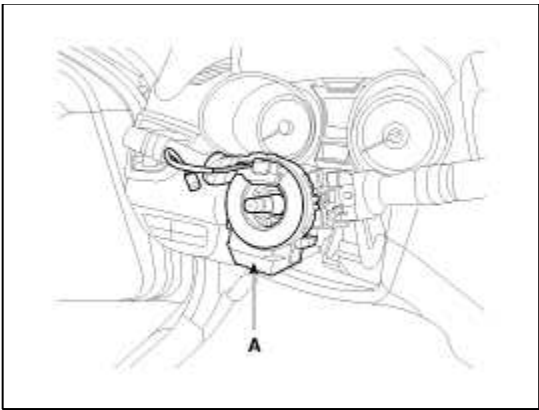
Do not hammer on the steering wheel to remove it; it may damage the steering column.

5. Loosen the screw and then remove the steering column upper (A) and lower shroud (B).



6. Disconnect the connector and then remove the clock spring (A).

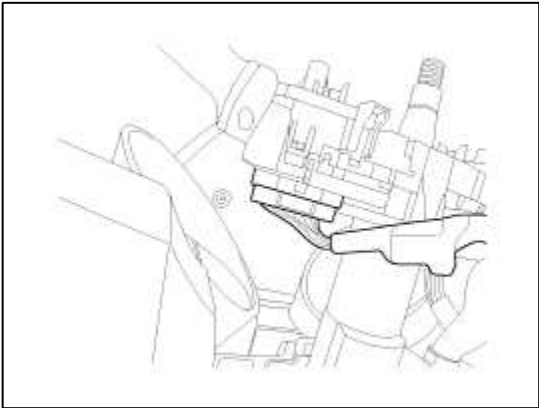
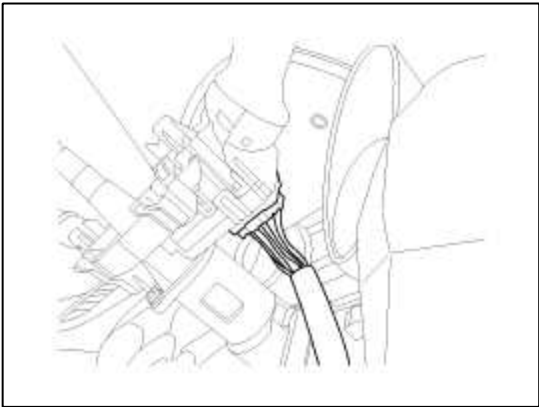




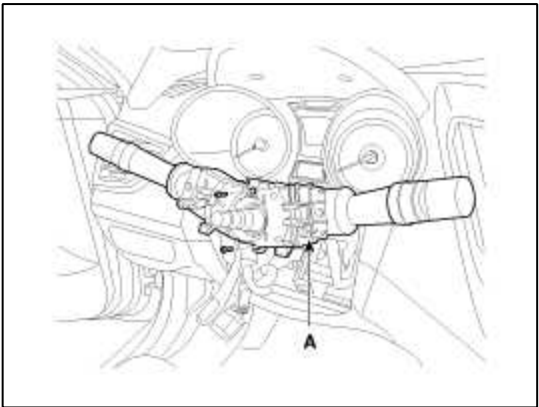
CAUTION

- When assembling set the center position by setting the marks between the clock spring and the cover into line. Make an array the mark () by turning the clock spring clockwise to the stop and then 2.0 revolutions counterclockwise.

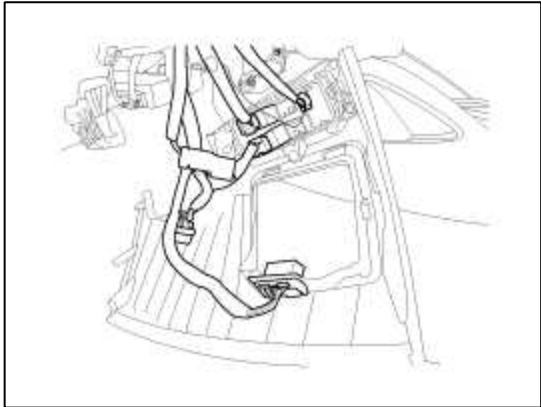
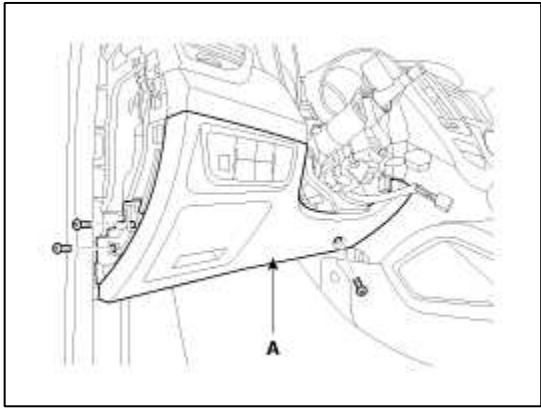
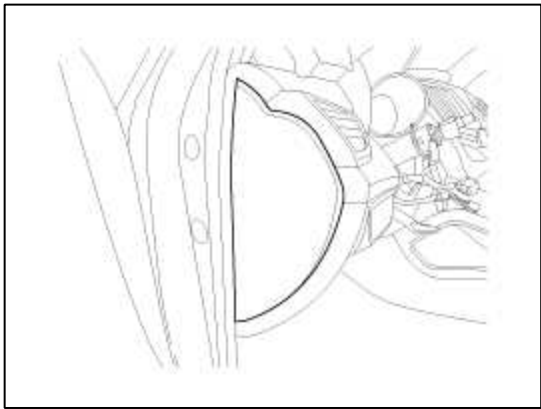
7. Remove the multifunction switches (A).
7-a. Disconnet the connector.



7-b. Loosen the screw.

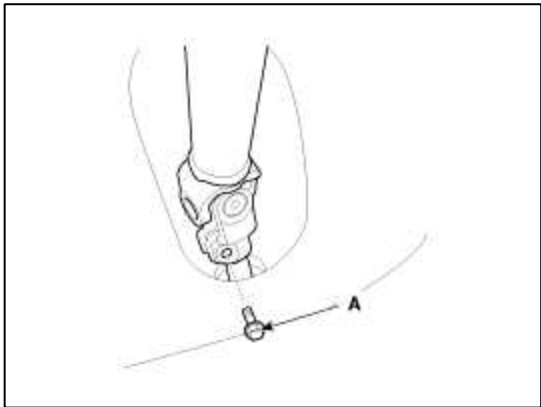


8. Remove the crash pad side cover and lower crash panel (A).



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

Tightening torque :
32.4 ~ 37.3N.m(3.3 ~ 3.8kgf.m, 23.9 ~ 27.5lb-ft)



CAUTION

- Lock the steering wheel in the straight ahead position to prevent the damage of the clock spring inner cable when you handle the steering wheel.
- Must be replaced with new bolts when assembling. (SEAL-LOCK has been processed)
SEAL-LOCK Specifications: MS721-39 "TYPE-D" Product: ND industries 1193S

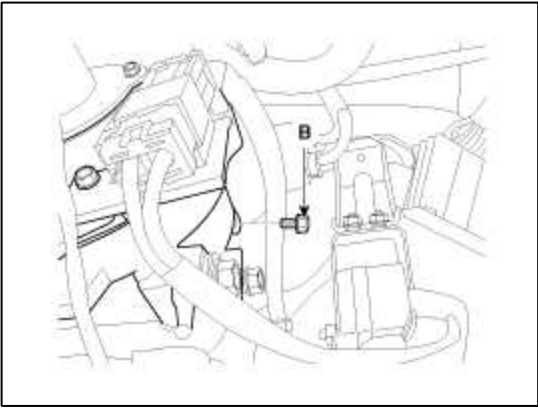
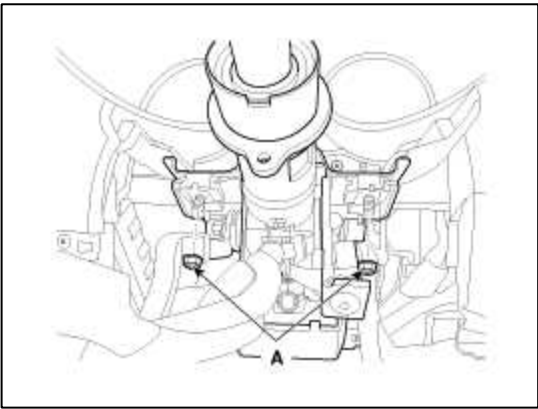
10. Disconnect all connectors connected the steering column & EPS unit assembly.

11. Remove the steering column & EPS unit assembly by loosening the mounting bolt (B) and nuts (A).

Tightening torque :

Nut : 12.7 ~ 17.7N.m(1.3 ~ 1.8kgf.m, 9.4 ~ 13.0lb-ft)

Bolt : 44.1 ~ 49.0N.m(4.5 ~ 5.0kgf.m, 32.5 ~ 36.2lb-ft)



12. Installation is the reverse of the removal.

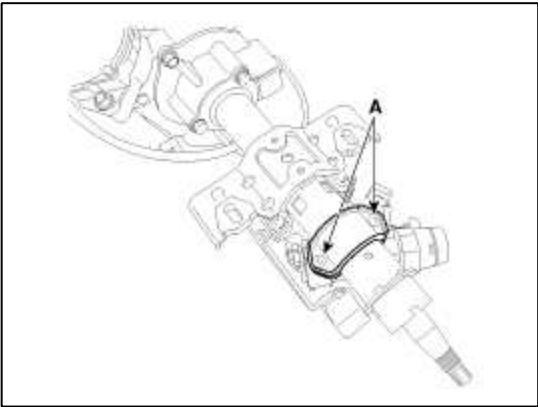
CAUTION

You must be EPS type recognition and ASP calibration when after mounting.
(Refer to ST group - E.P.S/repair procedures)

Disassembly

Key lock assembly

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

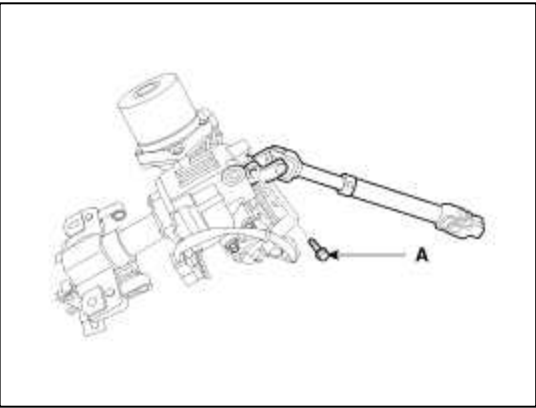


- 2. Loosen the special bolt using a screw driver and then remove the key lock assembly from the steering column assembly.
- 3. Reassembly is the reverse of the disassembly.

Universal joint assembly

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

Tightening torque :
53.9 ~ 63.7N.m(5.5 ~ 6.5kgf.m, 39.8 ~ 47.0lb-ft)



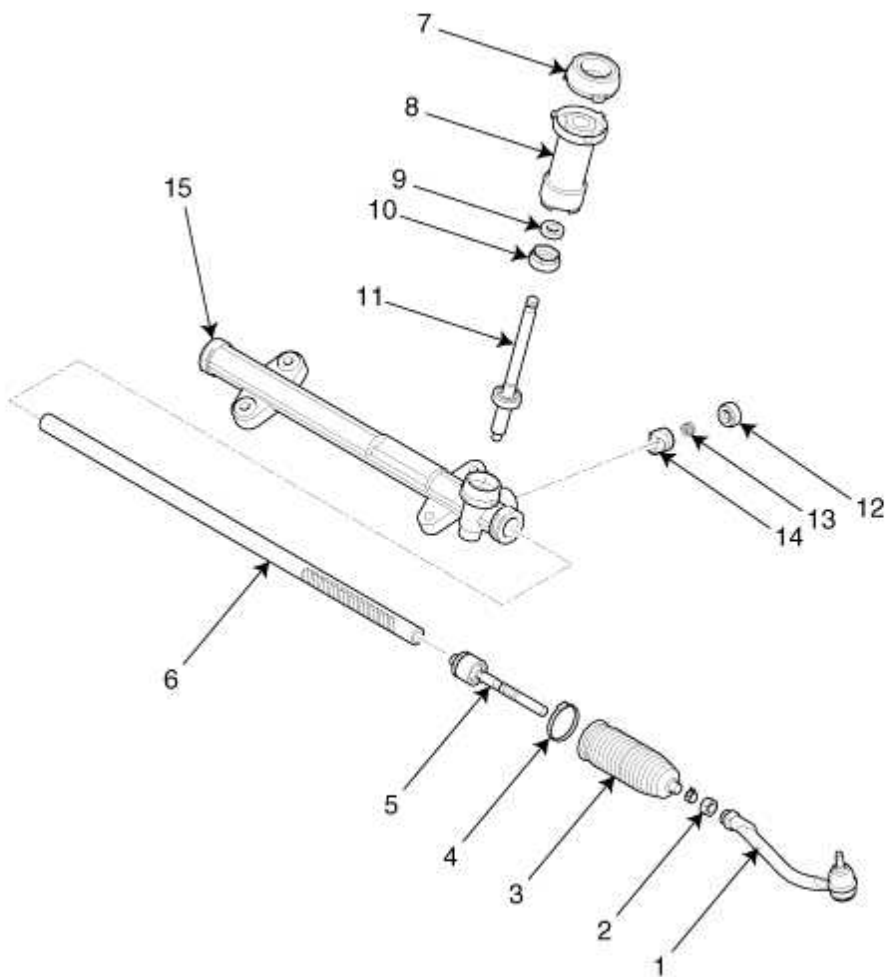
- 2. Reassembly is the reverse of the disassembly.

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.

Steering System > Electric Power Steering > Steering Gear box > Components and Components Location

Components



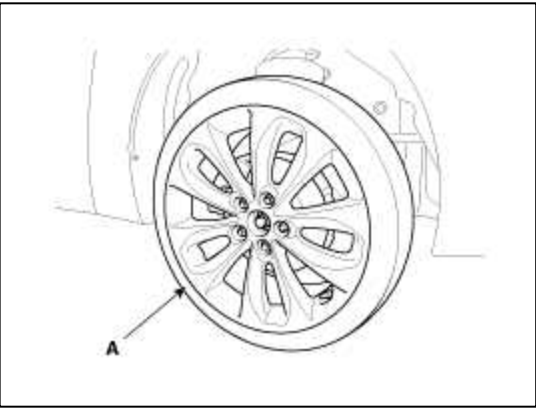
1. Tie-rod end	6. Rack bar	11. Pinion assembly
2. Lock nut	7. Dust packing	12. Yoke plug
3. Bellows clip	8. Dust cap	13. Yoke spring
4. Bellows	9. Oil seal	14. Support yoke assembly
5. Tie rod	10. Pinion plug	15. Rack housing

Steering System > Electric Power Steering > Steering Gear box > Repair procedures

Replacement

1. Remove the front wheel & tire.

Tightening torque :
88.3 ~ 107.9N.m(9.0 ~ 11.0kgf.m, 65.1 ~ 79.6lb-ft)

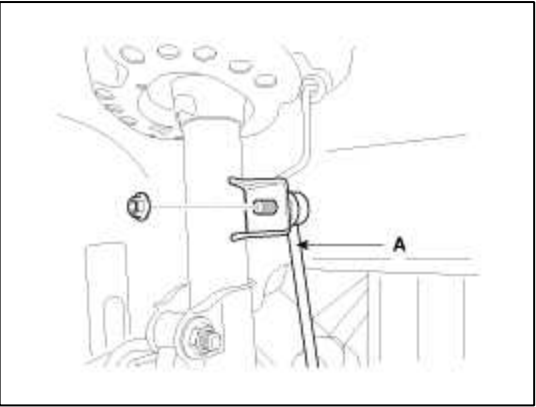


CAUTION

Be careful not to damage to the hub bolts when removing the front wheel & tire.

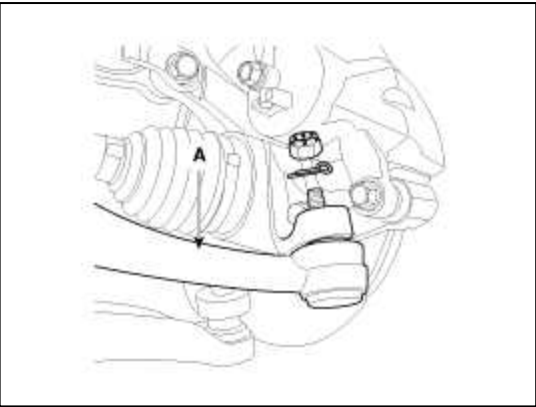
2. Disconnect the stabilizer link (A) with the front strut assembly after loosening the nut.

Tightening torque :
98.1 ~ 117.7N.m(10.0 ~ 12.0kgf.m, 72.3 ~ 86.8lb-ft)



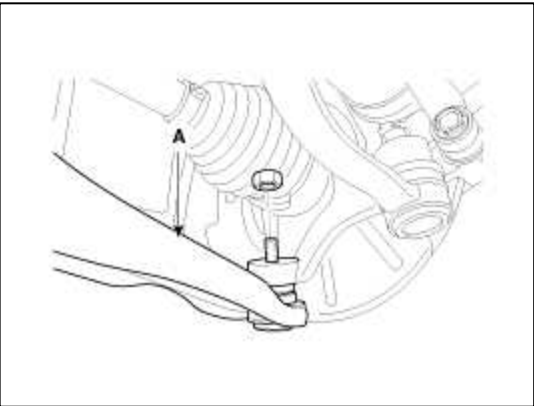
3. Loosen the nut and then remove the tie-rod end (A) with the front axle.

Tightening torque :
23.5 ~ 33.3N.m(2.4 ~ 3.4kgf.m, 19.4 ~ 24.6lb-ft)



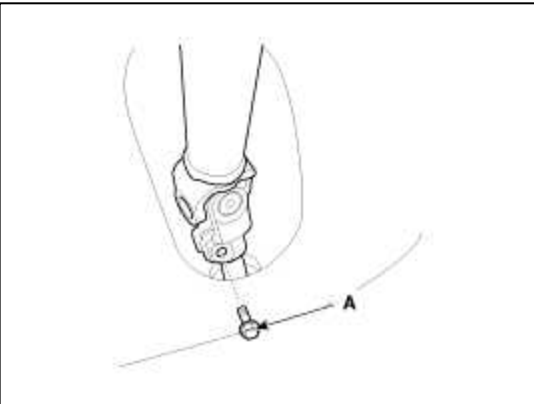
4. Loosen the nut and then remove the lower arm (A).

Tightening torque :
78.5 ~ 88.3N.m(8.0 ~ 9.0kgf.m, 57.9 ~ 65.1lb-ft)



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

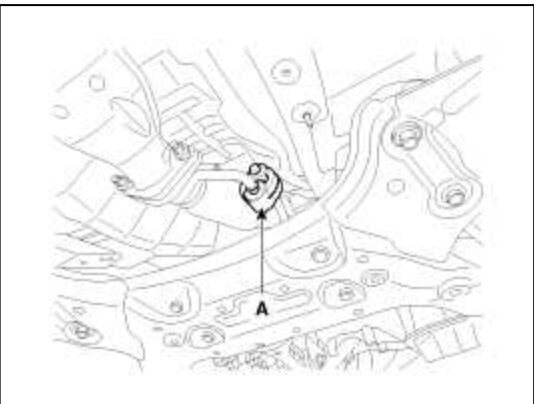
Tightening torque :
32.4 ~ 37.3N.m(3.3 ~ 3.8kgf.m, 23.9 ~ 27.5lb-ft)



CAUTION

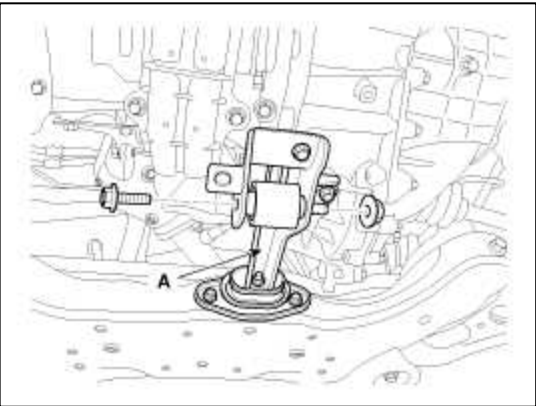
- Lock the steering wheel in the straight ahead position to prevent the damage of the clock spring inner cable when you handle the steering wheel.
- Must be replaced with new bolts when assembling. (SEAL-LOCK has been processed)
SEAL-LOCK Specifications: MS721-39 "TYPE-D" Product: ND industries 1193S

6. Remove the rubber hanger (A).



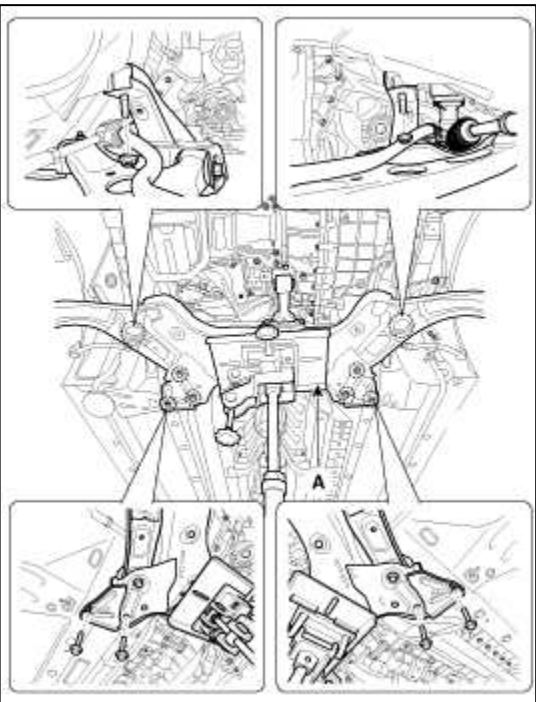
7. Loosen the roll rod (A) mounting bolts and nuts.

Tightening torque :
53.9 ~ 63.7N.m(5.0 ~ 6.5kgf.m, 39.8 ~ 47.0lb-ft)



8. Loosen the bolts & nuts and then remove the front sub frame (A).

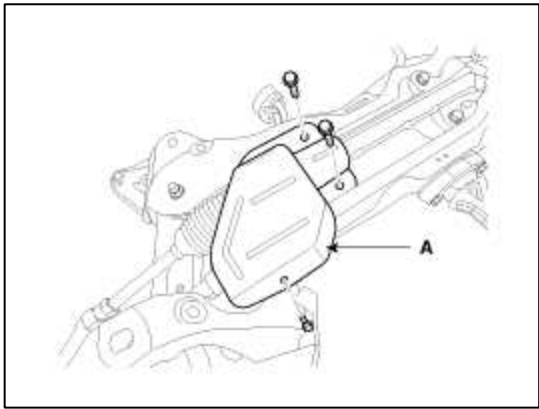
Tightening torque :
Sub frame mounting bolt & nut
156.9 ~ 176.5N.m(16.0 ~ 18.0kgf.m, 115.7 ~ 130.2lb-ft)
Sub frame stay mounting bolt
44.1 ~ 53.9N.m(4.5 ~ 5.5kgf.m, 32.5 ~ 39.8lb-ft)



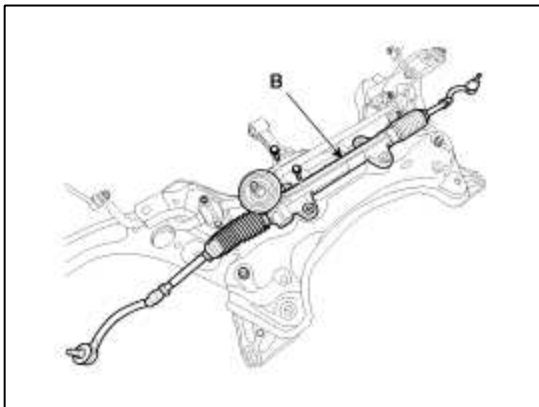
9. Remove the protector (A) and steering gearbox (B) from the front sub frame by loosening the mounting bolts.

Tightening torque :
58.8 ~ 78.8N.m (6.0 ~ 8.0kgf.m, 43.4 ~ 57.9lb-ft)

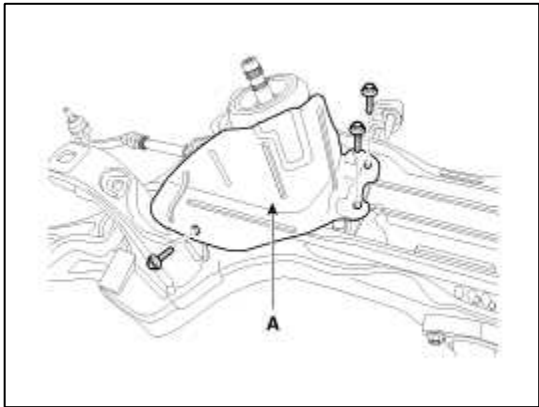
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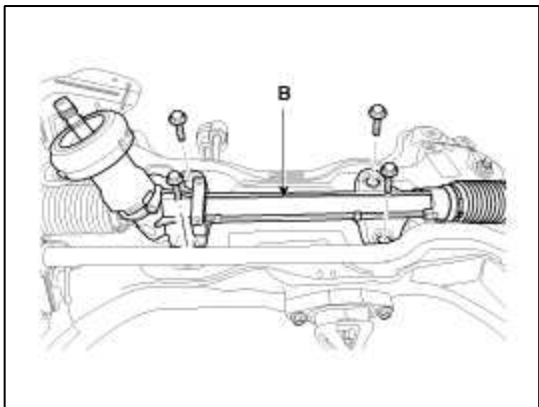
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[RHD]



[RHD]



10. Installation is the reverse of the removal.
11. Check the wheel alignment.
(Refer to SS group - "Tires/Wheels")