

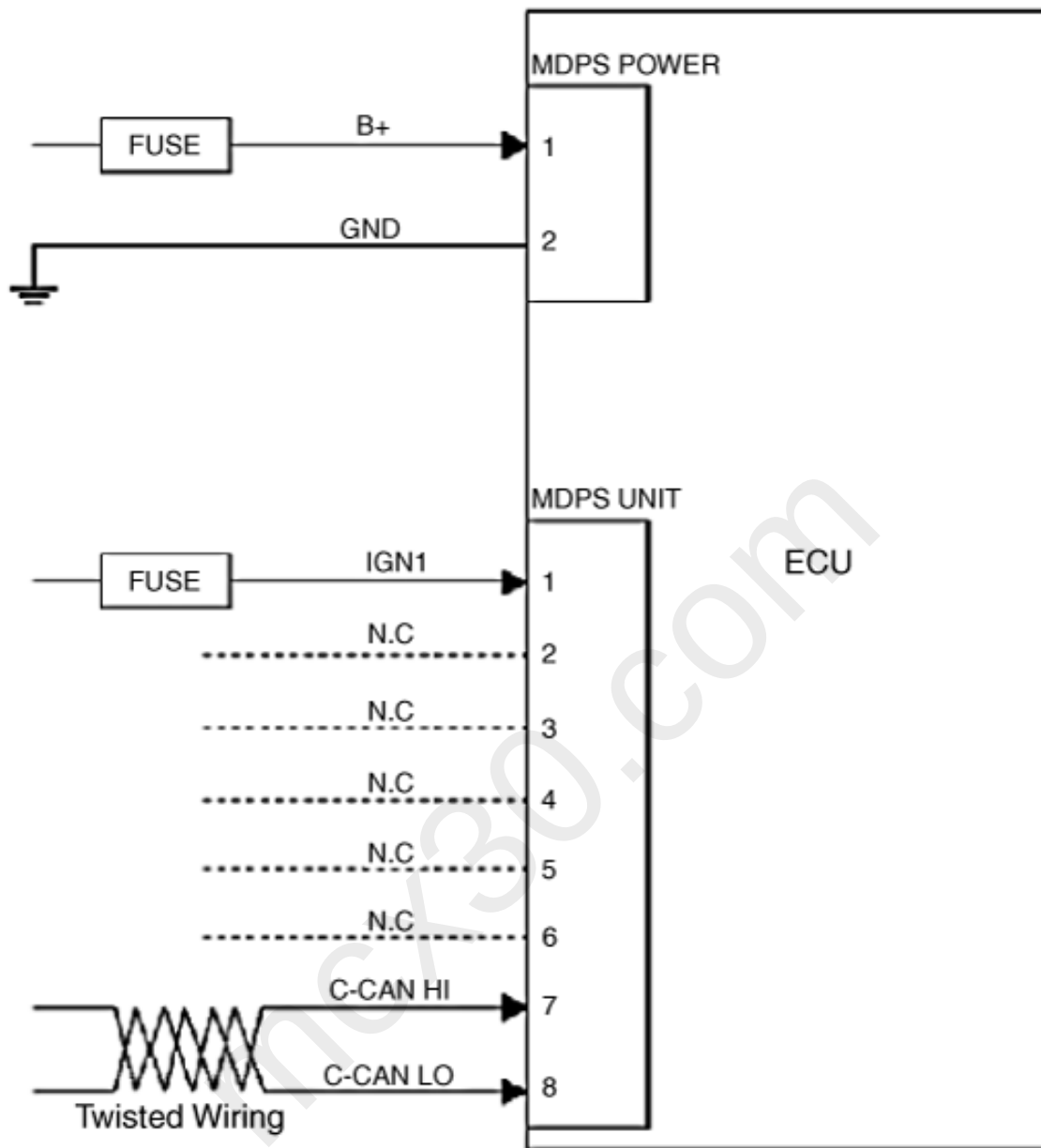
Description

MDPS (Motor Driven Power Steering) system uses an electric motor to assist the steering force and it is an engine operation independent steering system.

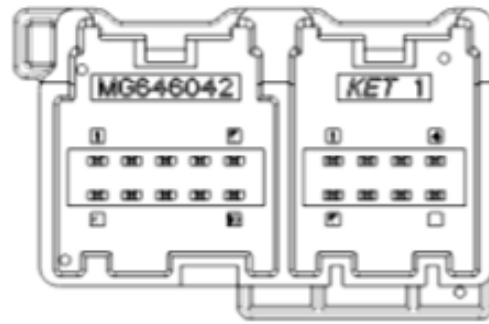
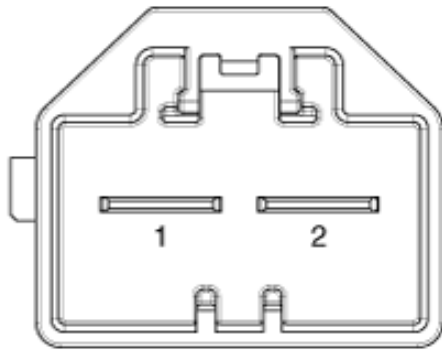
MDPS control module controls the motor operation according to information received from the each sensor and CAN (Controller Area Network), resulting in a more precise and timely control of steering assist than conventional engine-driven hydraulic systems,

MDPS system inspection is possible for each component, but replacement is possible only for partial units, and other parts should not be disassembled.

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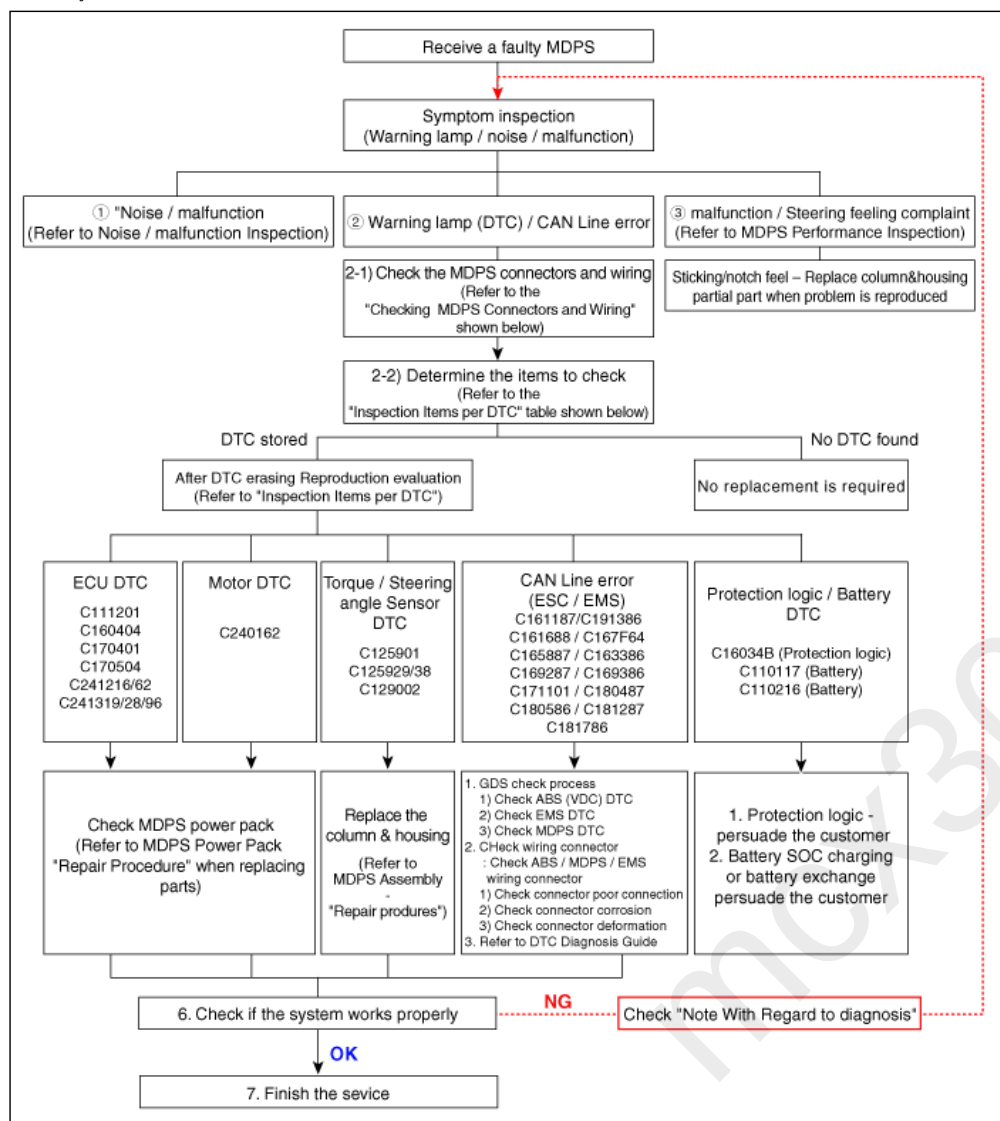


Harness Connector

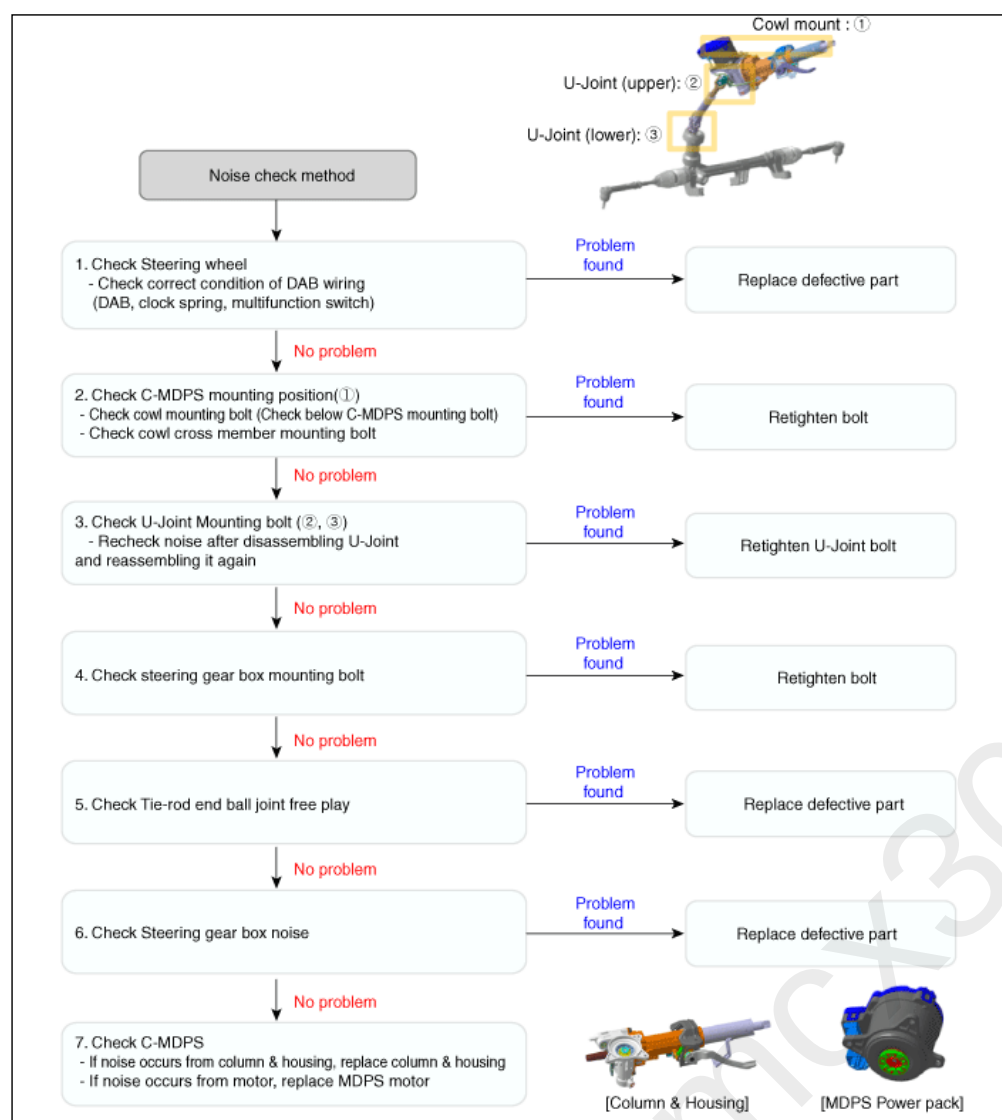


CONNECTOR NAME	PIN NUMBER	NAME	FUNCTION
BATTERY	1	B +	BATTERY +
	2	GND	BATTERY -
TORQUE	1	TORQUE2	TORQUE1_SUB
&	2	ANGLE2	PWM2
ANGLE	3	TORQUE4	TORQUE2_SUB
SENSOR	4	POWER2	SENSOR POWER2
	5	TORQUE3	TORQUE2_MAIN
	6	POWER1	SENSOR POWER1
	7	GND1	GND1
	8	TORQUE1	TORQUE1_MAIN
	9	GND2	GND2
	10	ANGLE1	PWM1
VEHICLE SIGNAL	1	IGN1	IGNITION
	2	-	-
	3	-	-
	4	-	-
	5	-	-
	6	-	-
	7	C-CAN_HI	CAN_HIGH
	8	C-CAN_LO	CAN_LOW

MDPS System A/S Workflow



① Noise / malfunction Inspection



② Warning lamp (DTC) / CAN Line error

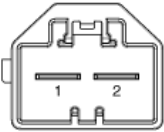
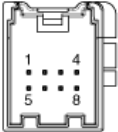
2 - 1 Checking Connectors and Wiring

1. Checking Connectors and Wiring.

Check for damage, push-back, or improper connection in each connector and wiring.

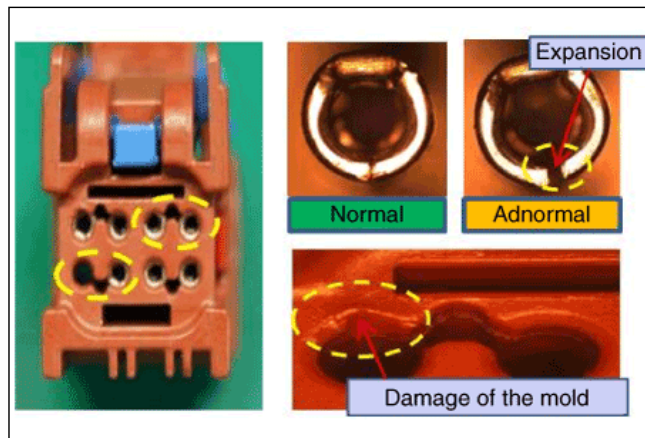
(1) Check the wiring on the vehicle side.

—Check for open / short - circuit due to faulty connection, damage, or foreign substance.

Battery Connector		Vehicle signal Connector	
 or 			
Pin no	Pin name	Pin no	Pin name
1	Battery (+)	1	Ignition
2	Battery (-)	2	-
		3	-
		4	-
		5	-
		6	-
		7	CAN_High
		8	CAN_Low

(2) Check the motor connector.

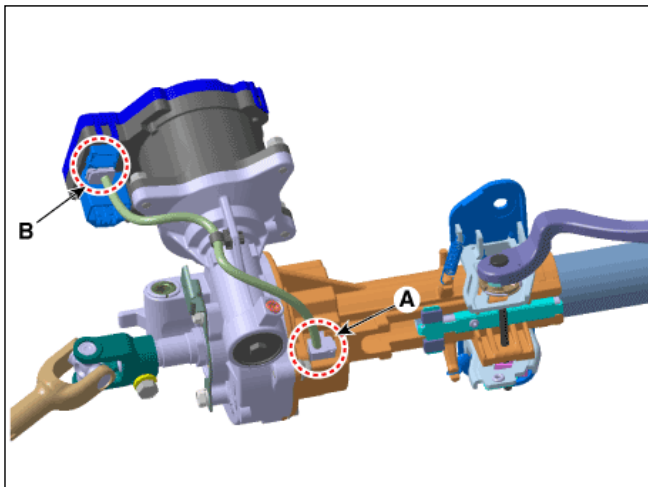
–Terminal Expansion and damage



•If a problem such as terminal expansion or damage occurs during the wiring inspection process, be sure to replace the MDPS power pack assembly.

(3) Check TAS side (A) and powerpack side (B) wiring.

–Inspect each connector and wiring for damage, push backs, or incorrect connections.



- For DTC C125901 / C125929 / C125938 / C129002, replace the MDPS wiring.
(Refer to Motor Driven Power Steering (MDPS) - "MDPS Wiring")
- If no problem is found during the MDPS wiring check, replace the MDPS column & housing.
(Refer to Motor Driven Power Steering (MDPS) - "MDPS Column & Housing")

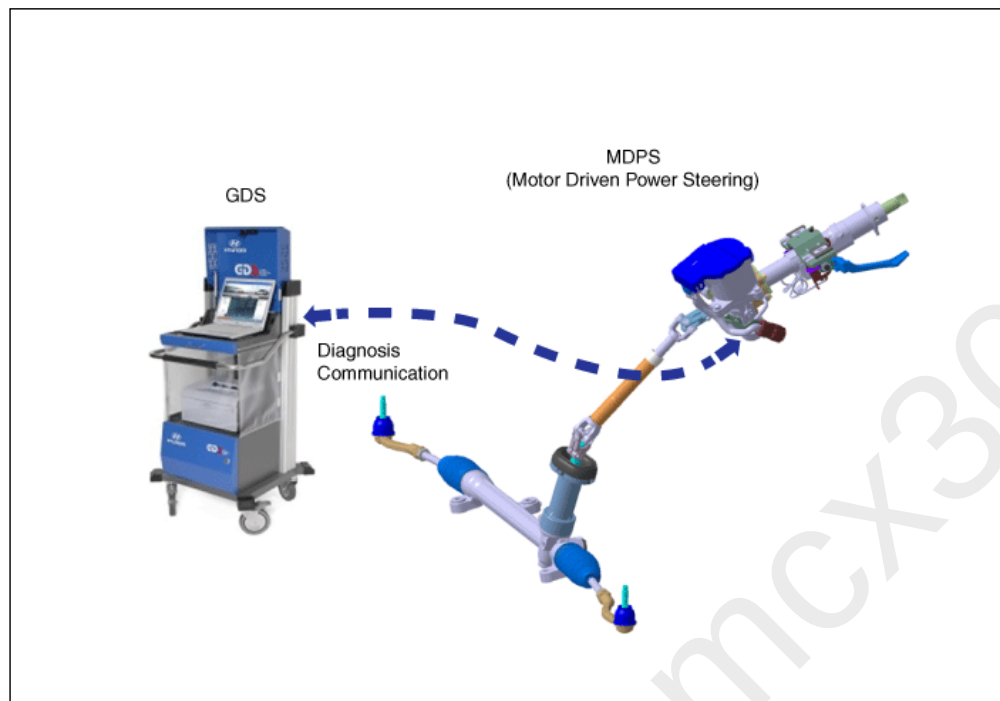
2 - 2 Inspection Items per DTC

DTC	Problem	First analysis method	How to repair
C129002	Torque sensor signal error	First erase DTC, check connector connection	When the sensor connector flows, the warning lamp reoccurs Replace the sensor cable, and replace the column & housing (56390)
C125901	Steering angle signal error	Erase DTC after resetting Steering angle zero point	
C125929		check connector connection	
C125938			
C111201	Torque sensor power supply error	First erase DTC, check connector connection	When the sensor connector flows, the warning lamp reoccurs Replace the sensor cable, and replace the power pack (56370)
C160404	ECU hardware error	Check after erasing the DTC	In case of reoccurrence, replace MDPS power pack (56370)
C170401	Relay breaking of a wire		
C170504	ECU over/discharge error		
C241216	Motor circuit break / short		
C241262	Motor current error		
C241319	Over current error		
C241328	Motor electric current gate error		
C241396	Broken the motor current sensor		
C240162	Motor circuit error		
C126154	Steering angle zero point error	Check after resetting Steering angle zero point Check sensor connector poor connect	Resetting Steering angle zero point or replace column & housing (56390)
C161187 C161F64 C161F86	Not received the EMS CAN message Vehicle speed monitoring error Vehicle speed signal error	1. Check chassis CAN condition 2. Check connector connection 3. Check engine ECU	
C161688	CAN BUS OFF	4. Start OFF history confirmation message while driving	

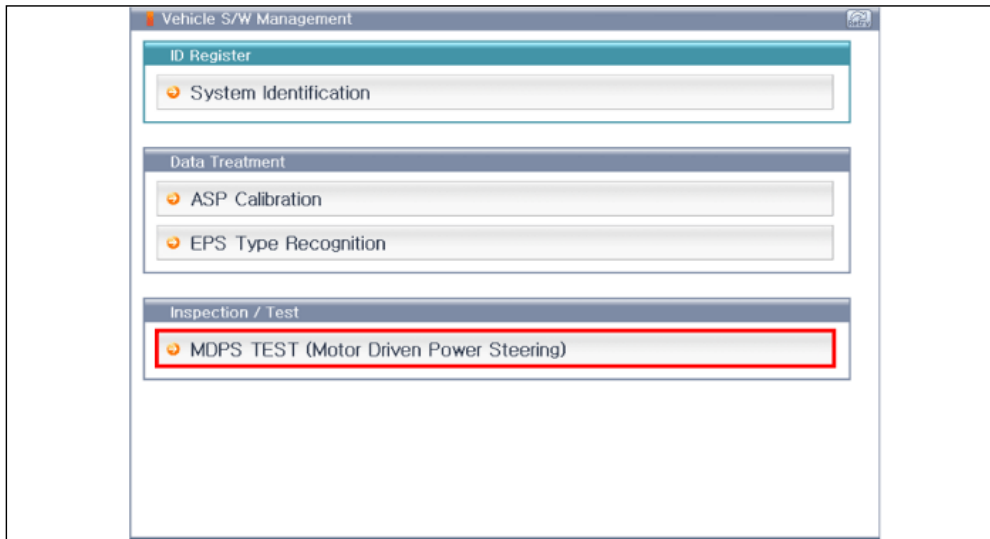
C162887 C163386	Not received the cluster CAN signal	Check cluster connector connection	Erase DTC (No MDPS replacement)
	Cluster display vehicle speed error		
C169287 C169386	Not received the VSM message	Check ESC, check chassis CAN condition	
	ESC signal error		
C171101	ECU abnormal end	Recheck after erasing the DTC	
C180487 C180586	Cannot be received the LKA message	Check LKA, check CAN line	
	LKA signal error		
C181287 C181786	Not received the gateway CAN message	Check gateway	
	Gateway CAN signal error		

③ MDPS Performance Inspection

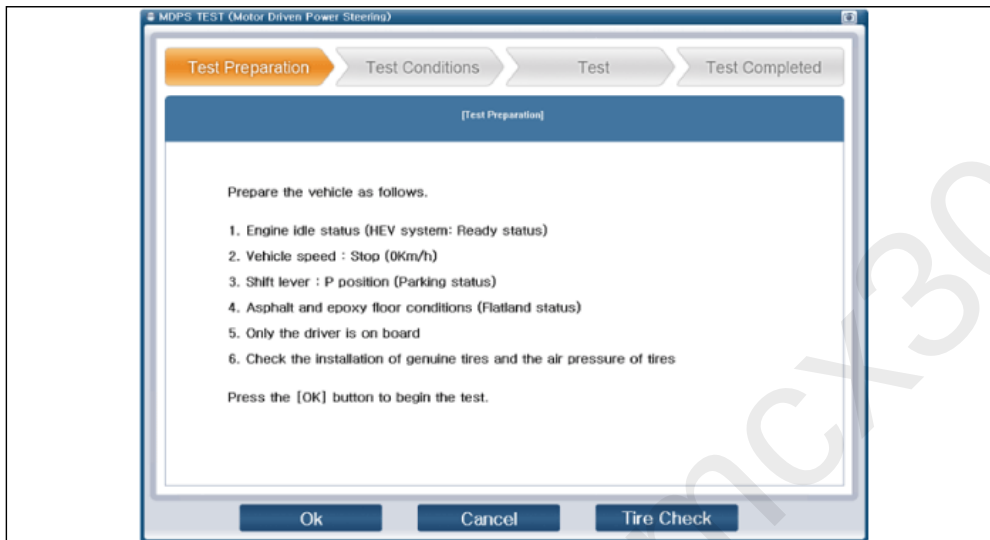
- This bulletin provides Motor Driven Power Steering (MDPS) diagnostic procedure using GDS to diagnose the heavy steering effort, abnormal position of steering parts and MIL illumination in steering system.
- GDS judges the MDPS normal / abnormal state by calculating the MDPS motor torque generated when turning the steering wheel to left and right at 360° per 3 seconds.



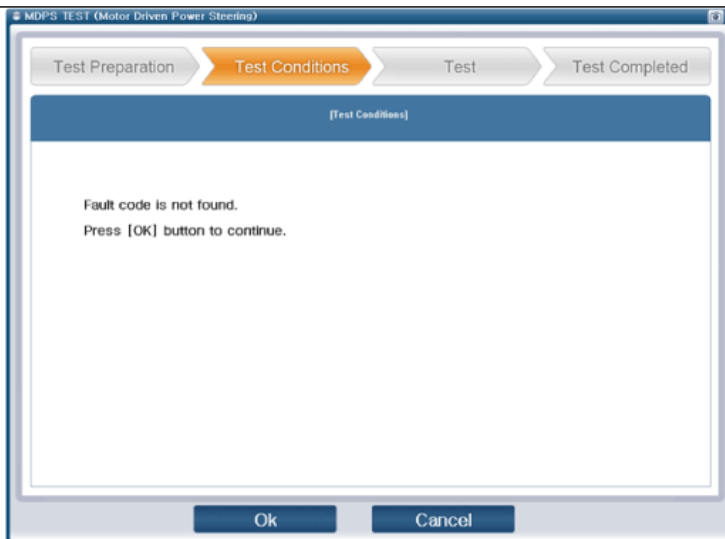
1. Connect self - diagnosis connector (16pins) located in the lower of driver side crash pad to self - diagnosis device.
2. Turn the self - diagnosis device after key is ON.
3. After Selecting the "vehicle model" and "system", select the "MDPS TEST" on GDS vehicle selection screen.



4. Prepare a vehicle according to the required vehicle's conditions.



5. Search the DTCs relevant to the MDPS and then erase them if found.



6. Perform the MDPS TEST.



7. If the results of MDPS performance inspection are "OK", click "OK" and then finish the service work.

[Test completed]				
Model	Year	Vin. No	Test date	User ID
Development Vehicle	2014		2014.07.22	
Engine Type		Development Engine		
Result		Judgment		
Average Speed of The Right Steering	157 Deg/s	GOOD		
Right Test Time	2.3 sec			
Torque of The Right Column	2.5 Nm	OK		
Average Steering Velocity Left	-164 Deg/s	GOOD		
Test Time Left	2.2 sec			
Torque of the Left Column	-2.7 Nm	OK		

8. If the results of MDPS inspection are "Check", click "Inspection" and then inspect below items.

(1) MDPS Warning light illuminated



–Inspect DTCs relevant to the steering system.

(2) Vibration and Noise

–Inspect MDPS portions where are mounted to the body. (Checking tightening conditions of bolts and nuts)

–Inspect universal joint mounting bolts.

(3) Inspection for heavy steering effort

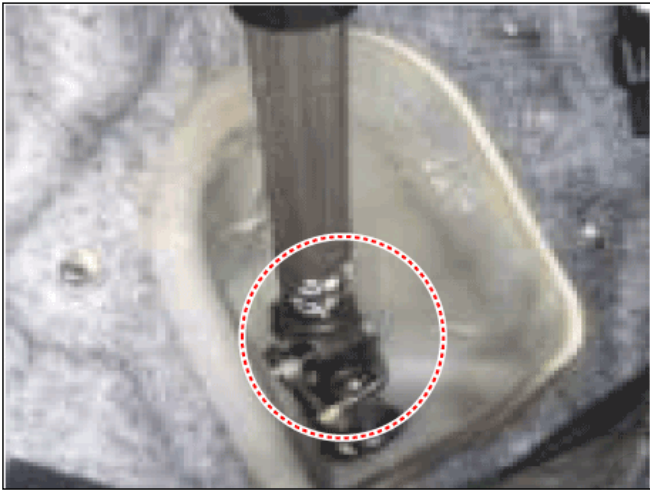
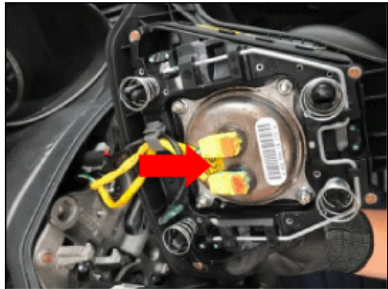
–Inspect tire pressure and width.

–Check that the heavy steering effort occurs or not when vehicle speed is not received.

–Check DTCs relevant to the CAN communication error.

DTC	Type	Service action
C1611, C1616, C1622	DTCs relevant to the CAN communication	–Conduct diagnosis if DTCs do not recur after erasing DTCs –Inspect CAN line if DTCs recur after erasing DTCs.
C1692, C1628, C1693		
C1614, C1969, C1697		
C1812, C1817		

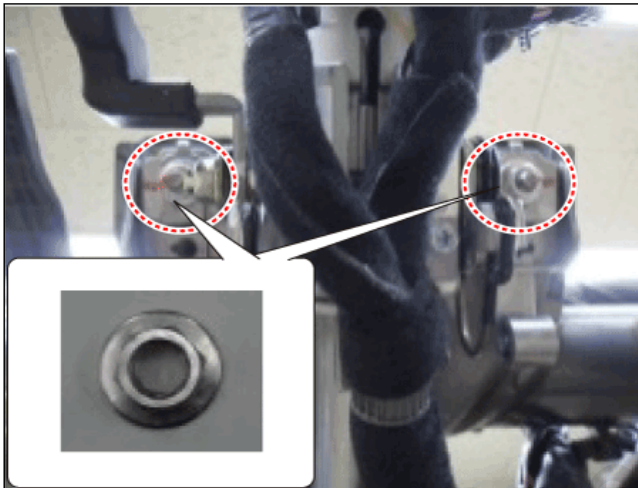
④ MDPS common problems

Case 1	Case 2	Case 3
		
Multifunction switch noise	Clock spring noise	DAB / Wire noise
Retighten the bolt	Replace clock spring	Rearrange and replace DAB

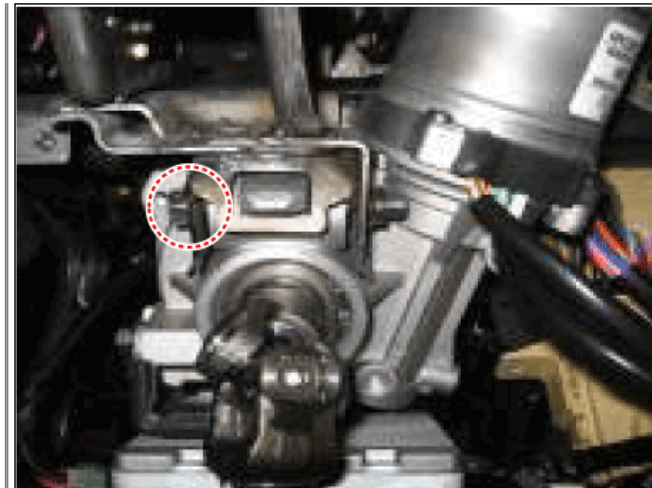
Case 4	Case 5	Case 6



Multifunction switch noise
Replace multifunction switch



MB nut mount defect
Retighten nut



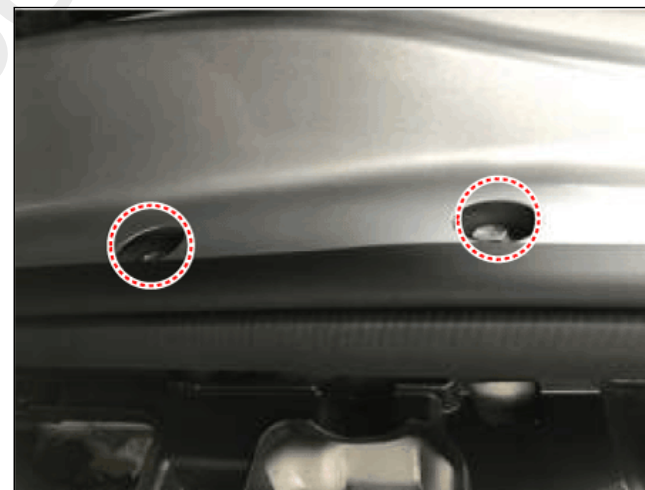
M10 nut mount defect
Retighten nut

Case 7



Cowl top bolt mount defect
Retighten cowl top bolt

Case 8



Cowl bar nut mount defect
Replace clock spring

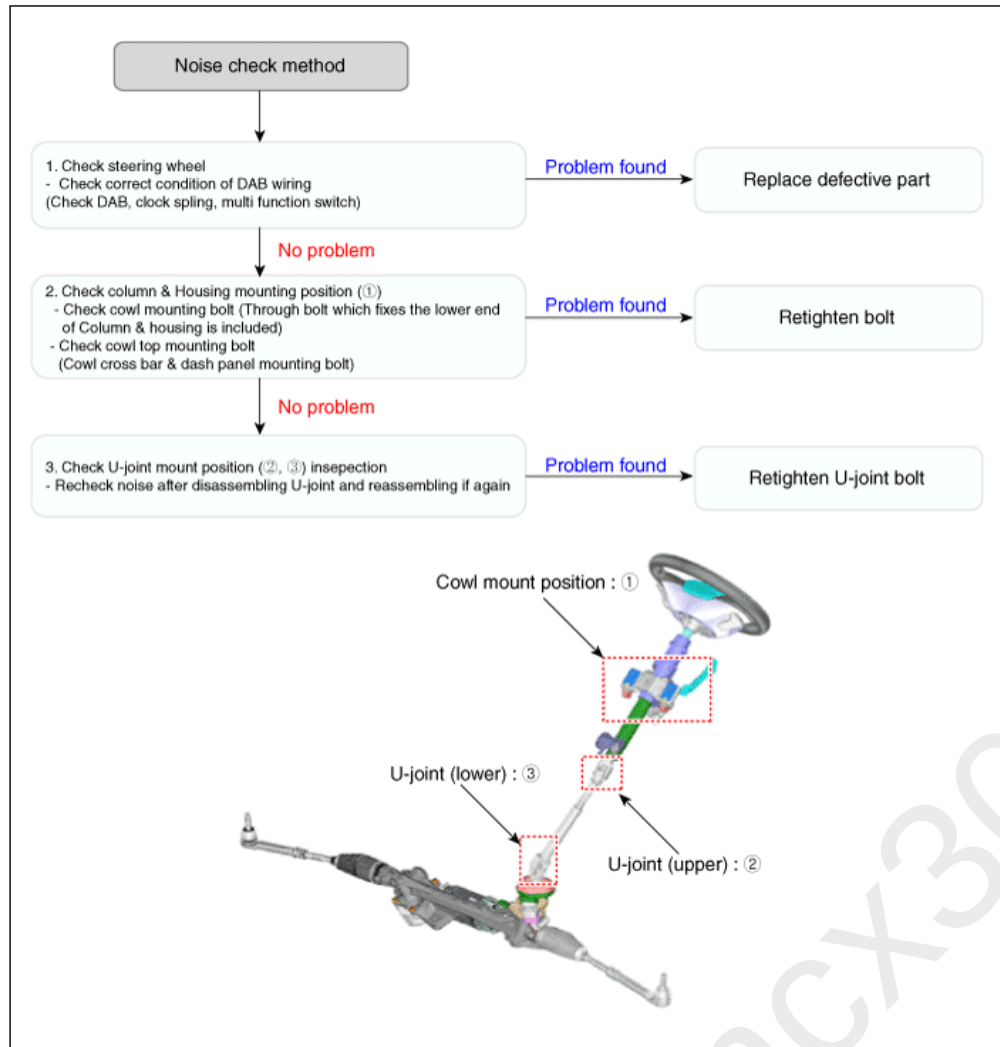


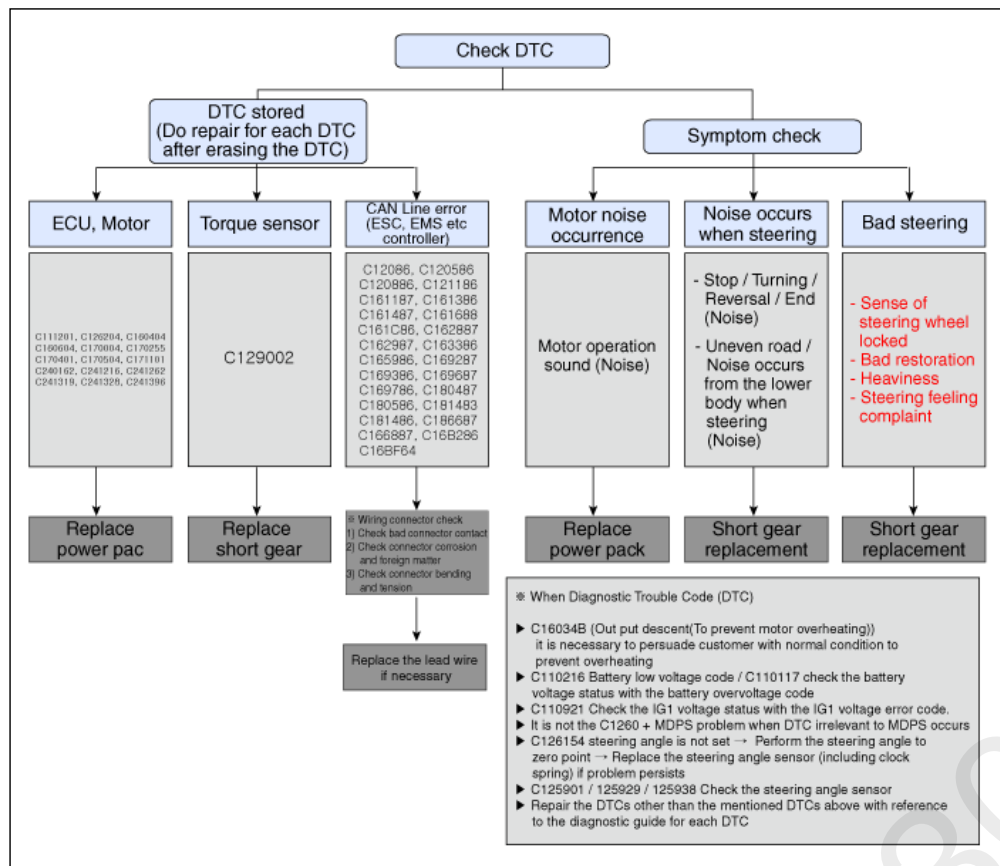
Cautions to be taken when handling the MDPS (Motor Driven Power Steering)

- Failure occurs due to internal damage because of the drop of and shock and excessive external force on the new partial component.
→ Be cautious of shock on the partial component and replace the damaged part (due to drop, etc.) with a new one.
- When fastening the steering, excessive impact may result in twisting the center point of the torque sensor.
- When removing/installing the connector the wiring may be damaged (deformed) by excessive external force.
- Be cautious when storing and replacing the partial components under the abnormal temperature and humidity conditions.

A/S Repair Procedures [R-
MDPS]

Column & Housing Noise Repair Guide





Inspection Items per DTC

NO	DTC	Problem	Items to check
1	C110117	High battery voltage	1. Generator
			2. Battery
			3. MDPS ECU
2	C110216	Low battery voltage	1. Generator
			2. Battery
			3. MDPS ECU
3	C110921	IG1 voltage error	1. Generator
			2. IGN Line
			3. MDPS ECU
4	C111201	Torque sensor supply voltage error	1. MDPS ECU
5	C120286	Wheel speed sensor signal error	1. CAN Line
	C120586		2. MDPS ECU
	C120886		3. Wheel sensor line
	C121186		
6	C125901	Steering angle circuit error	1. MDPS ECU
	C125929		
	C125938		
			1. Whether to initialize steering angle

7	C126154	Steering angle sensor zero point error	2. Battery
8	C126204	Temperature sensor error	1. Temperature sensor (MDPS ECU)
9	C129002	Torque sensor main signal error	1. Main torque sensor 2. Torque sensor connector
10	C16034B	Out put descent (Prevent overheating)	1. MDPS ECU
11	C160404	ECU hardware error	1. MDPS ECU
12	C160604	MDPS ECU software error	1. MDPS ECU
13	C161187	ECU CAN communication response delay	1. Check engine ECU CAN line 2. Check CAN Line
14	C161386	ECU CAN communication signal error	1. Check engine ECU CAN line 2. Check CAN Line
15	C161487	HCU CAN communication response delay	1. Check engine ECU CAN line 2. Check CAN Line
16	C161688	CAN BUS error	1. Check CAN Line
17	C161C86	HCU CAN communication signal error	1. Check engine ECU CAN line 2. Check CAN Line
18	C162887	CLU CAN communication response delay	1. CAN Line 2. MDPS ECU 3. Cluster
19	C162986	CLU CAN communication signal error	1. CAN Line 2. MDPS ECU 3. Cluster
20	C163386	CLU CAN communication signal error	1. CAN Line 2. MDPS ECU 3. Cluster
21	C165987	CAN SAS signal not entered	1. SAS Delivery UNIT 2. CAN Line
22	C169287	VSM CAN signal not entered	1. CAN Line 2. MDPS ECU 3. BCM (IPM)
23	C169386	VSM CAN signal error	1. CAN Line 2. MDPS ECU 3. BCM (IPM)
24	C169687	PA CAN signal not entered	1. CAN Line 2. MDPS ECU 3. SPAS ECU
25	C169786	PA CAN signal error	1. CAN Line 2. MDPS ECU 3. SPAS ECU
26	C170004	Specification recognition not applied (BYTE)	1. MDPS ECU
27	C170255	Specification recognition not applied (Variant)	1. Select regional specifications
28	C170401	ECU safety relay error	1. MDPS ECU
29	C170504	ECU spare charge circuit error	1. Motor relay

			2. MDPS ECU
30	C171101	Abnormal power OFF accumulate	1. Generator
			2. Battery
			3. MDPS ECU
31	C180487	LKAS CAN signal not entered	1. CAN Line
			2. MDPS ECU
			3. LKAS ECU
32	C180586	LKAS CAN signal error	1. CAN Line
			2. MDPS ECU
			3. LKAS ECU
33	C181483	CAN SAS signal error	1. SAS Delivery UNIT
	C181486		1. CAN Line
34	C240162	Motor circuit error	1. Motor location sensor
			2. Motor connector
35	C241216	Motor short/break	1. Motor
	C241262		2. Motor connector
36	C186687	ICSC CAN Not received	1. ICSC (Integrated controller)
37	C166B87	Wheel speed sensor signal Not received	1. Wheel speed sensor
			2. CAN Line
38	C16B286	Wheel speed sensor signal error	1. Wheel speed sensor
			2. CAN Line
39	C16BF64	Wheel speed sensor monitoring error	1. Wheel speed sensor
			2. CAN Line
40	C241319	Motor current error	1. Motor current sensor
	C241328		
	C241396		

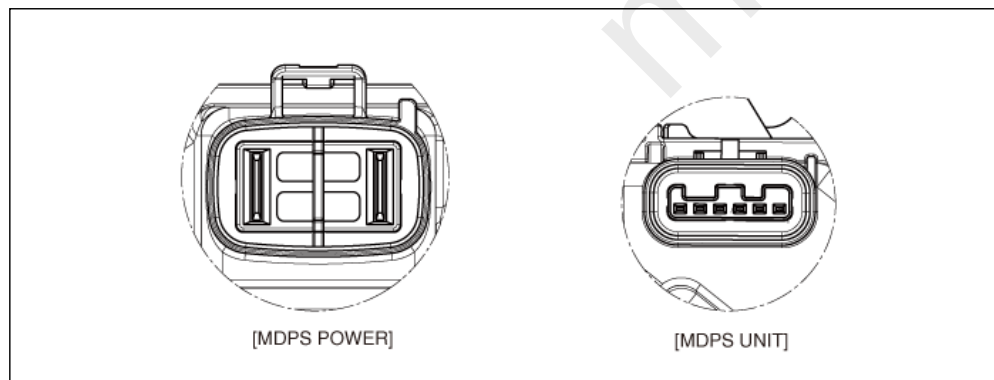
Checking Connectors and Wiring

1. Checking Connectors and Wiring.

Check for damage, push-back, or improper connection in each connector and wiring.

(1) Check the wiring on the vehicle side.

- Check for open / short - circuit due to faulty connection, damage, or foreign substance.



Classification	Pin no	Pin name
MDPS Power	1	Battery (-)
	2	Battery (+)

MDPS Unit	1	-
	2	-
	3	IG 1
	4	C-CAN [High]
	5	C-CAN [Low]
	6	-



The following phenomena are not malfunctions when the MDPS warning lamp is not lit.

- There is no auxiliary steering force temporarily during the MDPS system self-diagnosis time (about 2 seconds) immediately after the engine starts, but this is not a malfunction.
- There is noise due to relay connection when the engine is on or off, but this is a normal operation sound.
- There is noise caused by motor rotation when operating the steering wheel in a stationary or low-speed driving state, but this is a normal operating sound.

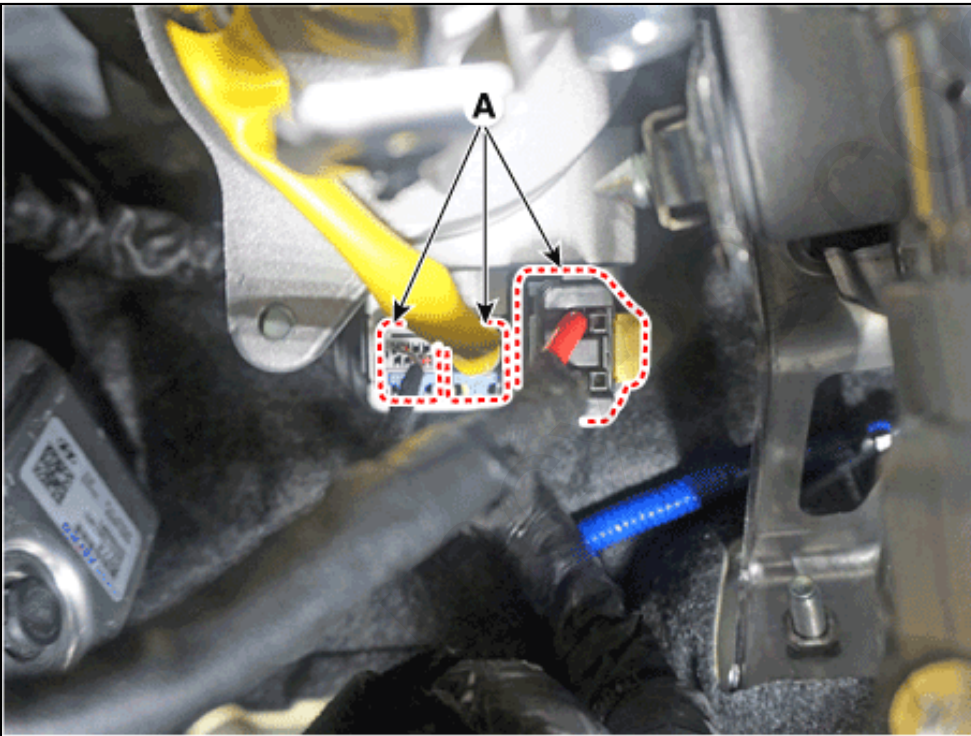
MDPS(Motor Driven Power Steering) Handling precautions

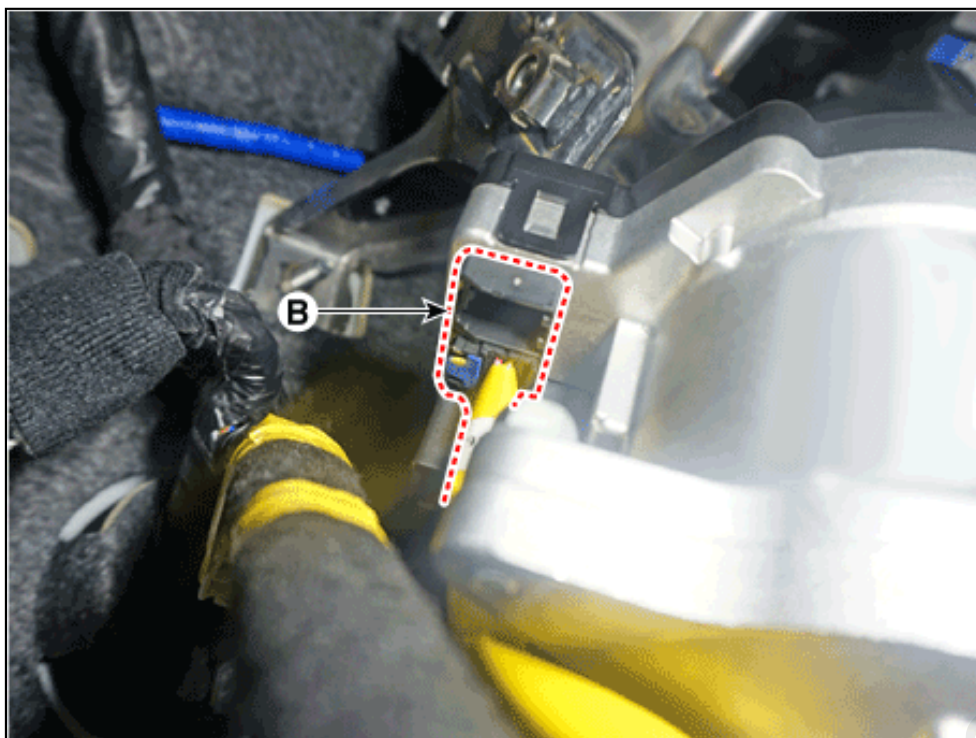
1. A failure may occur due to the internal damage when a new partial part is dropped, impacted or excessive external load is applied.
→ If a partial part is impacted or is dropped, replace it with a new part.
2. If excessive impact is applied when assembling the steering wheel, center point of the torque sensor may be warped.
→ Caution is needed when tightening by excessive impact.
3. Be careful for the damage to the wiring due to deformation, when detaching/attaching the contactor or excessive external force is applied.
→ Excessive insertion of the connector or using after removal is prohibited.
4. Caution is needed for partial part storage and replacement work under abnormal condition of the temperature and humidity.

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Replacement

1. Turn the steering wheel so that the front wheels are placed in the straight ahead position.
2. Turn the ignition switch OFF and disconnect the battery negative (-) cable.
3. Remove the driver airbag (DAB).
(Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")
4. Remove the steering wheel.
(Refer to Steering System - "Steering wheel")
5. Remove the clock spring.
(Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")
6. Remove the multifunction switch.
(Refer to Body Electrical System - "Multifunction switch")
7. Remove the steering column shroud lower panel.
(Refer to Body - "Steering Column Shroud lower Panel")
8. Remove the crash pad lower pannel.
(Refer to Body - "Crash Pad Lower Pannel")
9. Remove the brake pedal.
(Refer to Brake System - "Brake Pedal")
10. Disconnect the MDPS connector (A, B).



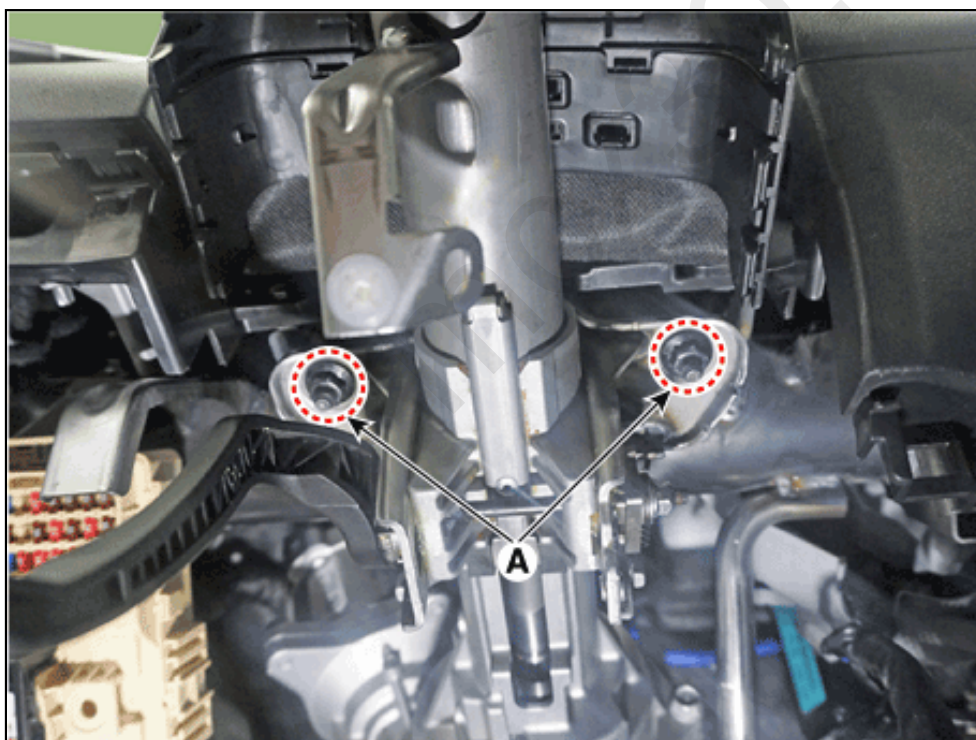


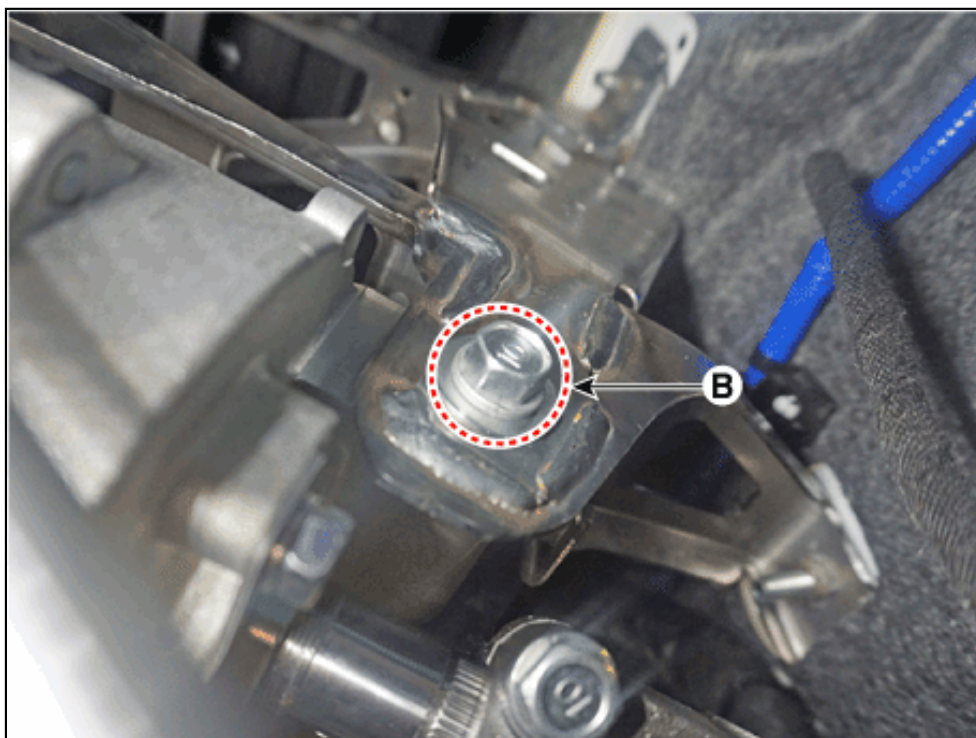
11. Remove the steering column assembly after loosening the mounting nuts (A) and bolt (B).

Tightening torque

(A) : 25.0 - 29.4 N.m (2.5 - 3.0 kgf.m, 14.5 - 21.7 lb-ft)

(B) : 53.9 - 58.8 N.m (5.5 - 6.0 kgf.m, 39.8 - 43.4 lb-ft)





12. Remove the MDPS power pack (A) after loosening the mounting bolts.

Tightening torque :

15.0 - 22.0 N.m (1.53 - 2.24 kgf.m, 11.1 - 16.2 lb-ft)



13. Install a new power pack.



•When installing a new power pack, be sure to check whether the coupling is assembled before installing it.

14. To install, reverse the removal procedures.

15. Conduct the "EPS Type Recognition" by diagnostic tool.

(Refer to MDPS PowerPack Assembly - "Diagnosis with diagnostic tool")

16. Conduct the "ASP Calibration" by diagnostic tool.

(Refer to MDPS PowerPack Assembly - "Diagnosis with diagnostic tool")

17. Check the DTC.

Diagnosis with diagnostic
tool

EPS Type Recognition



- When missing the EPS Type Recognition, occur a problem with motor driven power steering performance.

EPS Type Recognition procedures

1. Connect self-diagnosis connector(16pins) located in the lower of driver side crash pad to self-diagnosis device.
2. Turn the self-diagnosis device after key is ON.
3. Turn the steering wheel to straight ahead position.
4. After Selecting the "vehicle model" and "system", select the "EPS Type Recognition" on diagnostic tool vehicle selection screen.



■ IBU-TPMS



■ Smart Junction Block



■ Transmitter Code Saving



Do not touch any system buttons while performing this function.

S/W Management



• ESP Type Recognition

Purpose	To load accurate EPS type into Electric Power Steering(EPS) ECU.
Enable Condition	1.Engine Off 2.Ignition Switch On
Concerned Component	Electric Power Steering(EPS) ECU
Concerned DTC	C1702
Fail Safe	Warning Lamp On
Etc	-

OK



Do not touch any system buttons while performing this function.



Do not touch any system buttons while performing this function.

5. Remove the DTC.

6. Turn off the IG switch and wait for 20 seconds or more before starting the engine. And then make sure that MDPS works properly.

SAS Calibration

–Steering-angle sensor detects the steering angle and steering angle speed. Steering angle and steering angle speed are used for steering wheel damping and return controls in addition to providing assistance torque.



- You can use a scan tool to (diagnostic tool) check if the battery voltage is proper before perform the "SAS Calibration".
- Make sure that no connector engaged to the vehicle or scan tool is disconnected during the "SAS Calibration".
- Once the "SAS Calibration" is complete, turn off the IG switch and wait for 10 seconds or more before starting the engine to check the operation.

SAS Calibration procedures

1. Connect self - diagnosis connector (16pins) located in the lower of driver side crash pad to self - diagnosis device.
2. Turn the self - diagnosis device after key is ON.
3. Turn the steering wheel to straight ahead position.
4. After Selecting the "vehicle model" and "system", select the "SAS Calibration" on diagnostic tool vehicle selection screen.



■ Cluster Module



■ IBU-BCM



■ IBU-TPMS



■ Smart Junction Block



■ Transmitter Code Saving



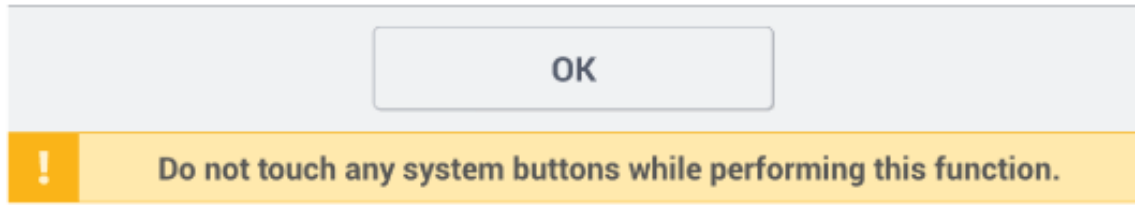
Do not touch any system buttons while performing this function.

S/W Management



• Steering Angle Sensor(SAS) Calibration

Purpose	To calibrate steering angle value on the Electric Power Steering(EPS) ECU to actual steering angle value of vehicle.
Enable Condition	1.Engine Off 2.Ignition Switch On
Concerned Component	Electric Power Steering(EPS) ECU, Steering Angle Sensor(SAS)
Concerned DTC	C1261
Fail Safe	Warning Lamp On
Etc	Perform this function when you replace EPS ECU or do work related to EPS.



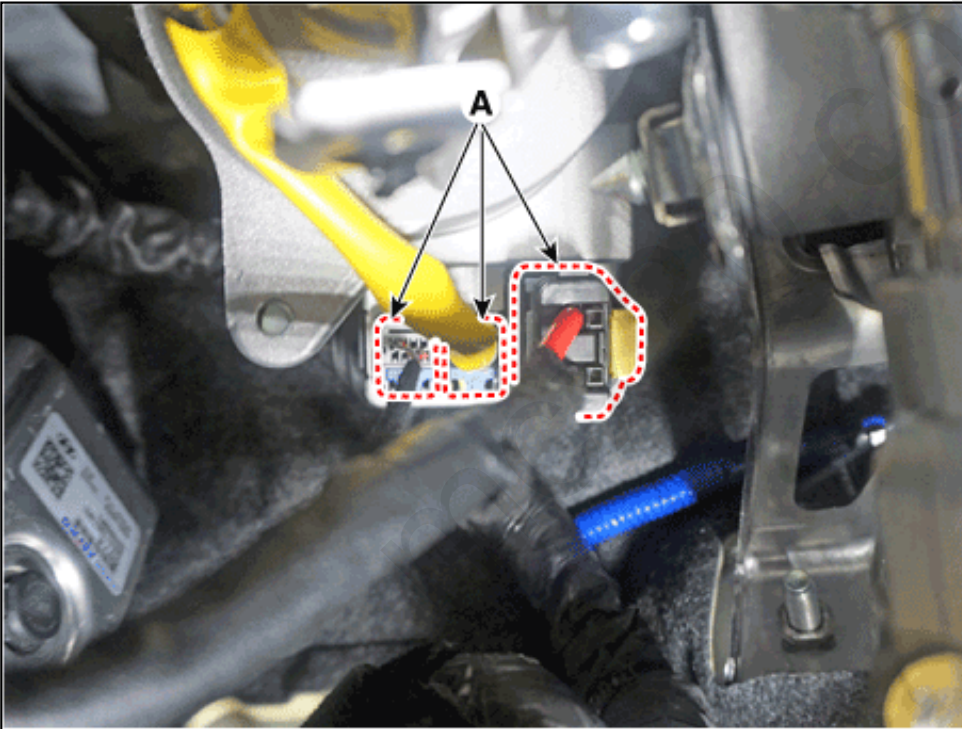
5. Remove the DTC.
6. Turn off the IG switch and wait for 10 seconds or more before starting the engine. And then make sure that MDPS works properly.

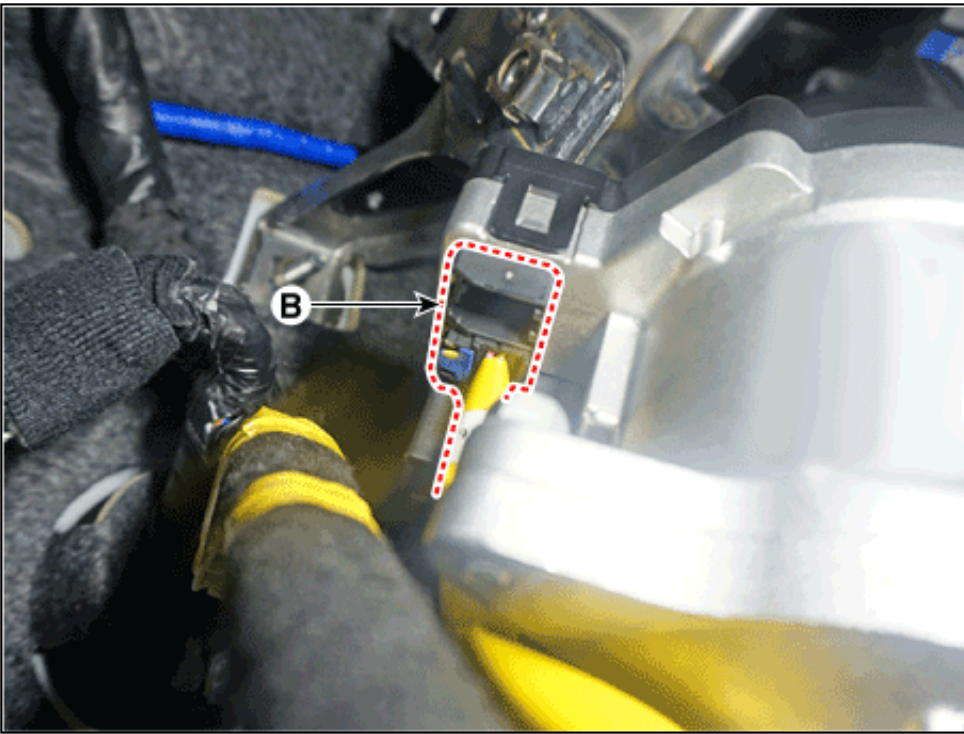
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Replacement

[C-MDPS]

1. Turn the steering wheel so that the front wheels are placed in the straight ahead position.
2. Turn the ignition switch OFF and disconnect the battery negative (-) cable.
3. Remove the driver airbag (DAB).
(Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")
4. Remove the steering wheel.
(Refer to Steering System - "Steering wheel")
5. Remove the clock spring.
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6. Remove the multifunction switch.
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7. Remove the steering column shroud lower panel.
(Refer to Body - "Steering Column Shroud lower Panel")
8. Remove the crash pad lower pannel.
(Refer to Body - "Crash Pad Lower Pannel")
9. Remove the brake pedal.
(Refer to Brake System - "Brake Pedal")
10. Disconnect the MDPS connector (A, B).





11. Separate the universal joint from the steering gear box after loosening the universal joint mounting bolt (A).

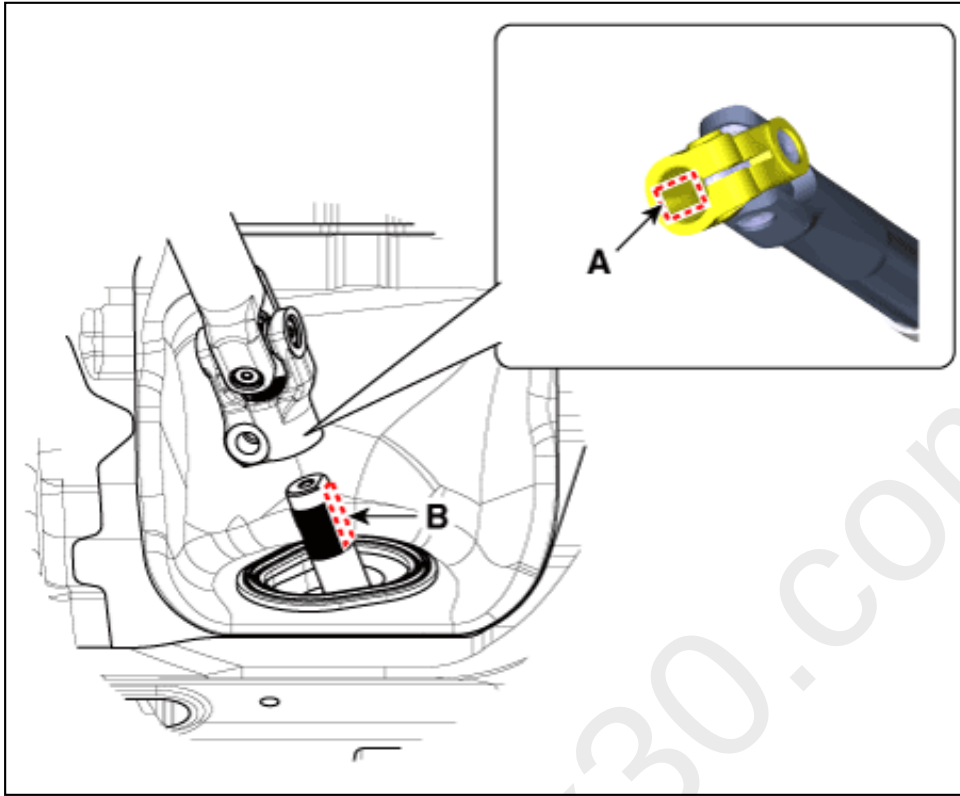
Tightening torque :

53.9 - 58.8 N.m (5.5 - 6.0 kgf.m, 39.8 - 43.4 lb-ft)





- Lock the steering wheel in the straight ahead position to prevent the damage of the clock spring inner cable.
- When mounting, securely insert the universal joint into the steering gear box pinion shaft.
- Do not reuse the universal joint bolt.
- Assemble so that pinion shaft shark pin can be inserted between the joint slots.
- Install by aligning the machining surface (A) of the universal joint and the machining surface (B) of the steering gearbox pinion shaft.

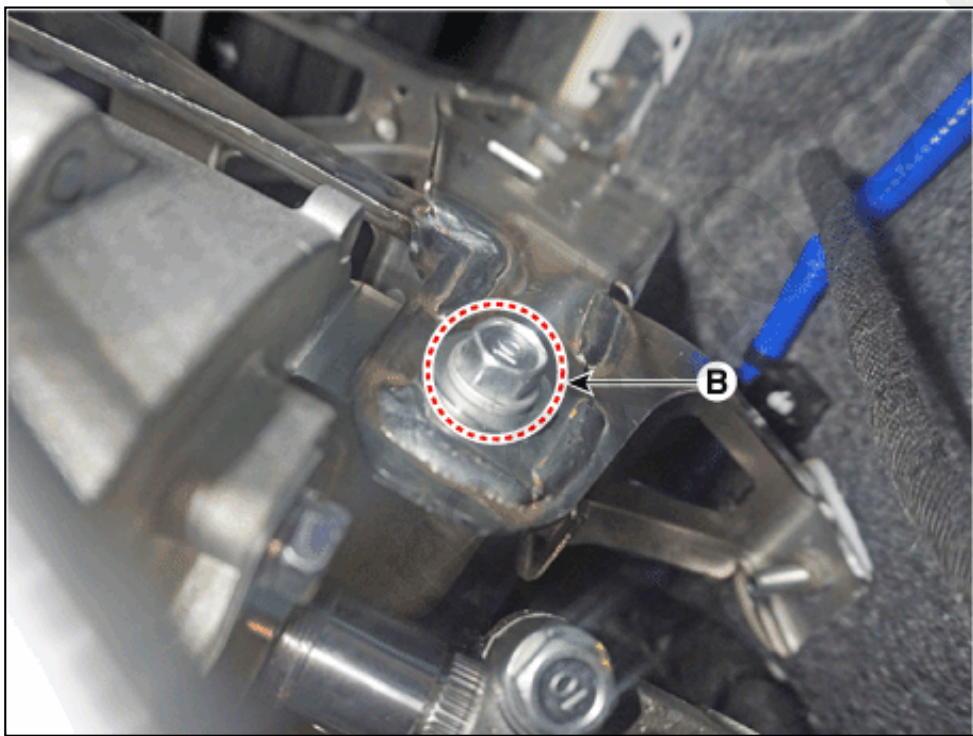
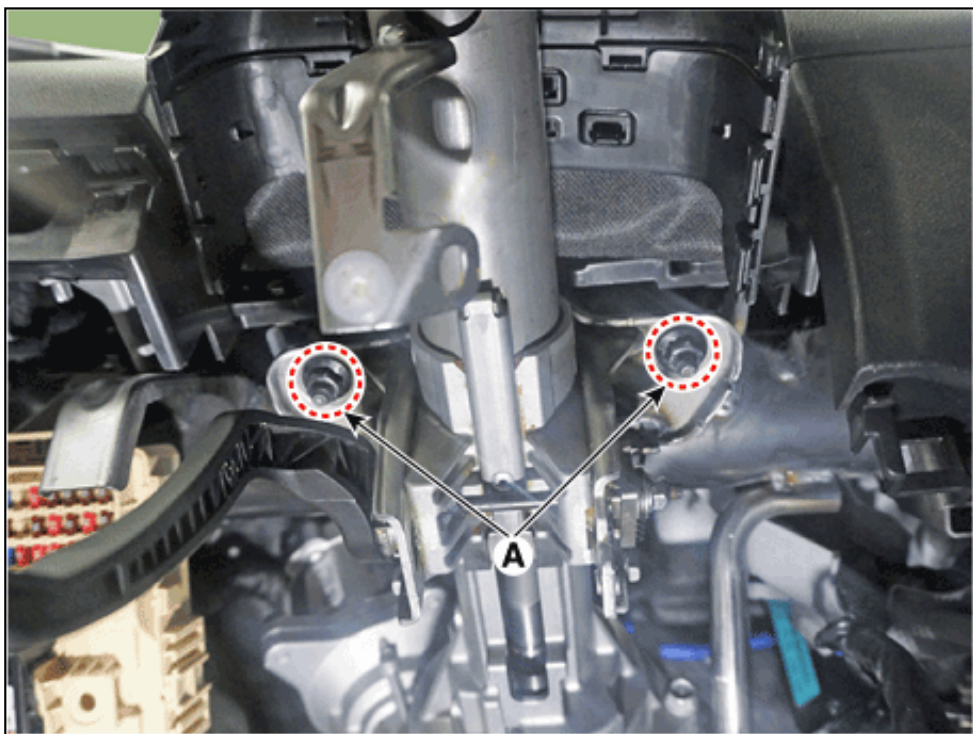


12. Remove the steering column assembly after loosening the mounting nuts (A) and bolt (B).

Tightening torque :

(A) : 25.0 - 29.4 N.m (2.5 - 3.0 kgf.m, 14.5 - 21.7 lb-ft)

(B) : 53.9 - 58.8 N.m (5.5 - 6.0 kgf.m, 39.8 - 43.4 lb-ft)



13. To install, reverse the removal procedures.



- When installing a new power pack, be sure to check whether the coupling is assembled before installing it.

14. Set the Steering angle zero point by using the diagnostic tool.

S/W Management

Systems

Components

Unfold All

■ Motor Driven Power Steering

■ System Identification

■ Steering Angle Sensor(SAS) Calibration

■ Part replacement (Power steering motor)

■ Part replacement (Power steering ECU)

■ EPS Type Recognition

■ Set the steering feel torque to zero

■ MDPS TEST (Motor Driven Power Steering)

■ Tire Pressure Monitoring

■ Parking Guide System

■ Blind Spot Detection

■ Multi Function Camera

■ Adaptive Front Lighting System

■ Immobilizer

■ Smart Key Unit

■ Assist Door Module

■ Body Control Module

!

Do not touch any system buttons while performing this function.

S/W Management

■ Set the steering feel torque to zero

● [Set the steering feel torque to zero]

This function readjusts the steering feel torque to zero to improve the steering feel difference between right and left.

This function needs to perform in the following situations.

1. When the steering feel difference between right and left steering wheel occurs during driving
2. Make sure to perform the function during the replacement of the column or housing assembly

● [Condition]

1. IG On, Engine Drive
2. Empty Vehicle State
3. Align the steering wheel to the center
4. Take driver's hands off the steering wheel

⚠ [Caution]

When the steering feel difference occurs between right and left, steering might be unstable after driving and set torque to zero through the corresponding function.

[OK] button: Set the steering feel torque to zero

[Cancel] button: Finish additional function

OK

Cancel

15. Conduct the "EPS Type Recognition" by diagnostic tool.

(Refer to MDPS PowerPack Assembly - "Diagnosis with diagnostic tool")

16. Conduct the "ASP Calibration" by diagnostic tool.

(Refer to MDPS PowerPack Assembly - "Diagnosis with diagnostic tool")

17. Conduct the MDPS Performance Inspection using the diagnostic tool.

(Refer to Motor Driven Power Steering - "Repair procedures")

18. Check the DTC.

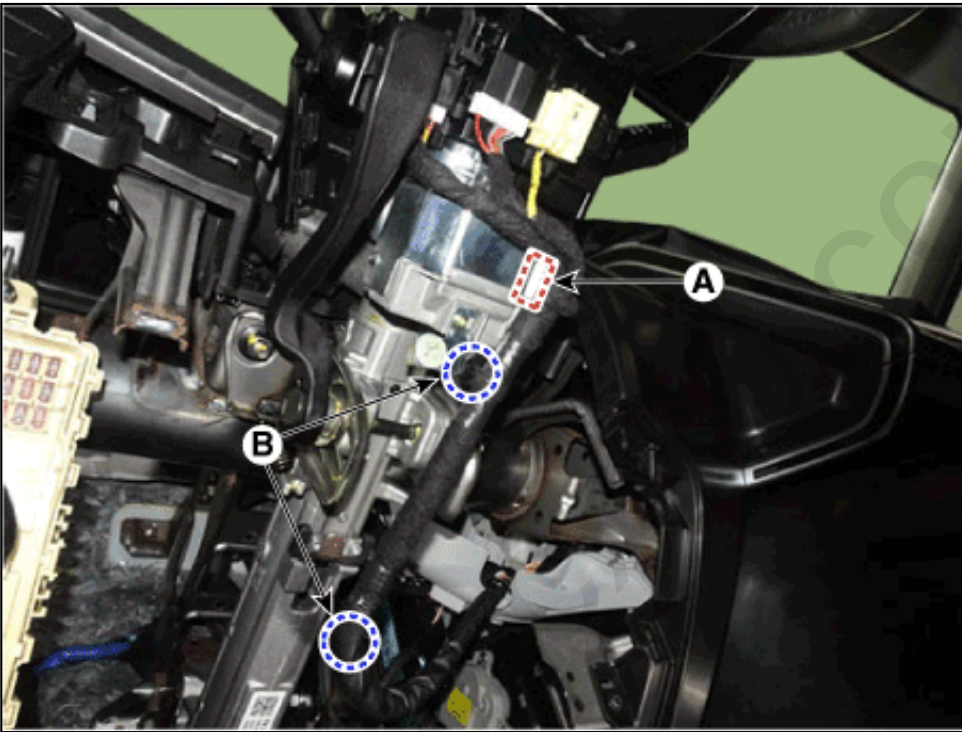
19. Turn off the IGN switch and wait for 20 seconds or more. Then check the operation after starting the engine.

[R-MDPS]

1. Turn the steering wheel so that the front wheels are placed in the straight ahead position.

2. Turn the ignition switch OFF and disconnect the battery negative (-) cable.

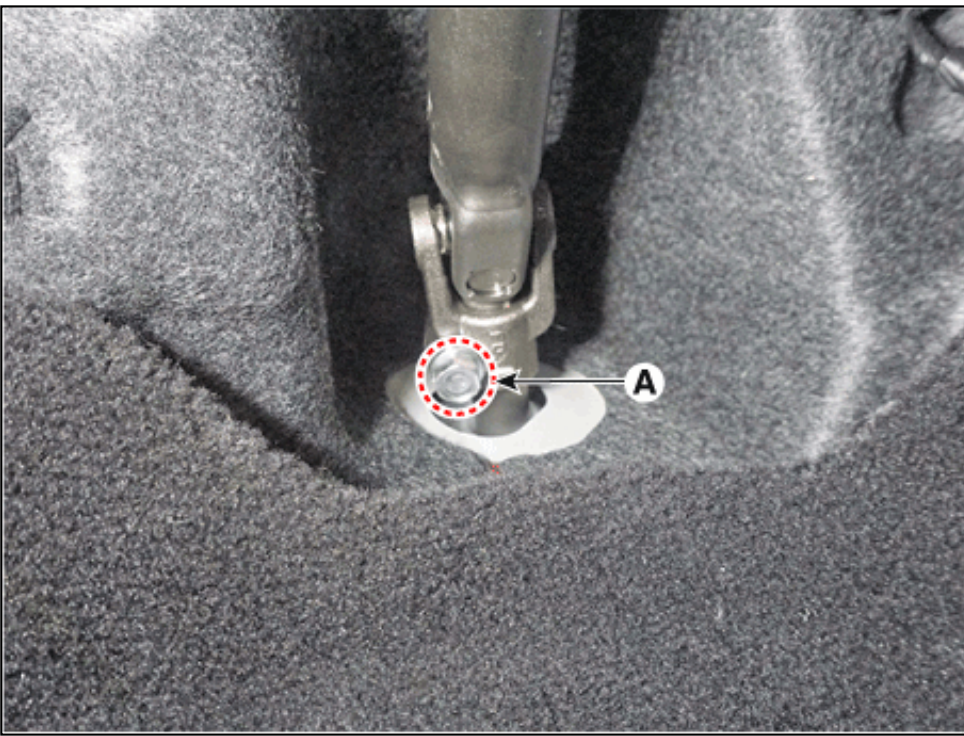
3. Remove the driver airbag (DAB).
(Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")
4. Remove the steering wheel.
(Refer to Steering System - "Steering wheel")
5. Remove the clock spring.
(Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")
6. Remove the multifunction switch.
(Refer to Body Electrical System - "Multifunction switch")
7. Remove the steering column shroud lower panel.
(Refer to Body - "Steering Column Shroud lower Panel")
8. Remove the crash pad lower pannel.
(Refer to Body - "Crash Pad Lower Pannel")
9. Remove the brake pedal.
(Refer to Brake System - "Brake Pedal")
10. Disconnect the electric steering column lock switch connector (A).
11. Remove the fixing clip (B) from the steering column.



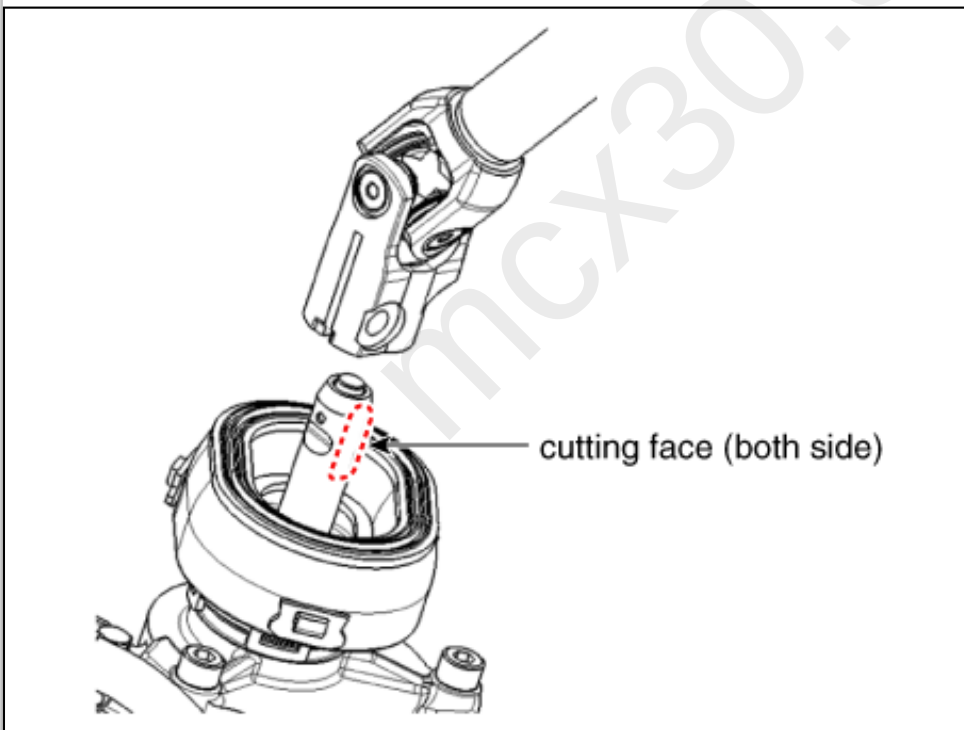
12. Separate the universal joint from the steering gear box after loosening the universal joint mounting bolt (A).

Tightening torque :

53.9 - 58.8 N.m (5.5 - 6.0 kgf.m, 39.8 - 43.4 lb-ft)



- Do not reuse the bolt.
- Lock the steering wheel in the straight ahead position to prevent the damage of the clock spring inner cable.
- Assemble so that the universal joint hole is inserted matching the cut surface of the pinion shaft.

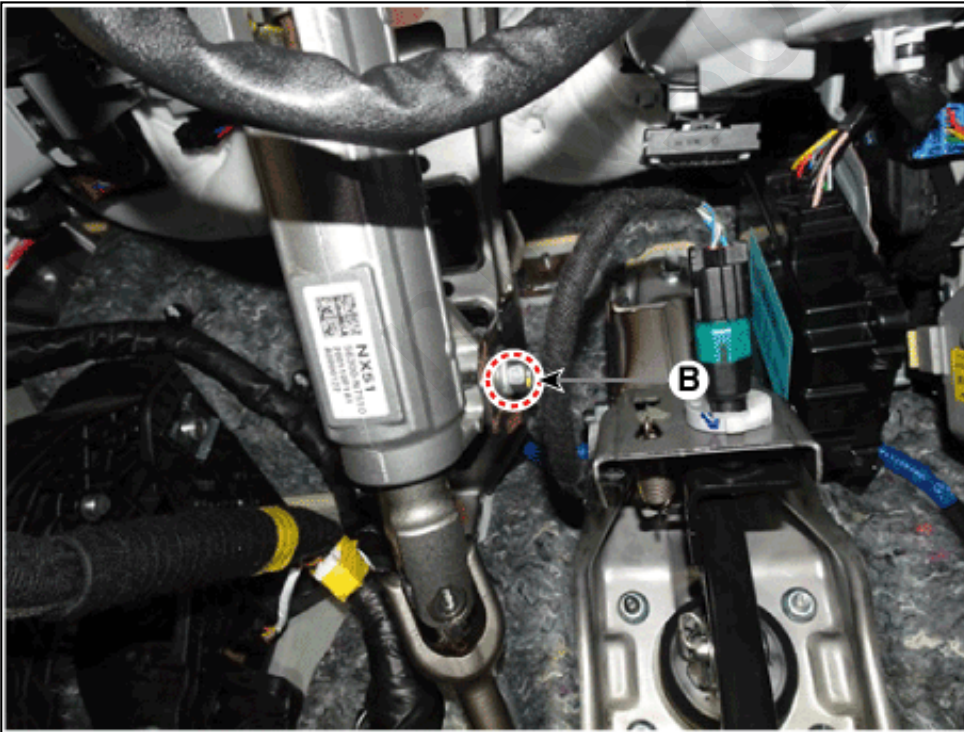
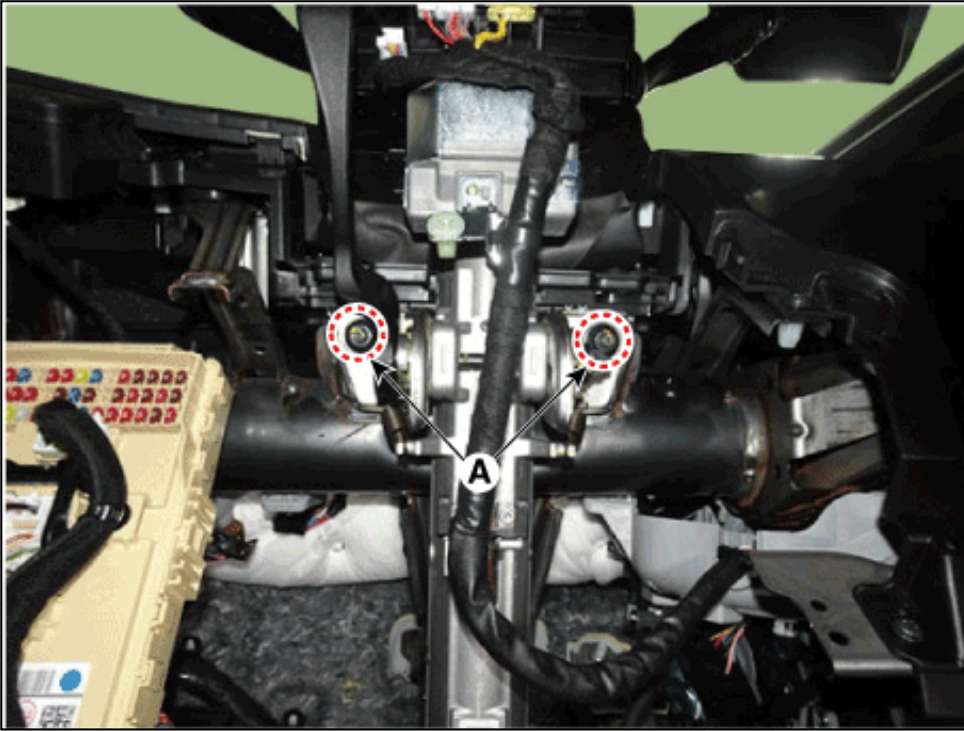


13. Remove the MDPS assembly by loosening the mounting nuts (A) and bolt (B).

Tightening torque

(A) : 25.0 - 29.4 N.m (2.5 - 3.0 kgf.m, 14.5 - 21.7 lb-ft)

(B) : 53.9 - 58.8 N.m (5.5 - 6.0 kgf.m, 39.8 - 43.4 lb-ft)



14. To install, reverse the removal procedures.

Disassembly

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

Tightening torque :

49.0 - 58.8 N.m (5.0 - 6.0 kgf.m, 39.8 - 43.4 lb-ft)

[C-MDPS]



[R-MDPS]

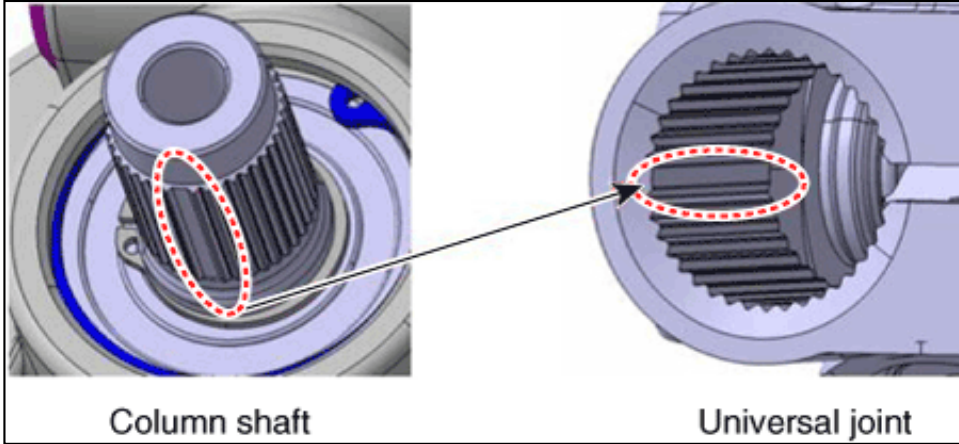


- Do not reuse the universal joint bolt.

2. Reassembly is the reverse of the disassembly.



- When assembling, match the gear teeth as the below illustration.



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.

Diagnosis with diagnostic
tool

EPS Type Recognition



- When missing the EPS Type Recognition, occur a problem with motor driven power steering performance.

EPS Type Recognition procedures

1. Connect self-diagnosis connector(16pins) located in the lower of driver side crash pad to self-diagnosis device.
2. Turn the self-diagnosis device after key is ON.
3. Turn the steering wheel to straight ahead position.
4. After Selecting the "vehicle model" and "system", select the "EPS Type Recognition" on diagnostic tool vehicle selection screen.



■ 4WD Control

■ Motor Driven Power Steering

■ System Identification

■ Steering Angle Sensor(SAS) Calibration

■ Part exchange (Power steering motor)

■ Part exchange (Power steering ECU)

■ EPS Type Recognition

■ Parking Guide System

■ BVM

■ Multi Function Camera

■ Immobilizer

■ Smart Key Unit

■ Cluster Module

■ IBU-BCM

■ IBU-TPMS

■ Smart Junction Block

■ Transmitter Code Saving



Do not touch any system buttons while performing this function.



• ESP Type Recognition

Purpose	To load accurate EPS type into Electric Power Steering(EPS) ECU.
Enable Condition	1.Engine Off 2.Ignition Switch On
Concerned Component	Electric Power Steering(EPS) ECU
Concerned DTC	C1702
Fail Safe	Warning Lamp On
Etc	-

OK



Do not touch any system buttons while performing this function.

5. Remove the DTC.

6. Turn off the IG switch and wait for 20 seconds or more before starting the engine. And then make sure that MDPS works properly.

SAS Calibration

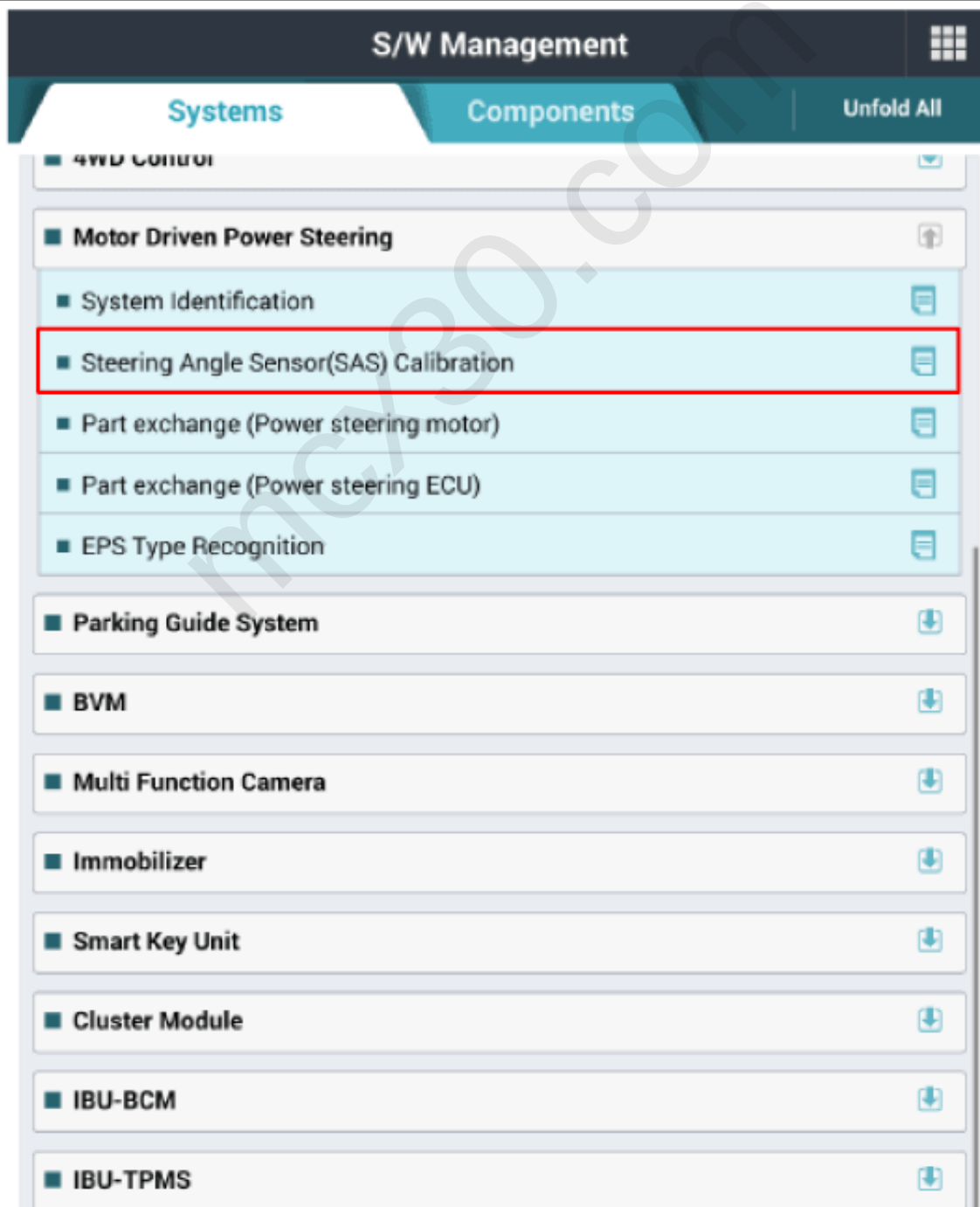
–Steering-angle sensor detects the steering angle and steering angle speed. Steering angle and steering angle speed are used for steering wheel damping and return controls in addition to providing assistance torque.



- You can use a scan tool to (diagnostic tool) check if the battery voltage is proper before perform the "SAS Calibration".
- Make sure that no connector engaged to the vehicle or scan tool is disconnected during the "SAS Calibration".
- Once the "SAS Calibration" is complete, turn off the IG switch and wait for 10 seconds or more before starting the engine to check the operation.

SAS Calibration procedures

1. Connect self - diagnosis connector (16pins) located in the lower of driver side crash pad to self - diagnosis device.
2. Turn the self - diagnosis device after key is ON.
3. Turn the steering wheel to straight ahead position.
4. After Selecting the "vehicle model" and "system", select the "SAS Calibration" on diagnostic tool vehicle selection screen.



■ IBU-TPMS



■ Smart Junction Block



■ Transmitter Code Saving



Do not touch any system buttons while performing this function.

S/W Management



• Steering Angle Sensor(SAS) Calibration

Purpose	To calibrate steering angle value on the Electric Power Steering(EPS) ECU to actual steering angle value of vehicle.
Enable Condition	1.Engine Off 2.Ignition Switch On
Concerned Component	Electric Power Steering(EPS) ECU, Steering Angle Sensor(SAS)
Concerned DTC	C1261
Fail Safe	Warning Lamp On
Etc	Perform this function when you replace EPS ECU or do work related to EPS.

OK



Do not touch any system buttons while performing this function.

OK



Do not touch any system buttons while performing this function.

5. Remove the DTC.
6. Turn off the IG switch and wait for 10 seconds or more before starting the engine. And then make sure that MDPS works properly.

Installation

1. To install, reverse the removal procedures.
2. Check the alignment.

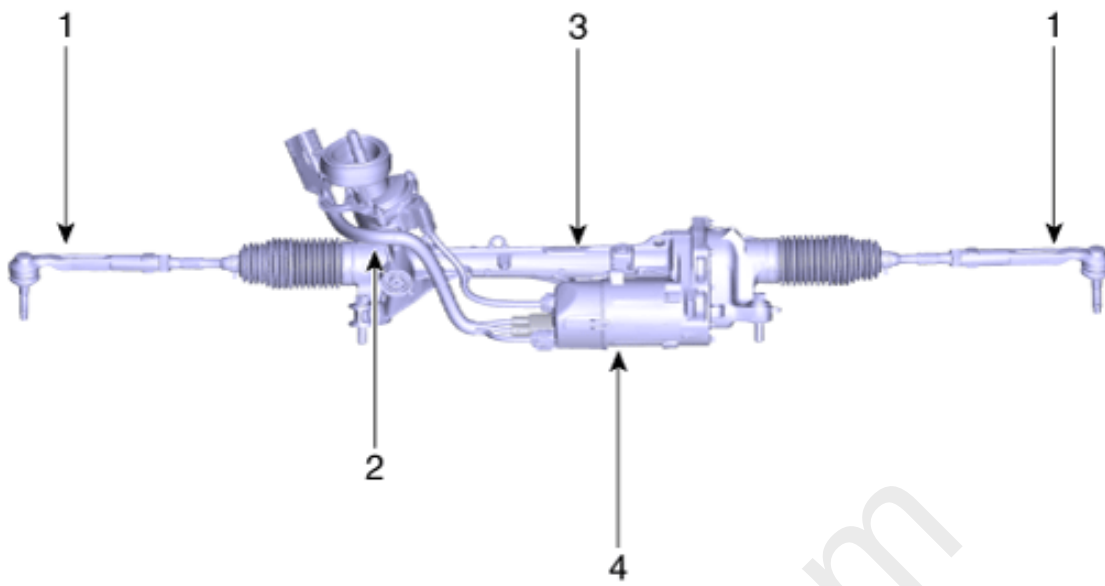
(Refer to Suspension System - "Alingment")

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[C-MDPS]

[R-MDPS]





- 1. Tie rod end
- 2. Lead wire

- 3. Short gear
- 4. Power pack

Removal and installation



- When lifting a vehicle using a lift, be careful not to damage the lower parts of the vehicle (floor under cover, fuel filter, fuel tank, canister).

(Refer to General Information - "Lift Point")

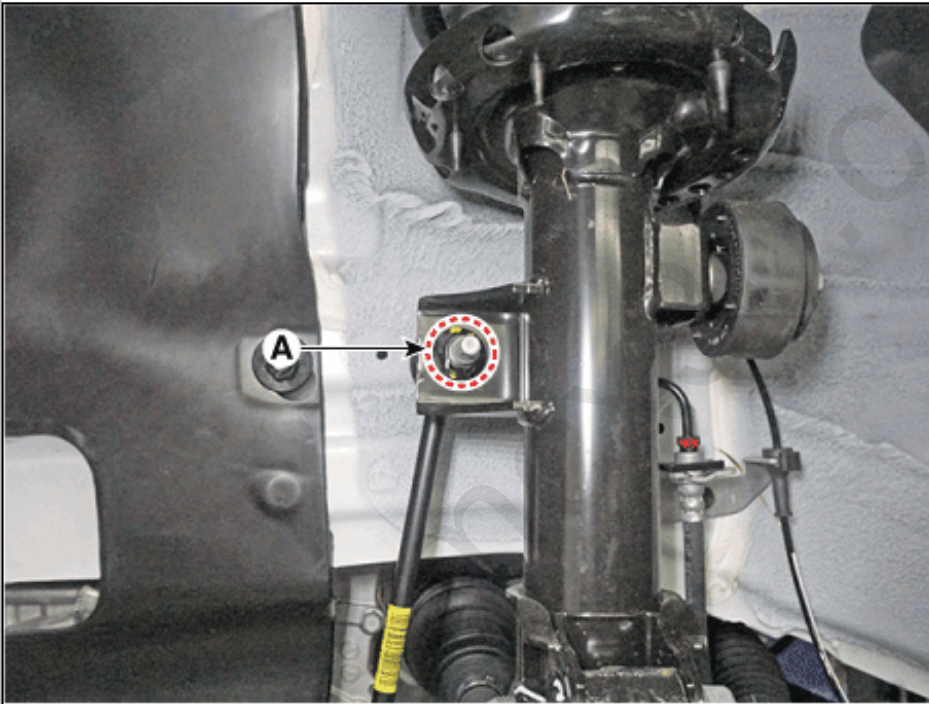
1. Loosen the front wheel nuts slightly.
Raise the vehicle, and make sure it is securely supported.
2. Remove the front wheel and tire.
(Refer to Suspension System - "Wheel")
3. Disconnect the stabilizer link with the front strut assembly after loosening the nut (A).

Tightening torque :

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



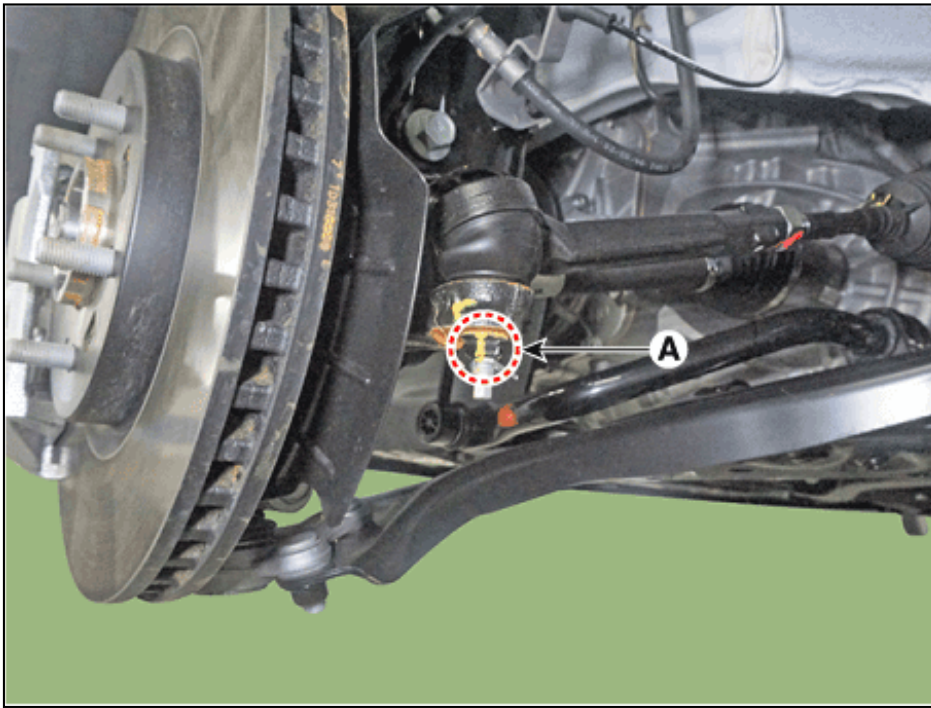
- When loosening the nut, fix the outer hexagon of stabilizer bar link.
- Be careful not to damage the stabilizer link boots.



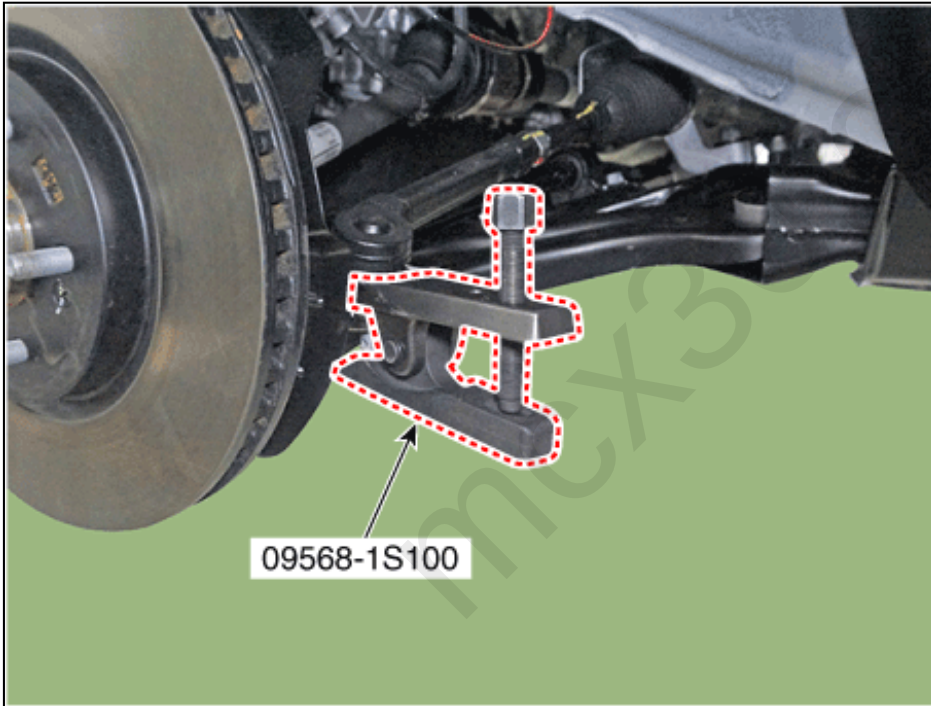
4. Remove the split pin and tie rod end ball joint nut (A).

Tightening torque:

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



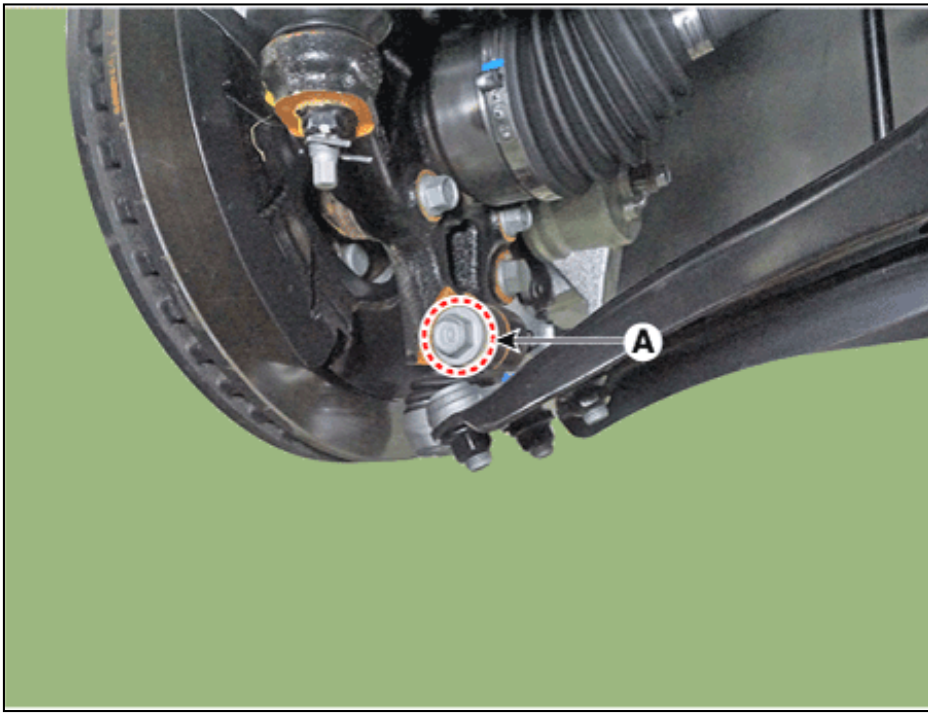
5. Remove the tie rod end ball joint (A) using the SST (09568-1S100).



6. Loosen the front lower arm bolt and nut (A).

Tightening torque:

98.0 - 117.6 N.m (10.0 - 12.0 kgf.m, 72.3 - 86.7 lb-ft)

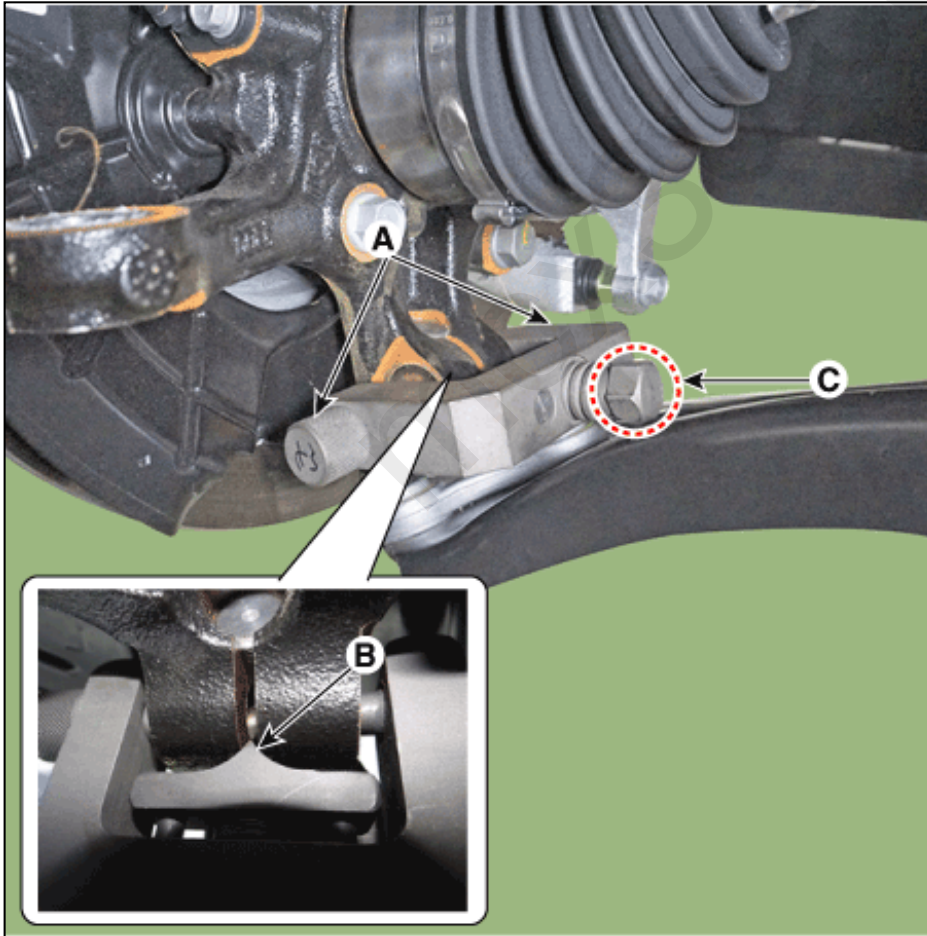


7. Remove the lower arm from the knuckle by using the SST (09568-4R100).

(1) Install the support bolt (A) from lower arm bolt hole.

(2) Install the support body (B) from front axle.

(3) Tighten the bolt (C).



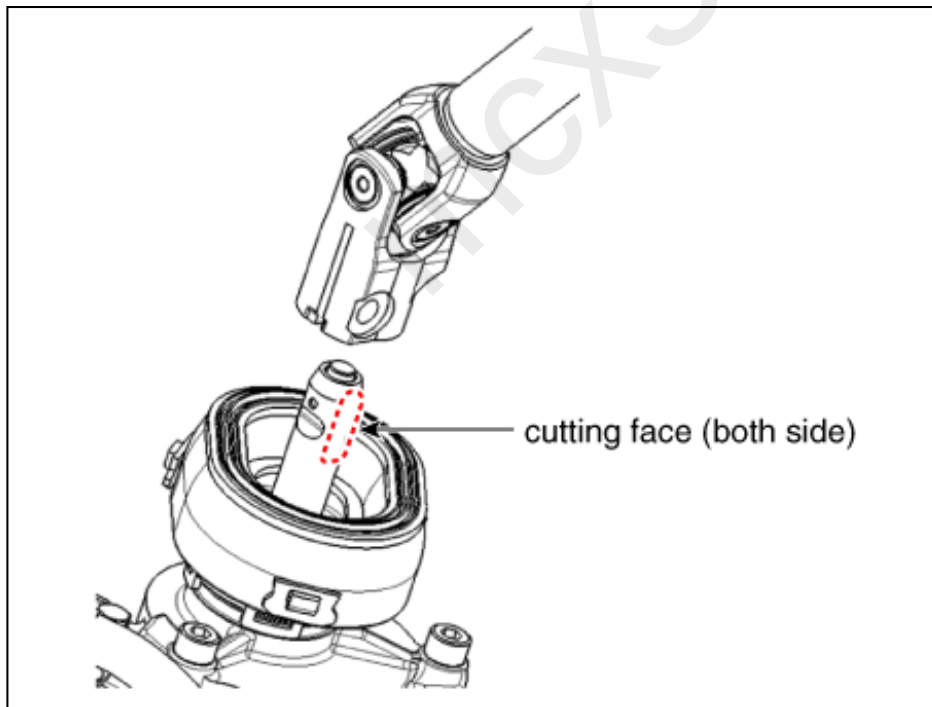
8. Separate the universal joint from the steering gear box after loosening the universal joint mounting bolt (A).

Tightening torque :

53.9 - 58.8 N.m (5.5 - 6.0 kgf.m, 39.8 - 43.4 lb-ft)



- Do not reuse the bolt.
- Lock the steering wheel in the straight ahead position to prevent the damage of the clock spring inner cable.
- Assemble so that the universal joint hole is inserted matching the cut surface of the pinion shaft.



9. Remove the under cover.

(Refer to Engine Mechanical System - "Engine Room Under Cover")

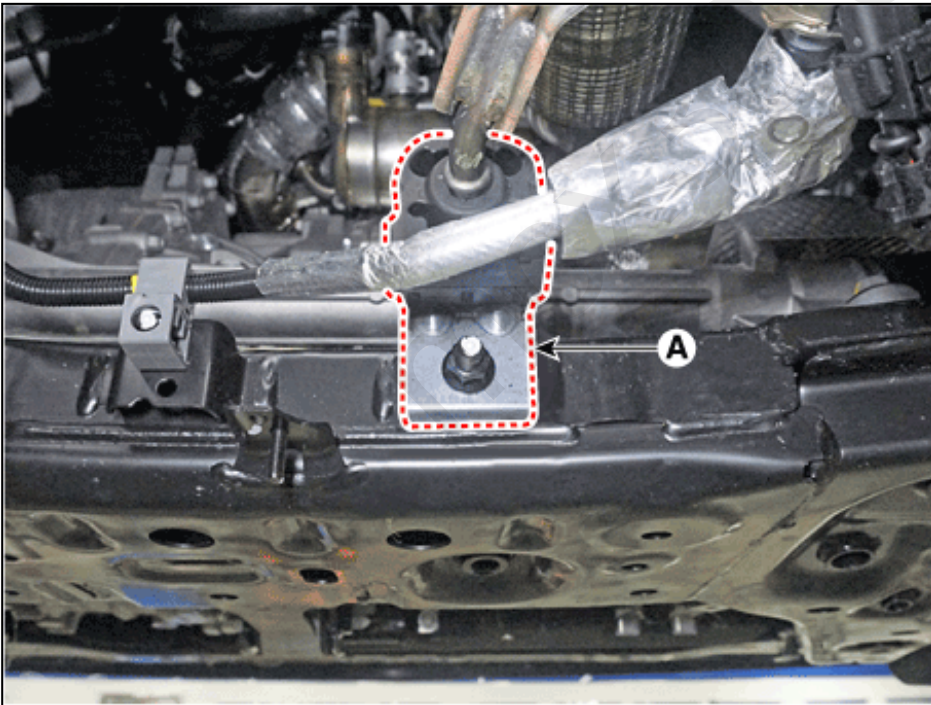
10. Disconnect the R-MDPS main connector (A). [R-MDPS Type only]



11. Remove the muffler rubber hanger (A) from the sub frame after loosening the mounting nut.

Tightening torque :

19.6 - 25.5 N.m (2.0 - 2.6 kgf.m, 14.5 - 18.8 lb-ft)

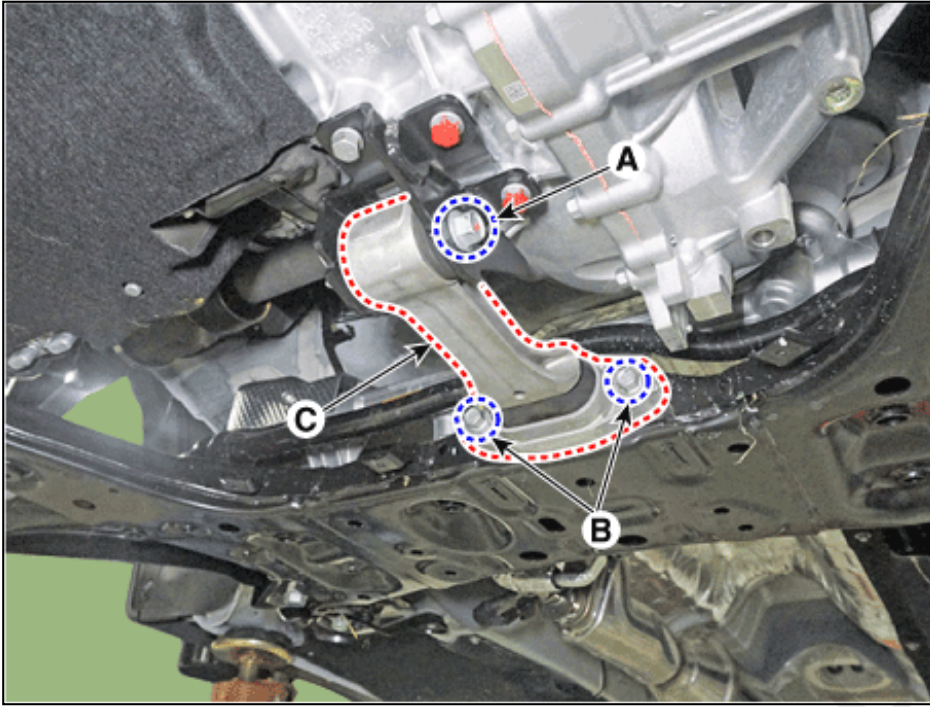


12. Remove the roll rod bracket (C) after loosening the bolt (A), (B).

Tightening torque :

(A) : 107.9 - 127.5 N.m (11.0 - 13.0 kgf.m, 79.6 - 94.0 lb-ft)

(B) : 49.0 - 63.7 N.m (5.0 - 6.5 kgf.m, 36.2 - 47.0 lb-ft)



•Set a transmission jack for safety.

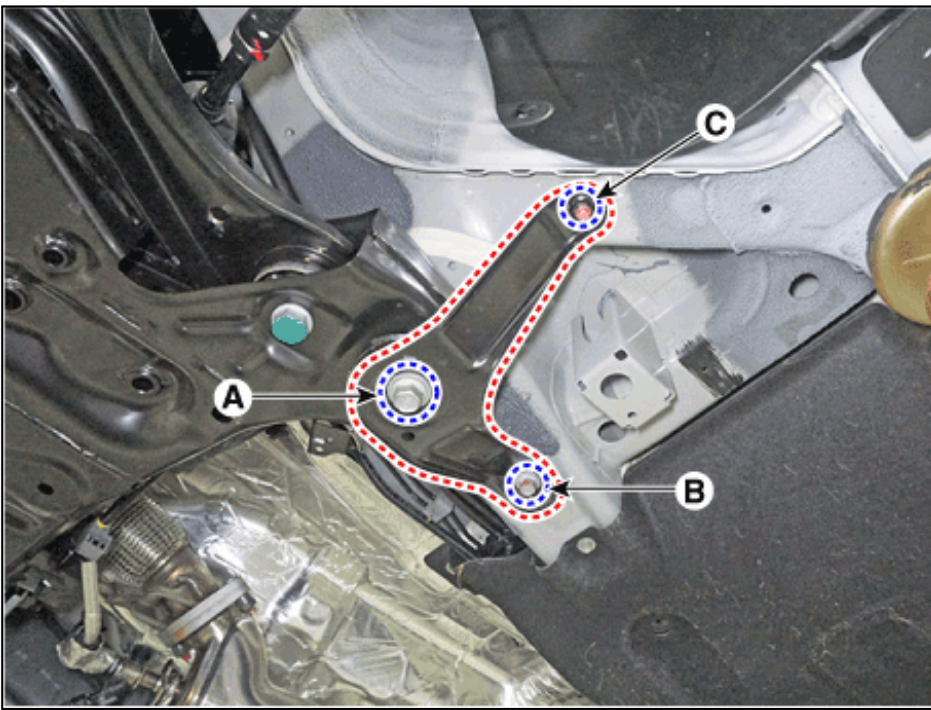
13. Remove the sub frame stay after loosening the mounting bolts (A, B) and nut (C).

Tightening torque :

(A) : 176.5 - 196.1 N.m (18.0 - 20.0 kgf.m, 130.2 - 144.7 b-ft)

(B) : 44.1 - 53.9 N.m (4.5 - 5.5 kgf.m, 32.5 - 39.8 lb-ft)

(C) : 44.1 - 53.9 N.m (4.5 - 5.5 kgf.m, 32.5 - 39.8 lb-ft)



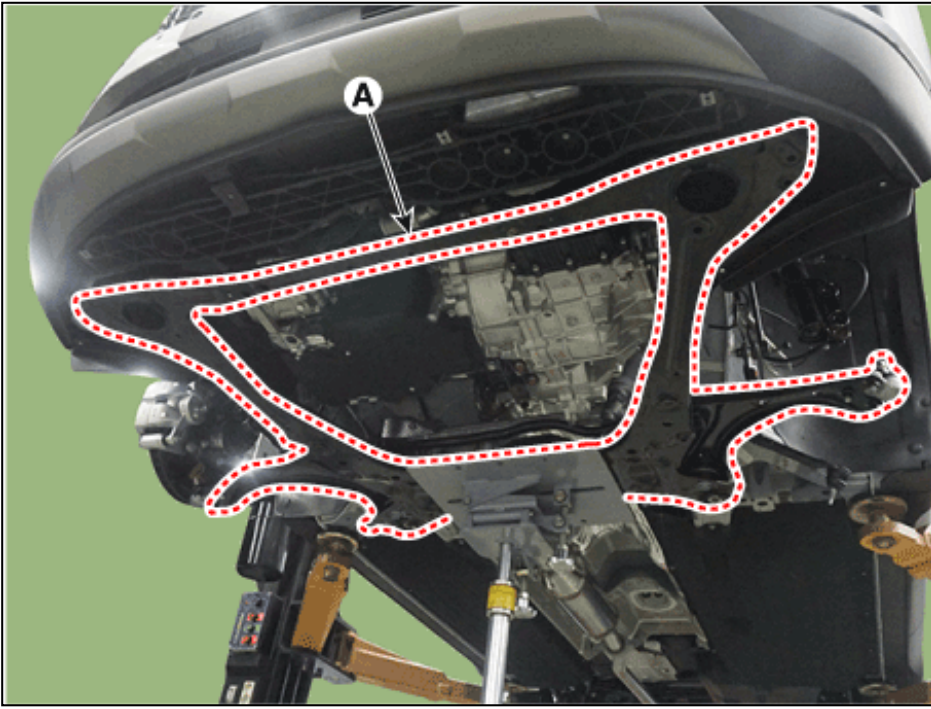
14. Loosen the sub frame mounting nuts (A).

Tightening torque :

176.5 - 196.1 N.m (18.0 - 20.0 kgf.m, 130.2 - 144.7 b-ft)



15. Remove the sub frame.

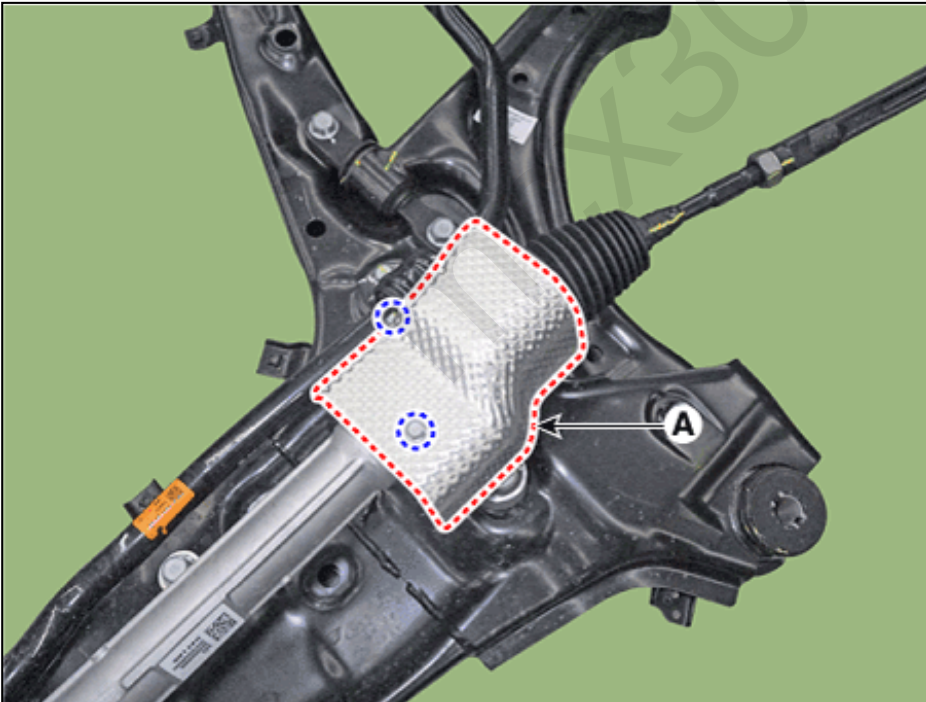


16. Remove the heat protector (A).

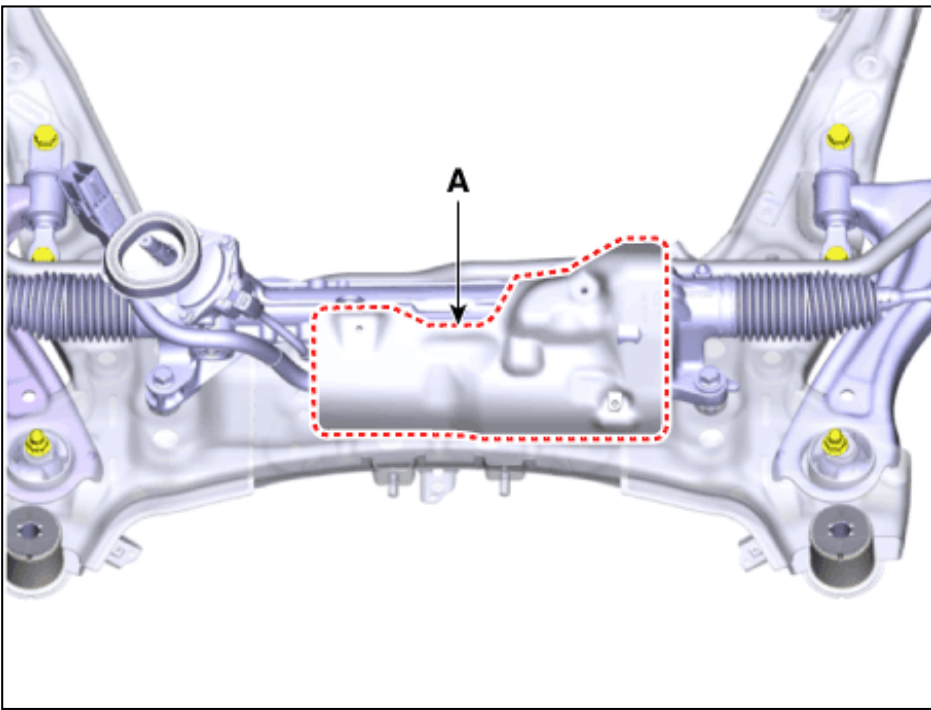
Tightening torque :

7.8 - 11.8 N.m (0.8 - 1.2 kgf.m, 5.8 - 8.7 lb-ft)

[C-MDPS]



[R-MDPS]

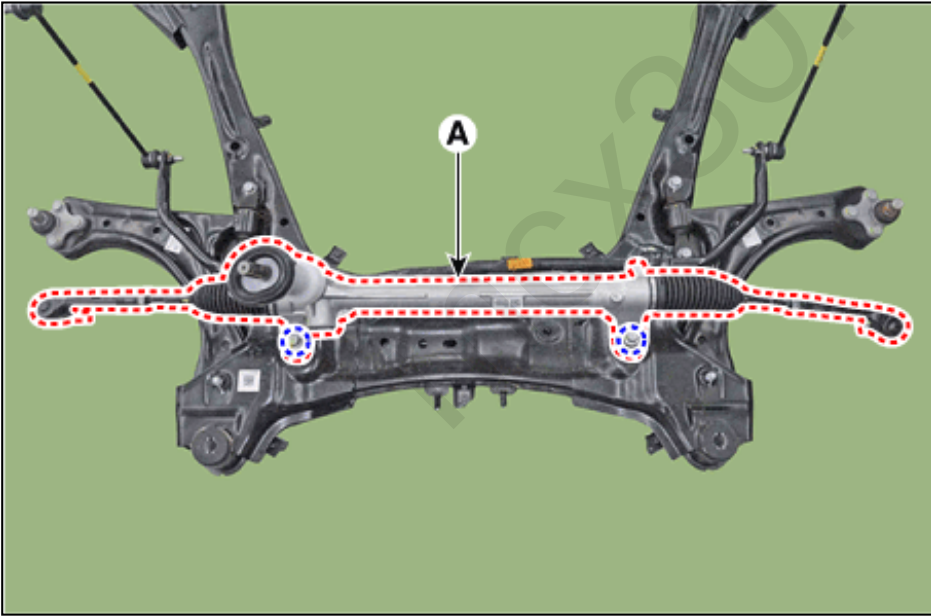


17. Remove the steering gearbox (A) from the front sub frame after loosening the mounting bolts.

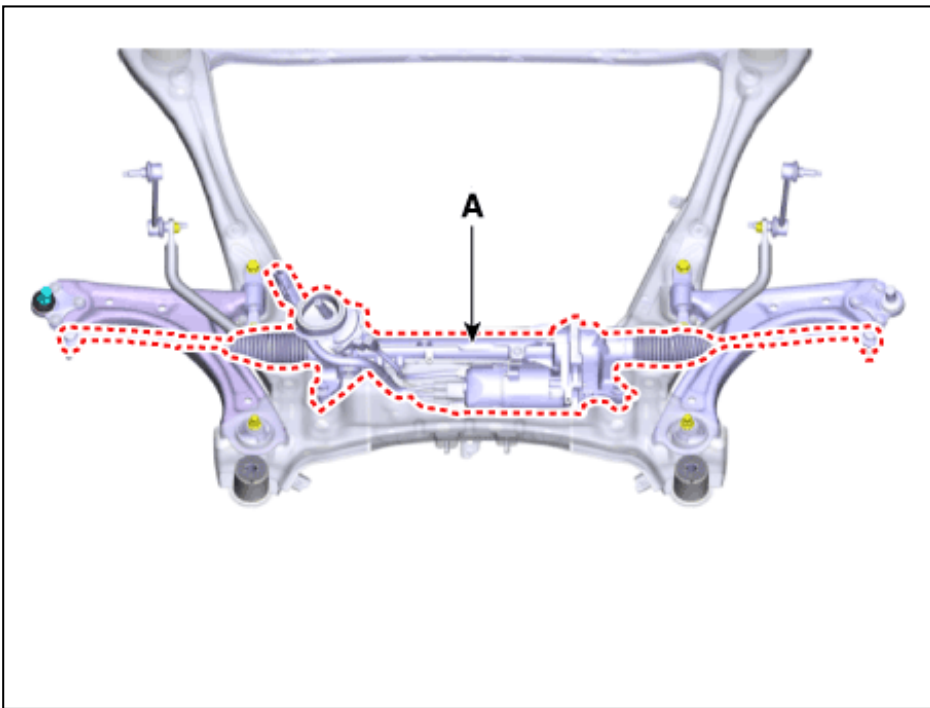
Tightening torque :

107.9 - 127.5 N.m (11.0 - 13.0 kgf.m, 79.6 - 94.0 lb-ft)

[C-MDPS]



[R-MDPS]



18. To install, reverse the removal procedures.

19. Check the alignment.

(Refer to Suspension System - "Alingment")

20. Conduct the "EPS Type Recognition" by diagnostic tool.

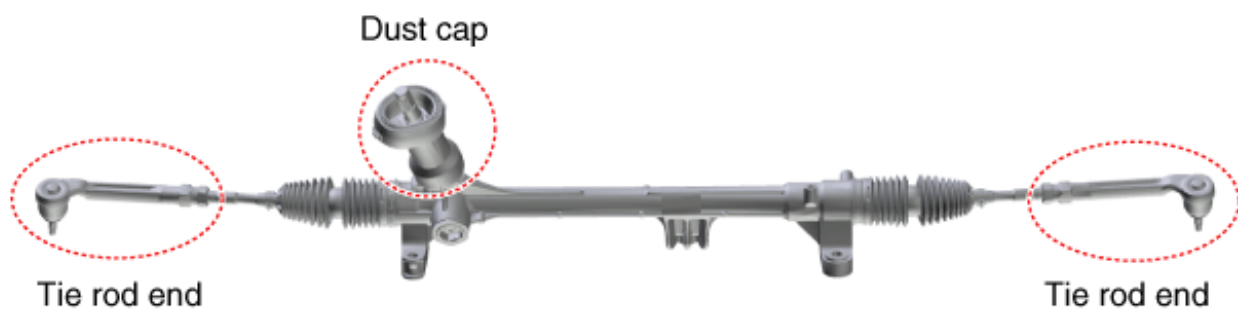
(Refer to Motor Driven Power Steering - "Diagnosis with diagnostic tool")

Replacement

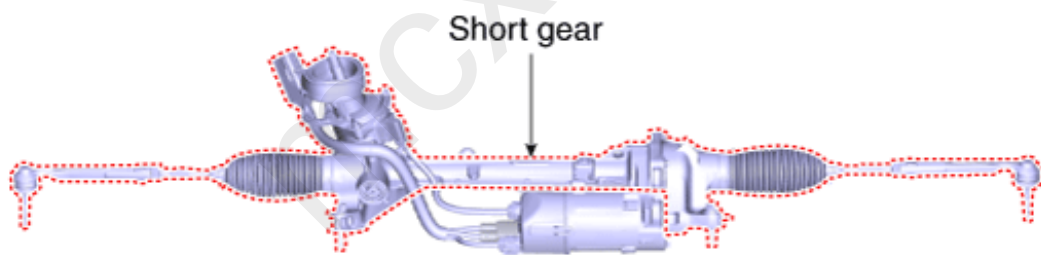


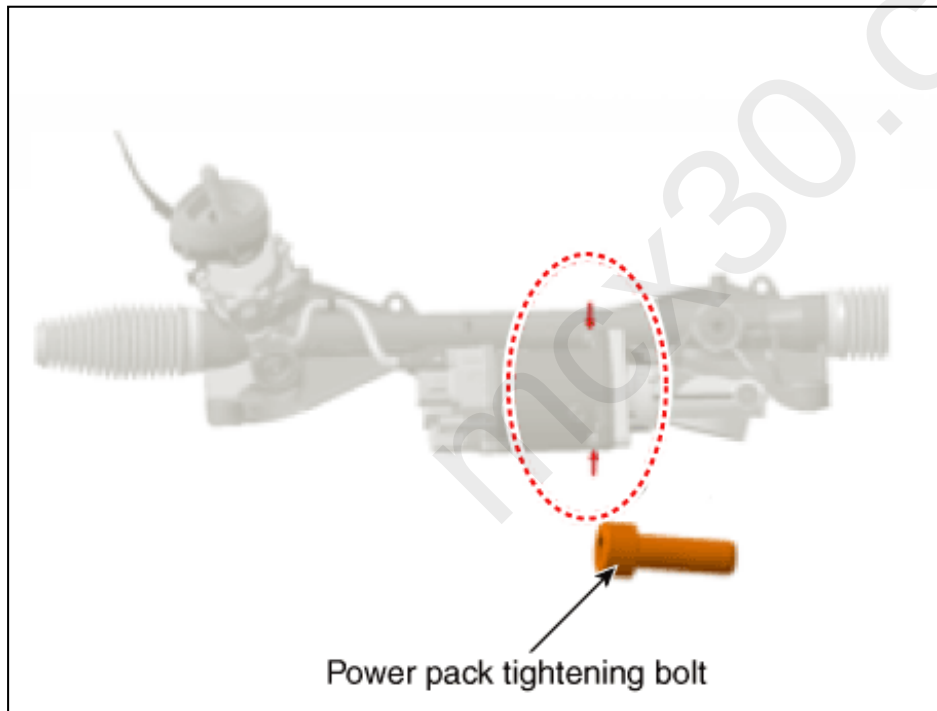
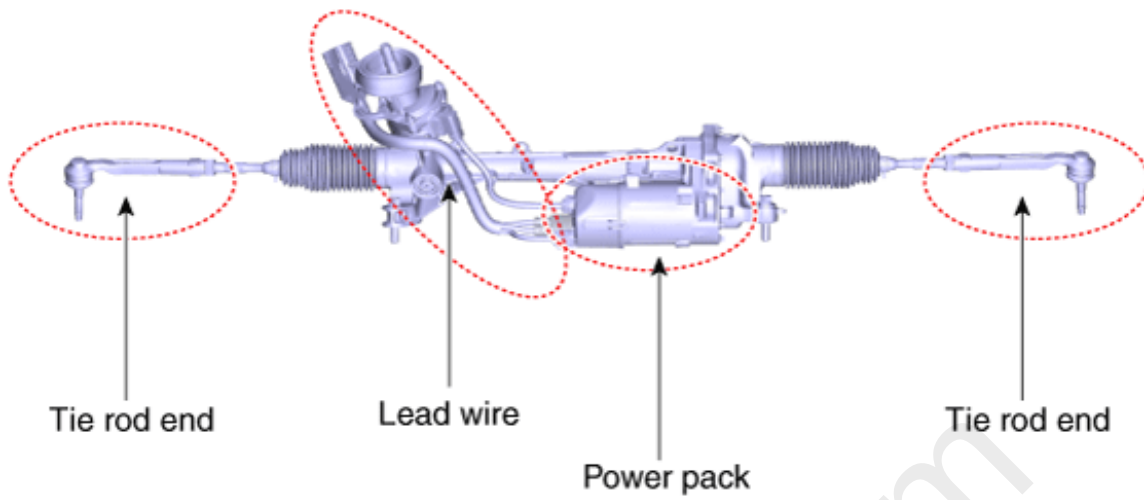
- Do not disassembly the steering gear box.
- If disassembly the steering gear box, the quality(Noise / cleanliness / functions) is not guaranteed.

[C-MDPS]



[R-MDPS]



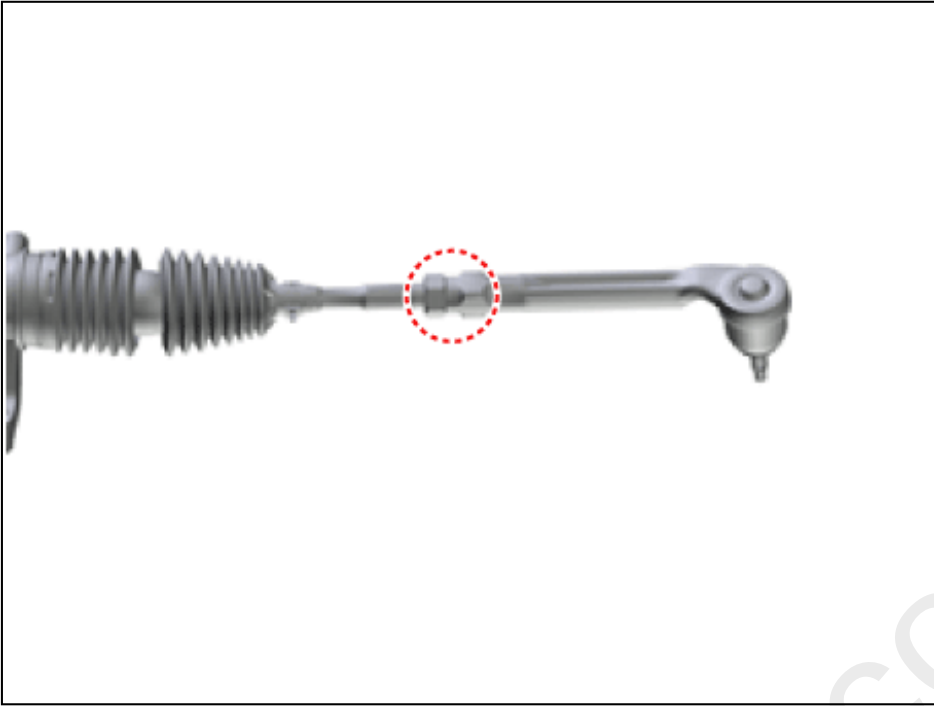


Tie rod end

1. Remove the tie rod end after loosening the nut.

Tightening torque :

49.0 - 53.9 N.m (5.0 - 5.5 kgf.m, 36.2 - 39.8 lb-ft)



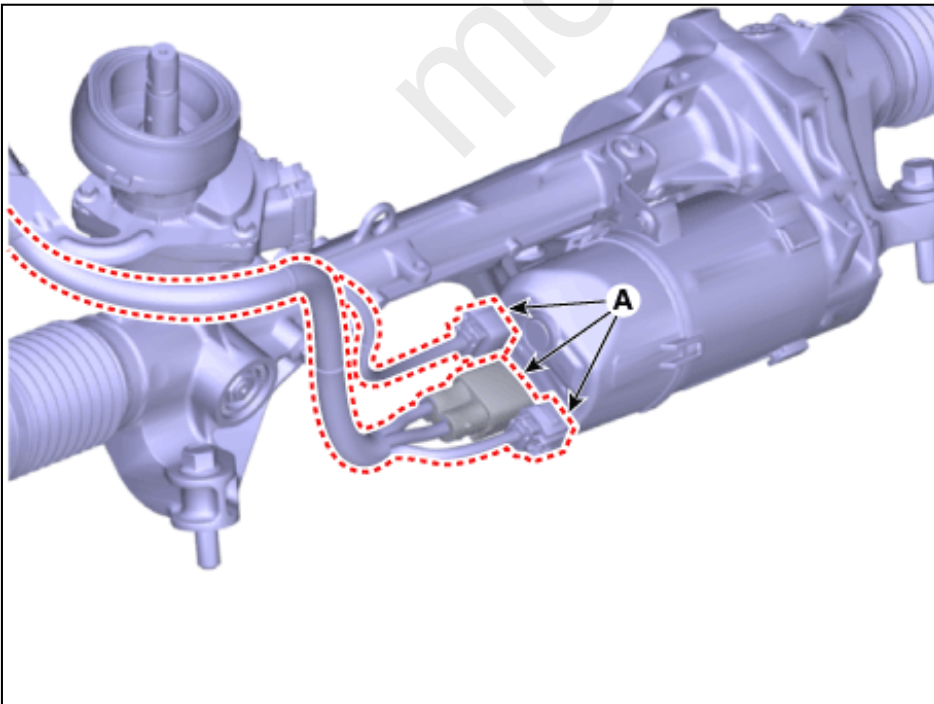
- Before removing the tie rod end, note by measuring the length of the thread or marked with paint.

2. Replace with new parts.
3. Check the alignment.

(Refer to Suspension System - "Alingment")

Power Pack And Short Gear

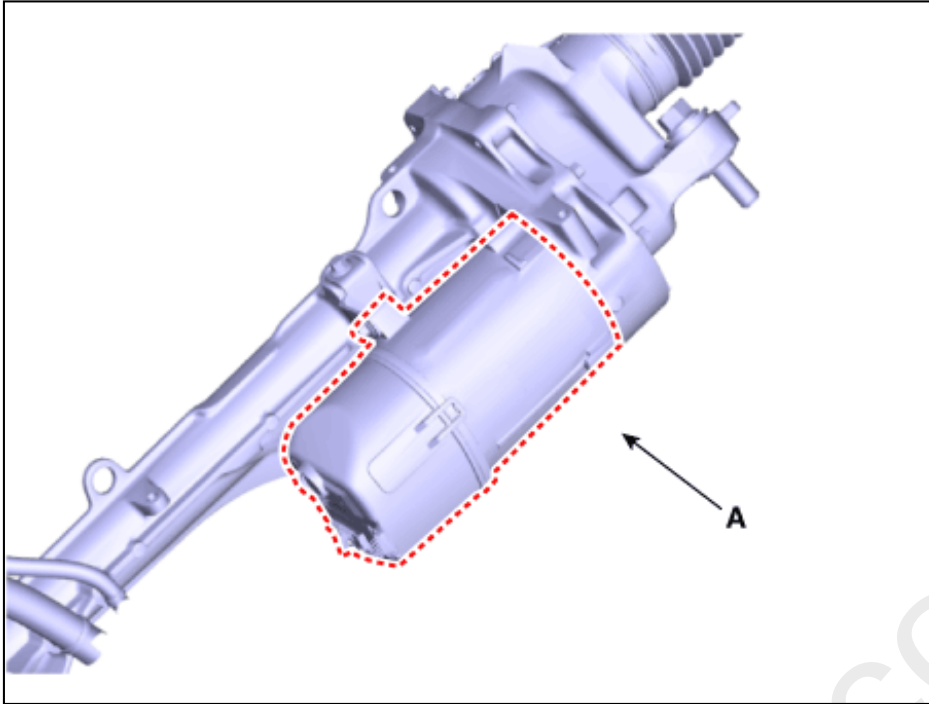
1. Disconnect the power pack connector (A).



2. Replace the power pack (A) after loosening the mounting bolts.

Tightening torque :

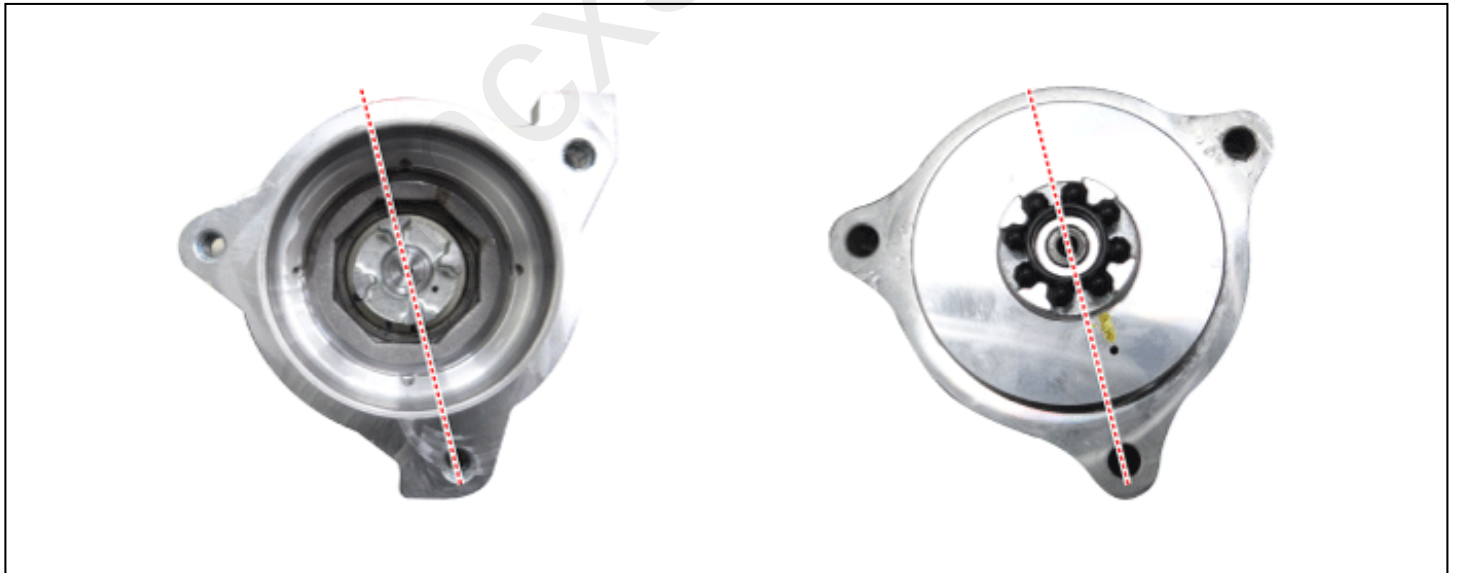
19.6 - 23.5 N.m (2.0 - 2.4 kgf.m, 14.5 - 17.4 lb-ft)



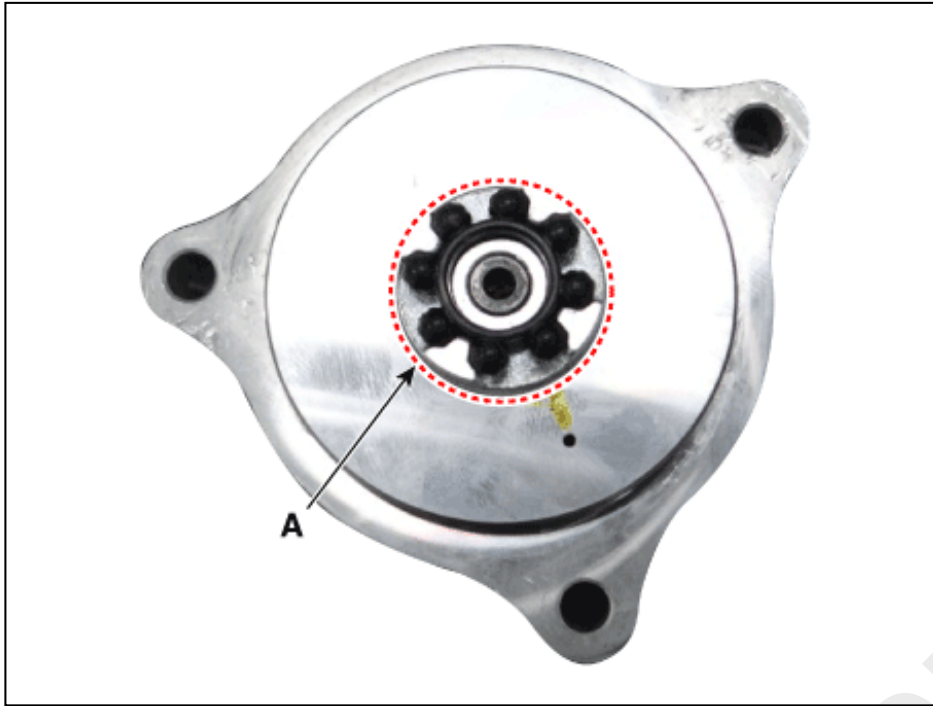
3. In case of the power pack replacement, replace the power pack only and reuse the existing short gear.
In case of the short gear replacement, replace the short gear only and reuse the existing power pack.



- For assembly, the new product is basically coated with grease for workability.
- When installing the power pack on the MDPS, install it in the following direction.



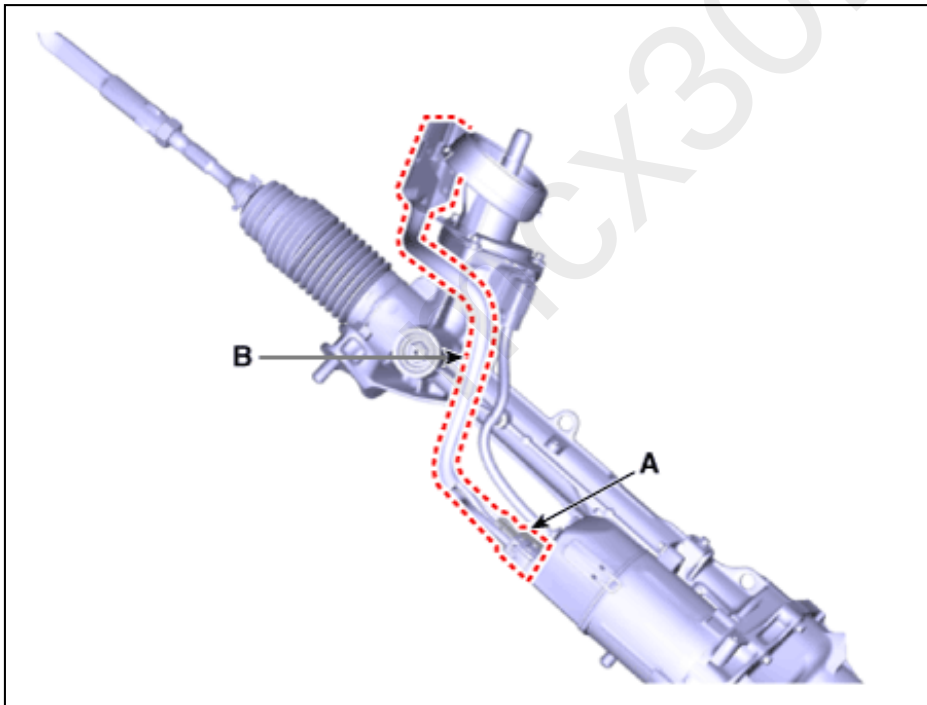
- Be sure to check whether the coupling (A) is assembled.
(If it cannot be used due to the existing coupling deformation/breakage, request for new A/S and assemble.)



4. After replacing the power pack motor, "Steering Angle Sensor (SAS) Calibration" and "MDPS Turning Data Setting (Backup and Write)" and "Set the steering feel torque to zero" must be done

Lead Wire

1. Replace the lead wire (B) after disconnecting the power connector (A).

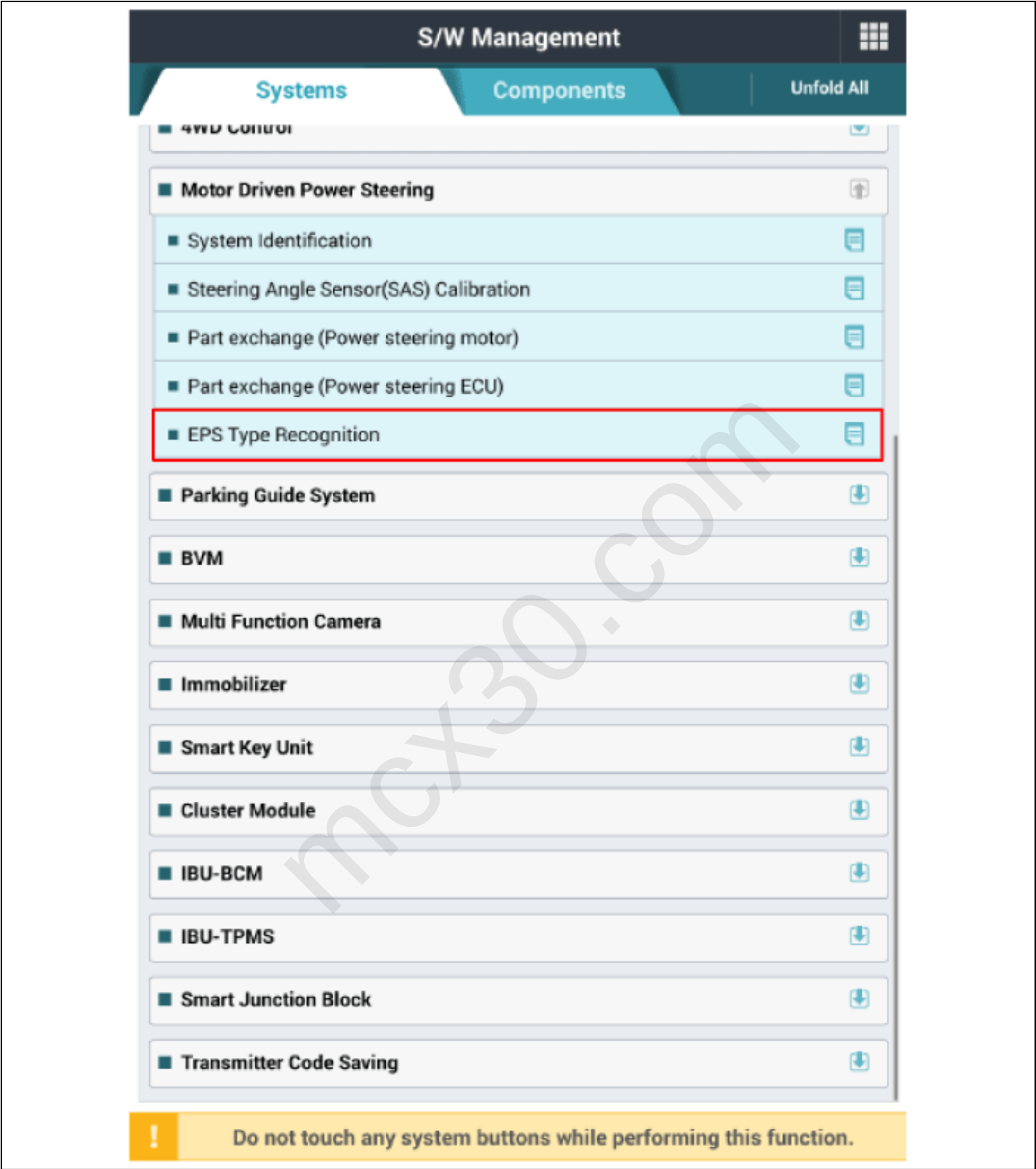


MDPS Type Recognition procedures

1. Connect the diagnostic tool diagnostic tool to the vehicle's self-diagnostic connector.
2. Key on the Ignition switch.

3. After Selecting the "vehicle model" and "system", select the "EPS Type Recognition" on diagnostic tool vehicle selection screen.

[MDPS Type Recognition]



[MDPS Type Recognition 1]



• ESP Type Recognition

Purpose	To load accurate EPS type into Electric Power Steering(EPS) ECU.
Enable Condition	1.Engine Off 2.Ignition Switch On
Concerned Component	Electric Power Steering(EPS) ECU
Concerned DTC	C1702
Fail Safe	Warning Lamp On
Etc	-

OK



Do not touch any system buttons while performing this function.