

SORENTO(XM) SERVICE HIGHLIGHT

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Engine Mechanical System

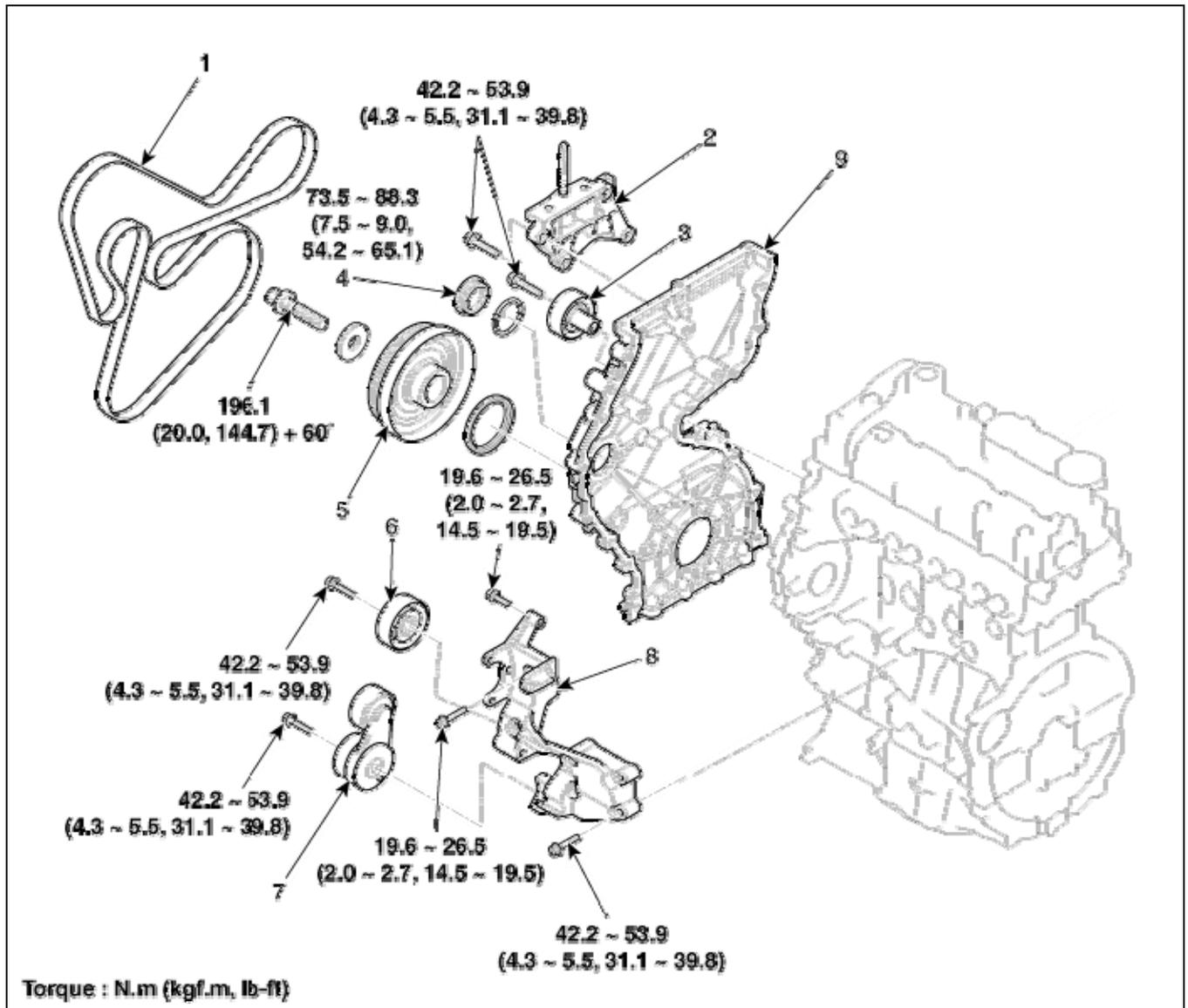
[R2.2 diesel engine]

1. Technical Service Specification

Description	R2.2	Limit
General		
Type	In-line, DOHC	
Number of cylinders	4	
Bore	85.4mm (3.3622in)	
Stroke	96.0mm (3.7795in)	
Total displacement	2199cc (134.20cu.in)	
Compression ratio	16.0 : 1	
Firing order	1-3-4-2	
Engine oil		
Total oil quantity	7.8L (8.24 US qt, 6.86 Imp qt)	When replacing a short engine or a block assembly
Oil pan quantity	5.7L (6.02 US qt, 5.02 Imp qt)	
Drain and refill	6.2L (6.55 US qt, 5.46 Imp qt)	Including oil filter
Oil grade	With DPF: ACEA C3 Without DPF: ACEA B4	
SAE viscosity grade	Recommended SAE viscosity number	Refer to the "Lubrication System" in the shop manual
Coolant quantity	MT: 8.6L (9.09 US qt, 7.57 Imp qt) AT: 9.0L (9.51 US qt, 7.92 Imp qt)	

2. Service Procedure and Notification

- Timing system

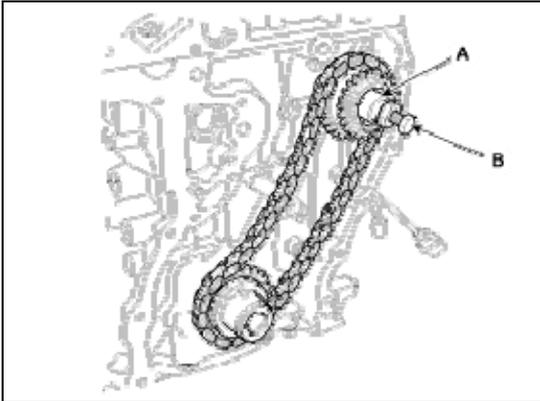


- | | |
|--|---------------------------------|
| 1. Drive belt | 5. Crankshaft damper pulley |
| 2. Engine support bracket | 6. Idler (#2) |
| 3. Idler (#1) | 7. Drive belt tensioner |
| 4. High pressure pump chain sproket service plug | 8. Fead system bracket assembly |

1. Engine removal is not required for this procedure.
2. Remove the cylinder head cover and the lower & upper oil pan.
3. Remove the timing chain cover.
4. Remove the timing chain guides, levers and auto tensioners and then remove the timing chains with the sprockets.

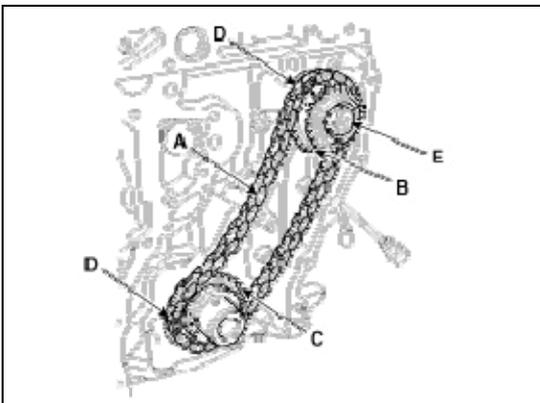
[NOTICE]

After removing the high pressure pump sprocket nut, install the sprocket stopper (A) of the SST (high pressure pump remover, 09331-1M100). Rotate the bolt (B) of the SST clockwise till the high pressure pump sprocket is pushed out.



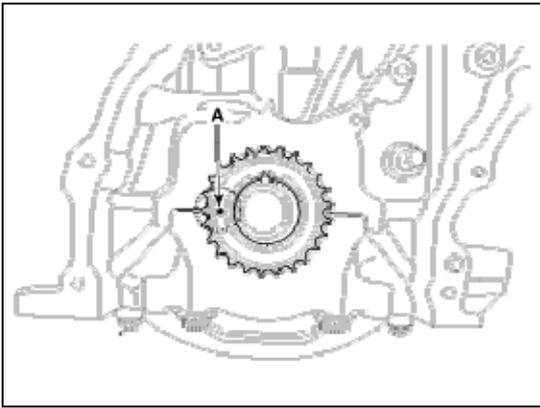
5. After assembling the timing chain "A" (A) with the timing marks (D) of the high pressure pump sprocket (B) and the crankshaft sprocket (C) aligned, install the sprockets on each shaft. Tighten the high pressure pump nut.

Tightening torque : 78.5 ~ 93.2N.m (8.0 ~ 9.5kgf.m, 57.9 ~ 68.7lb-ft)



[NOTICE]

Set the timing mark (A) of the crankshaft sprocket to be aligned with the cylinder block. As a result of this, the piston of the No.1 cylinder will be at the top dead center on compression stroke.

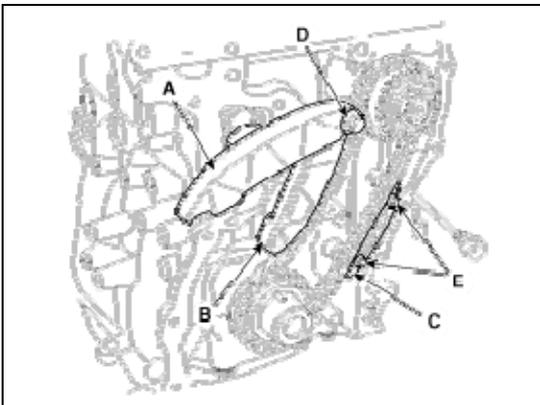


6. Install the timing chain "B" lever (A), the timing chain "A" lever (B) and the timing chain "A" guide (C).

Tightening torque :

Bolt(D): 29.4 ~ 31.4N.m (3.0 ~ 3.2kgf.m, 21.7 ~ 23.1lb-ft)

Bolts(E): 9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

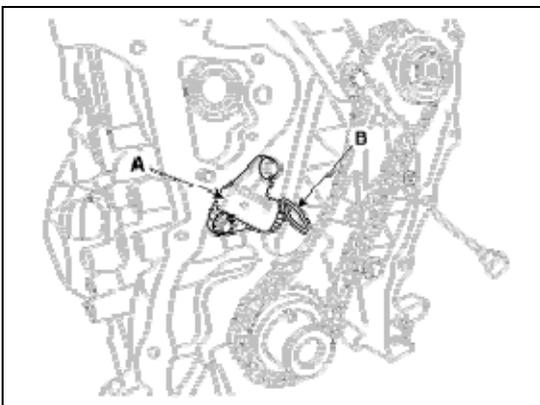


[NOTICE]

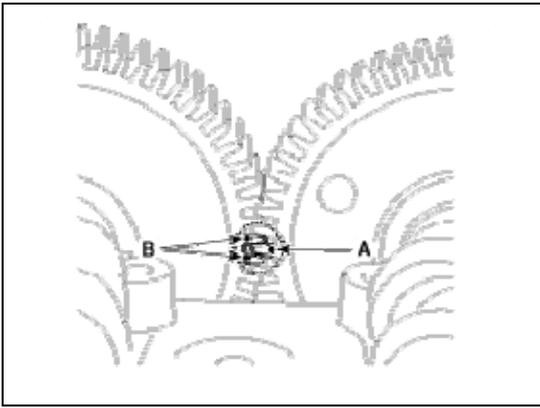
Do not reuse the tensioner lever and guide fixing bolt. If necessary, the bolt can be reused after removing hardening sealant and then applying sealant (LOCTITE 262, THREEBOND 1324N or equivalent) on the thread of the bolt.

7. Install the timing chain "A" auto tensioner (A), and then remove the set pin (B).

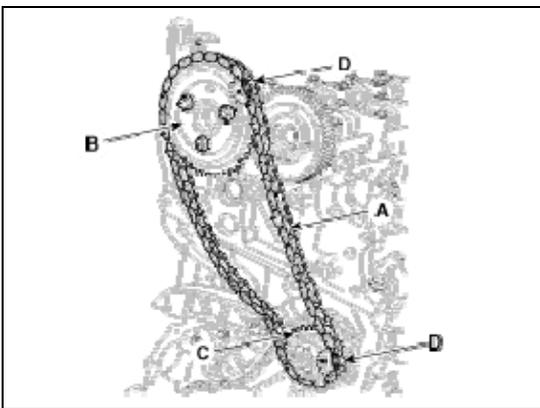
Tightening torque : 9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



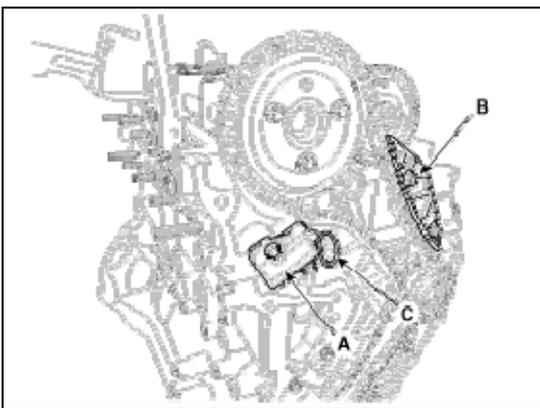
8. Check that the timing mark (A) of the exhaust camshaft timing gear and the timing mark (B) of the intake camshaft timing gear are aligned as shown in the illustration.



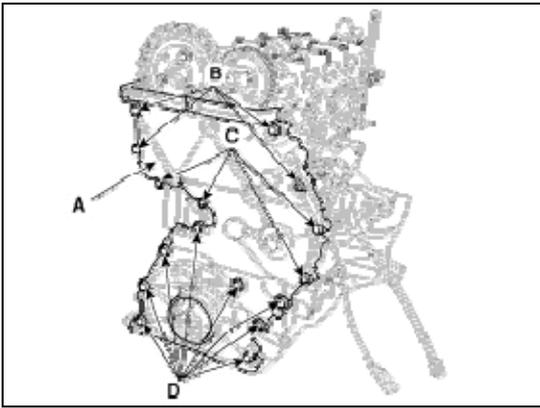
9. After assembling the timing chain "B" (A) with the timing marks (D) of the high pressure pump sprocket (C) and the camshaft sprocket (B) aligned, install the cam shaft sprocket on the exhaust cam shaft gear.
 Tightening torque : 14.7 ~ 19.6N.m (1.5 ~ 2.0kgf.m, 10.8 ~ 14.5lb-ft)



10. Install the timing chain "B" auto tensioner (A) and guide (B), and then remove the set pin (C).
 Tightening torque : 9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



11. Apply liquid gasket evenly on the mating surface of timing chain cover. Install the timing chain cover.
 Tightening torque :
 Bolt (B) : 19.6 ~ 24.5N.m (2.0 ~ 2.5kgf.m, 14.5 ~ 18.1lb-ft)
 Bolt (C, D) : 7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)



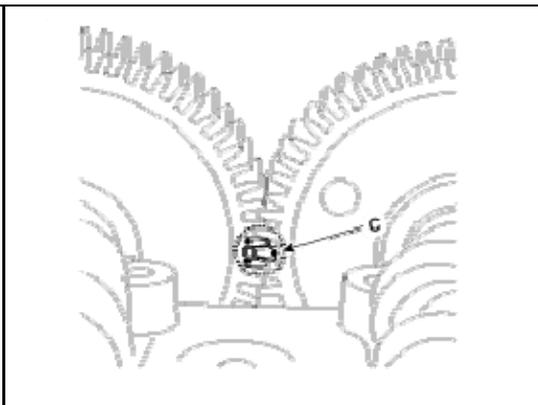
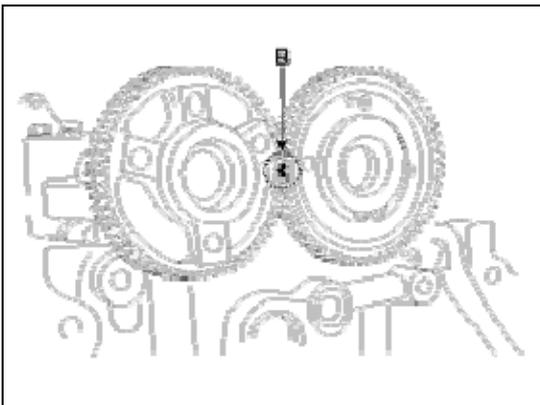
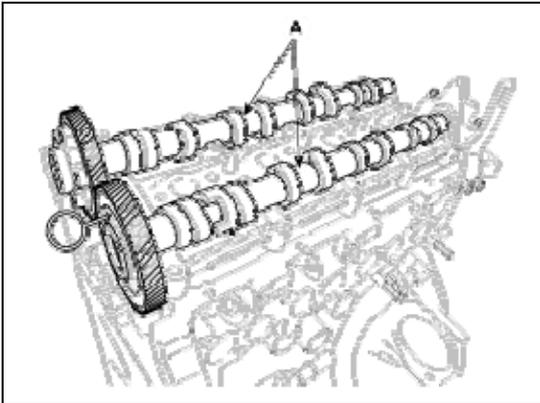
12. Install the lower & upper oil pan and the cylinder head cover.

- **Camshaft assembly**

When install the camshafts (A), align the timing marks (B,C).

[CAUTION]

When assembling the camshafts, check the front and rear timing marks on the gears.

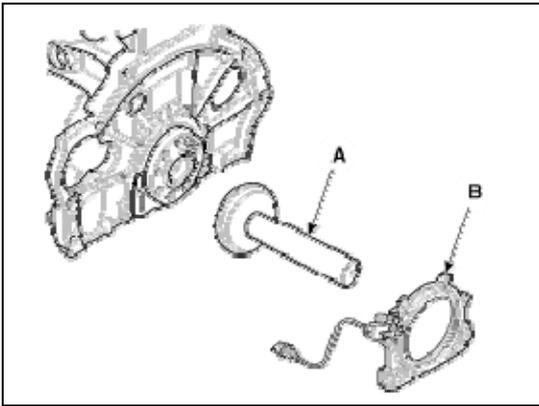


- **Rear oil seal case assembly**

1. Install the SST (09231-1M200, 09231-H110)(A) on the crankshaft.

2. Push in the rear oil seal case assembly by hand and then tighten the bolts.

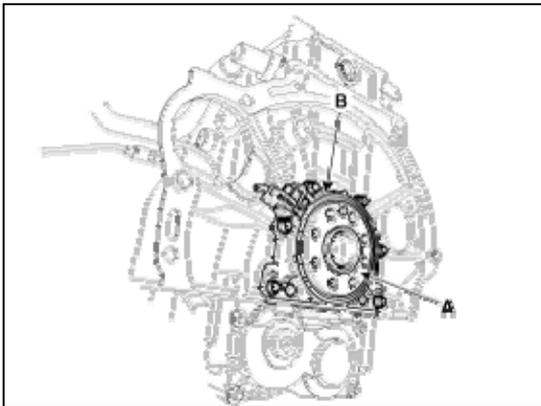
Tightening torque : 9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



[NOTICE]

- Apply a coat of engine oil around PTFE seal before installing the rear oil seal assembly.
- Be careful not to damage and twist the PTFE seal.
- Remove harmful materials on the crankshaft flange and use the SST to prevent the PTFE seal from being damaged and twisted.
- Insert the dust cover completely into the slot of the cylinder block and then confirm the assembly with the sensor cable.
- Do not reuse the rear oil seal case assembly.

3. Install the encoder (A) after installing the rear oil seal case assembly (B).

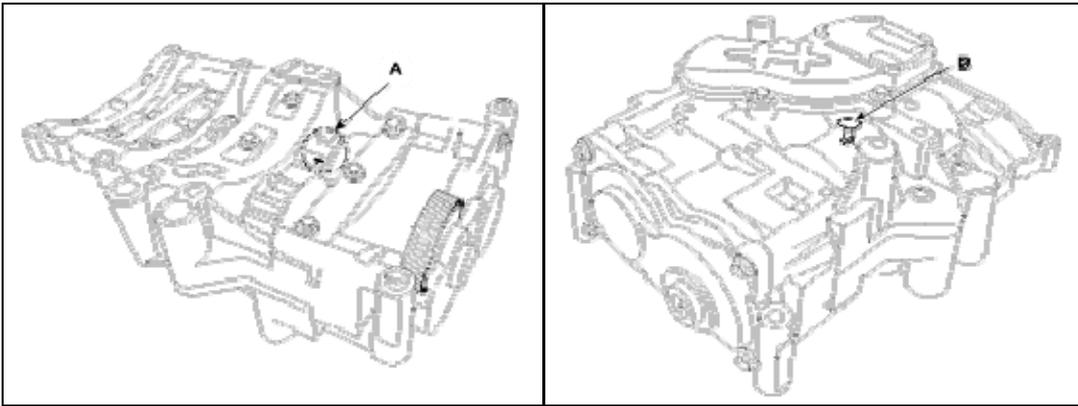


[CAUTION]

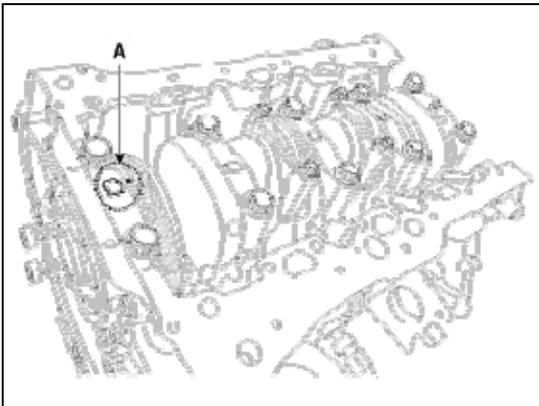
- Do not place a magnetic substance around the encoder.
- Be careful not to scratch or damage the encoder by falling down or impacting on.
- Keep the encoder from liquid sealant and other harmful materials.

● Balance shaft & oil pump module

1. Align the timing mark (A) of the balance shaft and then install the timing pin (B).



2. Turn the crankshaft pulley and align its groove with the timing mark of the timing chain cover. Check that the timing mark (A) of the crank gear is aligned.

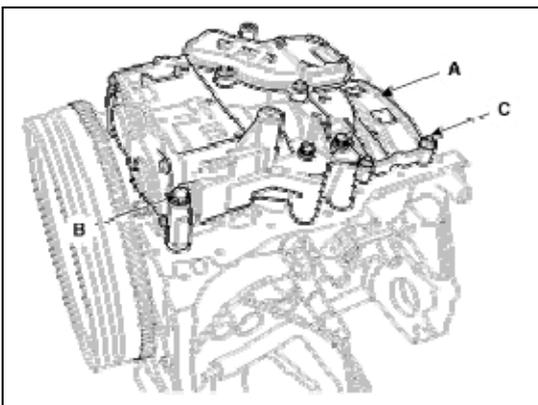


3. Install the balance shaft & oil pump module (A).

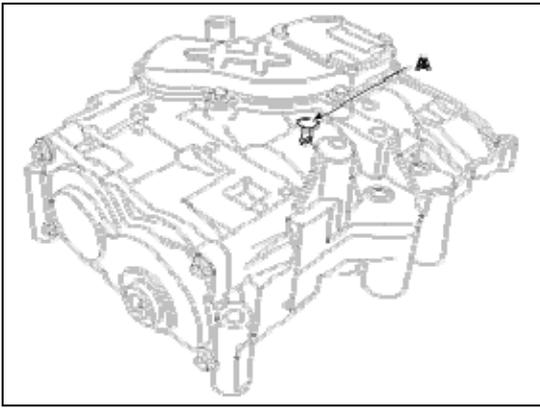
Tightening torque :

Bolt(B): 30.4 ~ 34.3N.m (3.1 ~ 3.5kgf.m, 22.4 ~ 25.3lb-ft)

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

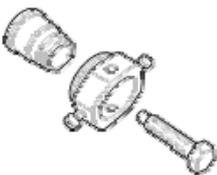
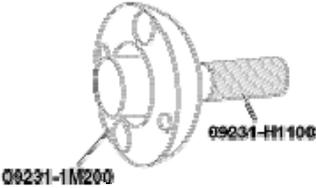
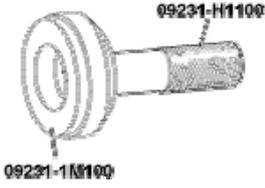


4. Remove the timing pin (A) of the balance shaft.



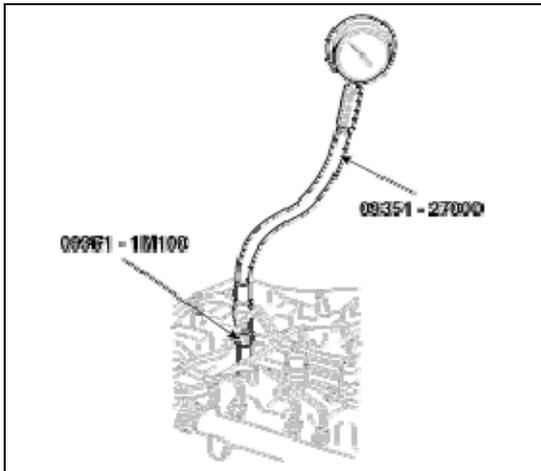
5. Install the lower & upper oil pan.

3. New Special Service Tool

Tool (Number and name)	Illustration	Use
Compression gauge adapter (09351-1M100)		Checking engine compression pressure
Valve stem seal installer (09222-1M100)		Installation of valve stem seals
High pressure pump sprocket remover (09331-1M100)		Removal of high pressure pump sprocket
Crankshaft rear oil seal installer (09231-1M200) Handle (09231-H1100)		Installation of crankshaft rear oil seal
Crankshaft front oil seal installer (09231-1M100) Handle (09231-H1100)		Installation of front cover oil seal

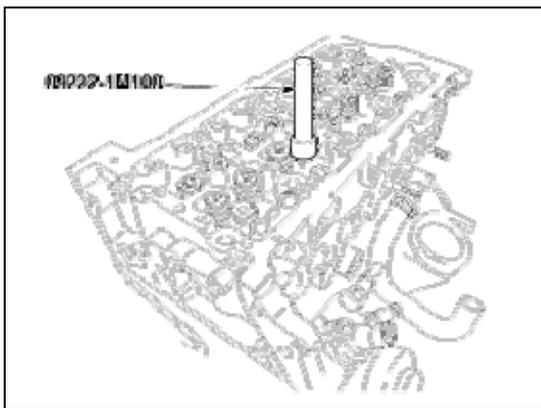
EX 1)

To measure the cylinder compression pressure, insert the SST(09351-27000, 09351-1M100) into the injector hole.



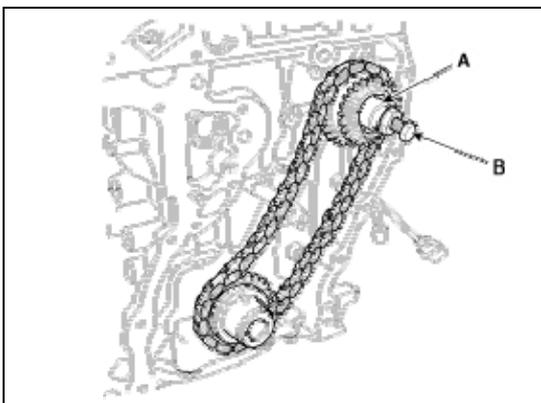
EX 2)

To install the valves, use the SST (09222-1M100), push in a new stem seal.



EX 3)

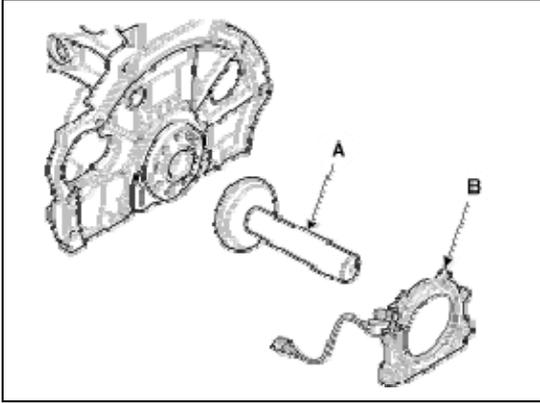
After removing the high pressure pump sprocket nut, install the sprocket stopper (A) of the SST (high pressure pump remover, 09331-1M100). Rotate the bolt (B) of the SST clockwise till the high pressure pump sprocket is pushed out.



EX 4)

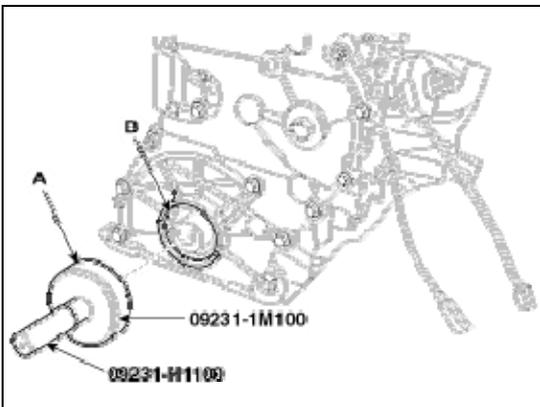
Install the SST (09231-1M200, 09231-H110)(A) on the crankshaft and push in the rear oil seal case

assembly by hand and then tighten the bolts.



EX 5)

Install the front oil seal by using SST (09231-1M100, 09231-H1100)(A).



Engine Electrical System

1. Service Procedure and Notification

- FET glow plug relay

1. Remove the glow plug relay after disconnecting it from wire harness.



2. Check open / short at each point of the glow plug relay by using multi meter (1M Ω range).

(1) Check open / short between terminals 87 and 31.

State	Open / short criteria	Remedy
Short	Out the range of 350k Ω \pm 30%	Change the glow plug relay
Not Short	In the range of 350k Ω \pm 30%	o.k

(2) Check open / short between terminals G and 30.

A. Connect (+) rod to 30 terminal and (-) rod to G terminal.

State	Open / short criteria	Remedy
Short	Out the range of 100k Ω \pm 30%	Change the glow plug relay
Not Short	In the range of 100k Ω \pm 30%	o.k

B. Connect (+) rod to G terminal and (-) rod to 30 terminal.

State	Open / short criteria	Remedy
Open	Out the range of 100k Ω \pm 30%	Change the glow plug relay
Not Open	In the range of 100k Ω \pm 30%	o.k

3. Install the glow plug relay and then connect wiring harness to it.

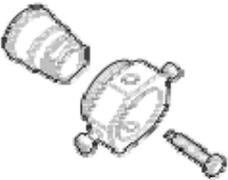
Fuel System

[R 2.2 Diesel engine]

1. Technical Service Specification

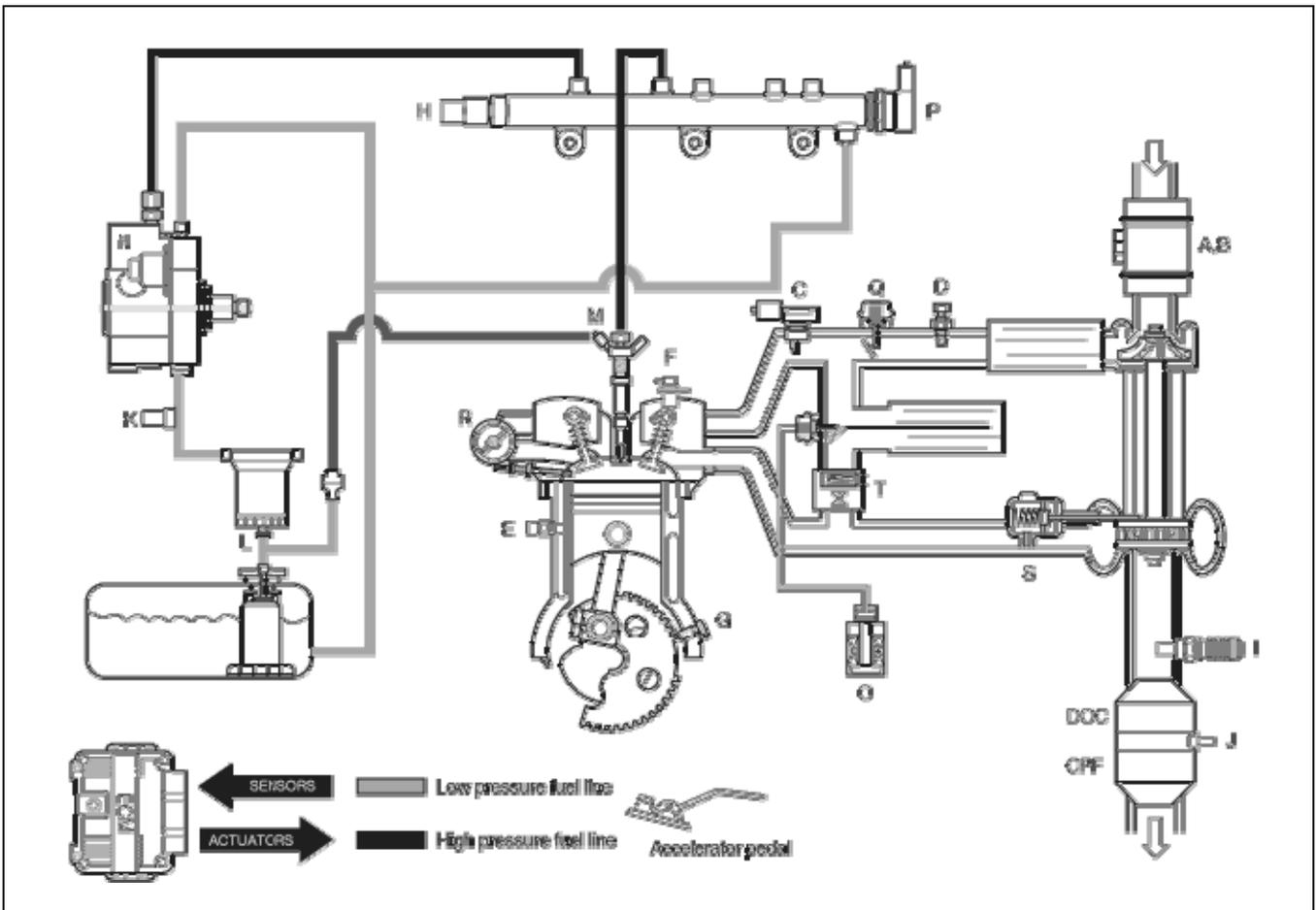
Items	Specification	
Fuel Injection System	Type	Common Rail Direct Injection (CRDI)
Fuel Return System	Type	Return type
Fuel Pressure	Max. Pressure	1,800 bar
Fuel Tank	Capacity	70 lit. (18.5 U.S.gal., 73.9 U.S.qt., 61.5 Imp.qt.)
Fuel Filter	Type	High pressure type (Built in engine room)
High Pressure Fuel Pump	Type	Mechanical, Plunger Pumping Type
	Driven by	Timing chain
Low Pressure Fuel Pump	Type	Electrical, in-tank type
	Driven by	Electric motor

2. New Special Service Tool

09331-3A000 High Pressure Fuel Pump Remover		Removing the high pressure fuel pump
09310-3P100 Fuel Pump Plate Cover Remover		Removing the low pressure fuel pump plate cover

3. System Description

CRDI: COMMON RAIL DIRECT INJECTION SYSTEM



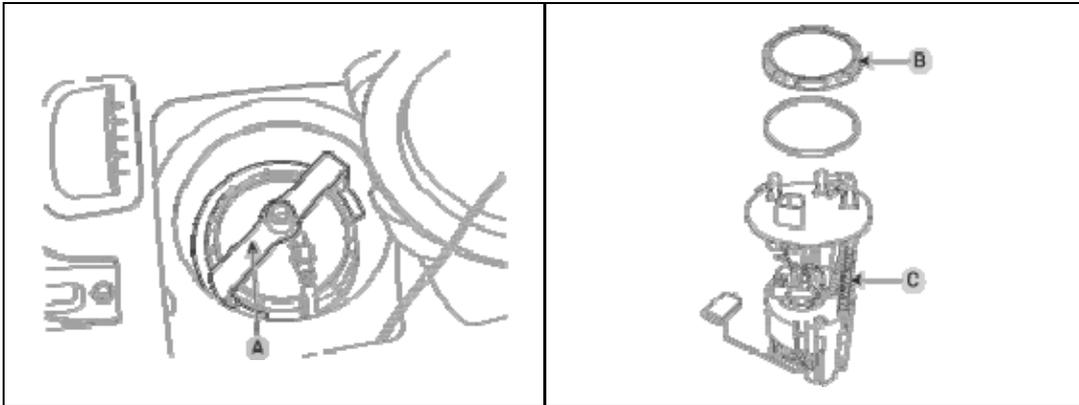
- A. Mass Air Flow Sensor (MAFS)
- B. Intake Air Temperature Sensor (IATS) #1
- C. Boost Pressure Sensor (BPS)
- D. Intake Air Temperature Sensor (IATS) #2
- E. Engine Coolant Temperature Sensor (ECTS)
- F. Camshaft Position Sensor (CMPS)
- G. Crankshaft Position Sensor (CKPS)
- H. Rail Pressure Sensor (RPS)
- I. Lambda Sensor
- J. Exhaust Gas Temperature Sensor (EGTS)

- K. Fuel Temperature Sensor (FTS)
- L. Water Sensor
- M. Injector
- N. Fuel Pressure Regulator Valve
- O. EGR cooler bypass solenoid valve
- P. Rail Pressure Regulator Valve
- Q. Air Control Valve
- R. Variable Swirl Actuator
- S. Electric VGT Control Actuator
- T. Electric EGR Control Valve

4. Service Procedure and Notification

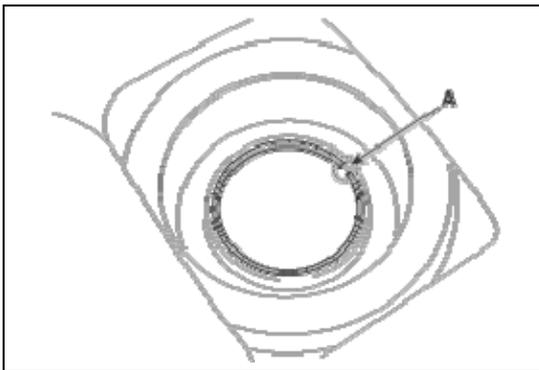
- Fuel pump / Sub Fuel Sender

Remove the fuel pump (C) after removing the plate cover (B) with SST (A) [SST No.: 09310-3P100] from the fuel tank.



[Caution]

Check the groove when installing the fuel pump.



- High Pressure Fuel Pump

Removal

[Warning]

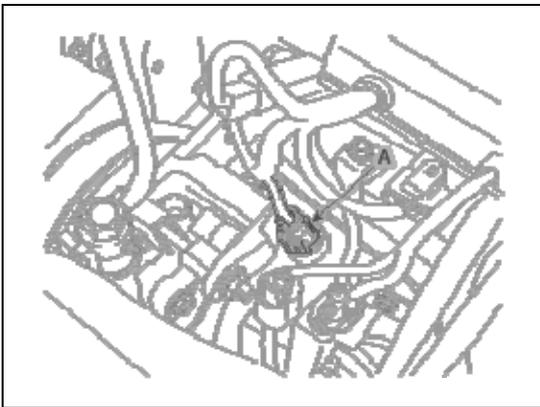
As the Piezo-Injector operates under maximum DC 200V, there may be a risk of an electric shock caused by shorted control line etc. So when repairing the injector or its wiring, disconnect the battery negative (-) terminal from the battery and wait for about 30 seconds.

[Caution]

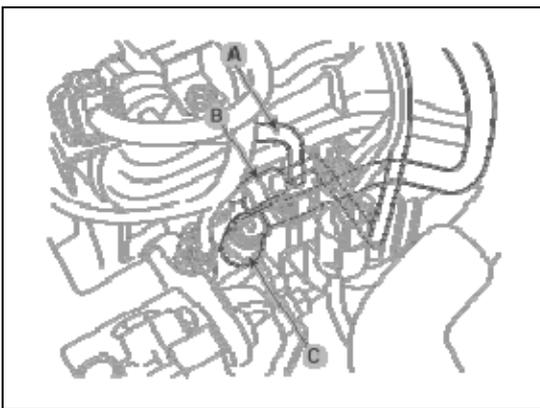
- Common Rail Fuel Injection System operates with extremely high pressure (approximately 1,800bar), so never perform any work on injection system with engine running or within 30 seconds after the engine stops.
- Keep cleanly the parts and the working area.
- Pay attention to a foreign substance.
- Just before installing injector, tube or hose, remove the protect-cap attached on them.

- Do not remove injector except for special case.
- When installing Injector
 - Wash the contact area of the injector and replace the gasket with a new one.
 - To protect damage caused by shock, vertically insert the injector into the cylinder head.
 - Clean the connecting surface of the injector gasket on the cylinder head before installing the injector.
- When installing High Pressure Fuel Pipe
 - Do not use again the used high pressure fuel pipe.
 - Install the flange nut correctly.

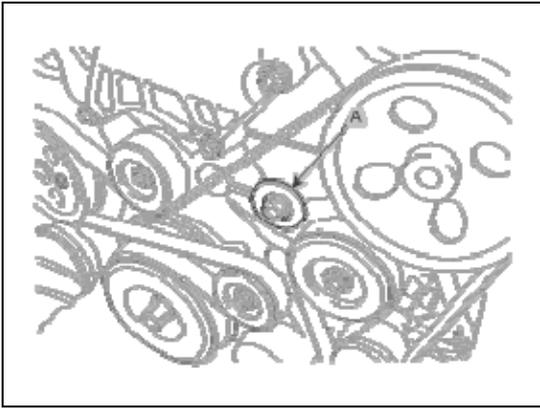
1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Disconnect the fuel pressure regulator valve connector (A).



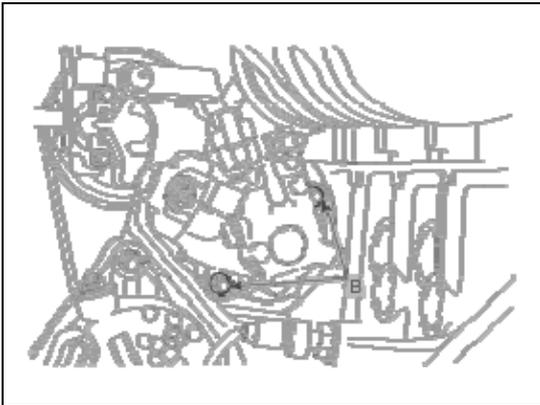
3. Remove the high pressure fuel pipe (A) connecting the high pressure fuel pump with the common rail.
4. Disconnect the fuel feed tube quick-connector (B) and the fuel return tube quick-connector (C).



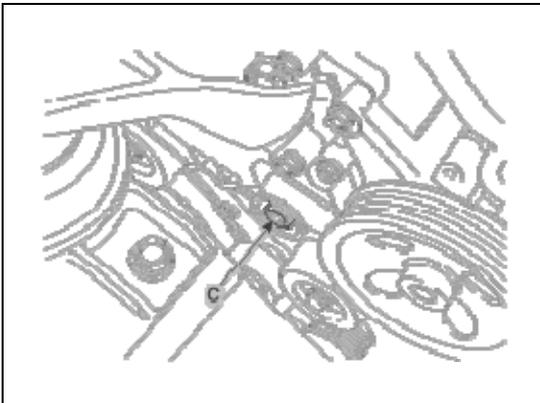
5. Remove the drive belt (Refer to "TIMING SYSTEM" in "EM" group).
6. Remove the front cover service plug (A).



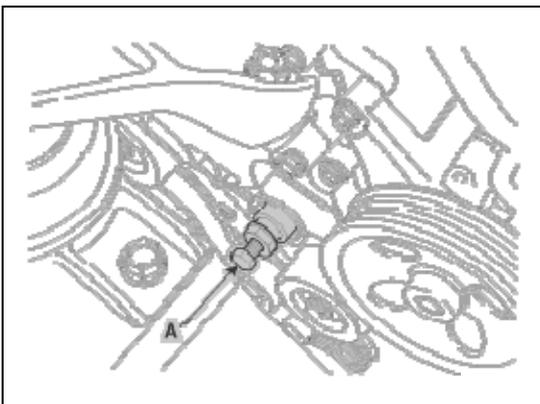
7. Remove the high pressure fuel pump installation bolt (B).



8. Remove the high pressure fuel pump sprocket nut (C) after fixing the crankshaft.

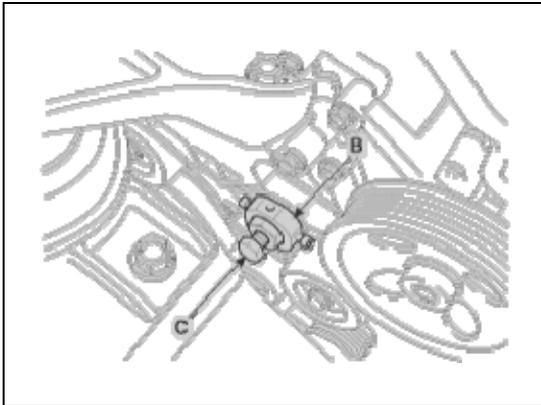


9. Install the sprocket stopper (A) of the high pressure fuel pump remover [SST No.: 09331-1M100].



10. Install the sprocket stopper support (B) of the high pressure fuel pump remover [SST No.: 09331-1M100].

11. Remove the high pressure fuel pump by rotating the bolt (C) of the high pressure fuel pump remover [SST No.: 09331-1M100] clockwise .



Installation

1. Installation is reverse of removal.

[Notice]

When installing the high pressure fuel pipe, apply the specified tightening torques with the special service tool [SST No.: 09314-27110]

Manual Transaxle

1. Technical Service Specification

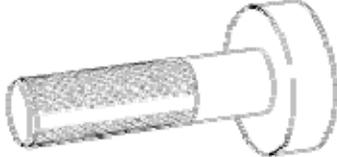
Engine type		R2.2
Manual transaxle type		M6LF1
Gear ratio	1st	3.538
	2nd	1.909
	3rd	1.179
	4th	0.814
	5th	0.737
	6th	0.628
	Reverse	3.910
Final gear ratio		4.750(1~4) / 4.071(5,6,R)
T/M Oil capacity		SAE 75W/85, API GL - 4

2. Lubricants

Items	Recommended lubricant	Quantity
Transaxle gear oil	SAE 75W/85 API GL-4 TGO-7(MS517-14)	1.6L(1.7US qt, 1.41Imp qt)

3. New Special Service Tools

Tool (Number and Name)	Illustration	Use
09459-3B100 Oil seal installer		Installation oil seal

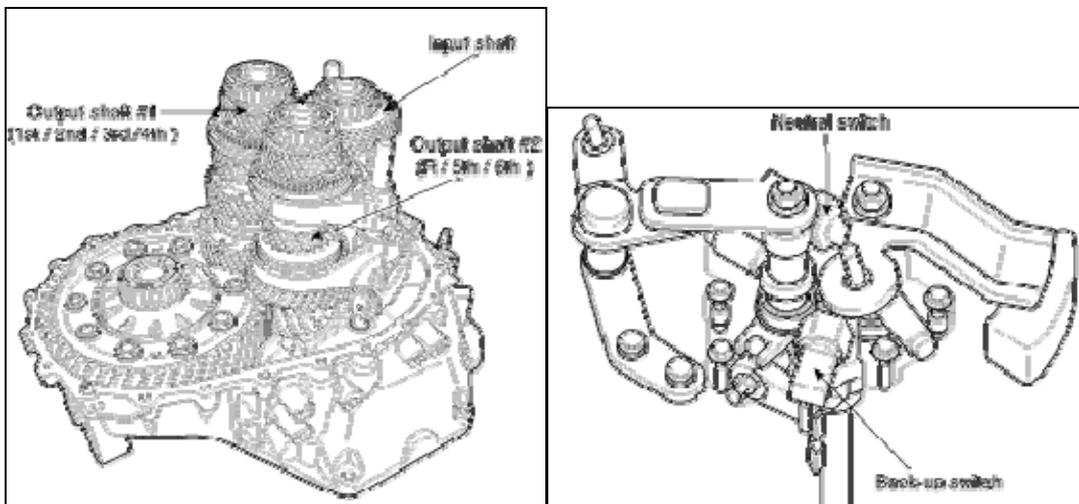
09453-3B300 Oil seal installer		Installation of differential oil seal
09453-3B400 Oil seal installer		Installation of differential oil seal

4. System Description

The new 6 speed FF manual transaxle, M6LF1 has been developed by adding one more gear on the output shaft of existing M5HF2.

Following is the main features comparing with M5HF2.

- As same as M6GF2 and M5HF2, 3 axis type was applied so that there are two output shafts.
- The maximum torque transmitting capacity has been increased by 2 kgf.m
- The Input~Diff(215→210) has been reduced by 5mm, this means that the layout and dimension was reduced to get a lower weight (reduced by about 6kgf) and enhanced fuel consumption.
- As same as M5HF2, output shaft #1 is for 1st, 2nd, 3rd and 4th gear. Output shaft #2



Generally, the grinding for the gear is done after heat treatment so that the cost is very high but ensures best durability and minimum noise in the transmission. In case of 1st gear and reverse gear, the time to be meshed in whole driving life is not so long so that the grinding treatment was not applied. The transmission case structure is almost same. It consists of two cases; clutch housing and transmission case as same as M5HF2.

Three kinds of synchronizer mechanism which was known in the modern technology; single, double and triple synchronizer system has been applied as shown in the table.

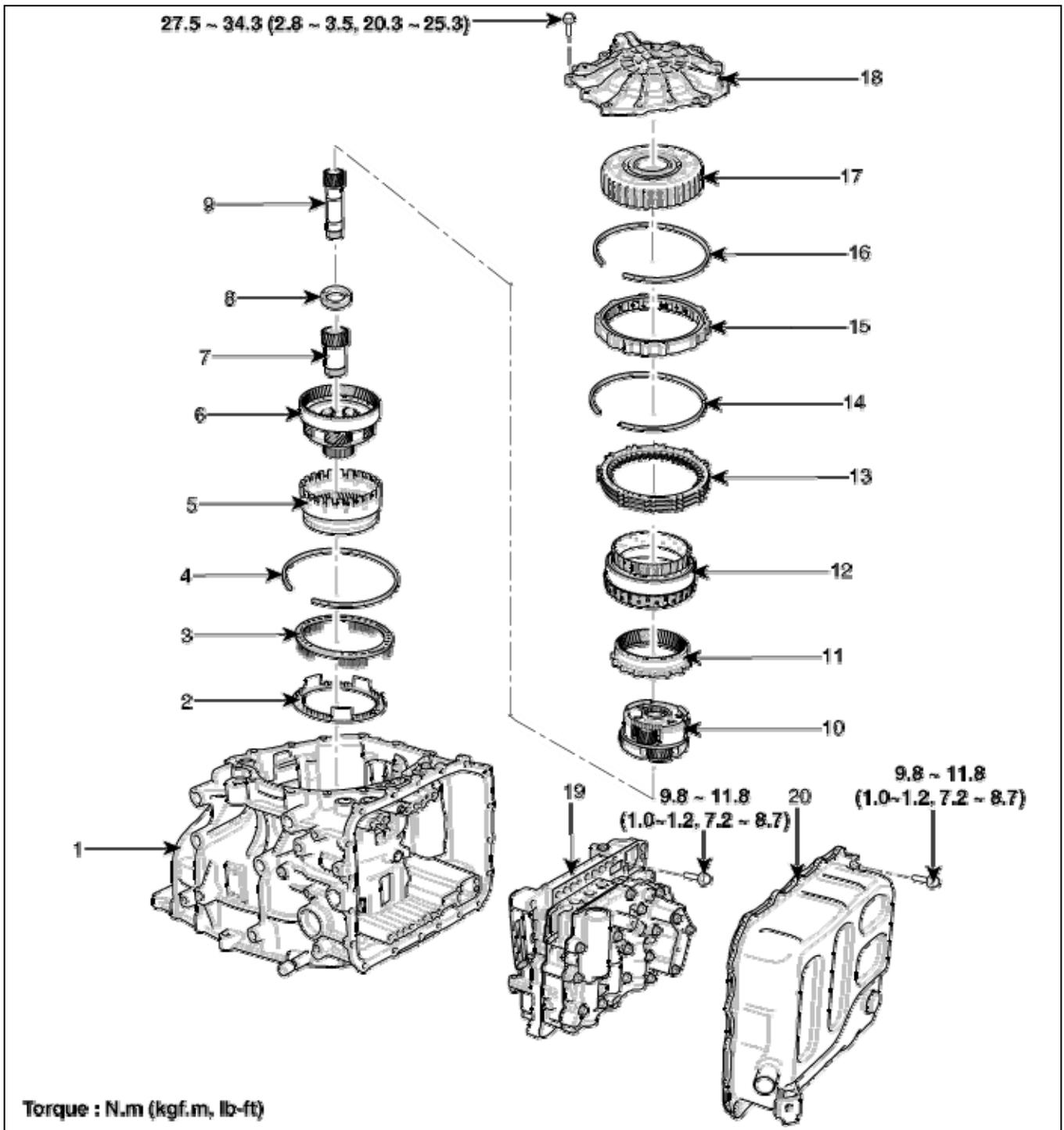
A module type control and shift lever assembly has been applied as same as one for M5HF

Automatic Transaxle

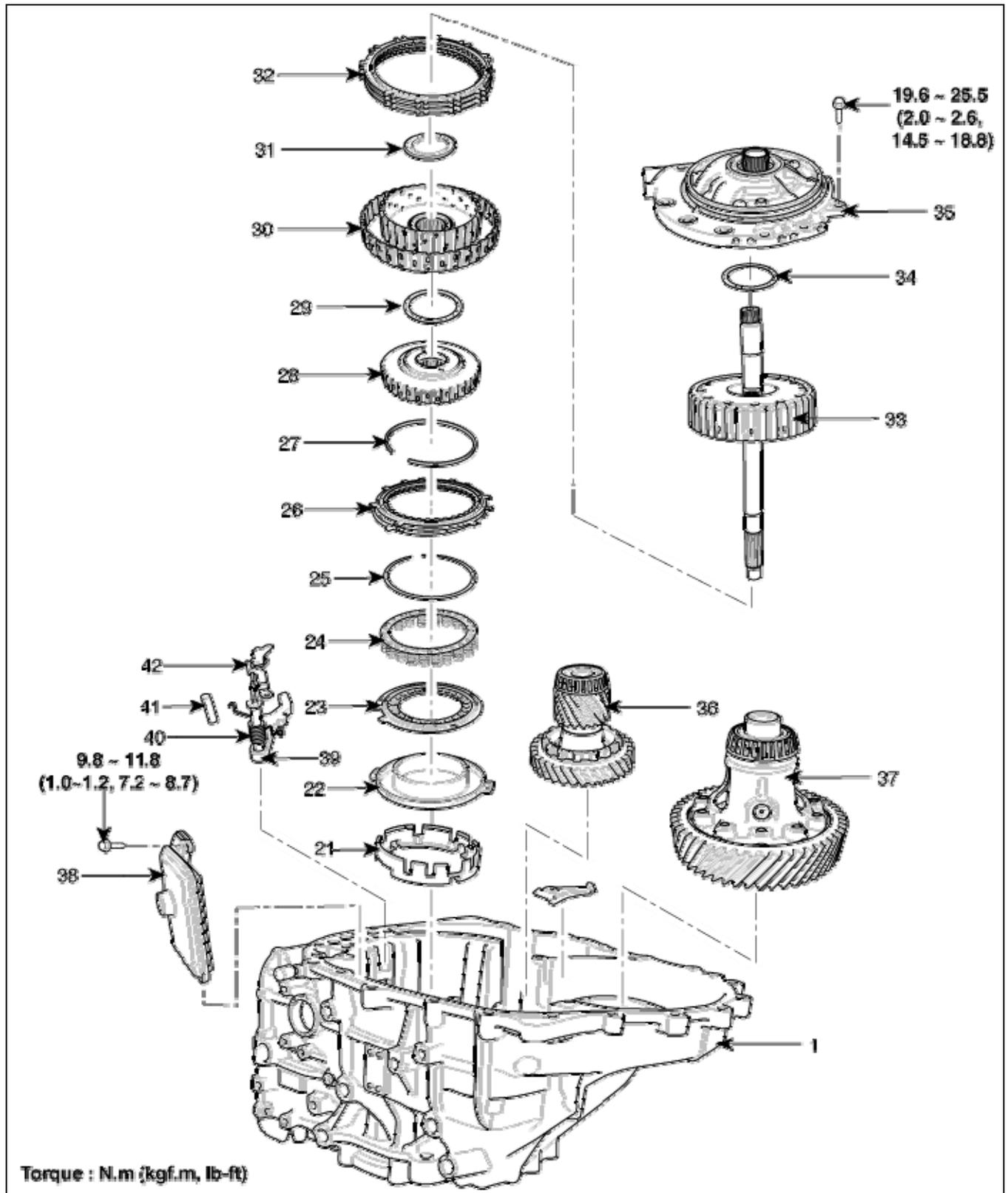
1. Technical Service Specification

Item		Specification
Transmission type		A6LF3/A6MF2
Engine model		DSL 2.2/GSL 2.4
Torque converter type		3-element, 1-stage, 2-phase type
Torque converter size		Ø236 mm
Oil pump system		Parachoid
Friction elements		Clutch: 2EA
		Brake: 3EA
		OWC : 1EA
Planetary gear		3EA
Gear ratio	1st	4.651 / 4.212
	2nd	2.831 / 2.637
	3rd	1.842 / 1.800
	4th	1.386
	5th	1.000
	6th	0.772
	Reverse	3.393 / 3.385
Final gear ratio		3.195 / 3.913
Fluid pressure balance piston		3EA
Accumulator		4EA
Solenoid valve		8EA (VFS:6EA, ON/OFF:2EA)
Shift lever position		4 Range (P,R,N,D)

2. Components (1)



Components (2)



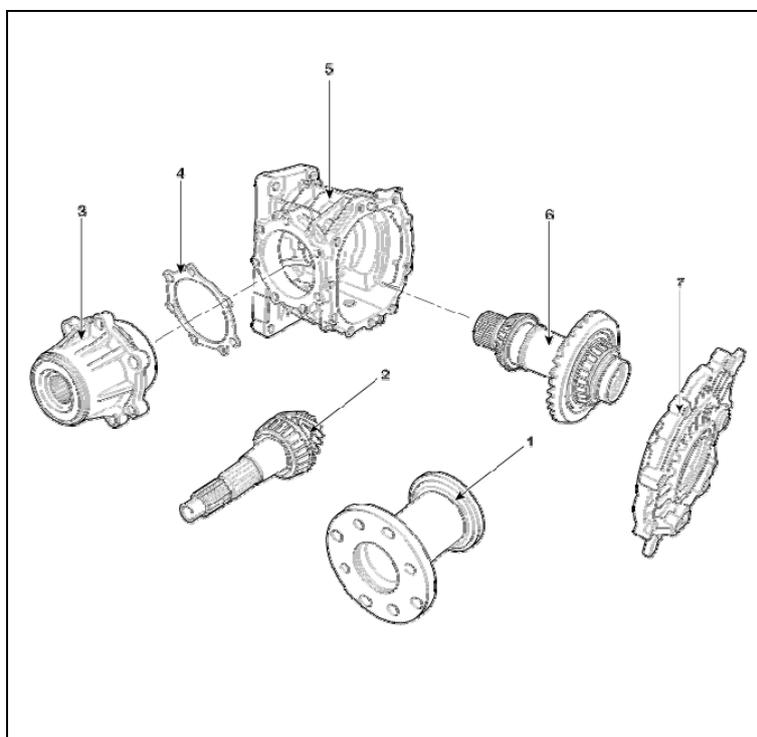
1. Automatic transaxle case
2. Low & reverse brake piston
3. Low & reverse brake return spring
4. Snap ring
5. Front annulus gear assembly
6. Front planetary gear assembly
7. Front sun gear assembly
8. Bearing
9. Middle sun gear assembly
10. Middle & rear planetary gear assembly
11. Rear annulus gear assembly
12. One way clutch inner race assembly
13. Low & reverse brake disc set
14. Snap ring
15. One way clutch assembly
16. Snap ring
17. Overdrive clutch assembly
18. Rear cover assembly
19. Valve body assembly
20. Oil pan
21. Under drive brake retainer
22. Under drive brake chamber
23. Under drive brake piston
24. Under drive brake spring
25. Snap ring
26. Under drive brake disc set
27. Snap ring
28. Under drive brake hub assembly
29. Thrust washer
30. 35R & 2/6 hub assembly
31. Thrust bearing
32. 2/6 brake disc set
33. 35R clutch assembly
34. Thrust washerr
35. Oil pump assembly
36. Transfer driven gear assembly
37. Differential assembly
38. Oil filter assembly
39. Parking sprag
40. Parking sprag shaft & spring
41. Support shaft
42. Parking load guide

4 Wheel Drive (4WD)

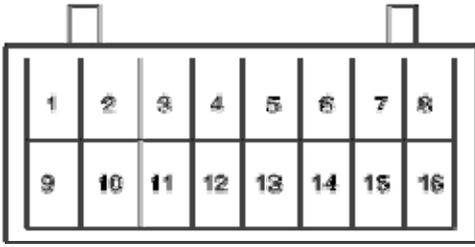
1. Technical Service Specification

Items		Specification
Torque output (N.m)		0 ~ 1,320
Oil	Type	JWS 3309 (Permanent use)
	Capacity	0.13 lit.(0.14 U.S.qt, 0.11 Imp.qt.)
Magnetic clutch	Resistance (Ω)	2.2~2.6 (25°C)

2. Components



1. Rear flange assembly
 2. Pinion shaft
 3. Pinion case
 4. Spacer
 5. Transfer housing
 6. Hypoid gear shaft assembly
 7. Transfer cover
3. 4WD ECU Pin Description



Pin	Description
1	4WD SOL+
2	NC
3	BATTERY
4	IG.1
5	CAN HIGH
6	NC
7	NC
8	NC
9	4WD SOL-
10	GROUND
11	NC
12	NC
13	CAN LOW
14	NC
15	NC
16	LOCK MODE SW

3. System Description

Four Wheel Drive (4WD) transfer mode selection

1. AUTO MODE:

[CAUTION]

- When driving in 4WD AUTO mode, the vehicle operates similar to conventional 2WD vehicles under normal operating conditions. However, if the system determines that there is a need for the 4WD mode, the engine's driving power is distributed to all four wheels automatically without driver intervention.

- When driving on normal roads and pavement, the vehicle moves similar to conventional 2WD vehicles.

2. LOCK MODE:

[CAUTION]

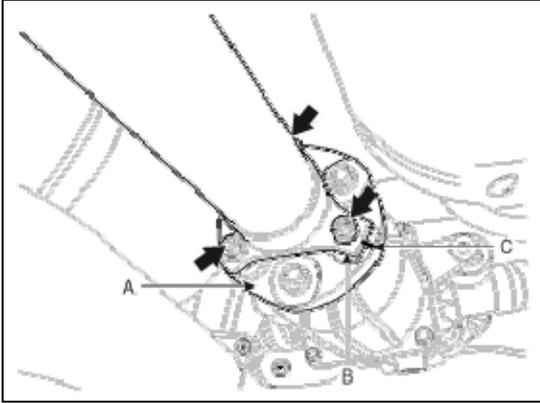
- This mode is used for climbing or descending sharp grades, off-road driving, driving on sandy and muddy roads, etc., to maximize traction.
- This mode automatically begins to deactivate at speeds above 30 km/h (19 mph) and is shifted to 4WD AUTO mode at speed above 40 km/h (25 mph). If the vehicle decelerates to speeds below 30 km/h (19 mph), however, the transfermode is shifted into 4WD LOCK mode again.

Driveshaft and axle

1. Service procedure and Notification

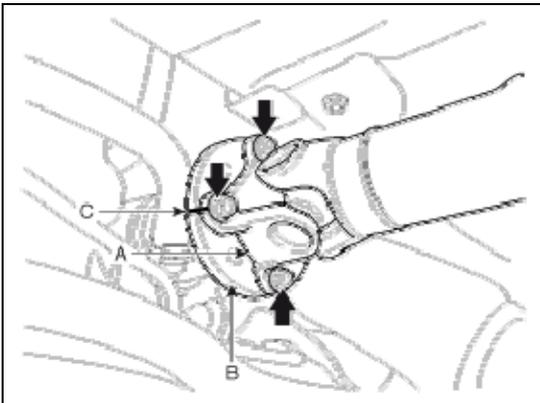
● Propeller shaft coupling

1. After making a match mark(C) on the rubber coupling(A) and rear differential companion(B), remove the rear propeller shaft mounting bolts(D).



Tightening torque : 49.0~68.6N.m(5.0~7.0Kgf.m, 36.1~50.6lb.ft)

2. After making a match mark(C) on the flange yoke(A) and transaxle companion(B), remove the front propeller shaft mounting bolts(D).



Tightening torque : 49.0~68.6N.m(5.0~7.0Kgf.m, 36.1~50.6lb.ft)

[Caution]

1. Use the hexagonal wrench to prevent damage of bolt head when removing bolts.
2. When retightening the propeller shaft mounting bolts after removing them, each bolt and washer must be placed in its original position and bolt insertion direction must be the same as before, so make marks not to allow the bolts and washers to be mixed up before removing the propeller shaft.
3. If the position and direction of the propeller shaft mounting bolts and washers are reversed, it may cause vibration and noise at high vehicle speeds due to imbalance in the propeller shaft.
4. If abnormal vibration and noise occur at high vehicle speeds after replacing propeller shaft with new one, balance the propeller shaft with a balancing machine.

Suspension System

1. Service procedure and Notification

- Front stabilizer

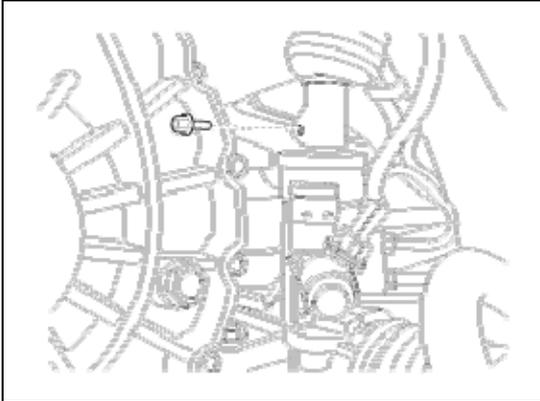
Removal caution

1) Front stabilizer assembly removal

1. Removal the front wheel & tire.

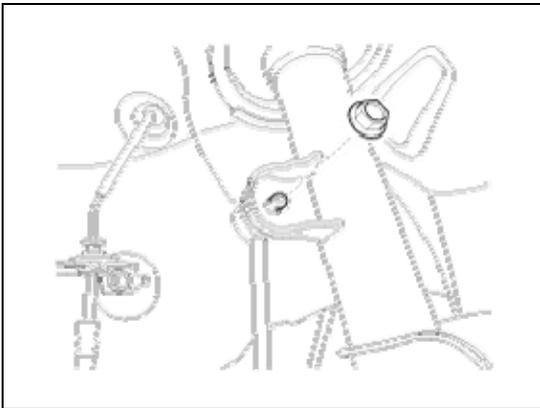
Tightening torque : 90 ~ 110 N.m(9.0 ~ 11.0 Kgf.m, 65~80 lb-ft)

2. Disconnect the universal joint. (Refer to steering gear box)



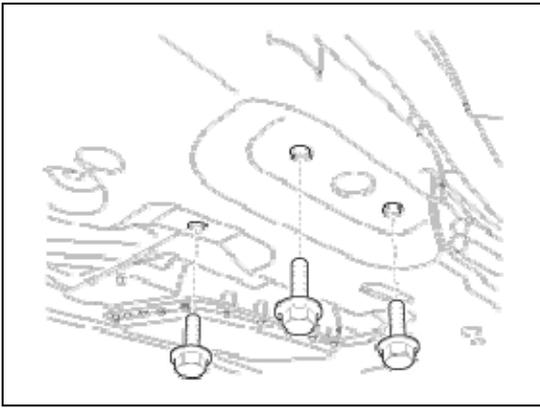
3. Disconnect the stabilizer link with the front strut assembly by loosening the nut.

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



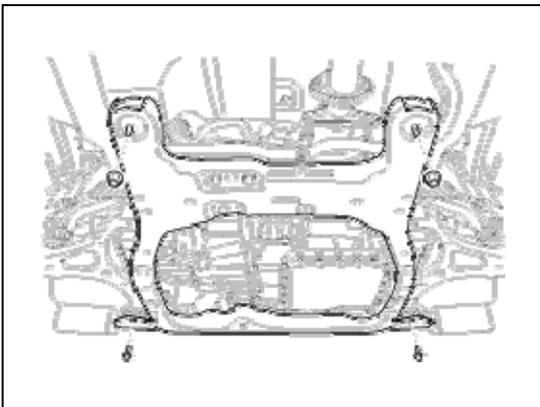
4. Loosen the roll stopper mounting bolts. (Refer to sub frame)

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



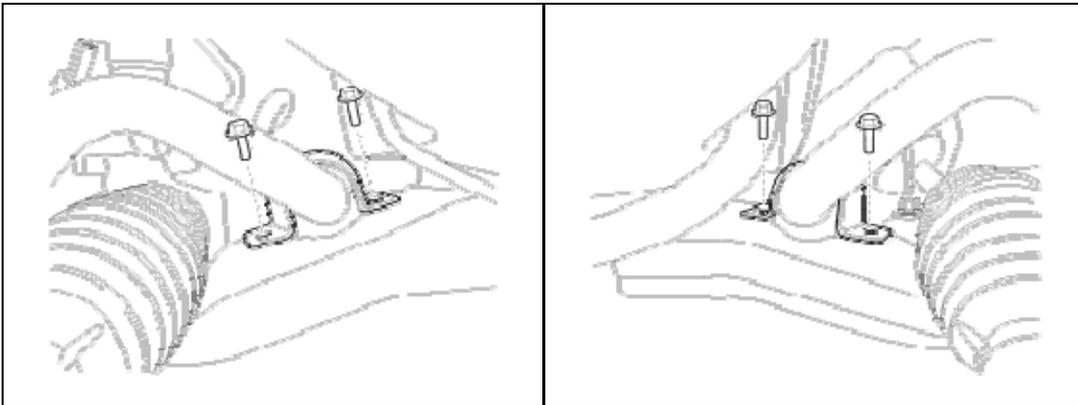
5. Loosen the sub frame mounting bolts & nuts. (Refer to sub frame)

Tightening torque : 140 ~ 160 N.m(14.0 ~ 16.0 Kgf.m, 101~116 lb-ft)



6. Loosen the stabilizer mounting bolts and then remove the front stabilizer bar.

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



7. Installation is the reverse of removal.

Brake system

1. Technical Service Specifications

Item	Specification
Master cylinder <ul style="list-style-type: none"> • Type • Cylinder I.D. • Piston stroke • Fluid level switch 	LHD : Single RHD : Tandem LHD : 22.22 mm (0.875 in) RHD : 26.99 mm (1.063 in) LHD : 45±1 mm (1.77±0.039 in) RHD : 31±1 mm (1.22±0.039 in) Provided
Brake booster <ul style="list-style-type: none"> • Type • Boosting ratio 	LHD : 11" Single RHD : 9" + 10" Tandem 9 : 1
Front Disc brake <ul style="list-style-type: none"> • Type • Disc O.D. • Disc thickness • Caliper piston • Cylinder I.D. 	Ventilated disc 298 mm (11.73 in) – Australia only 321 mm (12.64 in) – Except Australia 28 mm (1.10 in) Double Ø 45mm (1.77 in) X 2
Rear brake <ul style="list-style-type: none"> • Type • Disc O.D. • Disc thickness • Caliper piston • Cylinder I.D. 	Solid disc 302 mm (11.89 in) 11 mm (0.43 in) Single Ø 43 mm(1.68 in)
Parking brake <ul style="list-style-type: none"> • Type • Drum I.D. 	DIH (Drum in hat) Ø 190mm (7.48in)

[Notice]

O.D. : Outer Diameter

I.D : Inner Diameter

Service Standard

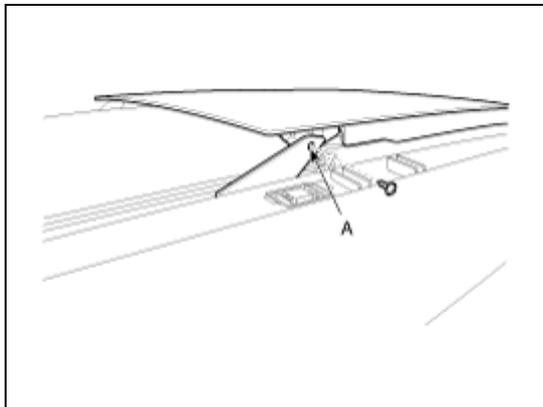
Items	Standard vale
Brake pedal height	LHD : 208 mm (8.19 in) RHD : 200 mm (7.87 in)
Brake pedal stroke	LHD : 131.1 mm (5.16 in) RHD : 122 mm (4.80 in)
Stop lamp clearance	1.0 ~ 2.0 mm (0.04 ~ 0.08 in)
Brake pedal free play	3 ~ 8 mm (0.12 ~ 0.31 in)
Front brake disc thickness	28 mm (1.10 in)
Front brake disc pad thickness	10.4 mm (0.41 in)
Rear brake disc thickness	11 mm (0.43 in)
Rear brake disc pad thickness	10 mm (0.39 in)

Body (Interior and Exterior)

1. Service procedure and Notification

● Glass Replacement

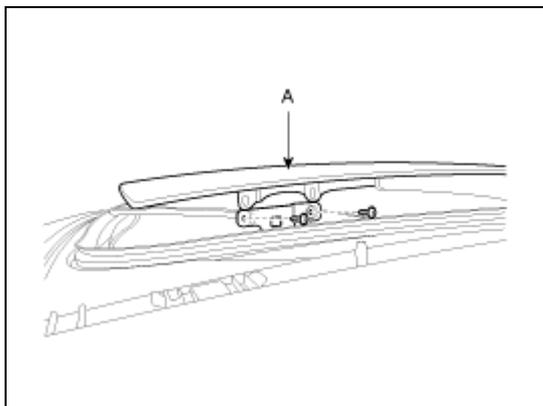
1. Open the glass.
2. Loosen the mounting screw (A).



3. After loosening the mounting screw, then remove the glass (A).

[CAUTION]

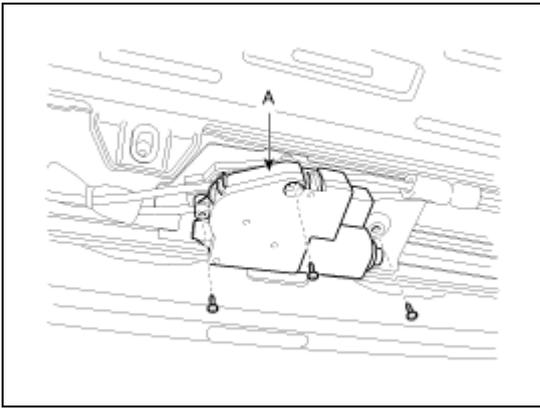
- Do not damage the screw.



4. Installation is the reverse of removal.

● Motor Replacement

1. Remove the roof trim.
2. Remove the sunroof motor after removing screws from the sunroof motor (A).



3. Installation is the reverse of removal.

[CAUTION]

- Make sure to initialize the motor.

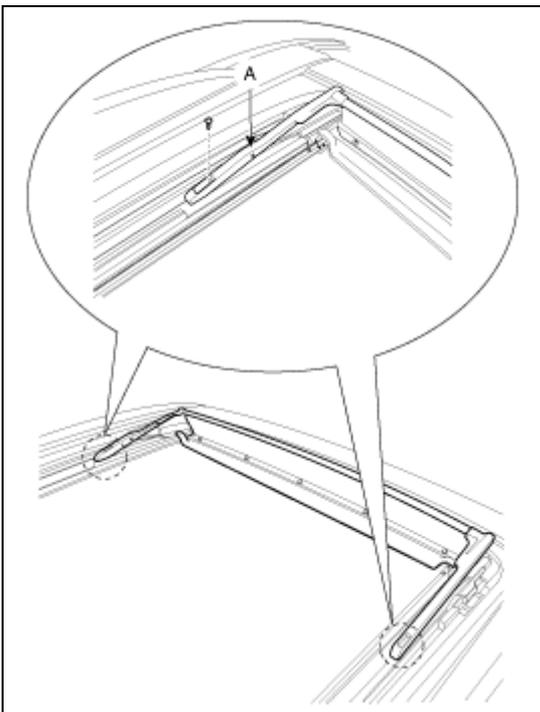
● Wind Deflector Replacement

1. Open the glass fully.

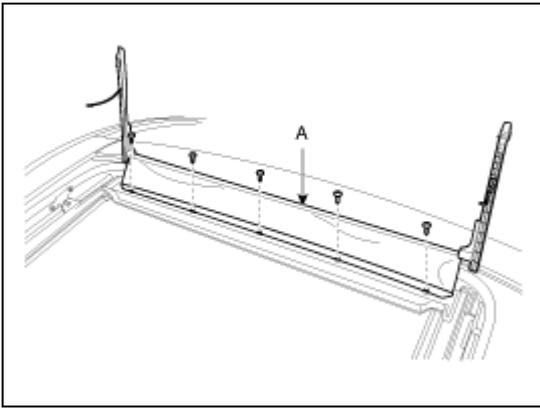
2. Using a star wrench, the wind deflector (A) loosening the mounting screw.

[CAUTION]

- Do not damage the screw.



3. After loosening the mounting screws, then remove the wind deflector (A).



4. Installation is the reverse of removal.

- **Roll Blind Replacement**

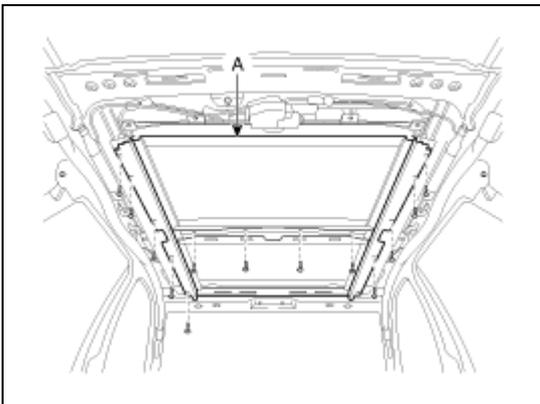
- **Removal**

1. Remove the glass.

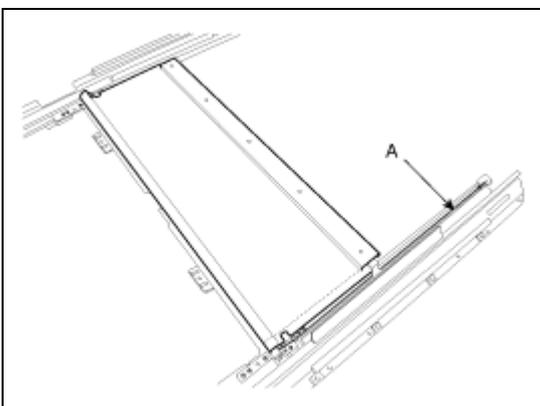
2. Remove the Mechanism rail assembly loosening the mounting screw, and then remove the Mechanism rail assembly (A).

[CAUTION]

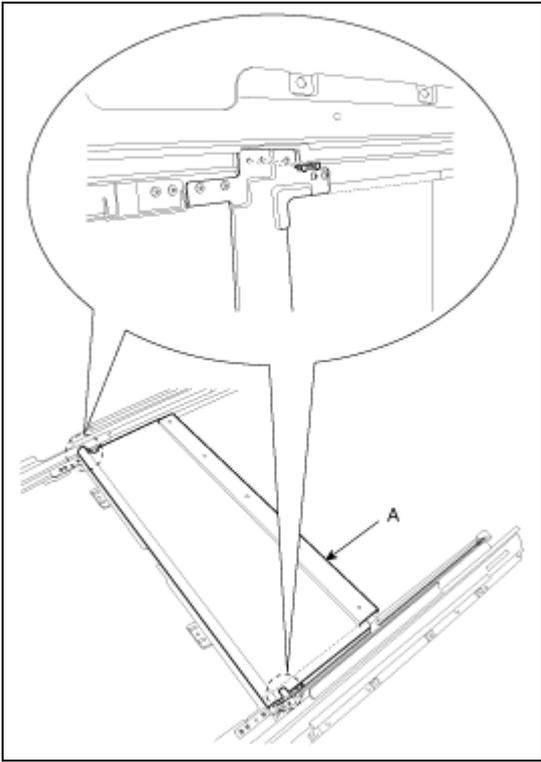
- **Do not damage the screw.**



3. Cut the tension wire (A) to prevent the injury.



4. After loosening the roll blind mounting screws, remove the roll blind (A).

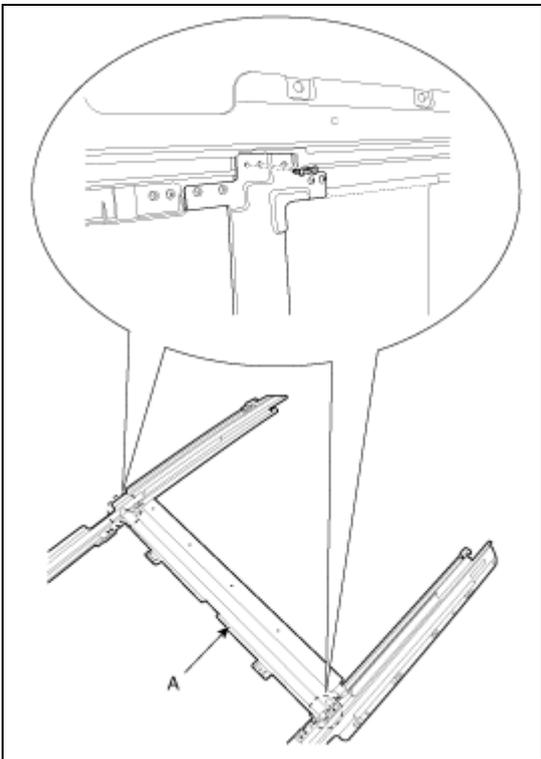


– Installation

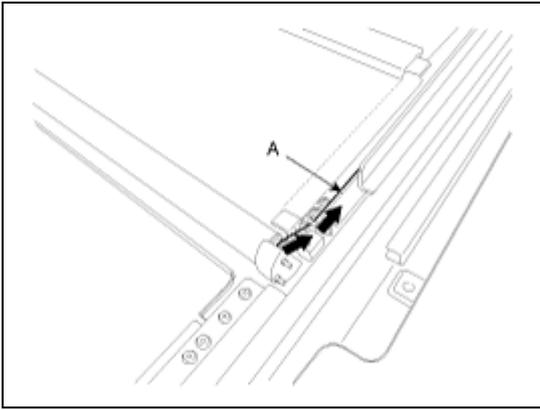
1. Installation is the roll blind (A).

[NOTICE]

- Insert the part of fabric both ends to guide.



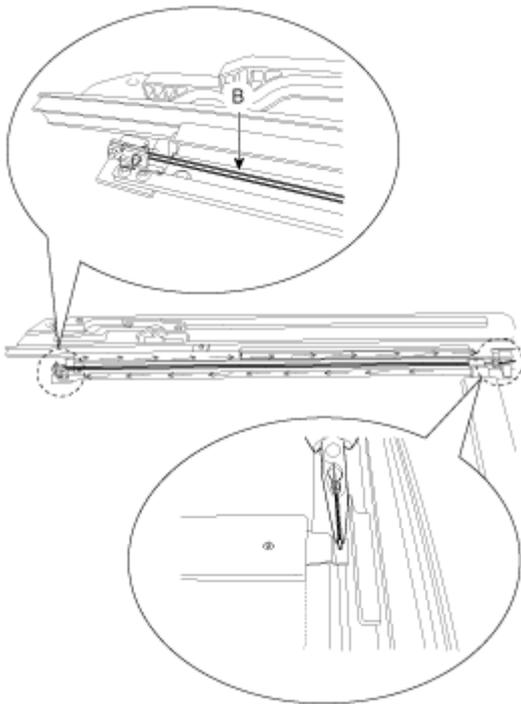
2. Install the wire (A) in arrow direction.



3. Install the wire (B) in arrow direction.

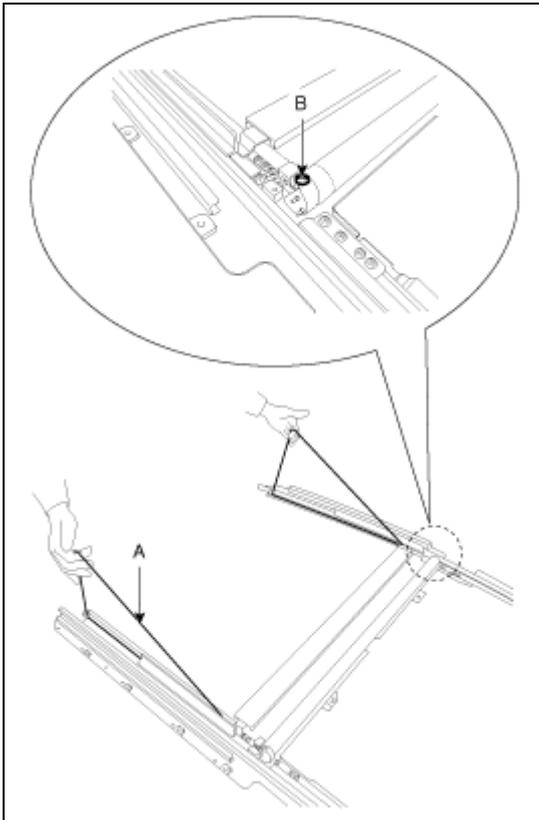
[NOTICE]

- Insert the wire into the cover completely when installing.



4. Pull the wire (A) as below picture.

5. Lay down the wire (A) slowly after removing the clip (B).



[NOTICE]

- Satisfy the coherence condition of roll blind is 2.6kgf.

● **Panoramaroof Assembly Replacement**

– **Removal**

1. Remove the following items :

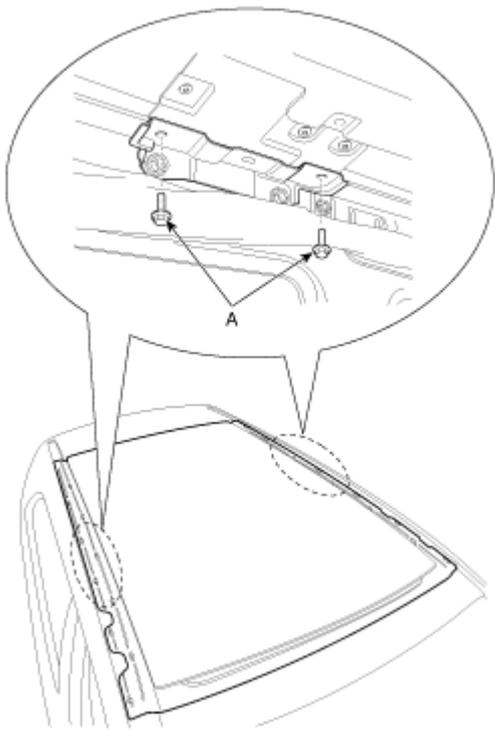
- A. Front seat
- B. Rear seat
- C. Interior trim
- D. Roof trim

[NOTICE]

- To prevent the interior contamination, spread the vinyl before panoramaroof operating.

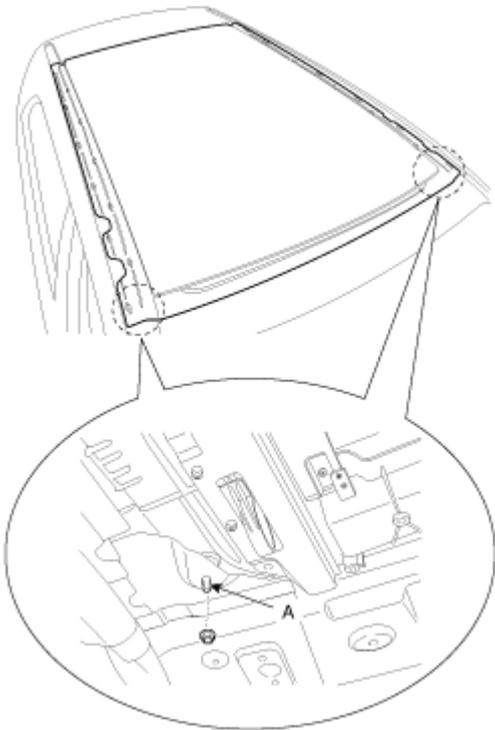
2. Remove the panoramaroof panel mounting bracket (A) loosening the mounting bolt.

Tightening torque : 19.6~29.4 N.m (2.0 ~ 3.0 Kgf.m, 14.5~21.7lb-ft)



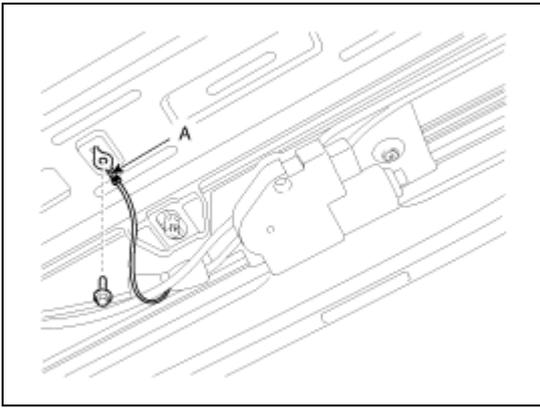
3. Remove the panoramaroof mounting nut (A).

Tightening torque : 19.6~29.4 N.m (2.0 ~ 3.0 Kgf.m, 14.5~21.7lb-ft)

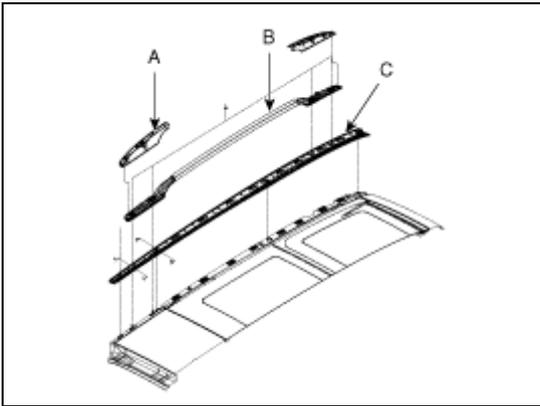


4. Disconnect the ground wire (A) by removing the bolt.

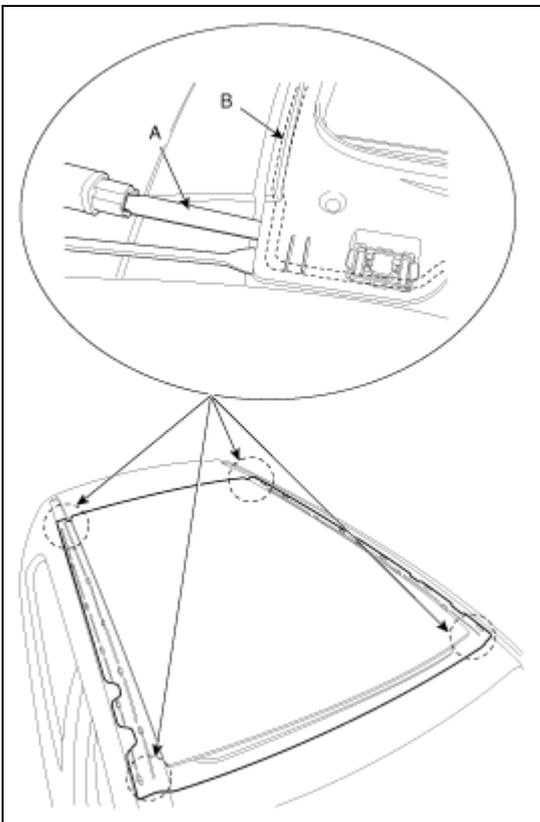
Tightening torque : 10.8~13.7 N.m (1.1 ~ 1.4 Kgf.m, 8.0~10.1lb-ft)



5. Remove the roof rack cover (A), roof rack (B), roof molding (C).



6. Open the space between chassis and sunroof using flathead screwdriver, and then cut the sealant (B) of edge using a tool (09816-2P130) (A).



[NOTICE]

- Be careful not to damage the sunroof when open the space between chassis and sunroof using flathead screwdriver.

7. Open the space between chassis and sunroof using flathead screwdriver, and then cut the sealant of edge using a tool (09816-2P121, 09816-2P122) (B).

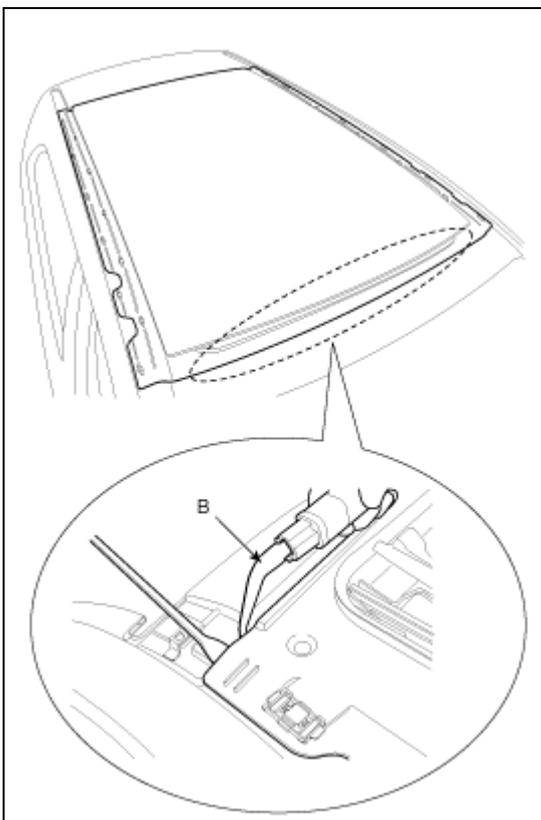
[NOTICE]

- This blade has a inclination to progress upward.

(09816-2P121, 09816-2P122)

- This blade has a inclination to progress downward.

(09816-2P123, 09816-2P124)



8. Open the space between chassis and sunroof using flathead screwdriver, and then cut the sealant of edge using a tool (09816-2P121, 09816-2P122) (B).

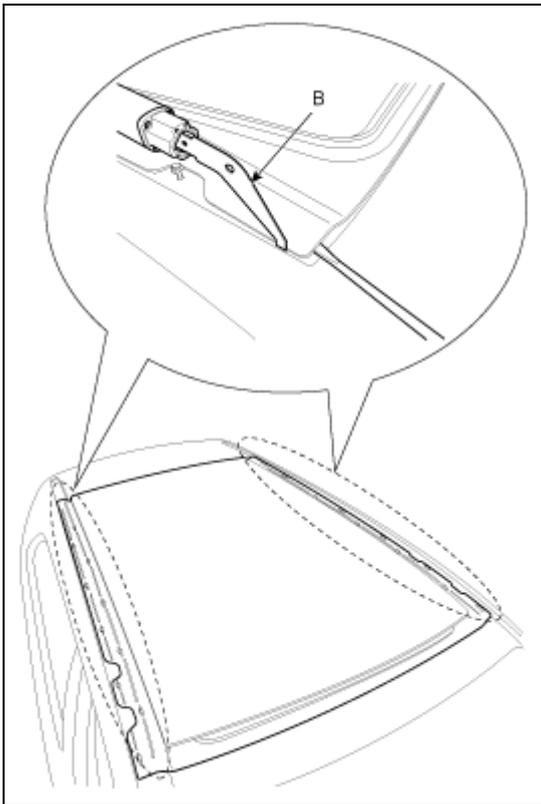
[NOTICE]

- This blade has a inclination to progress upward.

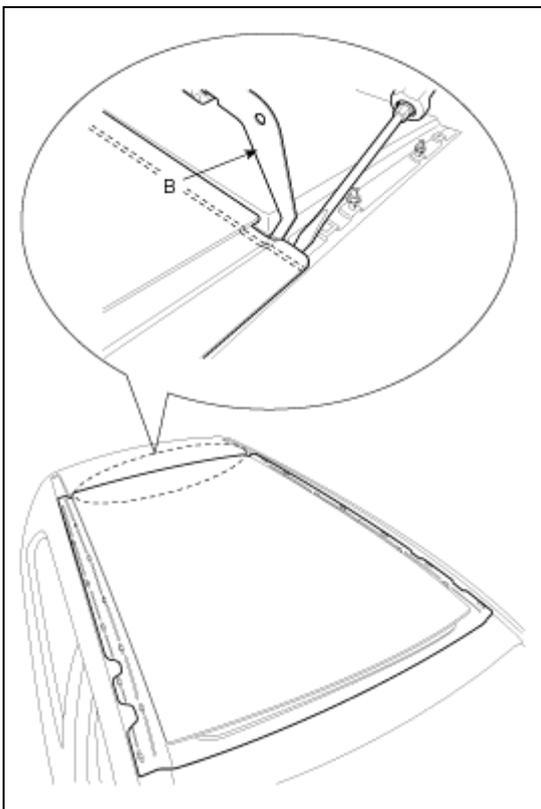
(09816-2P121, 09816-2P122)

- This blade has a inclination to progress downward.

(09816-2P123, 09816-2P124)



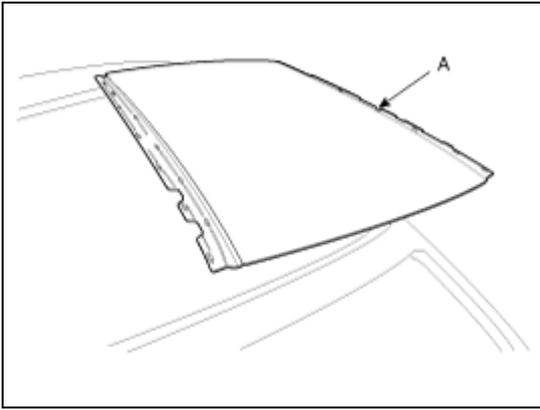
9. Open the space between chassis and sunroof using flathead screwdriver, and then cut the sealant of edge using a tool (09816-2P125, 09816-2P126) (B).



10. Remove the panoramaroof (A) carefully.

[NOTICE]

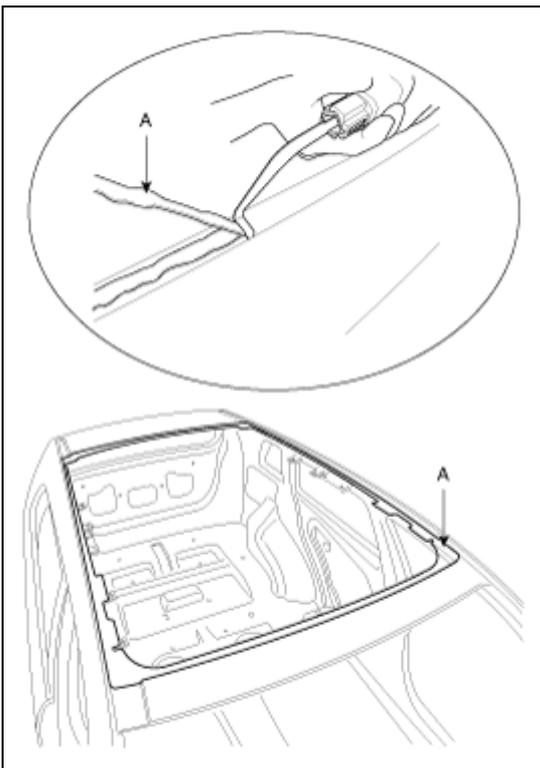
- When removing and installing the panoramaroof, an assistant is necessary.



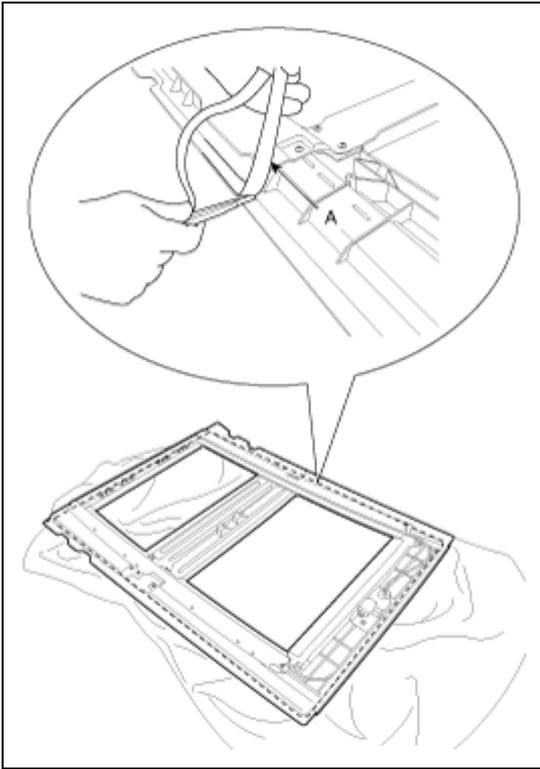
- Installation

1. With a knife, scrape the old adhesive smooth to a thickness of about 2mm (0.08 in.) on the bonding surface around the entire panoramaroof opening flange :

- Do not scrape down to the painted surface of the body; damaged paint will interfere with proper bonding.
- Remove the rubber dam and fasteners from the body.
- Mask off surrounding surfaces before painting.

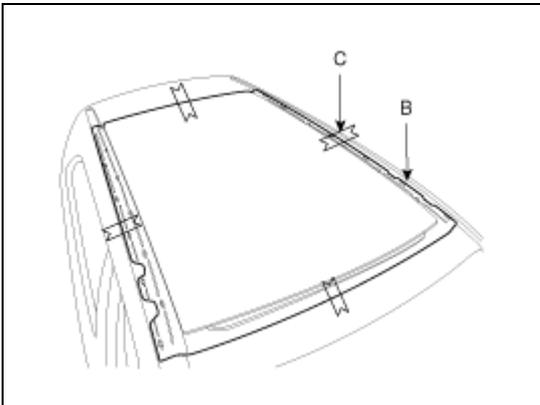


2. Clean the body bonding surface with a sponge dampened in alcohol. After cleaning, keep oil, grease and water from getting on the clean surface.



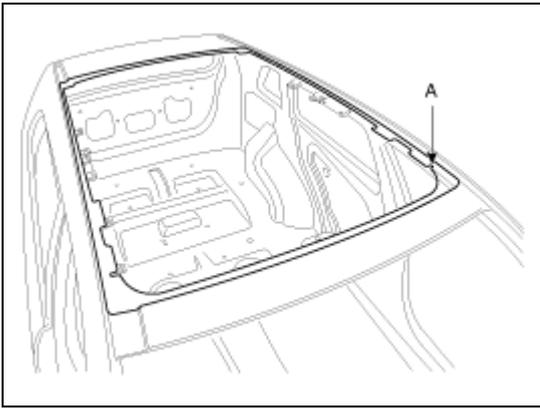
3. Install the panoramaroof (B) temporarily with making sure to position them on the center, and then place the alignment mark (C).

4. Remove the panoramaroof.



5. With a sponge, apply a light coat of body primer to the original adhesive remaining around the windshield opening flange. Let the body primer dry for at least 10 minutes :

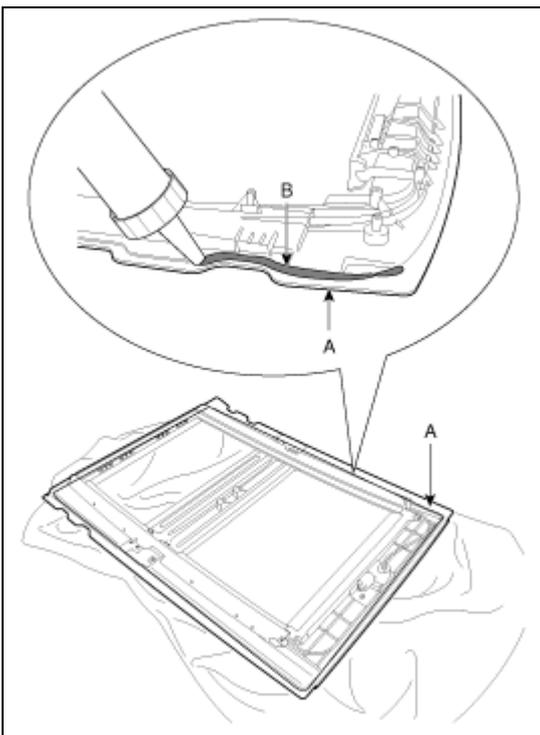
- Do not apply glass primer to the body, and be careful not to mixup glass and body primer sponges.
- Never touch the primed surfaces with your hands.
- Mask off the dashboard before painting the flange.



6. Apply a light coat of glass primer to the outside of the fasteners.

- Never touch the primed surface with your hand. If you do, the adhesive may not bond to the glass properly, causing a leak after the windshield glass is installed.
- Do not apply body primer to the glass.
- Keep water, dust, and abrasive materials away from the primer.

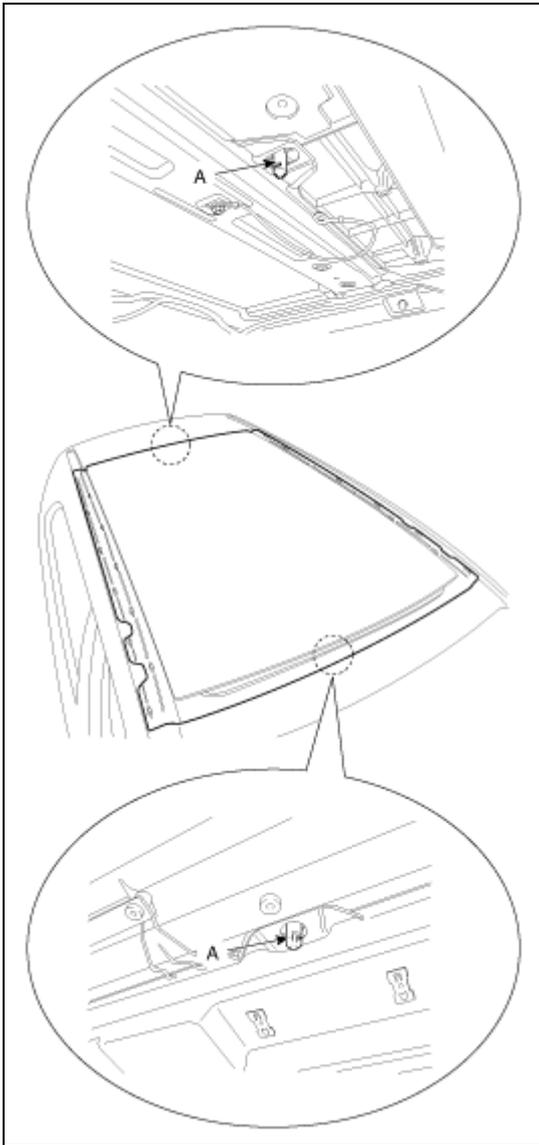
7. Pack adhesive into the cartridge without air pockets to ensure continuous delivery. Put the cartridge in a caulking gun, and run a bead of sealant (B) around the edge of the panoramaroof (A) as shown. Apply the adhesive within 30 minutes after applying the glass primer. Make a slightly thicker bead at each corner.



8. Installation is the panoramaroof.

[NOTICE]

- When removing and installing the panoramaroof, an assistant is necessary.



9. Scrape or wipe the excess adhesive off with a putty knife or towel. To remove adhesive from a painted surface or the windshield, wipe with a soft shop towel dampened with alcohol.

10. Let the adhesive dry for at least one hour, then spray water over the windshield and check for leaks. Make leaking areas, and let the windshield dry, then seal with sealant

- Let the vehicle stand for at least four hours after windshield installation. If the vehicle has to be used within the first four, it must be driven slowly.

- Keep the windshield dry for the first hour after installation.

11. Reinstall all remaining removed parts. Install the rearview mirror after the adhesive has dried thoroughly.

Advise the customer not to do the following things for two the three days :

- Slam the door with all the windows rolled up.

- Twist the body excessively (such as when going in and out of driveways at an angle or driving over rough, uneven roads).

-Adjustment

- **Inspect Glass Alignment**

1. Check for abnormal noise or bending during operation.

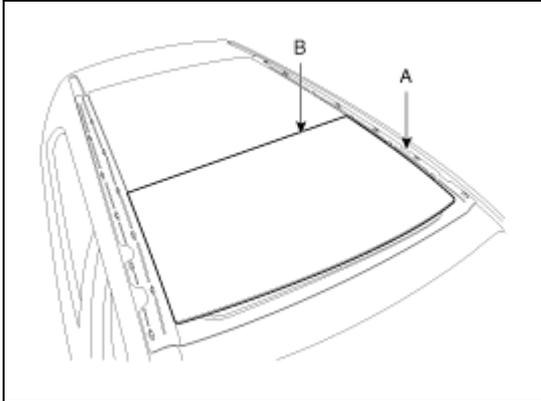
2. With the sunroof fully closed, check for water leakage.
3. The roof panel (A) should be even with the glass (B) weatherstrip, to within the standard value "E" all the way around. If not, make the following adjustment.

Standard value "E" [mm(in)]

Front edge : $-2+1.0/-2.0$ ($-0.0787+0.0394 / -0.0787$)

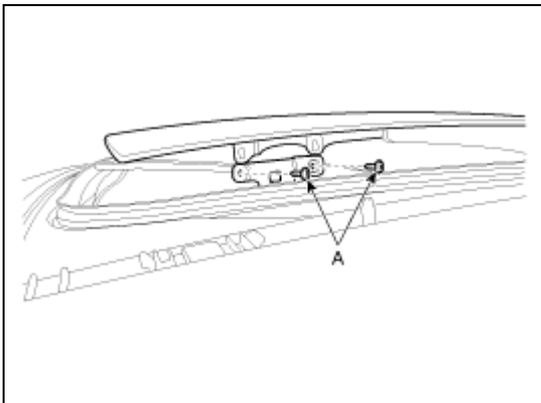
Rear edge : 1.0~1.4 (0.0394~0.0551)

Side edge : ± 0.5 (± 0.0197)



4. If the position is not as specified, lightly loosen the glass adjusting screw (A) to adjust the glass height and tighten it.

Tightening torque : 2.0 ~ 3.9N.m (0.2 ~ 0.4kgf.m, 1.4 ~ 2.9 lbf.ft)



● **How To Initialize Motor**

1. Check that the glass has been installed.
 - Finished height adjustment
2. Push the up switch. (Keep on pushing the switch)
 - The slide moved 5mm forward after 15 seconds.
3. After moving the slide 5mm forward, turn OFF the switch and push the UP switch (Keeping on pushing the switch with continuous operation).
 - If the operation above is normal condition, the sunroof once and closes.
4. When the sunroof is closed completely, turn OFF the UP switch initialize the motor completely

● **When To Initialize The Motor**

1. First operation the vehicle after manufacture it.

2. Initial value is erased or damaged because of short power electric discharge during operation.

3. After using the manual handle.

Operating The Sunroof Emergency Handle1. Use the sunroof emergency handle to close and open the sunroof manually for the following case only.

– To close the sunroof before driving a vehicle in a rainy day or on the highway if the sunroof cannot be closed due to failure of the sunroof motor or controller

4. Operating method

– Remove the overhead console.

– Push the emergency handle up into the hexagonal drive (A) of the sunroof motor. You must push hard enough to disengage the motor clutch; otherwise the emergency handle will slip due to incomplete fit in the motor.

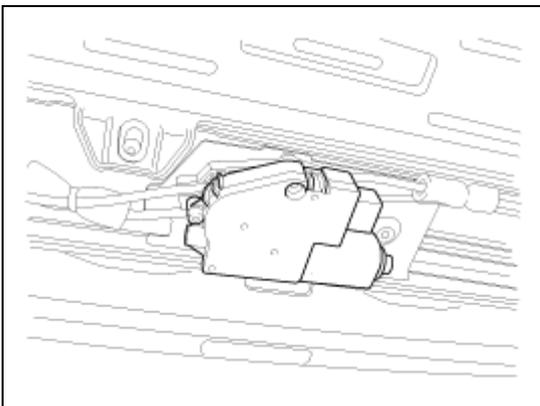
– Carefully turn the emergency handle clockwise to close the sunroof.

– After closing the sunroof, wiggle the handle back and forth as you remove the tool from the motor, to ensure the motor clutch reengages

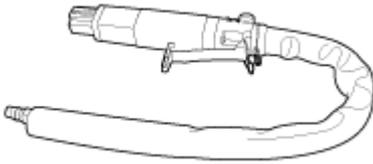
– A 5mm hex socket may be used in place of the emergency handle, with a "Speeder" type handle.

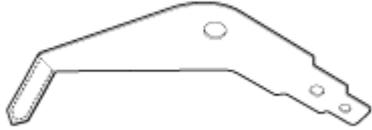
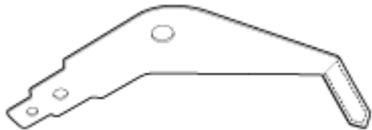
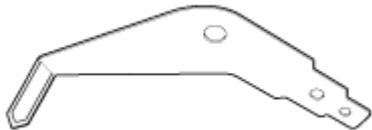
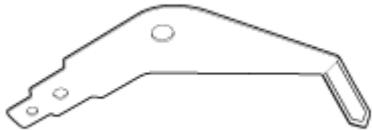
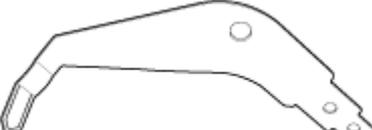
[CAUTION]

- Do not use power tools to operate the sunroof.
- Damaged to the components may occur.



2. Special Tools

09816-2P100 Power silent cutting tool	 A rectangular, light-colored tool box with a handle on top and latches on the front.	Tool box for removing panorama sunroof
09816-2P110 Air power tool	 An air-powered tool with a long, flexible, corrugated hose and a handle. It has a cylindrical body with various adjustment points.	Air tool for installing blade

<p>09816-2P121 Cutter-1</p>		<p>Blade for removing the front and side area of panorama sunroof (This blade has a inclination to progress upward.)</p>
<p>09816-2P122 Cutter-2</p>		<p>Blade for removing the front and side area of panorama sunroof (This blade has a inclination to progress upward.)</p>
<p>09816-2P123 Cutter-3</p>		<p>Blade for removing the front and side area of panorama sunroof (This blade has a inclination to progress downward.)</p>
<p>09816-2P124 Cutter-4</p>		<p>Blade for removing the front and side area of panorama sunroof (This blade has a inclination to progress downward.)</p>
<p>09816-2P125 Cutter-5</p>		<p>Blade for removing the rear area of panorama sunroof</p>
<p>09816-2P126 Cutter-6</p>		<p>Blade for removing the rear area of panorama sunroof</p>
<p>09816-2P130 Cutter-10</p>		<p>Blade for removing the edge area of panorama sunroof</p>

Body Electrical System

1. System Description

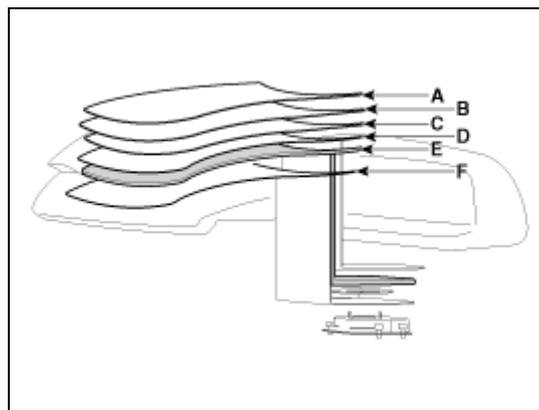
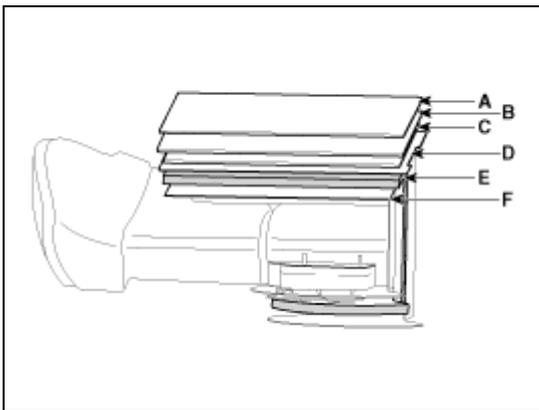
- Air ventilation seat

Description

It blows the indoor air through the blower fan installed at the seat cushion and back lower part, and supplies the air into the seat cushion and the seat back through the duct.

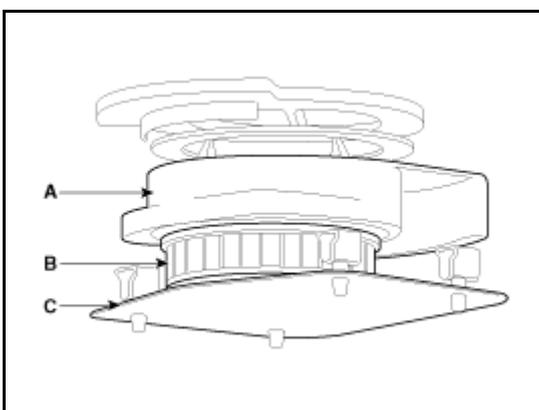
It sends a indoor air to the seat surface through the air ventilation layer between upper and lower layer.

Seat back & cushion layers



Item	Description
A	Leather
B	Pad
C	Seat Heater
D	Upper Layer
E	Air Ventilation Layer

FAN



Item	Description
A	Fan Cover
B	Fan
C	Bracket

- **ECO driving system**

ECO driving system

This system is designed to encourage eco-driving by providing real-time feedback to the driver.

The ECO indicator light assists you to drive in the most economical way.

The green indicator comes on when you drive with high fuel efficiency.

The fuel efficiency depends on driver's driving habit and road condition.

The system stops operation when the transaxle is in the P,R,N position or sports mode, or instantaneous fuel consumption mode is selected.

ECO indicator ON/OFF

1. ECO indicator system stops operation when instantaneous fuel consumption mode is selected.
2. ECO indicator light is always OFF when driver select the "ECO OFF" mode pushing the "Trip" button.
 - A. Set the main LCD display to "ECO ON" pushing "Trip" button as below picture.



- B. And then set the "ECO OFF" pushing "Trip" button more than 1 second as below picture.

In this option, ECO indicator light does not operate any trip mode.

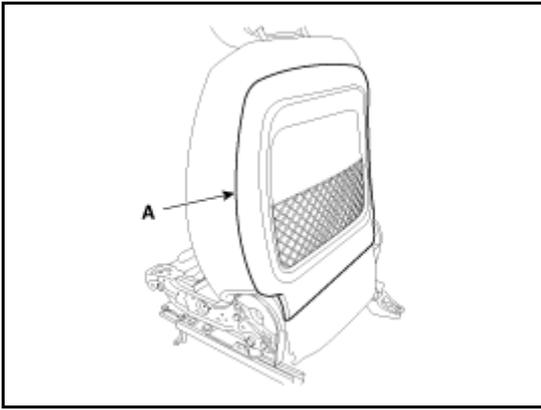


2. Service Procedure and Notification

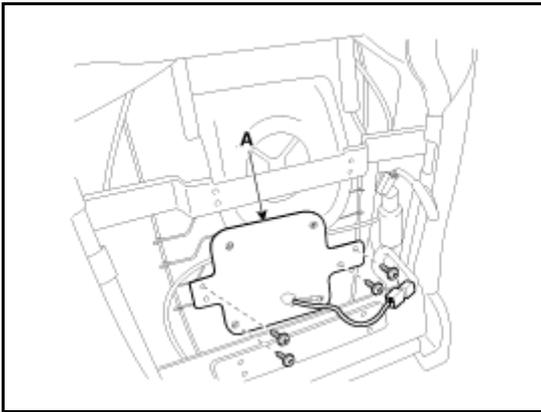
- **Air ventilation seat**

Inspection

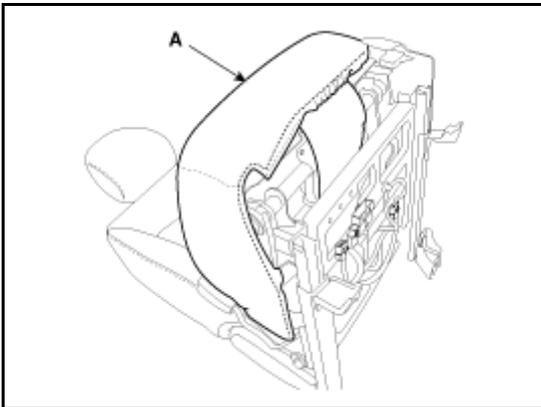
1. Remove the seat back cover (A). (Refer to BD group – "Front seat")



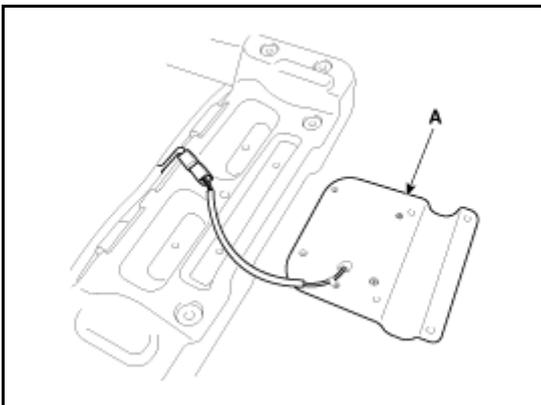
2. Remove the blower fan (A) after removing the screws from the seat back.



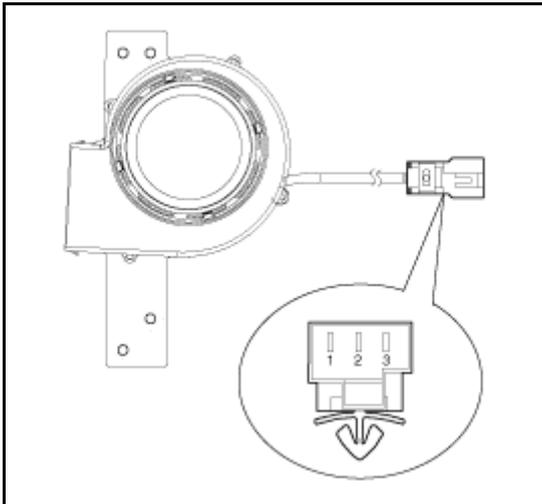
3. Remove the seat cushion (A). (Refer to BD group – "Front seat")



4. Remove the blower fan (A) after removing the rivets from the seat cushion.



5. Attach the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 3. Check that the fan motor operates.



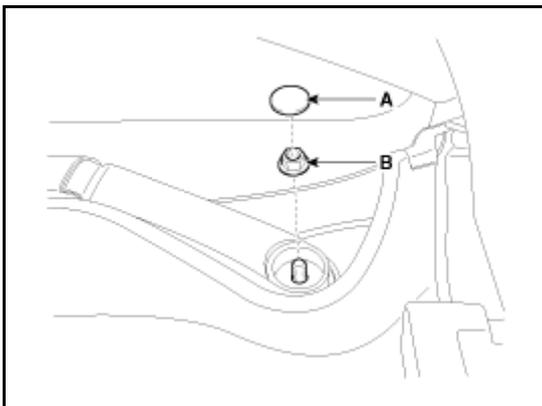
Pin	Description
1	12V
2	RPM control
3	GND

6. If the fan motor fails to operate, replace it.

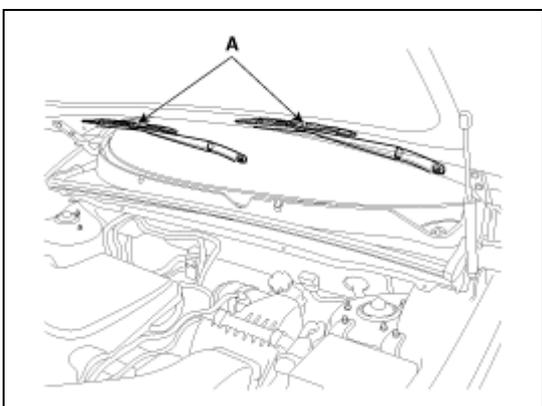
● Front wiper

Removal

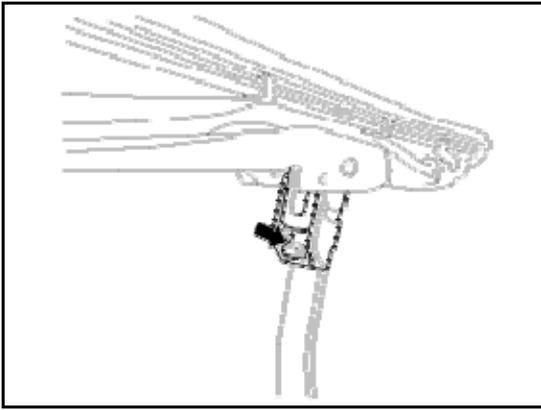
1. Remove the windshield wiper arm and blade after removing a nut (B) and wiper cap (A).



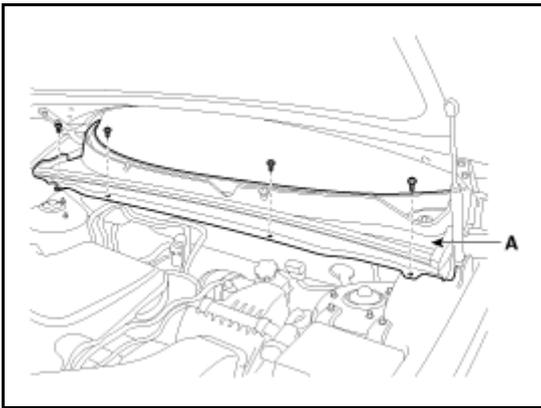
2. Remove the windshield wiper arm and blade (A) after removing a nut.



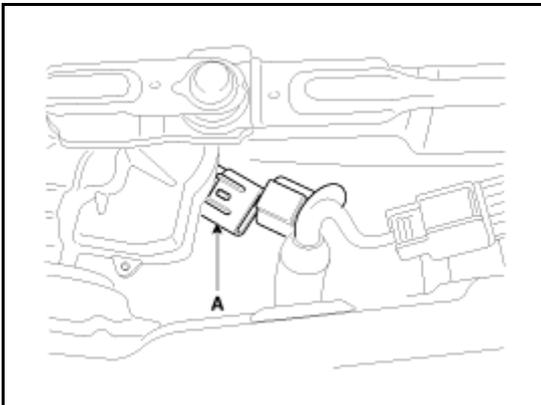
3. If necessary, release the wiper blade fixing clip by pulling up and remove the wiper blade from the inside radius of wiper arm.



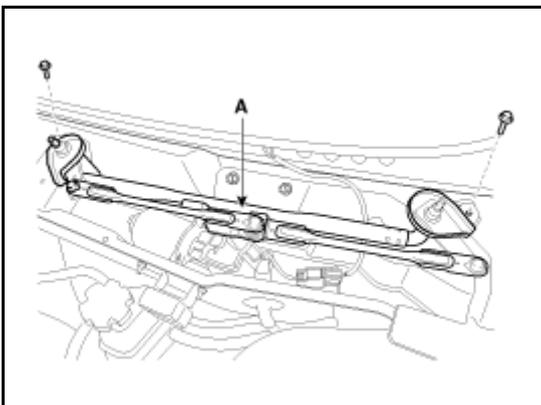
4. Remove the weather strip and the cowl top cover (A) after removing retainers.



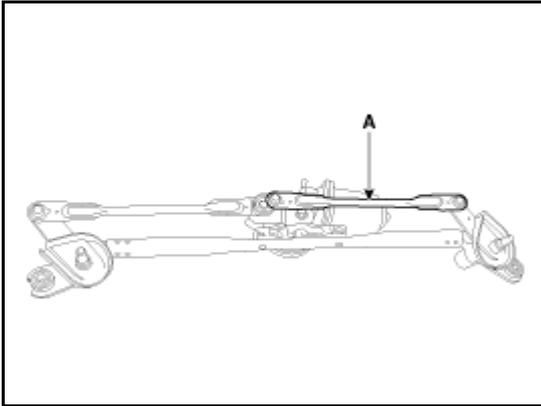
5. Disconnect the wiper motor connector (A) from the wiper motor & linkage assembly.



6. Remove the windshield wiper motor and linkage assembly (A) after removing 2 bolts.



7. Hold the wiper motor crank arm and remove the upper linkage (A) from the wiper motor crank arm.



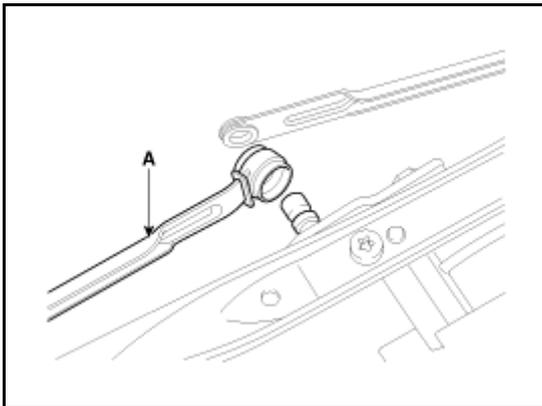
[CAUTION]

Before remove the wiper motor and linkage assembly, make sure that the linkage is stoped at auto stop position.

To install the wiper motor crank arm exactly, check that the linkage is aligned with the crank arm in straight line and the angle of each linkages.

Be careful not to bend the linkage.

8. Remove the lower linkage (A) from the wiper motor crank arm.

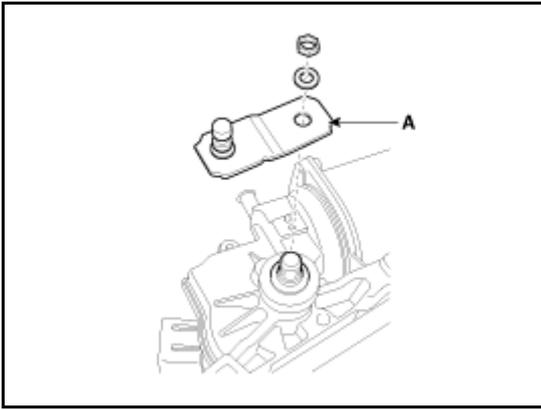


[Caution]

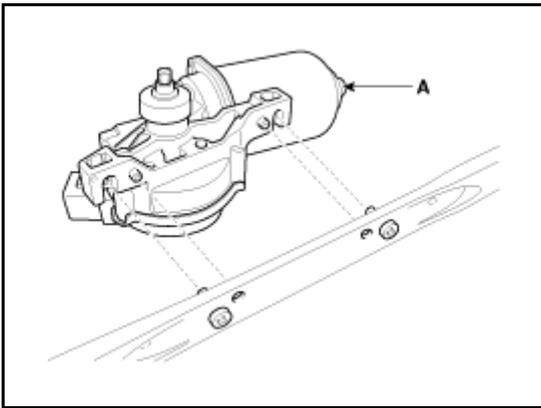
To install the wiper motor crank arm exactly, check that the linkage is aligned with the crank arm in straight line and the angle of each linkages.

Be careful not to bend the linkage.

9. Remove the crank arm (A) after loosening a nut.



10. Remove the wiper motor (A) after loosening the screws.



Installation

1. Install the wiper motor.
2. Install the crank arm.

Torque : 12.7–17.6Nm (1.3–1.8, kgf.m, 9.4–13.0 lbf.ft)

Caution

To install the wiper motor crank arm, make sure that the linkage is aligned with the crank arm in straight line and set the angle of each linkages exactly.

3. Install the lower and upper linkage to the wiper motor crank arm.

Caution

To install the wiper motor crank arm, make sure that the linkage is aligned with the crank arm in straight line and set the angle of each linkages exactly.

Be careful not to bend the linkage.

4. Install the wiper motor and linkage assembly and then connect the wiper motor connector.

Torque : 7–11Nm (0.7–1.1, kgf.m, 5.0–7.9 lbf.ft)

5. Install the cowl top cover.

6. Install the windshield wiper arm and blade.

Torque : 22.5~26.4 Nm (2.3~2.7 kgf.m, 16.6~21.7 lbf.ft)

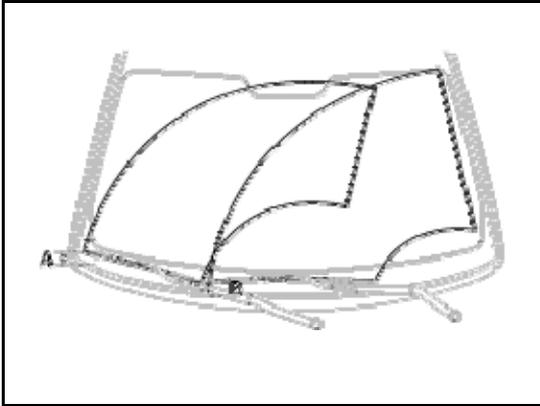
Notice

The windshield wiper motor must be cycled to make sure that it is in the park position.

If necessary, adjust the wiper arm and blade.

7. Install the wiper arm and blade to the specified position.

Specified position	A	B
Distance [in (mm)]	1.37 ± 0.2 (25±5)	1.17 ± 0.2 (30±5)



Heating, Ventilation, Air Conditioning

1. Technical Service Specification

Air Conditioner

Item		Specification	
		Diesel	Gasoline
Compressor	Type	6SBU16	
	Oil type & Capacity	Signal	PAG 120± 10CC
		Dual	PAG 180 ± 10CC
	Pulley type	6PK-TYPE	
	Displacement	160cc/rev	
Condenser	Heat rejection	13,500– 5% kcal/hr	16,000 – 5% kcal/hr
A/C Pressure transducer	The method to measure the pressure	Voltage= 0.00878835 * Pressure (psig) + 0.5	
Expansion valve	Type	Block type	
Refrigerant	Capacity [oz.(g)]	Signal	21.1 ± 0.88 (600 ± 25)
		Dual	26.4 ± 0.88 (750 ± 25)

Blower Unit

Item		Specification
Fresh and recirculation	Operating method	Actuator
Blower	Type	Sirocco
	Speed step	Auto + 8 speed (Automatic), 1~4speed (Manual)
	Speed control	Power mosfet (Auto) , Resistor (Manual)
Air filter	Type	Particle filter

Heater and evaporator unit

Item		Specification
Heater	Type	Pin & Tube type
	Heating capacity	4,600 ± 5% kcal/hr
	Mode operating method	Actuator
	Temperature operating method	Actuator
Evaporator	Temperature control type	Evaporator temperature sensor
	A/C ON/OFF [°C(°F)]	ON : 3.0 ± 0.3 (32.5 ± 32.5) OFF: 1.0 ± 0.3 (33.8 ± 32.5)