ENGINE ASSEMBLY

0000-00/1116-01/1128-01/1130-01/1130-12/1130-13/ 1130-25/1211-01/1337-04/1990-01/6820-02/

GENERAL INFORMATION

OVERVIEW AND OPERATING PROCESS

REMOVAL AND INSTALLATION

ENGINE ASSEMBLY 1116-01

GENERAL INFORMATION

1. SPECIFICATION

Unit	Description		Specification
Cylinder head	Height		142.5 mm
	Weight		15.6 kg
	Flatness		Below 0.05 mm
	Spark plug offset		2.5 mm
	Thickness of cylinder head gasket (when compressed)		0.7 mm
Camshaft	Axial end play	Intake	0.1~0.35 mm
		Exhaust	0.1~0.35mm
	Valve timing	Intake valve open	BTDC 35/-10
		Intake valve close	ABDC 14/62
		Exhaust valve open	BBDC 40/40
		Exhaust valve close	ATDC 12/12
	Journal bearing	Diameter	24mm
		Width	17 mm
		Oil clearance	0.037~0.074 mm
Intake/exhaust valve	Lift of intake valve		Max. 9.0 mm
	Lift of exhaust valve		Max. 8.0 mm
	Length of intake valve		115.0mm
	Length of exhaust valve		114.0mm
Connecting rod	End play		0.5~1.5mm

Modification basis	
Application basis	
Affected VIN	

2. TIGHTENING TORQUE

Name	Size	Quantity	Tightening torque
Heater core screw bolt	-	1	70 ± 7 Nm
Ladder frame bolt	M8 X 1.25 X 20	7	25 ± 2.5 Nm
TGCC	M6 X 1.0 X 25	10	10 ± 1.0 Nm
Oil drain plug	-	1	30 ± 3.0 Nm
Oil pan bolt	M6 X 1.0 X 20	16	10 ± 1.0 Nm
Oil pan bolt	M6 X 1.0 X 35	4	10 ± 1.0 Nm
Oil pan bolt	M6 X 1.0 X 85	2	10 ± 1.0 Nm
Oil dipstick gauge bolt	M6 X 1.0 X 16	1	10 ± 1.0 Nm
Main gallery screw bolt	-	1	55 ± 5.5 Nm
Main bearing cap bolt	-	10	55 Nm + 90°
Cylinder head bolt	M12X1.75X102	10	55 Nm + 180°
Cylinder head TGCC side bolt	M8 X 1.25 X 30	4	25 ± 2.5 Nm
Cylinder head front cover bolt	M6 X 1.0 X 25	8	10 ± 1.0 Nm
Cylinder head cover bolt	M6 X 1.0 X 30	20	10 ± 1.0 Nm
Crankshaft center bolt	M18 X 1.5 X 50	1	200 ± 20 Nm
			90 ° + 10 °
Flywheel bolt	M10 X 1.0 X 22	8	45 ± 5 Nm
			90 ° + 10 °
Connecting rod bolt	M9 X 1.0 X 52	8	40 + 5 Nm
			90 ° + 10 °
Cam Cap bolt (#1)	M6 X 1.0 X 35	4	10 ± 1.0 Nm
Cam Cap bolt (#2~5)	M6 X 1.0 X 30	16	10 ± 1.0 Nm
Solenoid valve bolt	M5 X 0.8 X 22	1	8 ± 1 Nm
Intake manifold bolt	M8 X 1.25 X 32	5	25 ± 2.5 Nm

Name	Size	Quantity	Tightening torque
Intake manifold lower bracket bolt	M8 X 1.25 X 16	4	25 ± 2.5 Nm
Exhaust manifold nut	-	7	40 ± 5 Nm
Heat protector bolt	M6 X 1.0 X 25	7	10 ± 1 Nm
Oil jet bolt	-	4	10 ± 1 Nm
Oil pump bolt	M8 X 1.25 X35	3	25 ± 2.5 Nm
Oil filter assembly assembly bolt	M8 X 1.25 X30	3	25 ± 2.5 Nm
Oil filter assembly assembly bolt	M8 X 1.25 X65	1	25 ± 2.5 Nm
Water pump bolt	M6 X 1.0 X22	1	10 ± 1 Nm
Belt tensioner upper bolt	M8 X 1.25 X30	1	25 ± 2.5 Nm
Belt tensioner lower bolt	M10 X 1.5 X55	1	65 ± 5 Nm
Water pump pulley bolt	M6 X 1.0 X12	4	10 ± 1 Nm
Thermostat bolt	M6 X 1.0 X22	3	10 ± 1 Nm
Coolant outlet port bolt	M6 X 1.0 X22	3	10 ± 1 Nm
Coolant pipe mounting bolt	M6 X 1.0 X14	3	10 ± 1 Nm
Bypass hose clamp	M24	2	3 ± 0.5 Nm
EPS idler pulley	-	1	25 ± 2.5 Nm
Engine mountinf stud bolt	-	2	50 ± 5.0 Nm
Engine front mounting bolt	M10 X 45	3	60 ± 6.0 Nm
Engine front mounting bolt	M10 X 77	1	60 ± 6.0 Nm
Engine front hanger bracket	M8 X 1.25 X 20	2	25 ± 2.5 Nm
Engine rear hanger bracket	M8 X 1.25 X 20	4	25 ± 2.5 Nm
A/C compressor bolt	-	4	25 ± 2.5 Nm
Alternator bolt	M10	4	45 ± 4.5 Nm
Start motor bolt	M10	4	Max. 48Nm
Power steering braket bolt	M8 X 1.25 X 50		30 ± 3.0 Nm

Modification basis	
Application basis	
Affected VIN	

3. GUIDELINES ON ENGINE SERVICE

G20DF engine is for FF (Front Engine Front Drive) type vehicle. Therefore, there are some deferent maintenance and repair works compared to the engine for FR (Front Engine Rear Drive) type vehicle. For safe and correct works, you must observe the working procedures and instructions in this manual. And, use the designated tools as follow:
: Power train mounting stand / Engine hanger / Engine stand / Heavy duty engine jack.

▶ Cautions before service works

- G20DF engine is FF (Front Engine Front Drive) type engine, and the engine and transmission are integrated in a same module. Remember that there are many differences compared to conventional engine in FR (Front Engine Rear Drive) type SUV vehicle.
  To remove the engine, use the dedicated equipments such as engine jack, transmission jack, engine stand and engine crane (1 ton).
- To prevent the engine from abruptly starting during service in engine compartment, never allow anybody to stay in the vehicle.
- Make sure to disconnect the negative (-) cable from the battery to prevent any damage to electric systems.
- Make sure to clean the working area and to prepare the necessary tools before service works.
  Always place the ignition switch to OFF position if not required. Otherwise, there could be
- unexpected damage to electric devices or personal injuries due to short-circuit..
  To prevent the foreign material from entering into the fuel injection system, completely seal the
- inlets of HP pump, fuel hoses and high pressure pipes.
  Do not remove the engine while supporting the oil pan with a jack.
-

▶ Lifting up the vehicle

- Before lifting up the vehicle with a lift, correctly support the lifting points.
- To prevent the vehicle from rolling down, put the chocks under the tires (when using a 4-post lift).
  Make sure to support the correct lifting points (when using a 2-post lift).
-

Modification basis	
Application basis	
Affected VIN	

▶ Engine and accessories

Engine has a lot of precise components. The specified tightening torque and correct procedures should be kept during service works. And, the working area is always clean and well prepared.
When disassembling the engine, related parts (bolts, gaskets, etc.) should be stored as a set.

- Carefully read the disassembly and reassembly procedures in this manual before starting the works.
- Clean the components completely with engine oil before assembling if needed.
- Fully drain the engine oil, coolant and fuel from the vehicle and seal the inlets with the plugs before removing the engine.
- All the interference should be eliminated before removing the engine.

▶ Exhaust system

- Wear the protective gloves before removing the exhaust pipe.
- The exhaust pipe is very hot immediately after stopping th engine. Check if the exhaust pipe is fully cooled down before servicing the exhaust system.

▶ Cooling system

- Scalding hot coolant and steam could be blown out under pressure, which could cause serious injury. Never remove the coolant reservoir cap when the engine and the radiator are hot.

▶ Tightening the fastener

When reassembling the parts to G20DF, use the angle tightening as a final step.
1. Clean the mating surfaces before tightening.
2. Place the marks with paint to tighten by angle if the angle wrench is not available.

NOTE

The position and direction of the componets is based on the rear view.
Do not tighten the fasteners with excessive force. Especially, the threads of cylinder block could be damaged.
The self screw bolt makes the thread itself when tightening it. Do not apply excessive force.
Do not reuse the bolt that has been tightened with angle tightening method.

▶ Fuel and engine oil system

The engine oil and fuel damages the painted surfaces and rubber material of the vehicle.

- Disconnect the negative cable from the battery before servicing the fuel system, and prepare the service plug grip.
- When working with the fuel or oil systems in enclosed area, always keep the working area well-ventilated and never allow anybody to smoke.
- Do not allow the gasoline to contact to rubber or leather parts.
- Carefully separate the pipe between high pressure fuel pump and fuel injector so that any fuel can be spilled out.
- Fully release the pressure from the fuel system before removing any parts of fuel system.
- To release the fuel pressure in high pressure line, let the engine fully cool down.
- Gaskets and seals on the fuel and oil systems should be replaced with new ones. All bolts and nuts should be tightened as specified.
- Prolonged exposure to the engine oil make cause a skin cancer or an irritation.
- Used engine cotains the hazardous material that may cause the skin cancer. Do not allow the used engine to make contact with your skin.
- Make sure to wear the protection gloves and goggle when handling the engine oil. If contact happens, rinse affected areas immediately with plenty of water. Do not wash it with gasoline or solvent. If irritation persists, consult a doctor.
- Improperly disposed engine oil can pollute the environment. Dispose the used engine oil and oil filter in accordance with local environmental regulations.
- Make sure to check the connections for leak after installation.

▶ Electric devices

Extraordinary care should be taken when servicing the electric systems. Currently, the engine uses a lot of electric devices. Short circuit and poor contact may cause the low engine performance, incomplete combustion and other abnormalities.

- To prevent any damage to electric systems, make sure to disconnect the negative (-) cable from the battery and place the ignition switch to OFF position before servicing.
- Use only the specified parts with same ratings when replacing the electric devices. Check the grounds and connections for looseness.

OVERVIEW AND OPERATING PROCESS

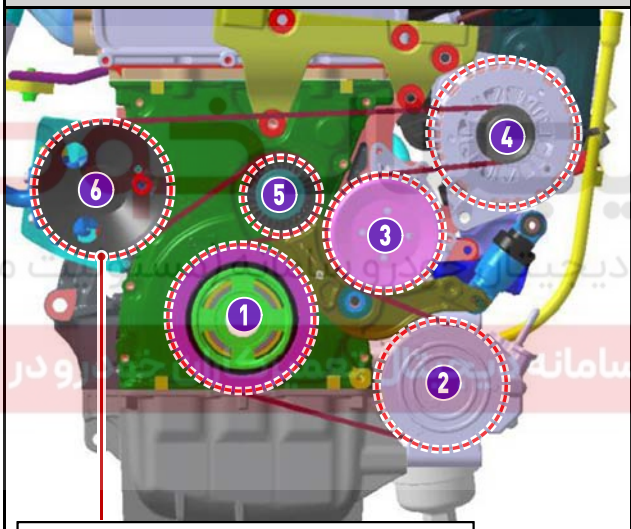
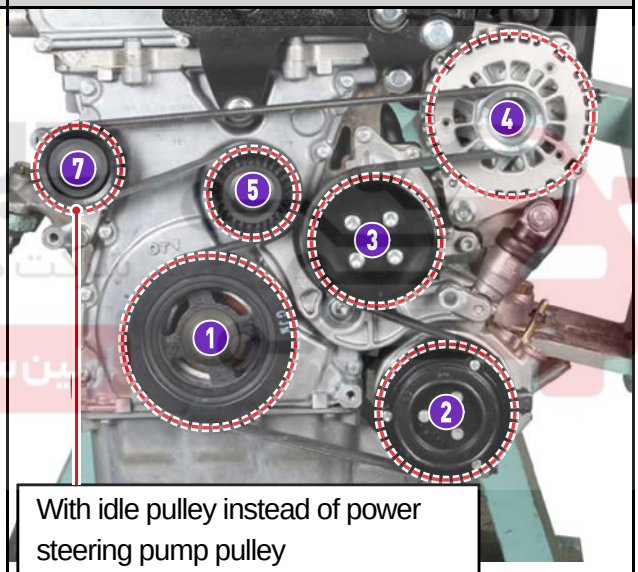
S.G.N. 1337-04 BELT SYSTEM

1) Drive Belt

▶ Overview

There are two types of belt system; EPS (Electric Power Steering) and HPS (Hydraulic Power Steering). In the vehicle with ESP, instead of power steering pulley, the idle pulley is installed on the engine. The belt system is a single belt drive system which uses single V-belt with 6 grooves. This design provides the long life span and minimizes the belt slip and noise.

▶ Components

With HPS (Hydraulic Power Steering)	With ESP (Electric Power Steering)
 With power steering pump pulley	 With idle pulley instead of power steering pump pulley
Length of belt : 1913mm	Length of belt : 1740mm

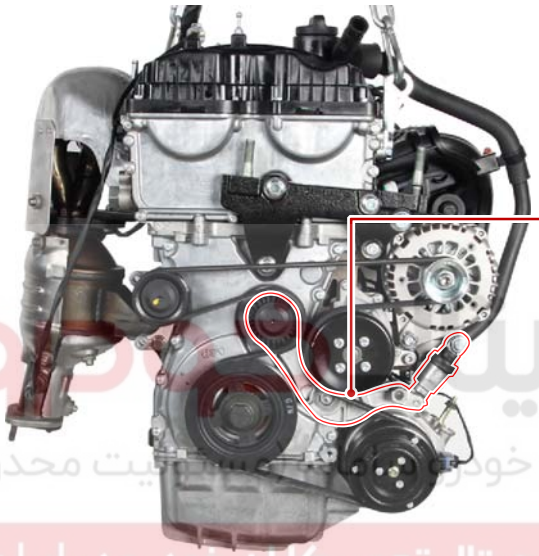
1. Crankshaft pulley
2. Air conditioner compressor
3. Water pump
4. Alternator
5. Tension pulley
6. Power steering pump pulley
7. Idler pulley

2) Hydraulic Tensioner Assembly

▶ Overview

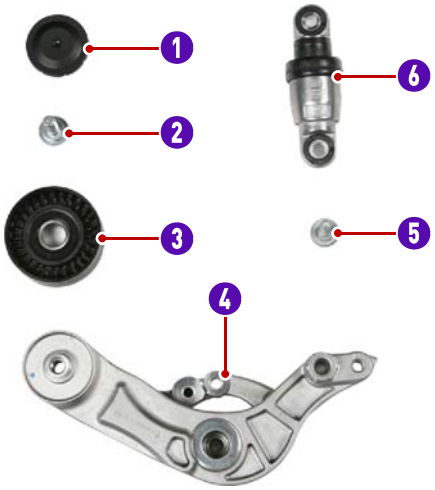
The hydraulic tensioner maintains the belt tension to minimize the slip and vibration and provides long life span of the belt. Hydraulic tensioner consists of hydraulic tension spring, hydraulic damper, lever arm and tension pulley.
To transfer the tension to the belt from the hydraulic tensioner in small working space in G20DF engine, the belt system uses the longer lever arm.

▶ Location and Components



Hydraulic tensioner assembly

Components



No	Name
1	Tensioner pulley cap
2	Tensioner pulley mounting bolt
3	Tensioner pulley
4	Lever arm
5	Hydraulic tensioner bolt
6	Hydraulic tensioner

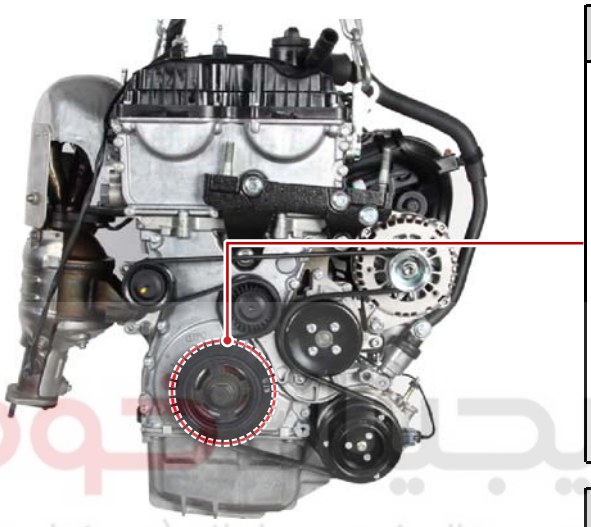
Modification basis	
Application basis	
Affected VIN	

3) Crankshaft Pulley (CRS)

▶ Overview

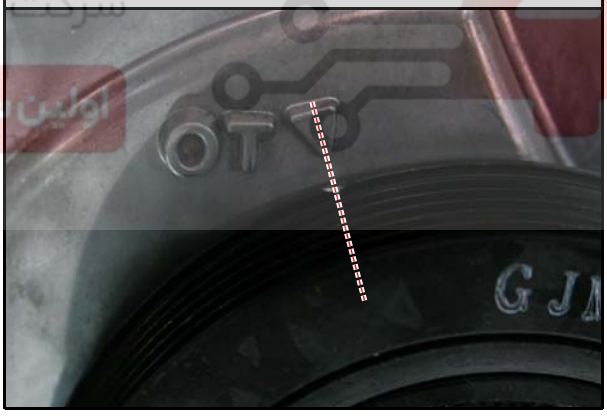
The strut type tensioner automatically adjusts the belt tension to provide the reliability and durability for the system. And, the belt tension is decreased to minimize the friction loss and improve the belt operating noise.

▶ Location



Crankshaft pulley (CRS)

Timing mark



Modification basis	
Application basis	
Affected VIN	

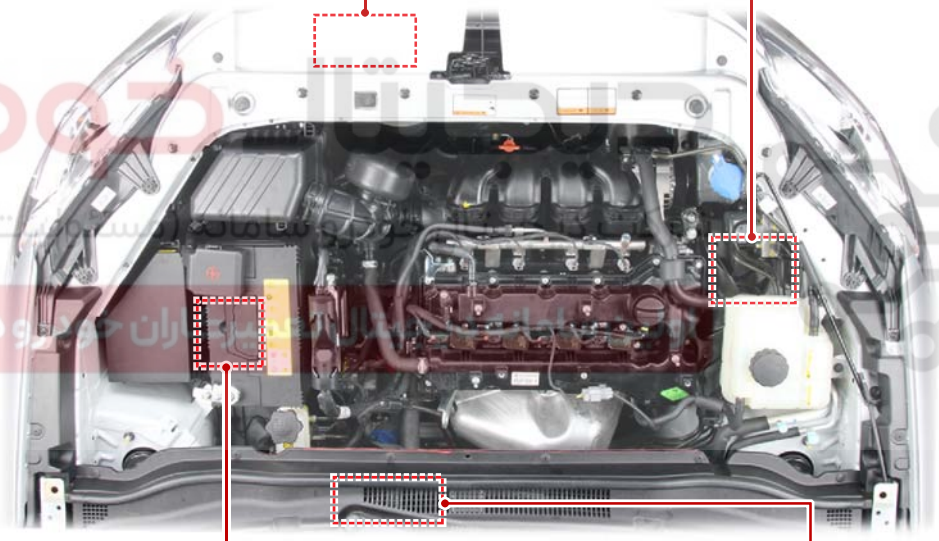
S.G.N. 1990-01

ENGINE MOUNTING

▶ **Location**

Front mounting assembly Location: Front side of transaxle housing and front side of sub frame	
Location	Front mounting
	

Right mounting assembly Location: Engine block side and body side member	
Location	Right mounting
	



Left mounting assembly Location: Upper side of transaxle housing and body side member	
Location	Left mounting
	

Rear mounting assembly Location: Rear side of transaxle housing and front side of sub frame	
Location	Rear mounting
	

Modification basis	
Application basis	
Affected VIN	

▶ Function

Appearance	Type and function
Front mounting: Bracket + Insulator 	Type: Rubber type mounting Function: support torque reaction
Rear mounting: Bracket + Insulator 	Type: Rubber type mounting Function: support torque reaction
Left mounting: Bracket + Insulator 	Type: Rubber type mounting Function: - support power train rod - support torque reaction
Rear mounting: Bracket + Insulator and D-damper 	Type: Hydraulic type mounting Function: - support power train rod - power train bounce vibration absorber - support torque reaction

Modification basis	
Application basis	
Affected VIN	

S.G.N. 1211-01

CYLINDER HEAD ASSEMBLY

1) Cylinder Head

▶ Overview

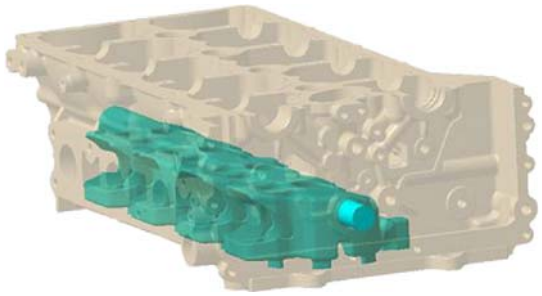
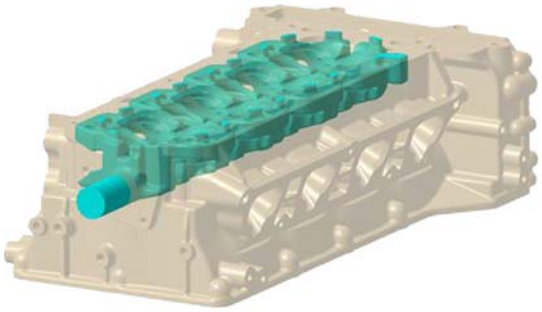
The cylinder head assembly is located on the cylinder block.
This contains the combustion chamber, intake and exhaust ports, valve running housing, and oil gallery.
And, this also contains the water jacket to dissipate the heat from the combustion chamber

▶ Location

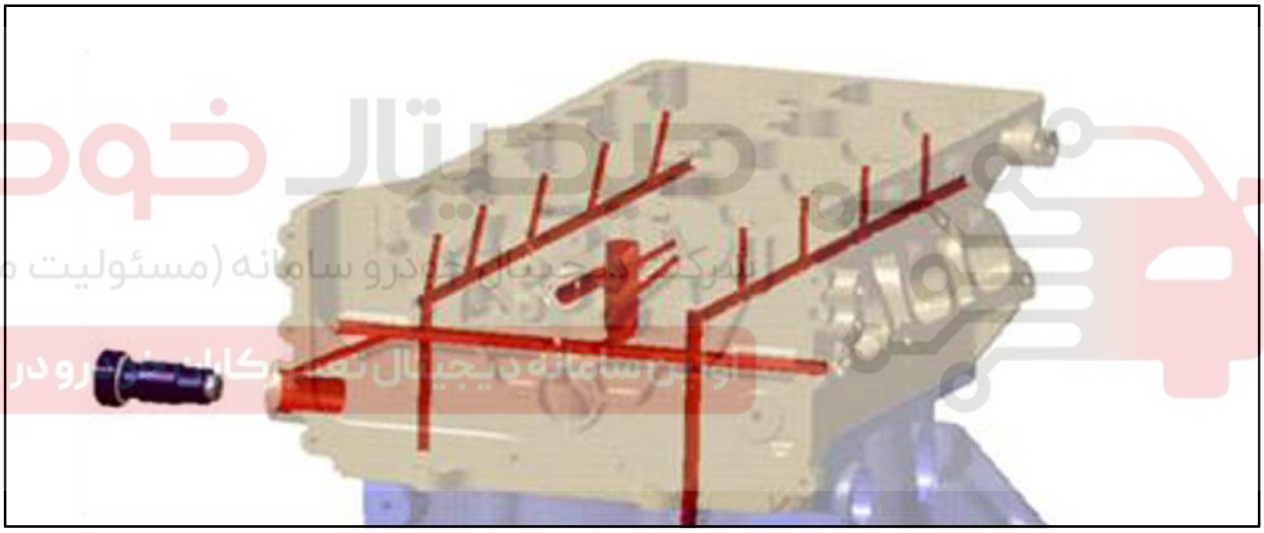
Top of cylinder head	Bottom of cylinder head
	
Intake side	**Exhaust side**
	

Modification basis	
Application basis	
Affected VIN	

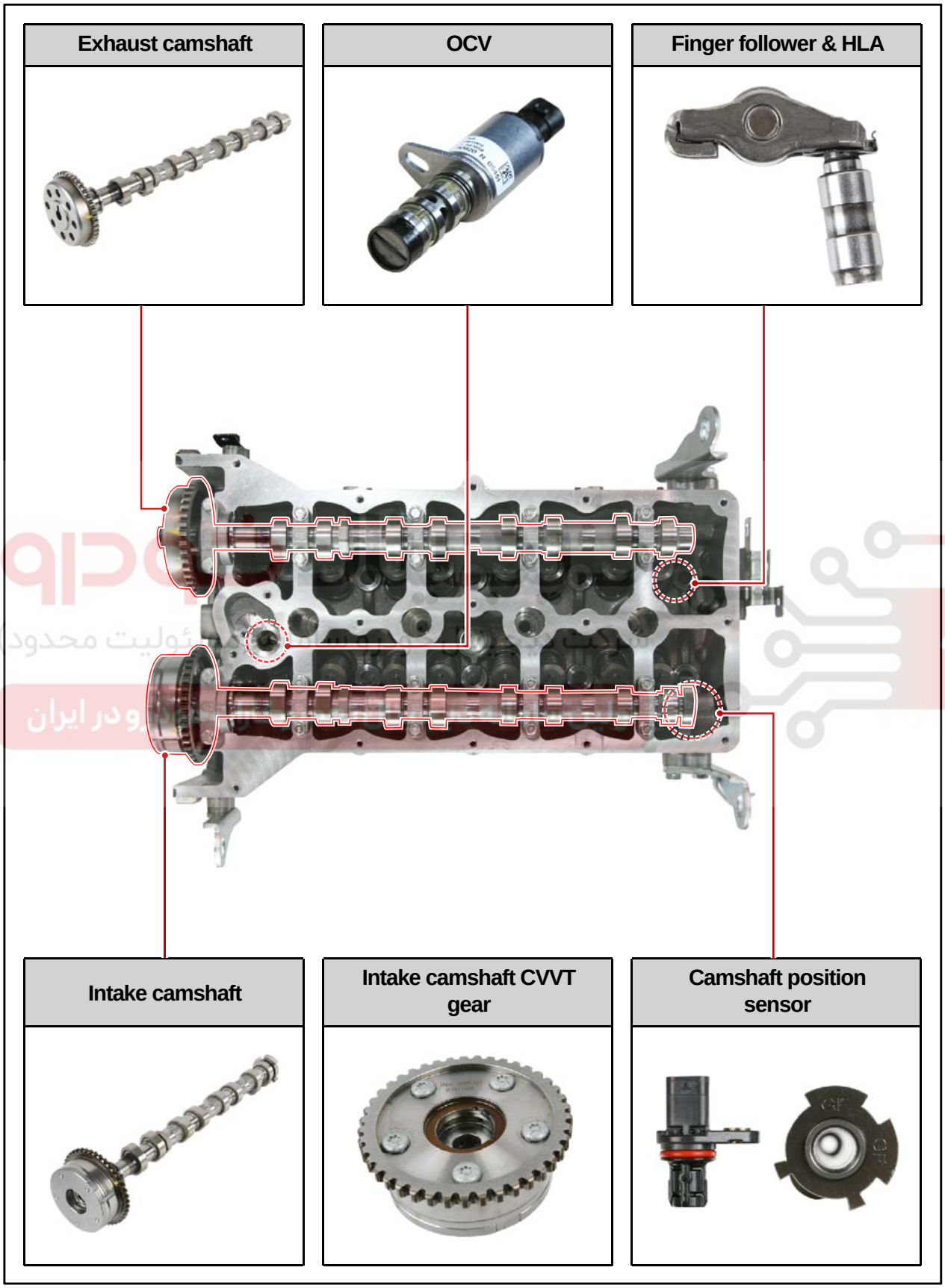
▶ **Closed-roof water jacket (improving coolimg efficiency)**

Intake side	Exhaust side
	

▶ **Cylinder head oil gallery**



▶ Components



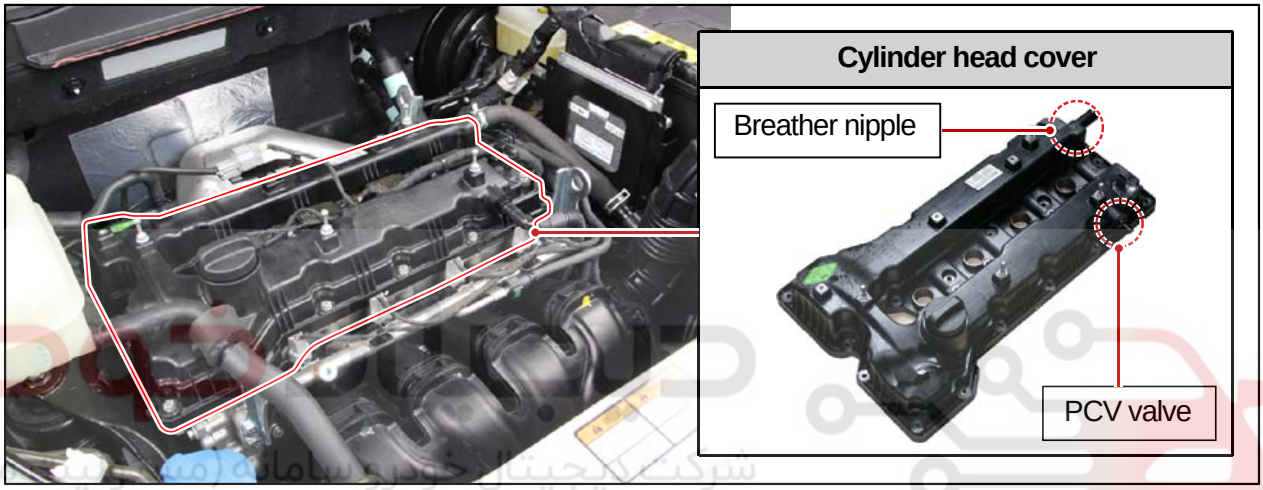
Modification basis	
Application basis	
Affected VIN	

2) Cylinder Head Cover

▶ Overview

The cylinder head cover protects the valve system. It contains the breathing system with PCV valve for recirculation of blow-by gas. The blow-by gas is induced into the intake manifold through the breather nipple and PCV Valve. To improve the sealing performance, new bolt pattern is introduced. And, to prevent the freezing, the PCV valve is tilted with 9° to the below direction.

▶ Location



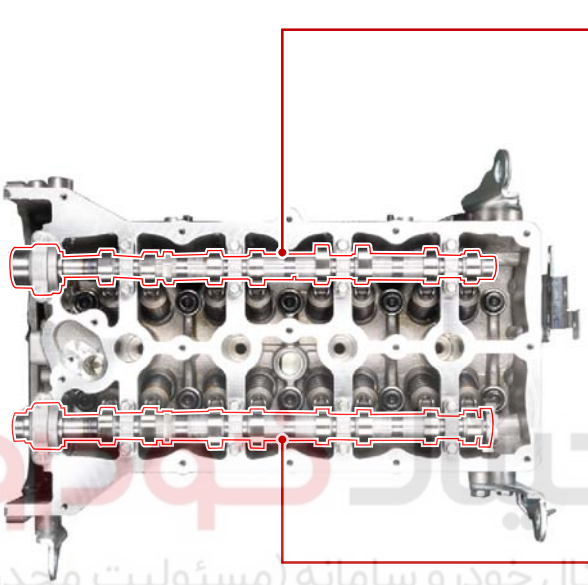
Modification basis	
Application basis	
Affected VIN	

3) Camshaft Assembly

▶ Overview

The camshaft is hollow type, and contains the cam, octagon cam, OCV gallery, cam position rotor. The camshaft operates the intake and exhaust valves.

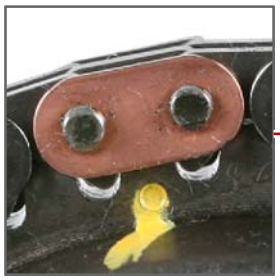
▶ Location

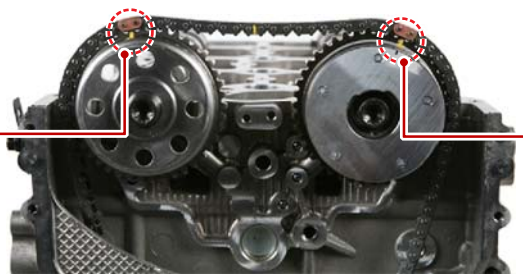


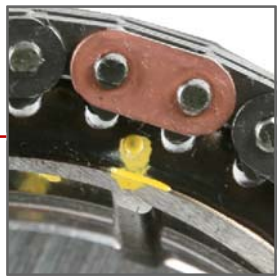
Exhaust camshaft

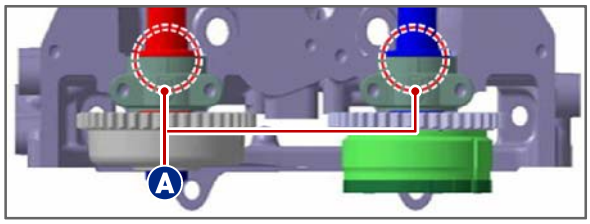
Intake camshaft

Timing marks









Align the timing marks (A) on the camshaft flange and camshaft cap when installing the intake/exhaust camshaft.

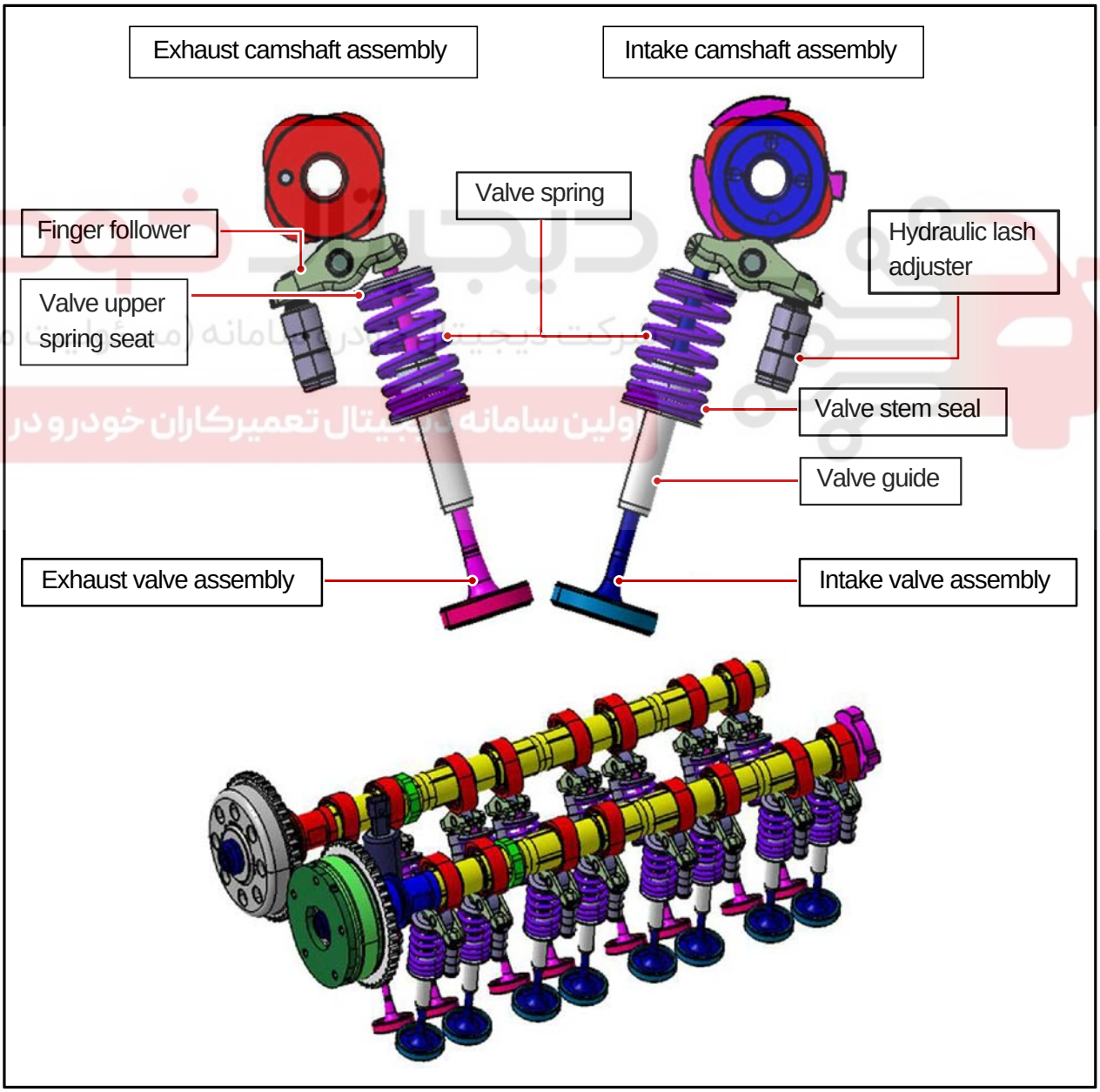
Modification basis	
Application basis	
Affected VIN	

4) Intake/Exhaust Valve Assembly (Installed on Cylinder Head)

(1) Features

- Automatic adustment of valve clearance by hydraulic pressure system (Maintenance Free)_Hydraulic lash
- Decreased valve operating noise
- Decreased friction loss by introducing the roller type finger follower
- Valave installation angle: 17°
- Decreased running amount by compact design (increased valve following movement in high speed and improved fuel economy by decreased friction loss)

(2) Layout and components



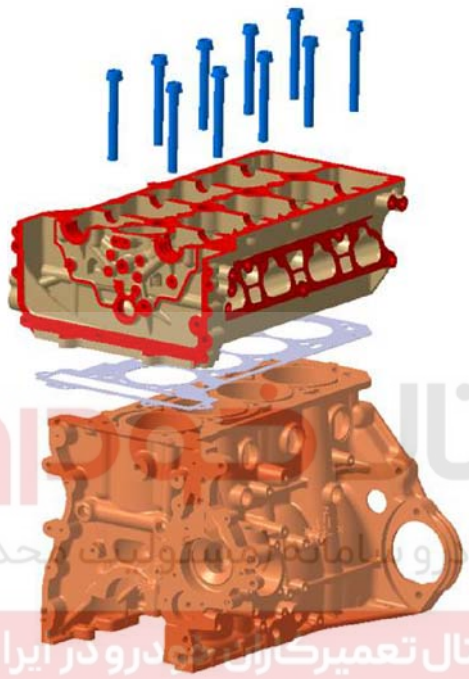
Modification basis	
Application basis	
Affected VIN	

5) Cylinder Head Gasket

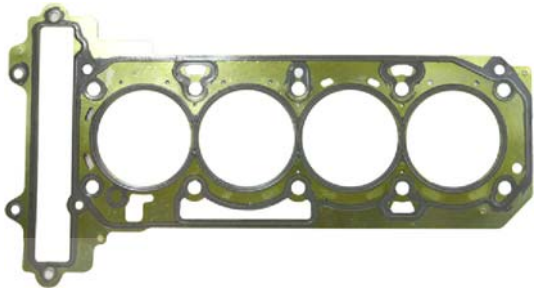
▶ Overview

The cylinder head gasket is installed between cylinder block and cylinder head to seal the combustion gas from the combustion chamber, engine oil and coolant.

▶ Location



Cylinder head gasket



- 3 Layer MLS Gasket
- Thickness : 0.7 mm (Compressed)
- PFP: Max. 85 bar

Modification basis	
Application basis	
Affected VIN	

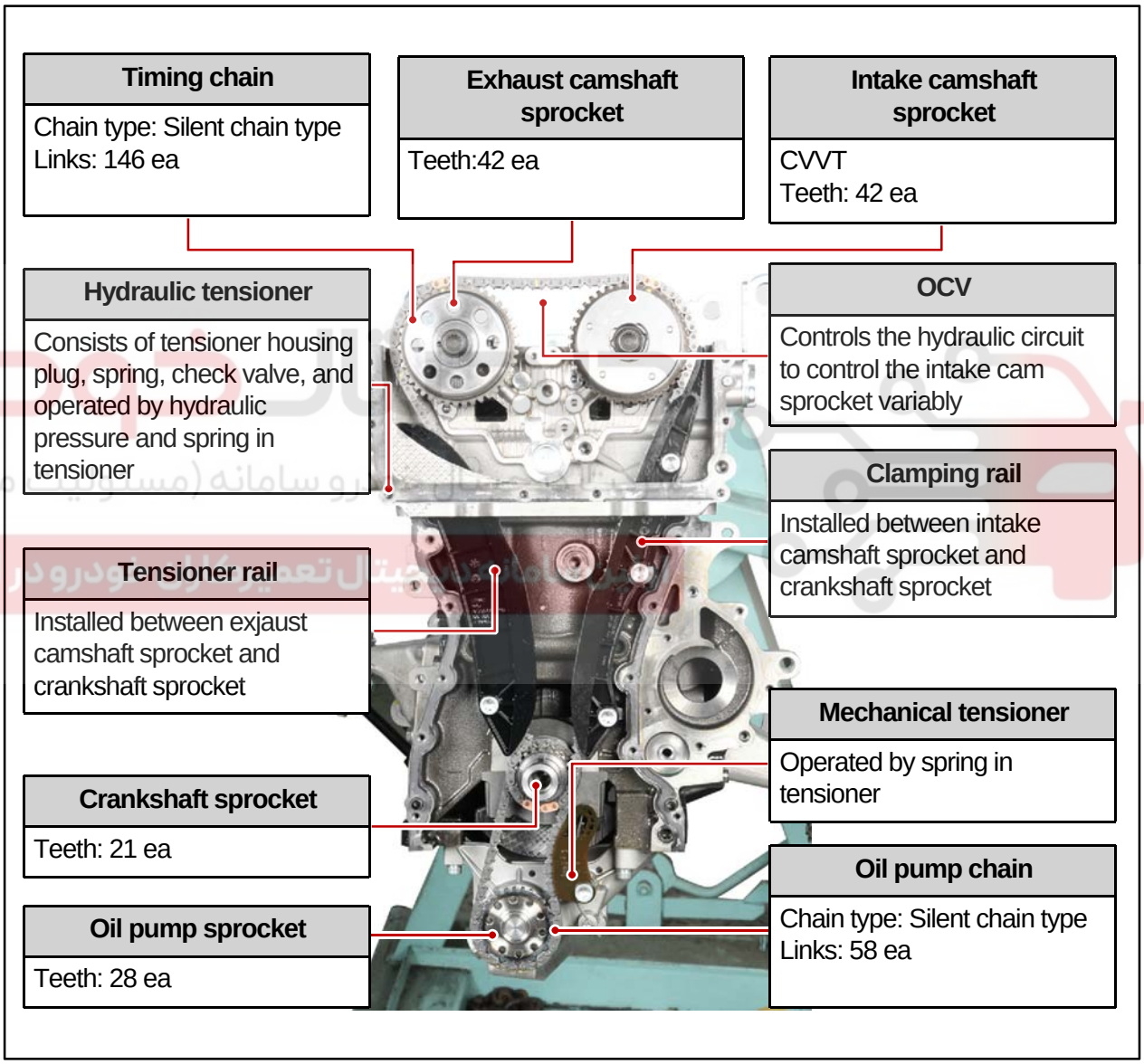
S.G.N. 1311-01

CHAIN DRIVE SYSTEM

▶ Overview

The drive chain is single chain drive system with simple design and variable performance, and it utilizes the hydraulic tensioner to reduce the wave impact generated by the chain. The silent chain provides the silence during the operation. To improve NVH, the shoulder bolt has been introduced.

▶ Layout and Components

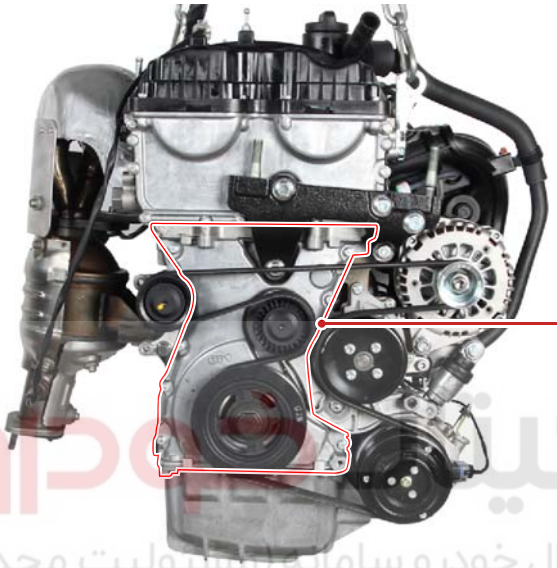


Modification basis	
Application basis	
Affected VIN	

1) Timing Gear Case Cover

▶ Features

- Major function: Protecting the chain drive system, minor function: Shielding the chain noise
- Timing gear case cover prevents the oil from leaking.
- The crankshaft front seal and the engine mounting bracket are installed on the timing gear case cover.



Timing gear case cover

CAUTION

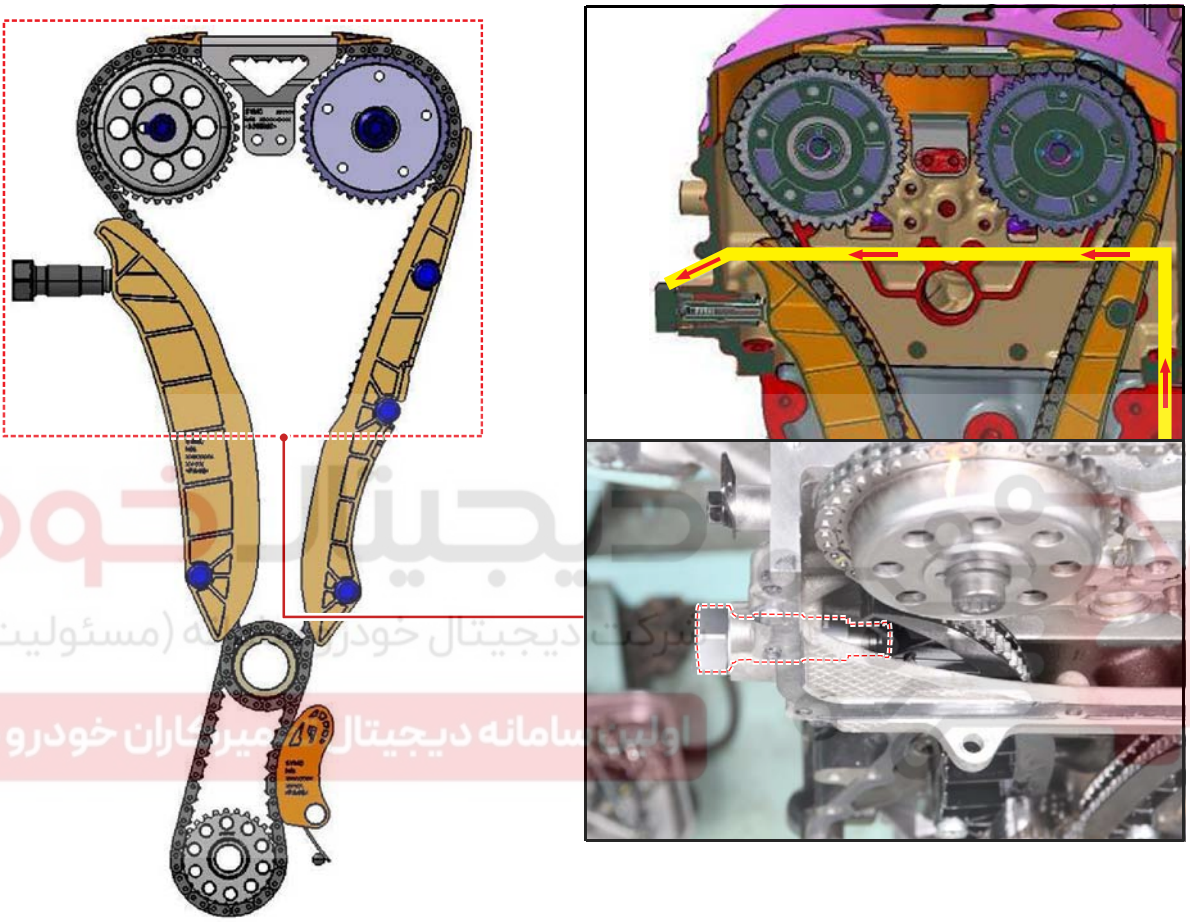
- Do not touch the inner lip of crankshaft front seal installed on the timing gear case cover.

Modification basis	
Application basis	
Affected VIN	

2) Hydraulic Auto Tensioner

In G20DF engine, the hydraulic auto tensioner is used to keep the tension for chain drive system of engine. The auto tensioner is operated by the spring in tensioner and the hydraulic pressure.

Layout and Location

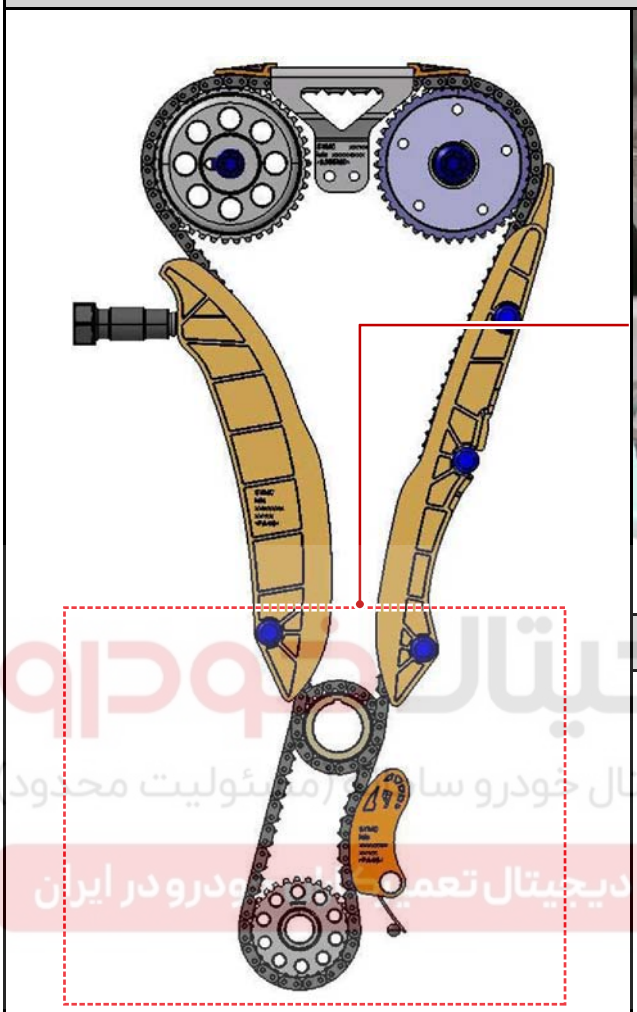


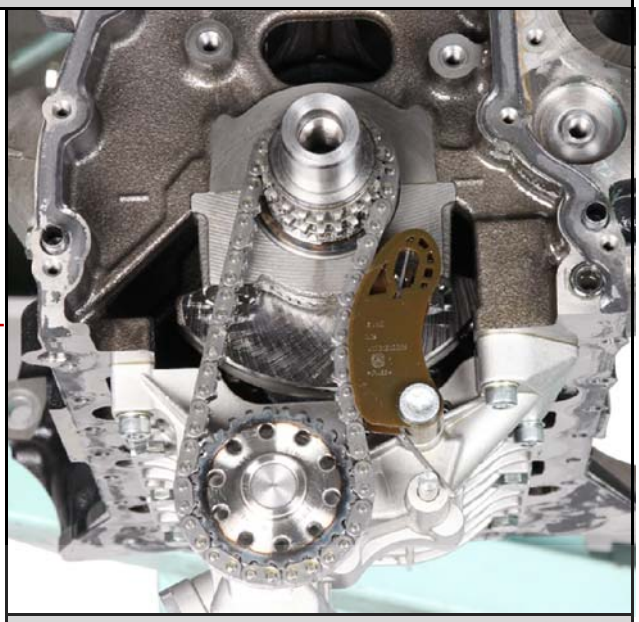
Hydraulic chain tensioner

Modification basis	
Application basis	
Affected VIN	

3) Oil Pump Chain Tensioner

Layout and Location





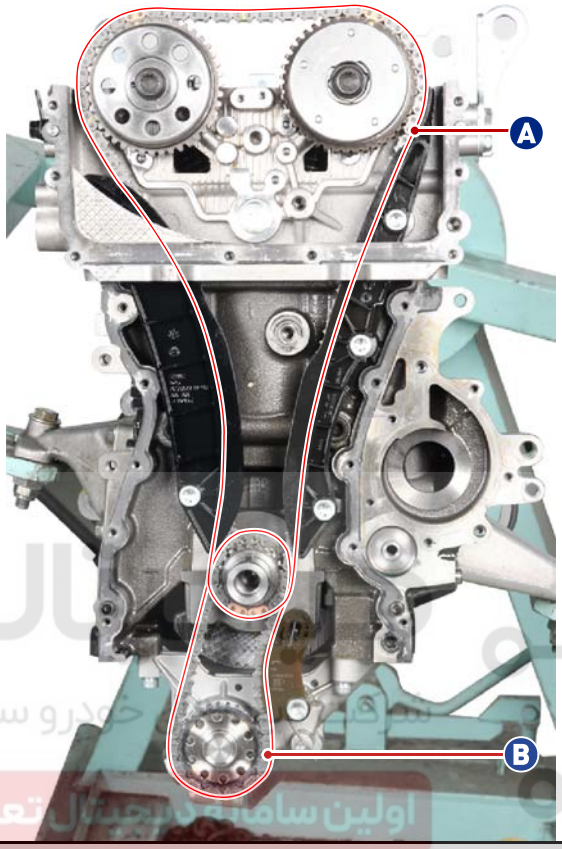
Oil pump chain tensioner

- Operated by spring in tensioner
- Tensioner type: Compensating and absorbing the impact
- Static and dynamic force: spring

Modification basis	
Application basis	
Affected VIN	

4) Timing Chain and Gear

▶ Timing chain



A. Timing chain

Teeth: 146 ea

B. Oil pump chain

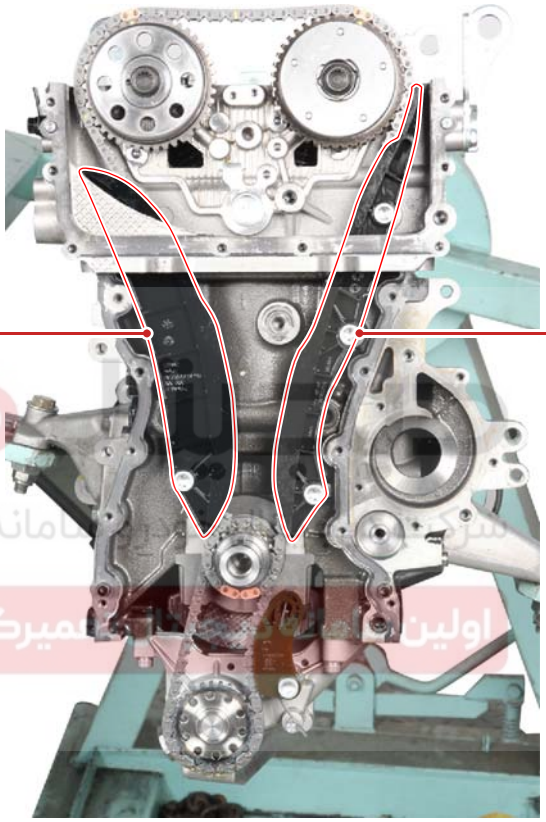
Teeth: 58 ea

- Simple layout provides the optimized timing.
- Decreased chain vibration and noise
- Single stage layout: minimized chain load

Modification basis	
Application basis	
Affected VIN	

5) Chain Rails

The chain rails are used for optimizing the movement of chain drive system. And they also prevent the chain from contacting each other when the chain is loose, and reduces the chain wear. The chain rail is normally made of PA (Polyamide nylon), and PA66 and PA46 are used for the chain rails in G20DF engine. For the tensioner rail, PA46 is used to provide high anti-wear function and high strength since the load to the rail is huge. Ther is an open area for shoulder bolt hole in the clamping rail. The chain rails are installed by shoulder bolts.

Tensioner rail		Clamping rail
		
Installed between exhaust camshaft sprocket and crankshaft sprocket		Installed between intake camshaft sprocket and crankshaft sprocket

Modification basis	
Application basis	
Affected VIN	

S.G.N. 1130-13

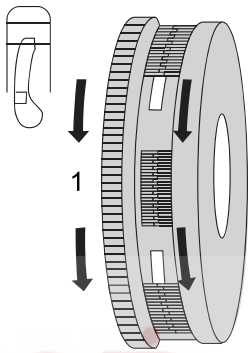
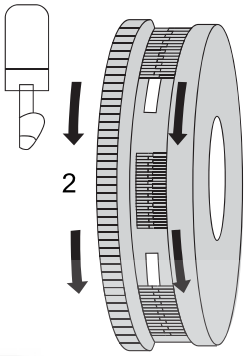
FLYWHEEL

1) Overview

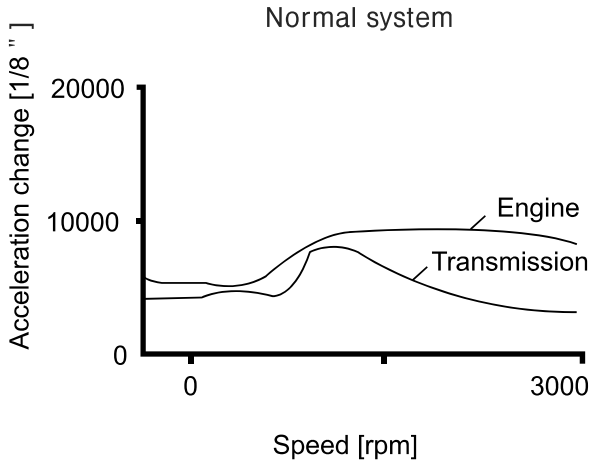
Dual mass flywheel (DMF) - Manual transaxle	Drive plate - Automatic transaxle
	
Dual mass flywheel reduces the unbalanced rotation of crankshaft in manual transaxle equipped vehicle. The flywheel is installed on the crankshaft and is engaged to the clutch disc to transfer the driving torque from the engine to the powertrain system. Additionally, DMF decreases the rattling noise in transaxle and the vehicle vibration by reducing the differences of torque and rotational speed due to the combustion in engine.	The drive plate initially drives the powertrain system by using the power from the start motor when starting the engine. The drive plate is installed on the crankshaft and is engaged to the torque converter of automatic transaxle to transfer the driving torque from the engine to the powertrain system.

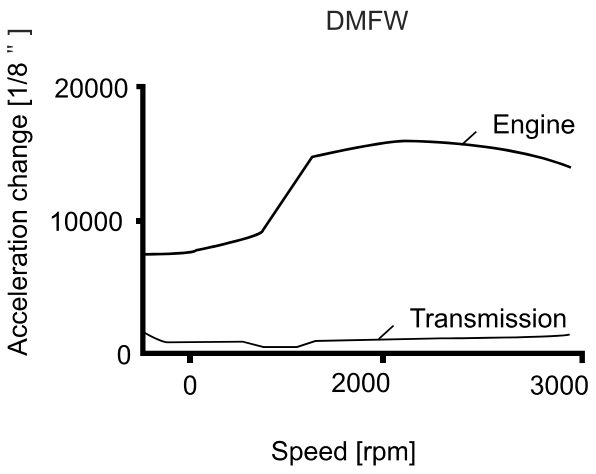
2) Operation of DMF

- Compensating the irregular operation of engine: The secondary flywheel operates almost evenly so does not cause gear noises
- The mass of the primary flywheel is less than conventional flywheel so the engine irregularity increases more (less pulsation absorbing effect).
- Transaxle protection function: Reduces the torsional vibration to powertrain (transaxle) by reducing the irregularity of engine.

Compression stroke	Combustion stroke
	
Small changes from engine (k): Damper increases the torque changes to clutch	**Large changes from engine (j):** Damper decreases the torque changes to transaxle by absorbing the impact

Torque change curve of engine and drive shaft





Modification basis	
Application basis	
Affected VIN	

3) Features of DMF

- Reduced vibration noise from the powertrain by blocking the torsional vibrations
- Enhanced vehicle silence and riding comforts: reduced engine torque fluctuation
- Reduced shifting shocks
- Smooth acceleration and deceleration

4) Advantages of DMF

- Improved torque response by using 2-stage type spring: Strengthens the torque response in all ranges (low, medium, and high speed) by applying respective spring constant at each range.
- Stable revolution of the primary and secondary wheel by using planetary gear: Works as auxiliary damper against spring changes
- Less heat generation due to no direct friction against spring surface: Plastic material is covered on the spring outer surface
- Increased durability by using plastic bushing (extends the lifetime of grease)

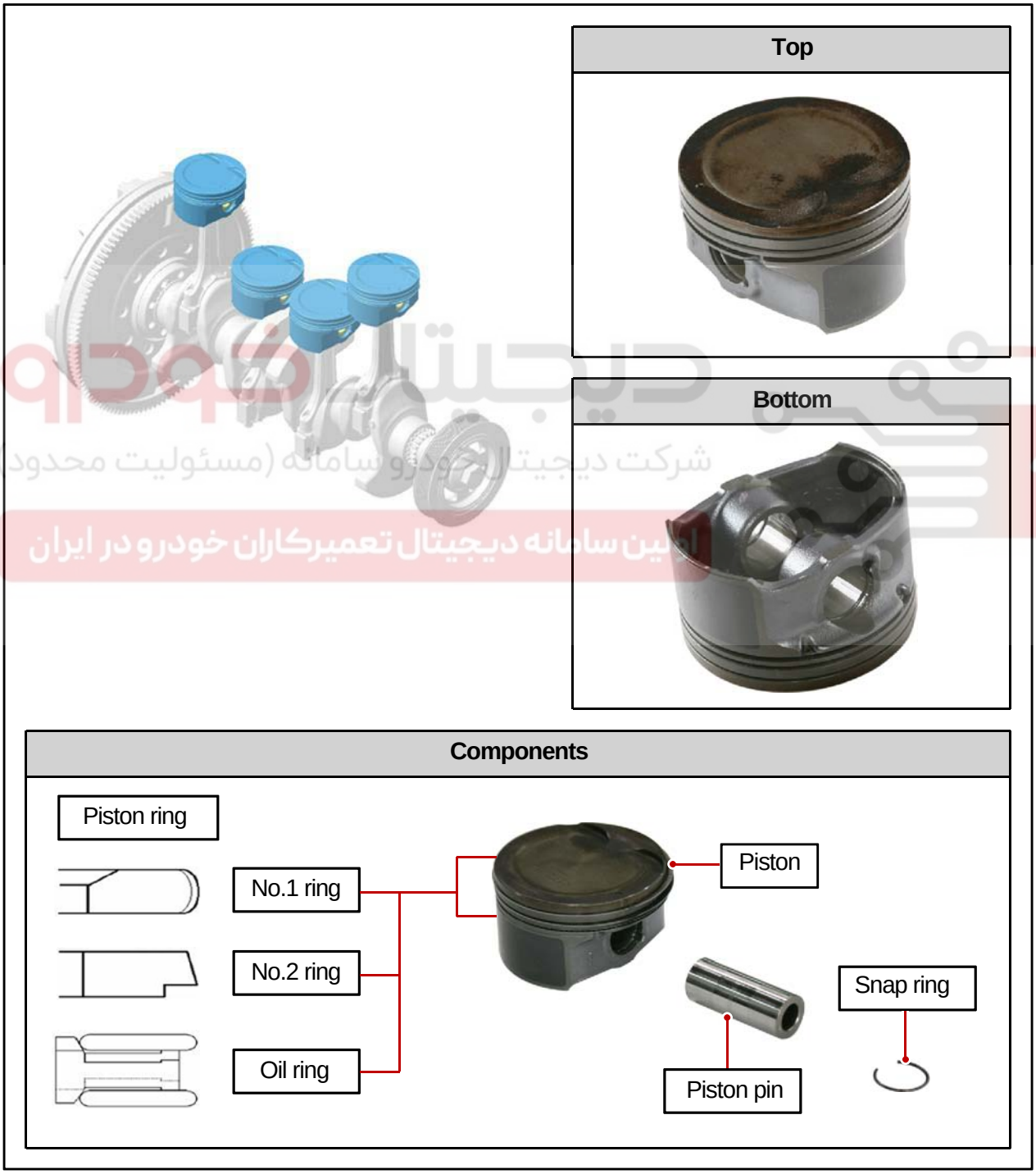
S.G.N. 1130-33

PISTON ASSEMBLY

▶ Overview

Piston assembly contains piston, #1 ring, #2 ring, oil ring, piston pin and snap ring. The expansion energy from engine is transferred to the crankshaft through connecting rod to convert the linear movement to rotating energy.

▶ Layout and Components



Modification basis	
Application basis	
Affected VIN	

▶ Functions

Piston transfers the combustion energy from engine to connecting rod.

A. Piston ring

- #1 ring (Top ring) : Prevents the high pressurized combustion gas from leaking into crank chamber, and prevents the engine oil getting into combustion chamber.
- #2 ring: Scrapes the engine oil on the cylinder bore, and prevents the leaked combustion gas from #1 ring from leaking into the crank chamber.
- Oil ring: Scrapes the engine oil on the cylinder bore.

B. Piston pin

- Connects the piston the connecting rod, and transfers the linear movement of piston to connecting rod to convert it to rotating energy.

C. Snap ring

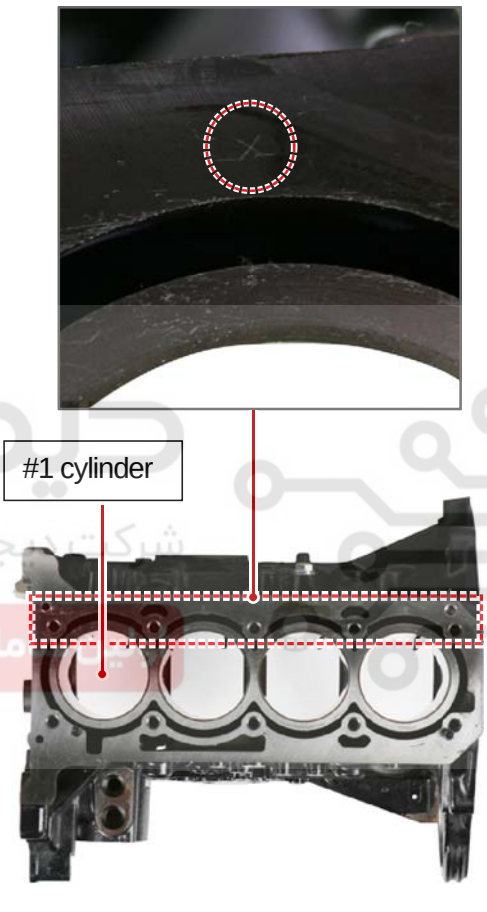
- Locks the piston pin.

▶ Piston ring

Piston ring end gap (mm)	Piston ring side clearance (mm)
#1 end gap: 0.170 ~ 0.320 #2 end gap: 0.300 ~ 0.450	#1 groove: 0.040 ~ 0.080 #2 groove: 0.040 ~ 0.080

▶ Assembling the piston

- Install the piston rings with the "X" mark on the ring facing upwards.
- Position the end gap of #1 ring at 180° away from the end gap of #2 ring.
- Position the end gap of oil ring at 180° away from the end gap of coil spring, and position the end gap of oil ring at 90° away from the end gap of #2 ring.

Assembly mark	
Top surface of piston	Top surface of cylinder block
	

Modification basis	
Application basis	
Affected VIN	

S.G.N. 1130-25

CONNECTING ROD

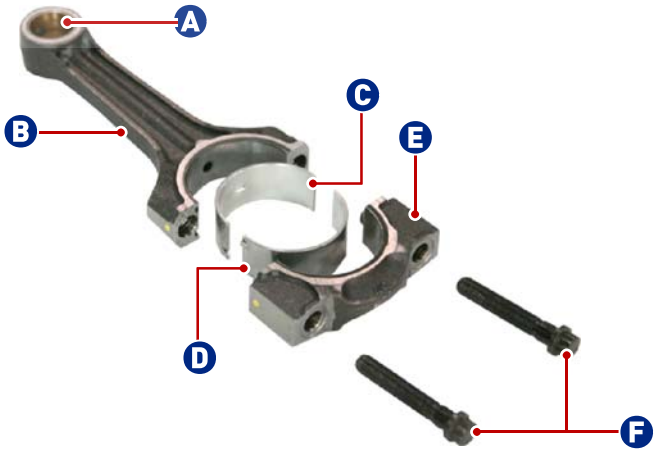
▶ Overview

Connecting rod converts the reciprocating movement of piston to the rotating movement of crankshaft. The big end is connected to connecting rod bearing and the crank pin journal, and the small end is connected to the piston pin.

▶ Components

Connecting rod

Components



A. Piston pin bush
B. Connecting rod
C. Connecting rod upper bearing
D. Connecting rod lower bearing
E. Connecting rod cap
F. Connecting rod cap bolt

Modification basis	
Application basis	
Affected VIN	

▶ **Selection of connecting rod bearing**

Select the bearing shell combination according to the table below:

Conrod_UPR Grade	Conrod_LWR Grade	Clearance
Red	Blue	0.005 ~ 0.050
Yellow	Yellow	0.005 ~ 0.050
Blue	Red	0.005 ~ 0.050

S.G.N. 1130-01

CRANKSHAFT

▶ Overview

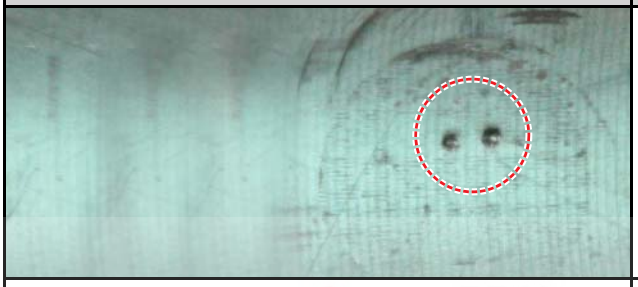
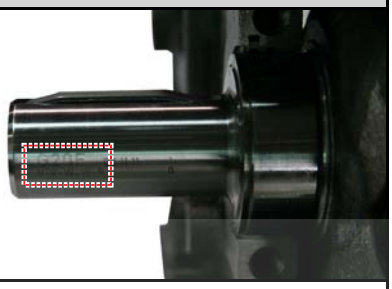
Crankshaft is installed on the cylinder block. The crankshaft converts the reciprocative movement of piston to the rotatinal movement.

▶ Layout and Components

Crankshaft


Modification basis	
Application basis	
Affected VIN	

▶ Selection of crankshaft main bearing

Bottom of cylinder block	Crankshaft sprocket installing surface
	

Engine name	G	2	0	D	F
Main journal bearing	R	R	W	W	R
	#1	#2	#3	#4	#5

Pin punch mark	Color	Diameter of crankshaft main journal in cylinder block (mm)
*	Blue	62.500 ~ 62.506
**	Yellow	62.506 ~ 62.513
***	Red	62.513 ~ 62.519

Mark	Color	Diameter of crankshaft main journal (mm)
B	Blue	57.960 ~ 57.965
Y	Yellow	57.955 ~ 57.960
R	Red	57.950 ~ 57.955
W	White	57.945 ~ 57.950
V	Violet	57.940 ~ 57.945

Crankshaft lower bearing	Crankshaft lower bearing
	

Modification basis	
Application basis	
Affected VIN	

S.G.N. 1128-01

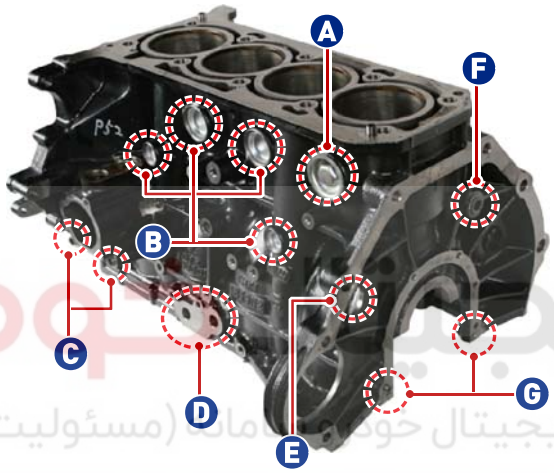
CYLINDER BLOCK

▶ Overview

The cylinder block is made of special cast iron, and contains the major components such as cylinder head, crankshaft and piston assembly. There are oil and coolant galleries to lubricate and cool the engine.

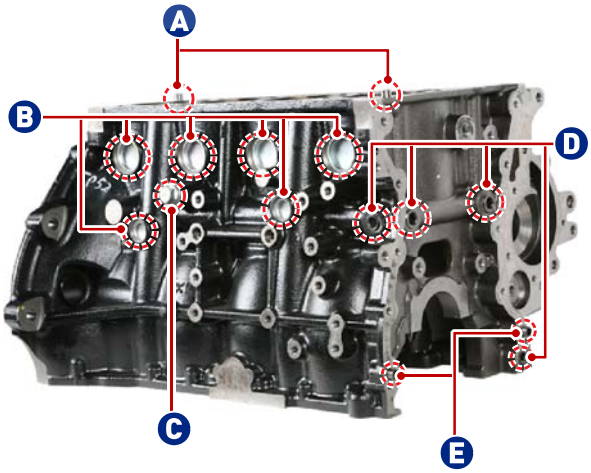
▶ Components

Front view



A. Plug screw (water jacket plug) (70Nm)
B. Expansion plug (intake: 4)
C. Spring pin (A/C mounting)
D. Oil gallery (oil filter assembly)
E. Ctankshaft position sensor mounting
F. Plug screw (oil gallery plug)
G. Spring pin (RR seal mounting)

Rear view

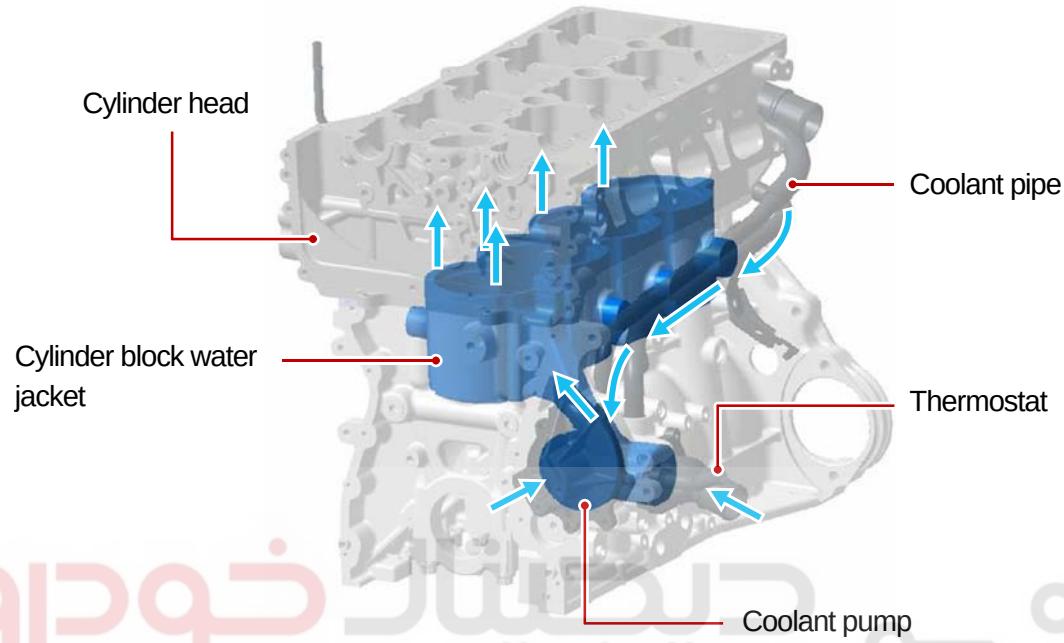


A. Spring pin (cylinder head mounting)
B. Expansion plug (exhaust: 6)
C. Screw plug (water jacket plug) (30Nm)
D. Screw plug (oil gallery plug)
E. Spring pin (T.G.C.C)

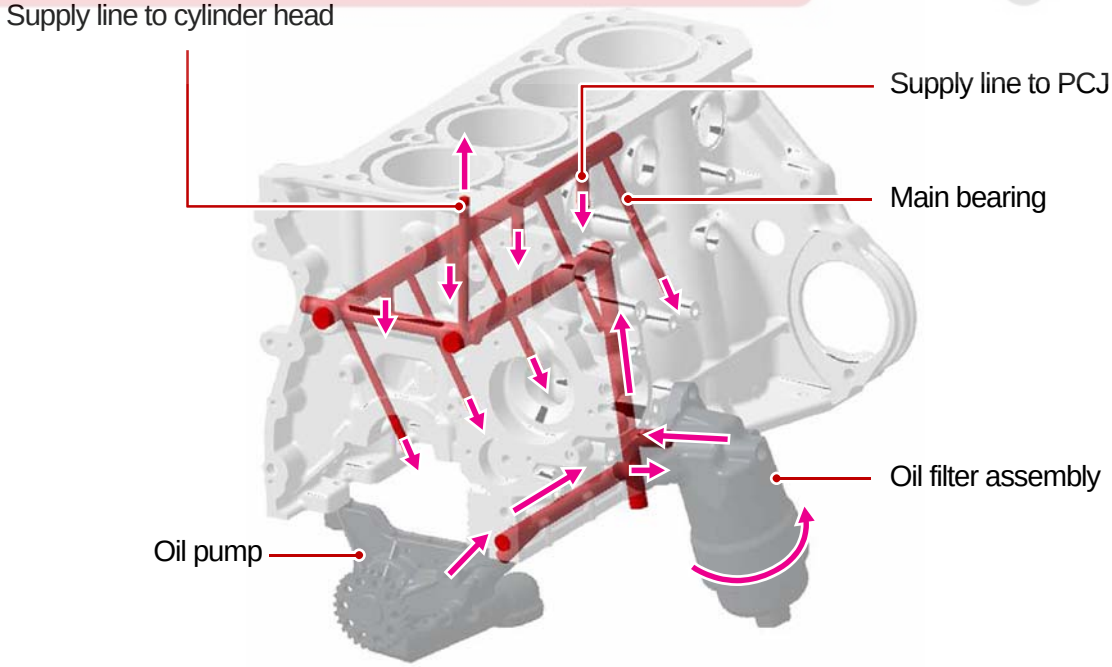
Modification basis	
Application basis	
Affected VIN	

▶ **Coolant and oil flows**

Coolant



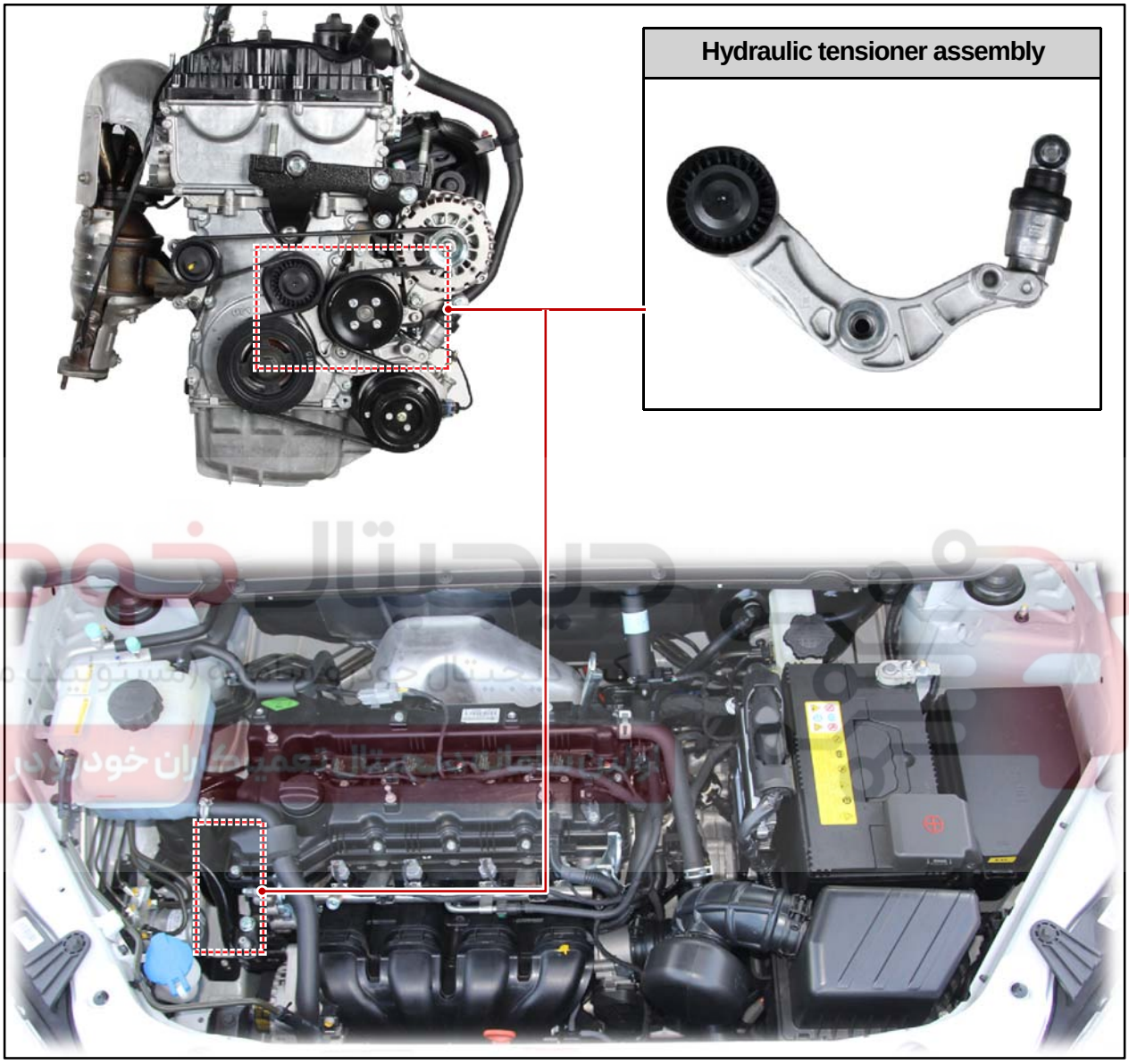
Engine oil



Modification basis	
Application basis	
Affected VIN	

REMOVAL AND INSTALLATION

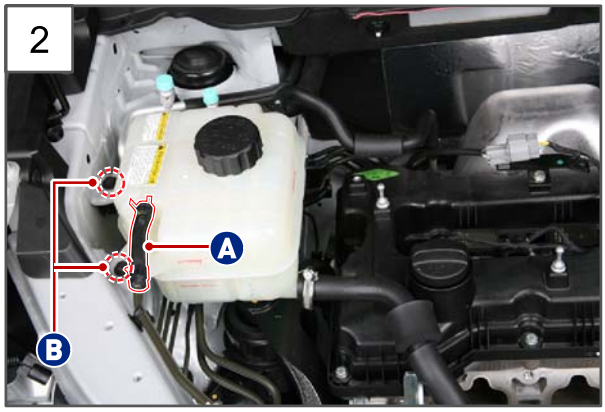
S.G.N. 1337-04 BELT TENSIONER ASSEMBLY



1. Support the bottom of the oil pan with a floor jack.

Modification basis	
Application basis	
Affected VIN	

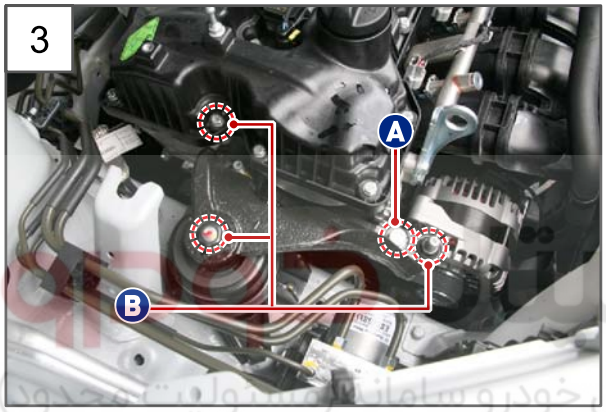
2



2. Remove the deaeration hose (A) and unscrew two bolts (B, 10 mm).

CAUTION
Do not allow the coolant to make contact with the body paintwork and engine.

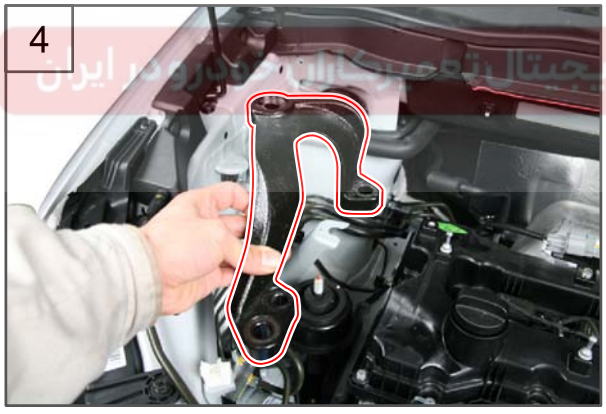
3



3. Unscrew the bolt (A, 17 mm) and three nuts (B, 17 mm) from the RH mounting bracket.

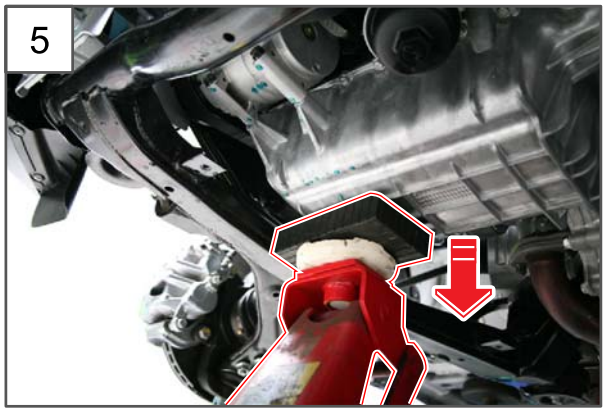
Tightening torque 68.6 ~ 88.2Nm

4



4. Remove the RH mounting bracket.

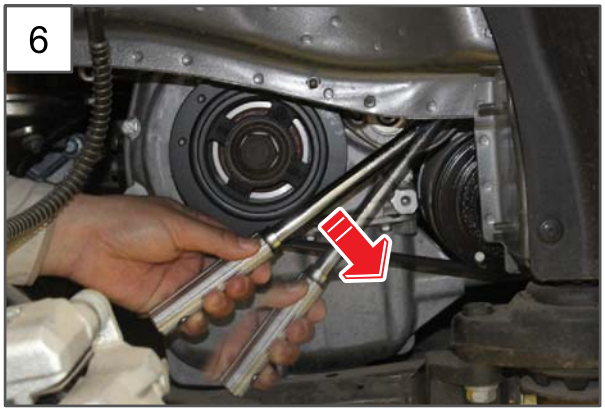
5



5. Slowly lower the floor jack as it goes without any overload to emgine mountings.

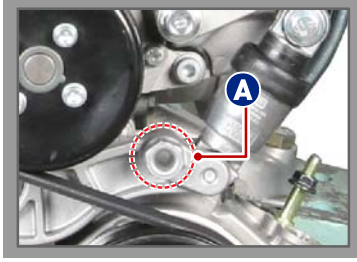
Modification basis	
Application basis	
Affected VIN	

6



6. Release the tension by turning the hydraulic tensioner adjust bolt (A) counterclockwise.

NOTE

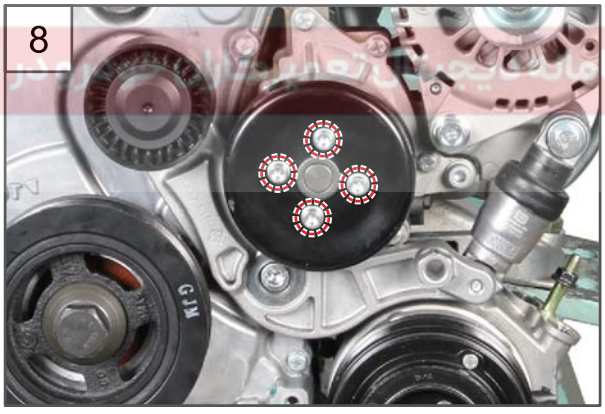


Carry out the work using a hinge handle connecting rod, if necessary.

7

7. Remove the fan belt.

8



8. Unscrew four bolts (5 mm) from the water pump pulley.

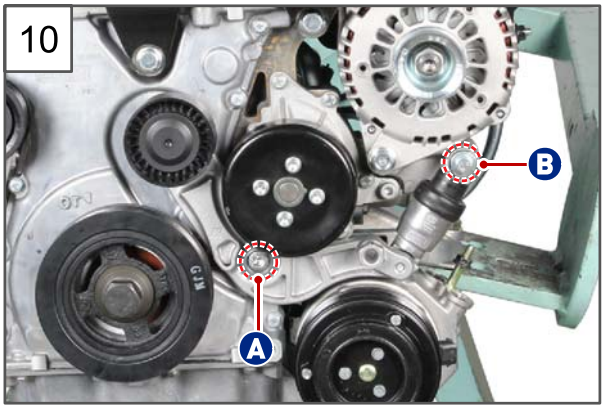
Tightening torque 10.0 ± 1.0Nm

9

9. Remove the water pump pulley.

Modification basis	
Application basis	
Affected VIN	

10



10.Unscrew the bolt (A, 8 mm) from the hydraulic tensioner pivot and the upper bolt (B, 13 mm) from the hydraulic tensioner.

Tightening torque (A) 65.0 ± 5.0Nm

Tightening torque (B) 32.0 ± 3.2Nm

CAUTION

Keep the hydraulic tensioner with 45° or higher angle.

11

11.Remove the hydraulic tensioner assembly.

12

12.Install the belt tensioner assembly in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

Caution when keeping the hydraulic tensioner

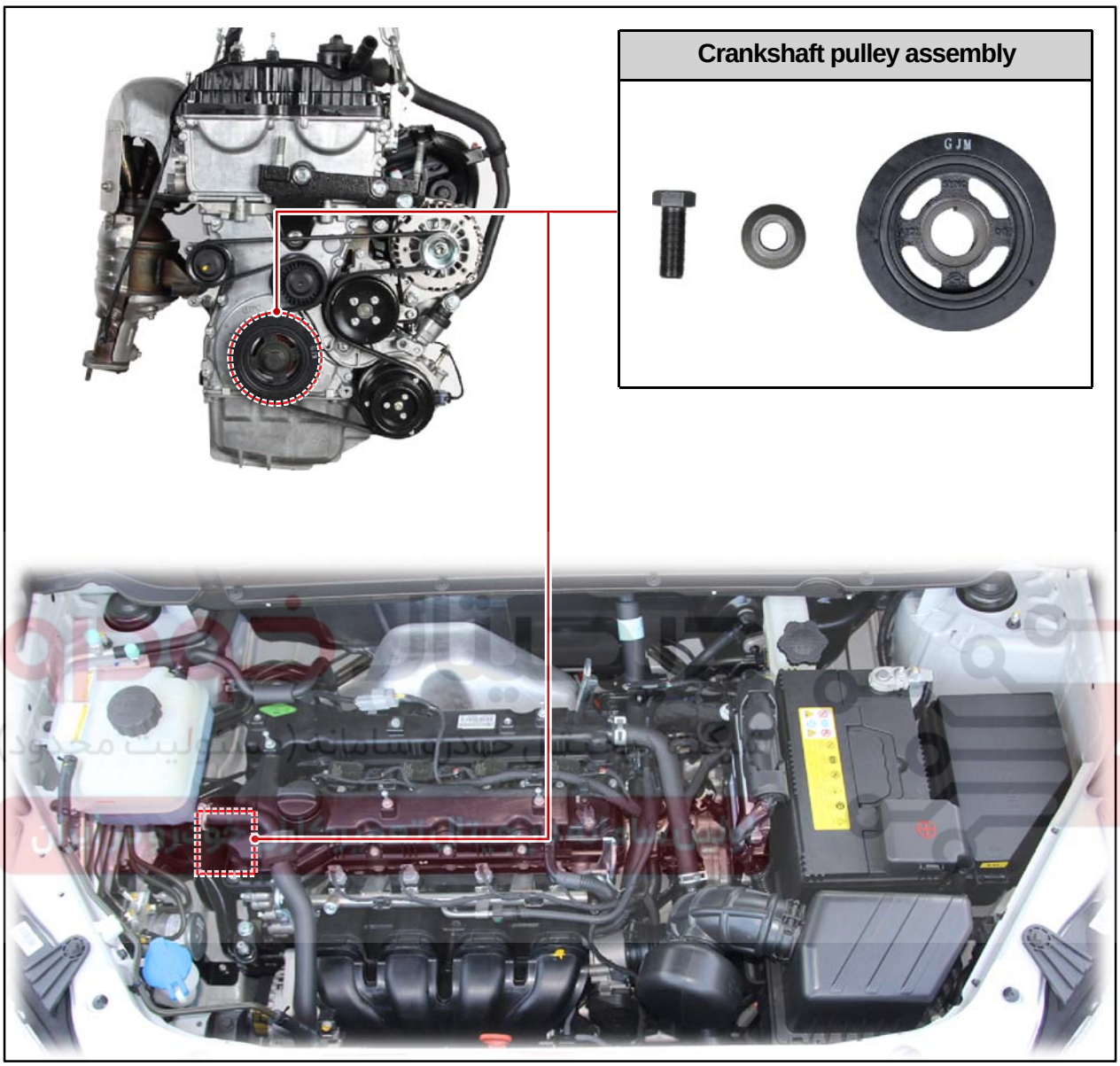
Keep the hydraulic tensioner with 45° or higher angle.

Components

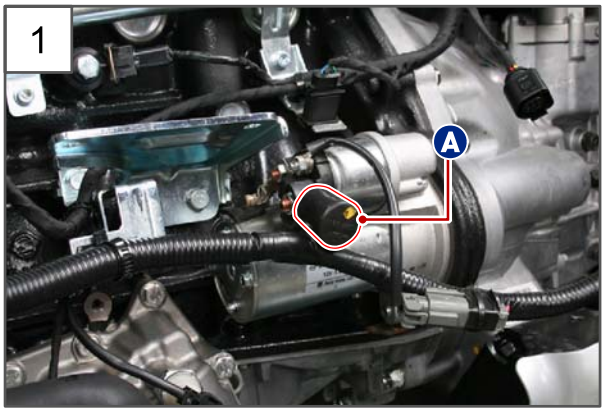
No	Name
1	Tensioner pulley cap
2	Tensioner pulley bolt
3	Tensioner pulley
4	Lever arm
5	Hydraulic tensioner bolt
6	Hydraulic tensioner

Modification basis	
Application basis	
Affected VIN	

S.G.N.
1130-12 CRANKSHAFT PULLEY



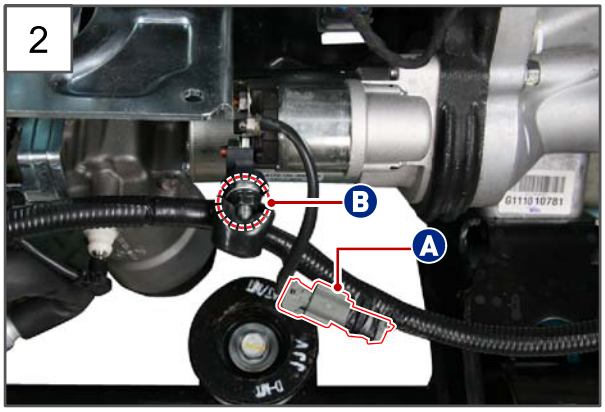
1



1. Take off the B+ terminal cover (A) on the start motor.

Modification basis	
Application basis	
Affected VIN	

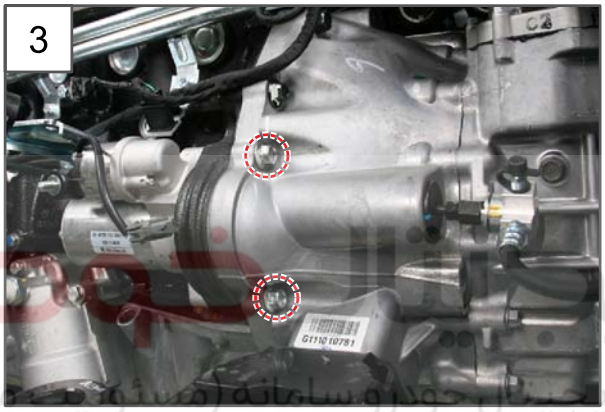
2



2. Separate the ST connector (A) and B+ terminal (B) from the start motor.

Tightening torque (B) 15 ± 1.5Nm

3



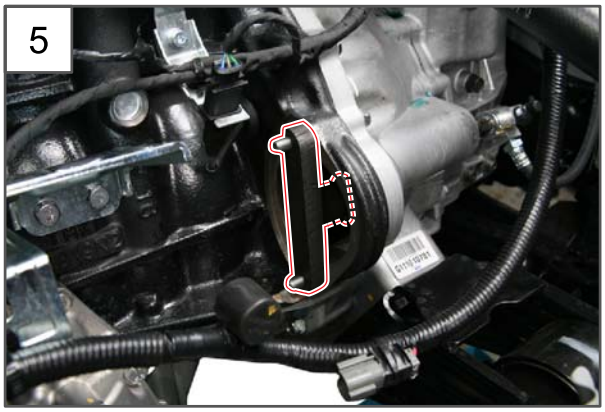
3. Unscrew two bolts (14 mm) from the start motor.

Tightening torque 48.0 ~ 58.8Nm

4

4. Remove the start motor.

5



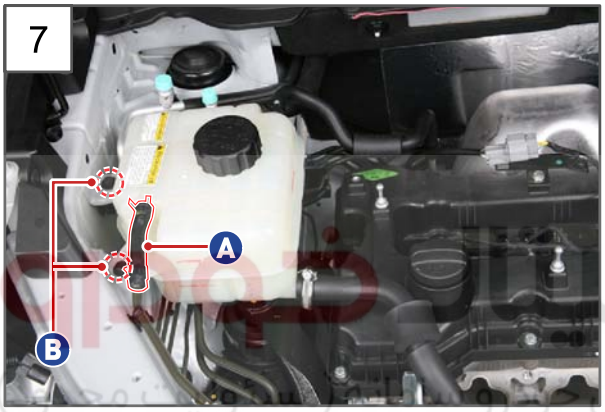
5. Lock the flywheel with the special service tool.

Modification basis	
Application basis	
Affected VIN	

6

6. Support the bottom of the oil pan with a floor jack.

7

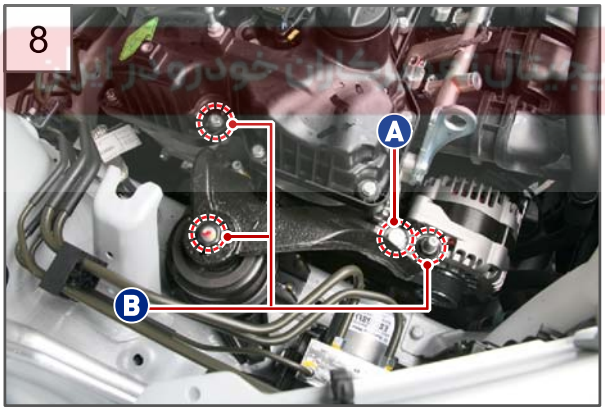


7. Remove the deaeration hose (A) and unscrew two bolts (B, 10 mm).

CAUTION

Do not allow the coolant to make contact with the body paintwork and engine.

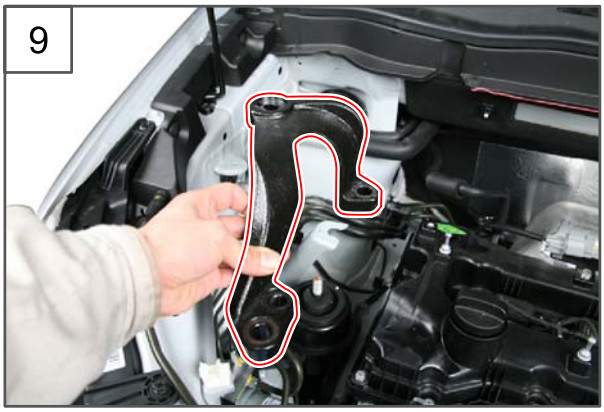
8



8. Unscrew the bolt (A, 17 mm) and three nuts (B, 17 mm) from the LH mounting bracket.

Tightening torque 68.6 ~ 88.2Nm

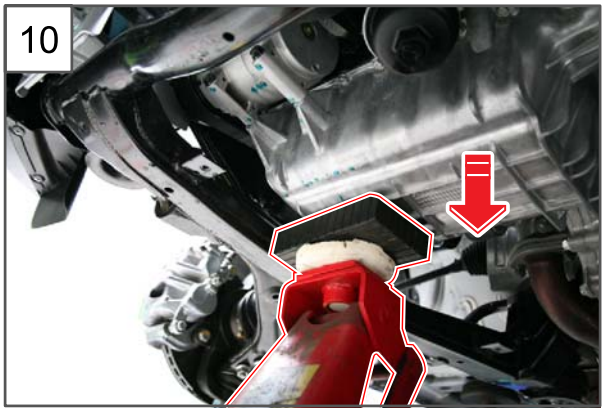
9



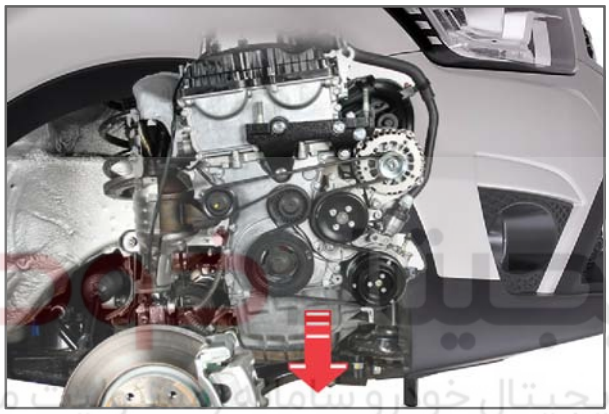
9. Remove the LH mounting bracket.

Modification basis	
Application basis	
Affected VIN	

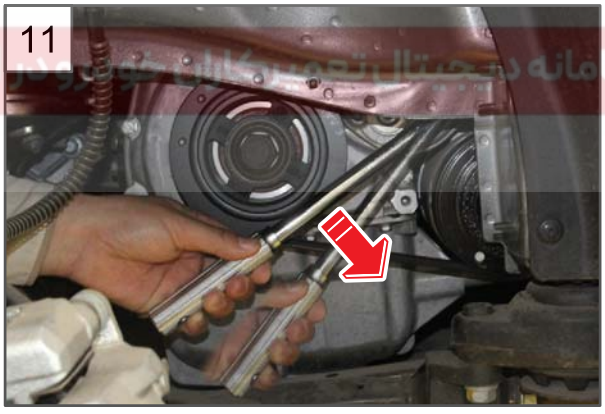
10



10.Slowly lower the floor jack as it goes without any overload to emgine mountings.

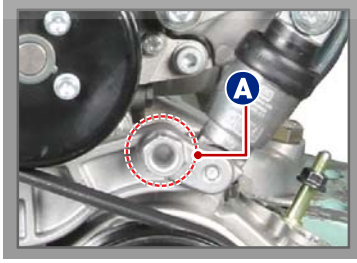


11



11.Release the tension by turning the hydraulic tensioner adjust bolt (A) counterclockwise.

NOTE



Carry out the work using a hinge handle connecting rod, if necessary.

12

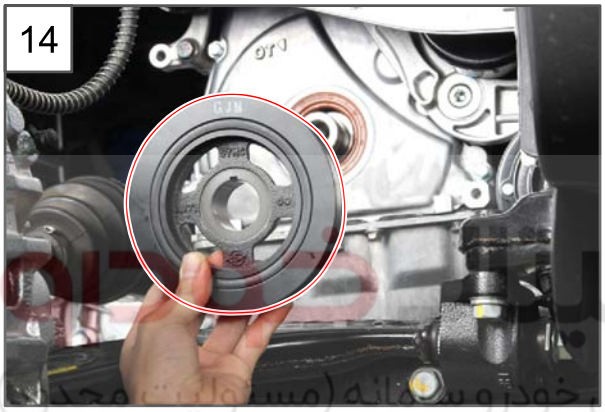
12.Remove the fan belt.

Modification basis	
Application basis	
Affected VIN	

13

13.Unscrew the crankshaft pulley bolt with a special service tool.

14



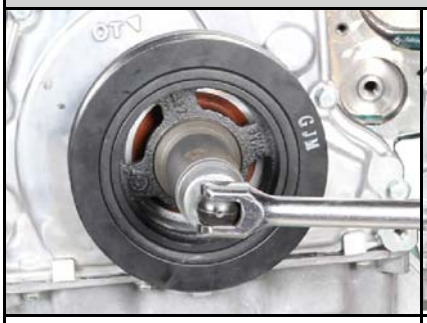
14.Remove the crankshaft pulley.

15

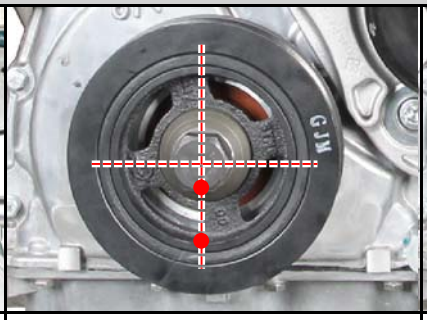
15.Install the crankshaft pulley in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

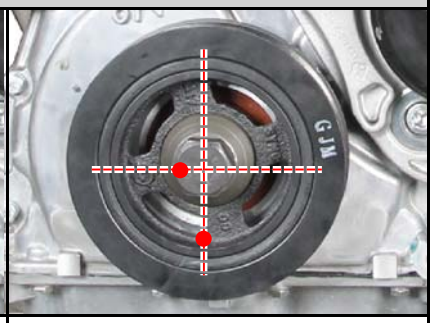
Tightening sequence of crankshaft center bolt



Torque wrench
200 + 20 Nm



Paint marking



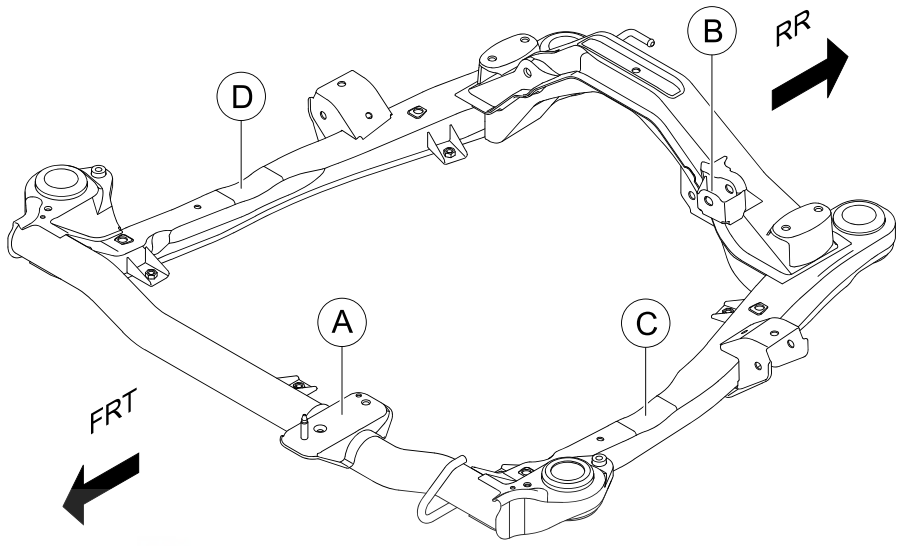
Angle tightening
90°

Removal of cranksfaht sealing (A)

Carefully remove the sealing with a screwdriver and clean cloth. Pay attention not to damage the seating groove and crankshaft.

Modification basis	
Application basis	
Affected VIN	

S.G.N.
1990-01 ENGINE MOUNTING INSULATOR

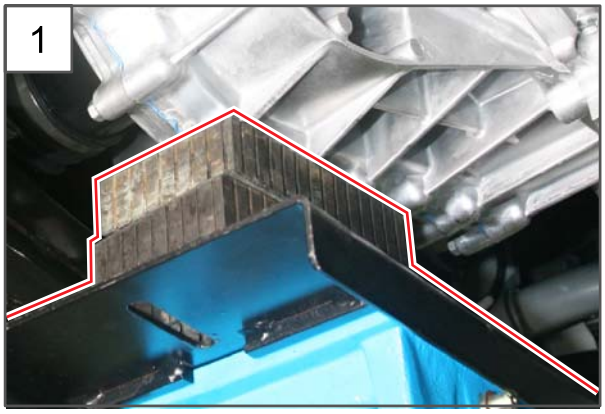


A. Front Engine Mounting (FRT-MTG)	B. Rear Engine Mounting (RR-MTG)
	

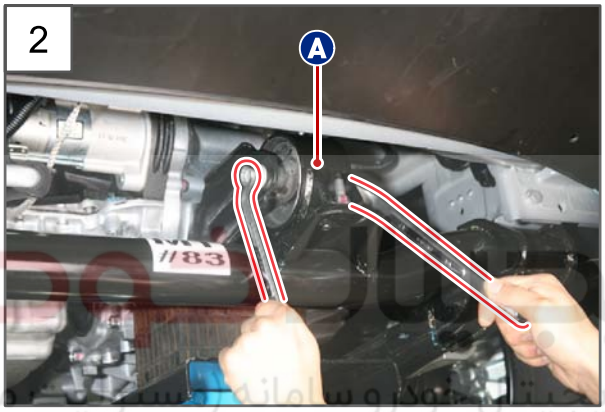
C. Left Engine Mounting (LH-MTG)	D. Right Engine Mounting (RH-MTG)
	

Modification basis	
Application basis	
Affected VIN	

▶ Front Engine Mounting Insulator (FRT-MTG)

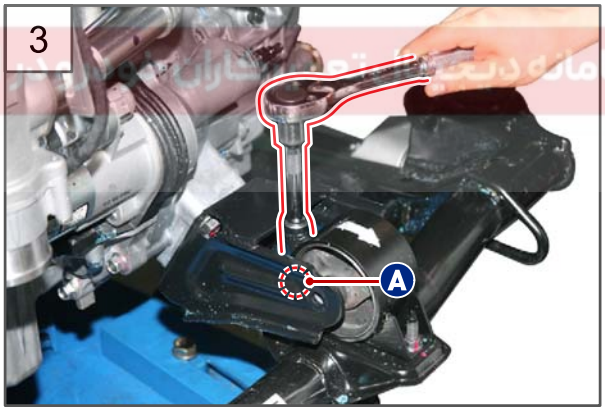


1. Support the bottom of transaxle with a transmission jack.

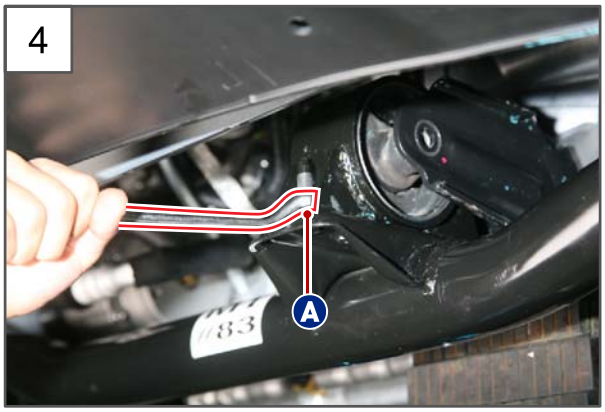


2. Remove the through bolt (A) from the fron engine mounting.

Tightening torque 68.6 ~ 88.2Nm



3. Unscrew the bolt (A) from the engine mounting insulator.



4. Unscrew the nut (A) and remove the front engine mounting.

Tightening torque 29.4 ~ 49.0Nm

Modification basis	
Application basis	
Affected VIN	

5

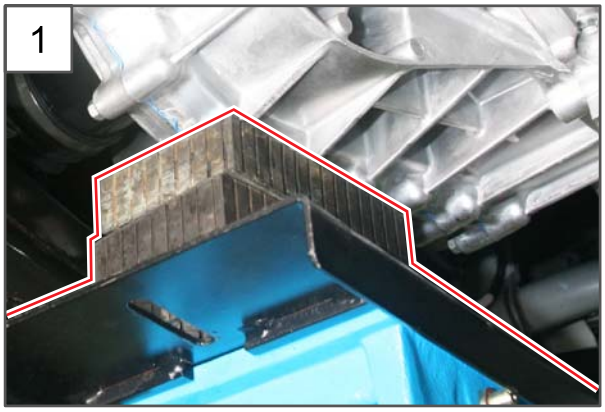
5. Remove the engine mounting insulator.

6

6. Install the engine mounting insulator in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

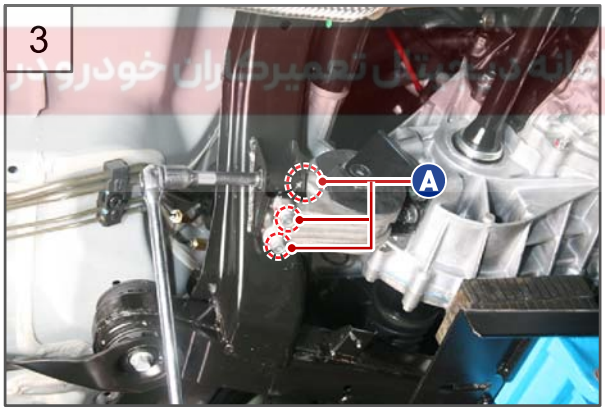
▶ Rear Engine Mounting Insulator (RR-MTG)



1. Support the bottom of transaxle with a transmission jack.

2. Remove the through bolt from th rear engine mounting insulator.

Tightening torque 686. ~ 88.2Nm

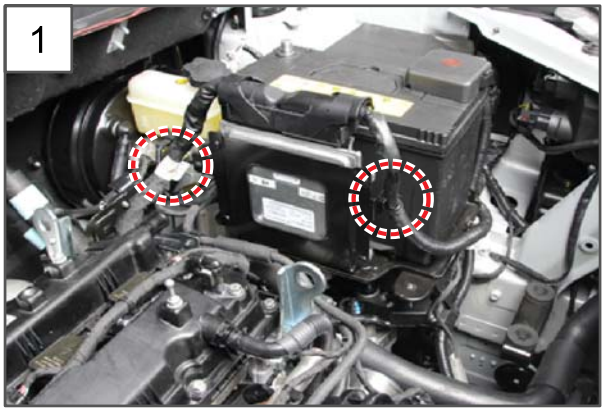


3. Unscrew the bolt (A) and remove the rear engine mounting insulator.

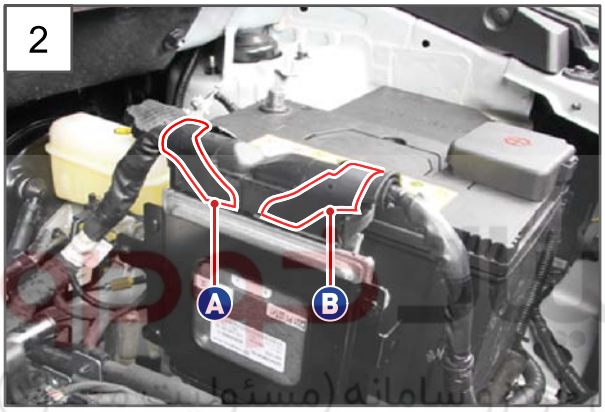
Tightening torque 68.6 ~ 49.0Nm

4. Install the rear engine mounting insulator in the reverse order of removal.

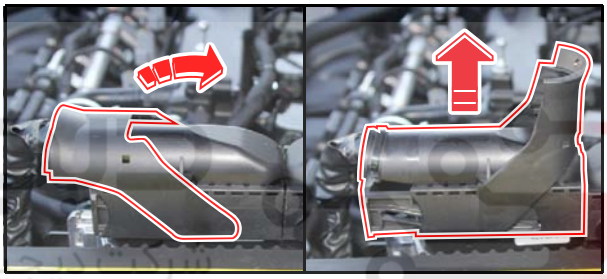
▶ Left Engine Mounting (LH-MTG)

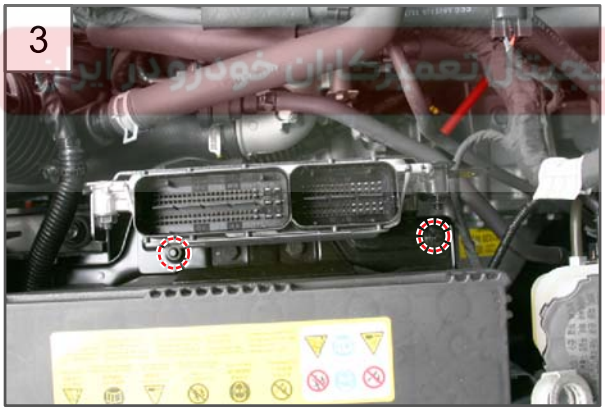


1. Release two clamps from the engine ECU wiring harness.



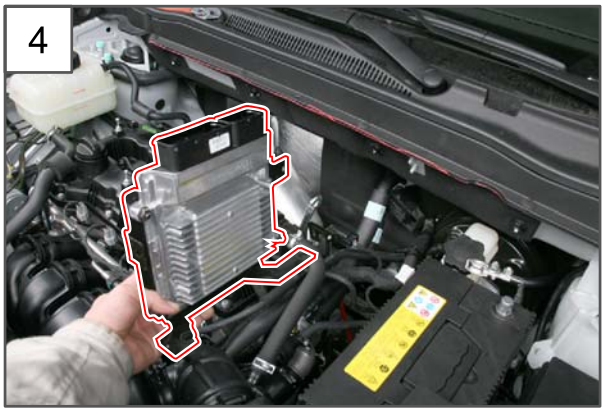
2. Disconnect the engine ECU connectors (A, B).





3. Unscrew two nuts (12 mm) from the engine ECU bracket.

Tightening torque 9.0 ~ 10.0Nm



4. Remove the engine ECU assembly.

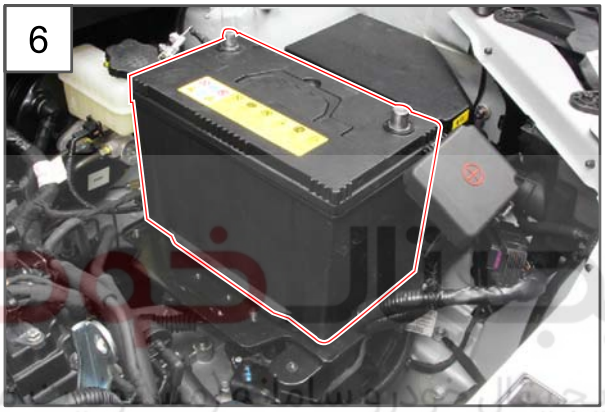
Modification basis	
Application basis	
Affected VIN	

5

5. Unscrew two bolts (12 mm) and remove the battery holder.

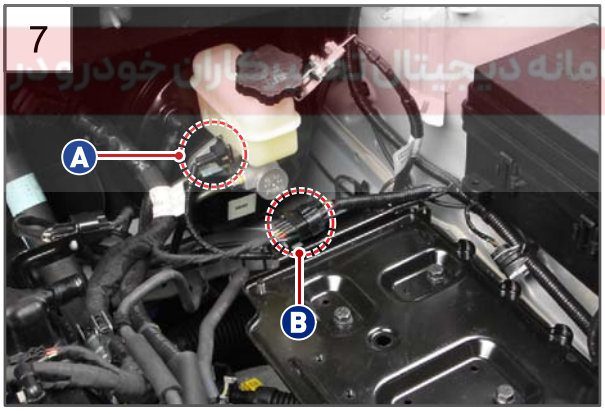
Tightening torque 25.0 ± 2.5Nm

6



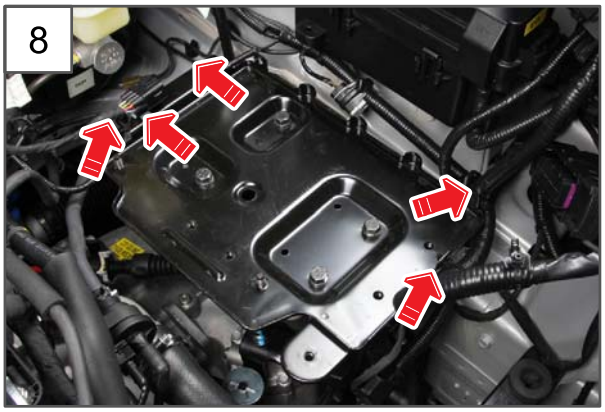
6. Remove the battery.

7



7. Disconnect the connectors (A, B).

8



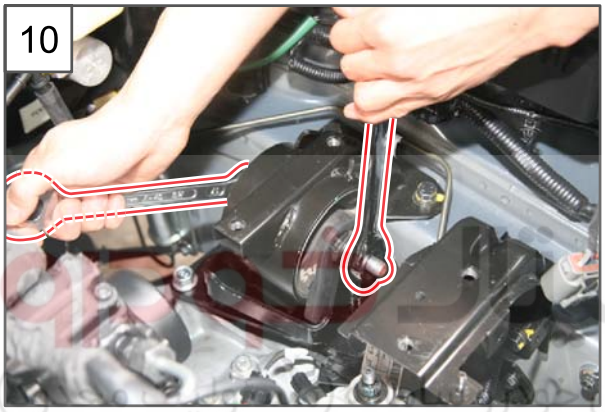
8. Release five clamps (arrows) from the wiring harness to the battery lower bracket.

Modification basis	
Application basis	
Affected VIN	

9

9. Support the bottom of transaxle with a transmission jack.

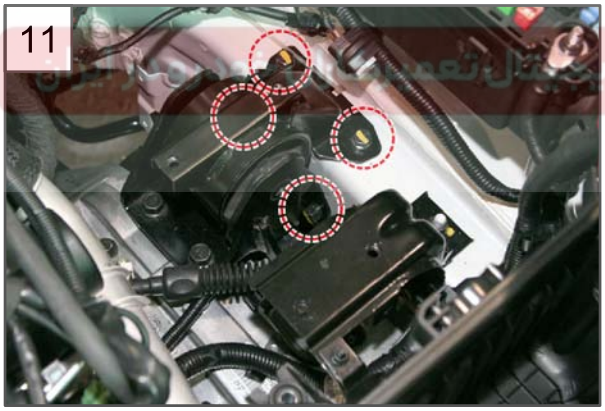
10



10. Remove the through bolt from the engine mounting bracket.

Tightening torque 88.2 ~ 107.8Nm

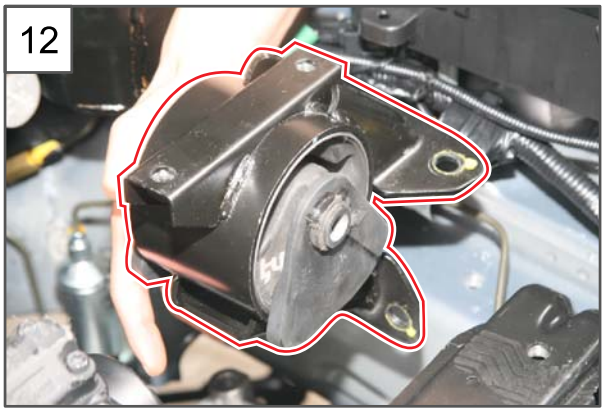
11



11. Unscrew four bolts (14 mm) and remove the engine mounting bracket.

Tightening torque 29.4 ~ 49.0Nm

12

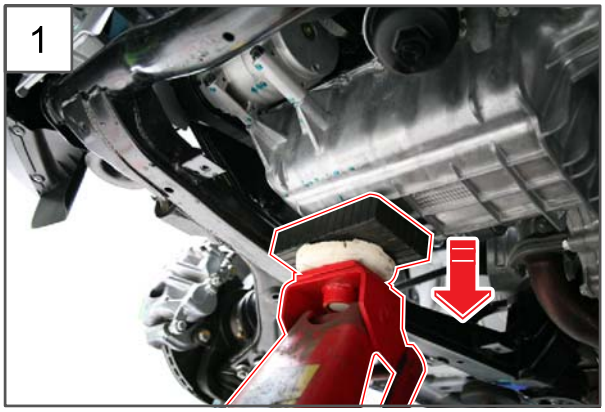


12. Install the left engine mounting in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

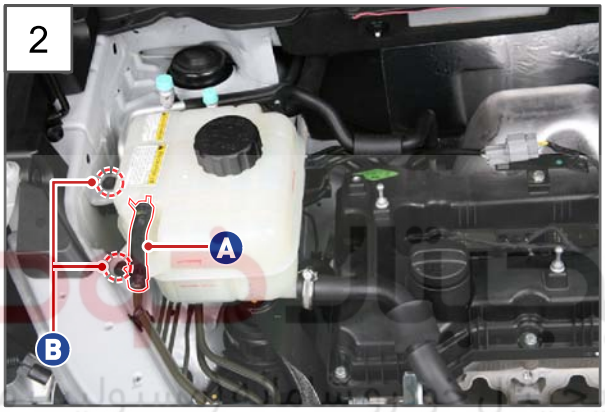
▶ Right Engine Mounting (RH-MTG)

1



1. Support the bottom of the oil pan with a floor jack.

2

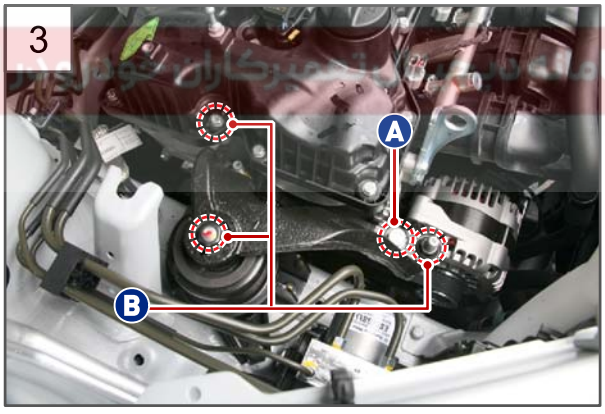


2. Remove the deaeration hose (A) and unscrew two bolts (B, 10 mm).

Tightening torque (B) 10.0 ± 1.0Nm

CAUTION
Do not allow the coolant to make contact with the body paintwork and engine.

3

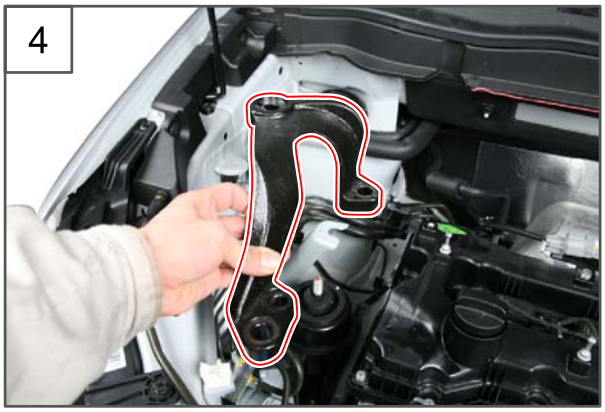


3. Unscrew the bolt (A, 17 mm) and three nuts (B, 17 mm) from the LH mounting bracket.

Tightening torque (A) 55.0 ± 5.0Nm

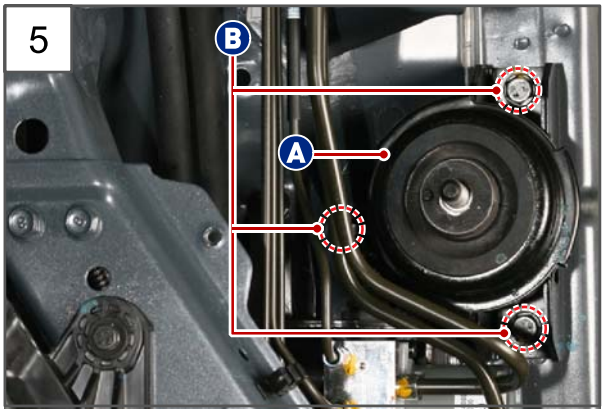
Tightening torque (B) 55.0 ± 5.0Nm

4



4. Remove the LH mounting bracket.

5



5. Unscrew the bolts (B) and remove the right engine mounting (A).

Tightening torque 68.6 ~ 88.2Nm

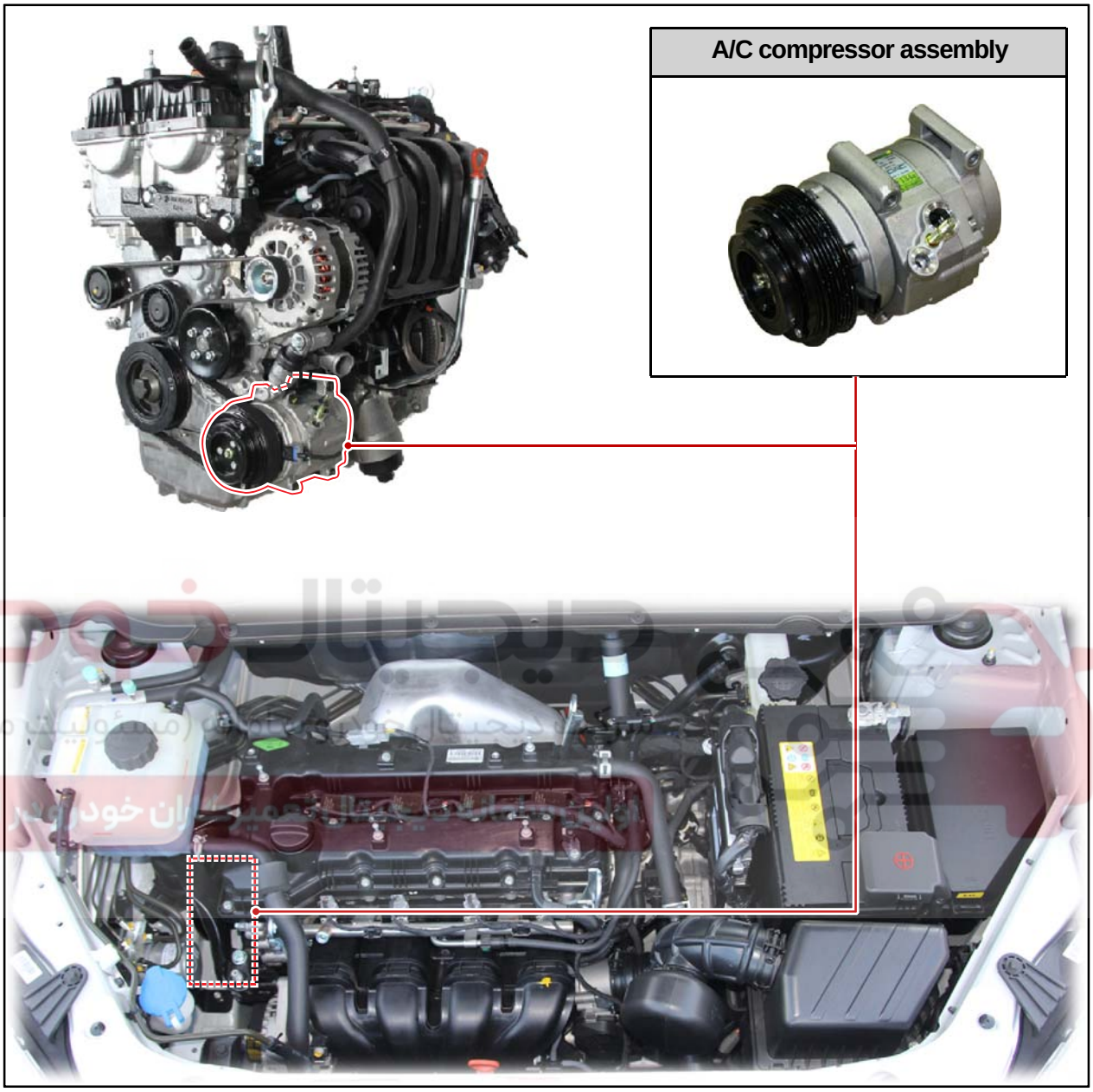
6

6. Install the right engine mounting in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

S.G.N. 6820-02

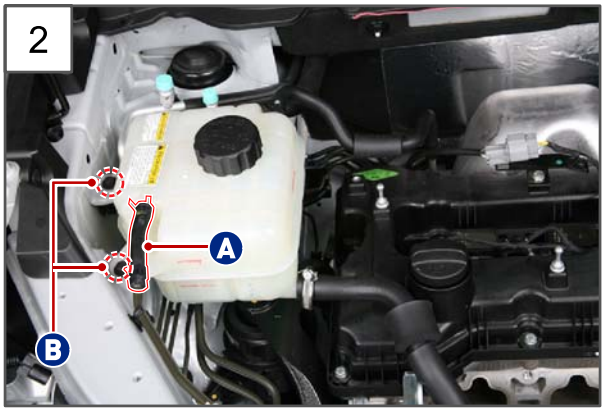
AIR CONDITIONER COMPRESSOR



1. Support the bottom of the oil pan with a floor jack.

Modification basis	
Application basis	
Affected VIN	

2

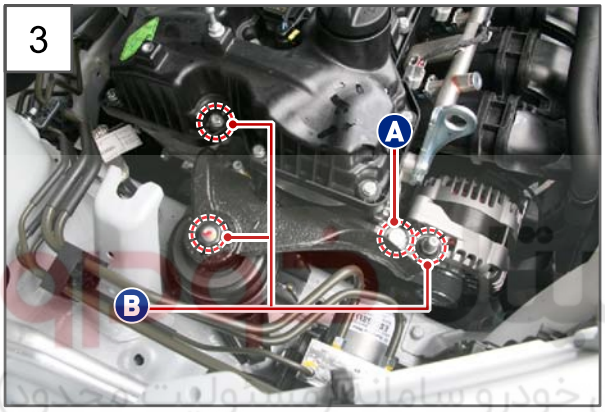


2. Remove the deaeration hose (A) and unscrew two bolts (B, 10 mm).

CAUTION

Do not allow the coolant to make contact with the body paintwork and engine.

3



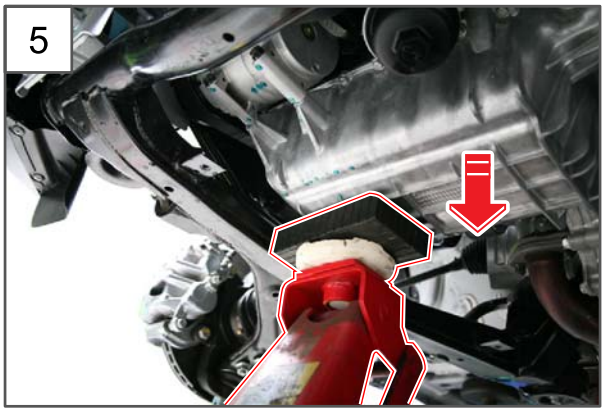
3. Unscrew the bolt (A, 17 mm) and three nuts (B, 17 mm) from the RH mounting bracket.

Tightening torque 68.6 ~ 88.2Nm

4

4. Remove the RH mounting bracket.

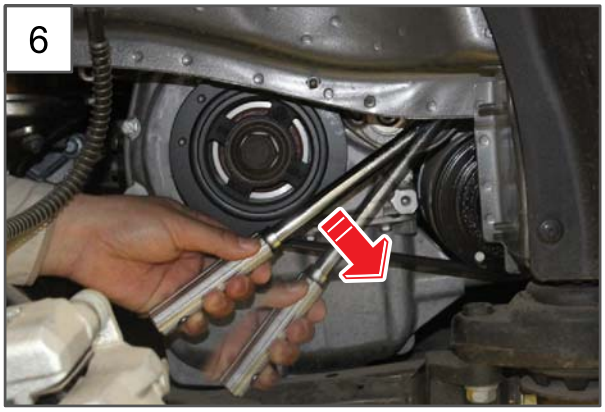
5



5. Slowly lower the floor jack as it goes without any overload to emgine mountings.

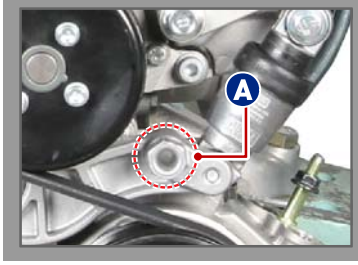
Modification basis	
Application basis	
Affected VIN	

6



6. Release the tension by turning the hydraulic tensioner adjust bolt (A) counterclockwise.

NOTE

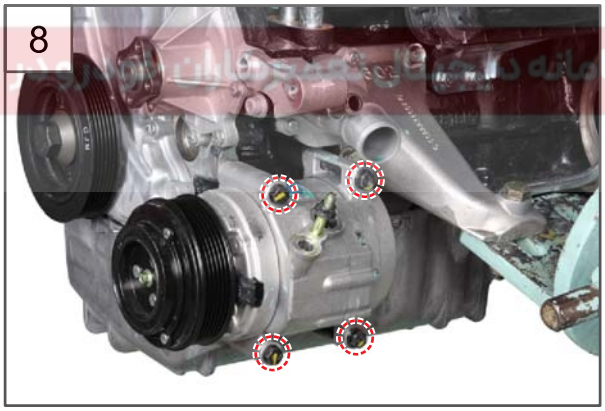


Carry out the work using a hinge handle connecting rod, if necessary.

7

7. Remove the fan belt.

8



8. Unscrew four bolt(13 mm) and remove the A/C compressor.

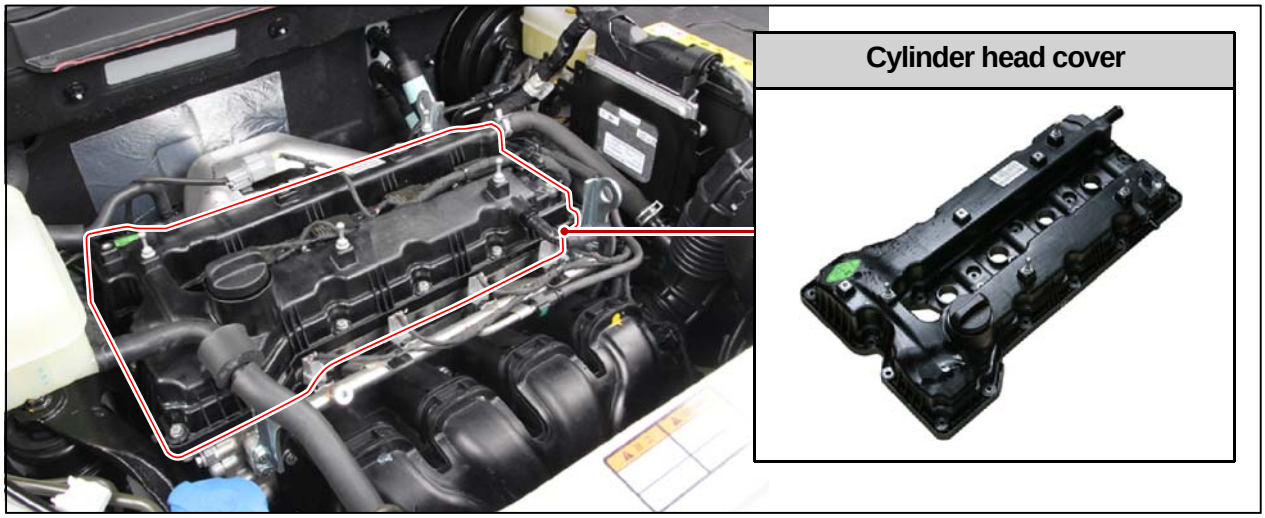
Tightening torque 25.0 ± 2.5Nm

9

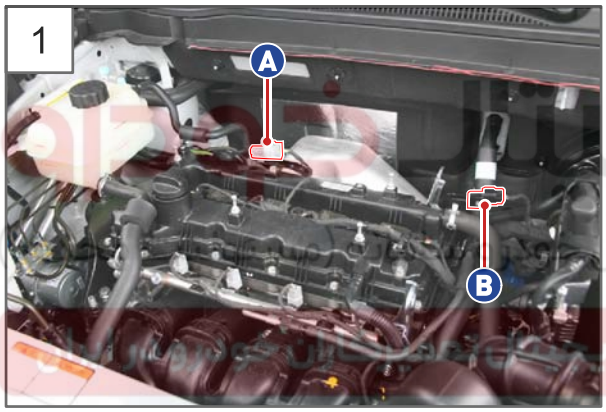
9. Install the A/C compressor assembly in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

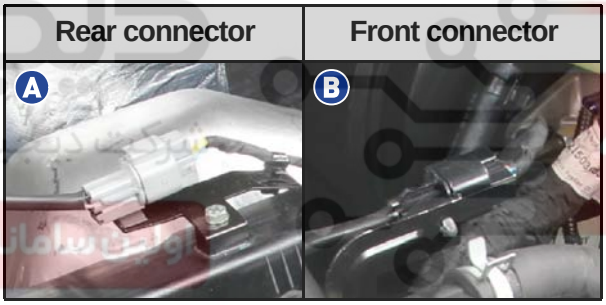
S.G.N.
1221-01 CYLINDER HEAD COVER



1



1. Disconnect the front and rear oxygen sensor connectors.

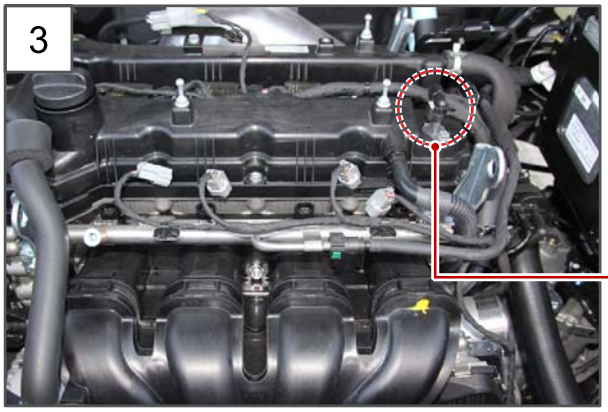


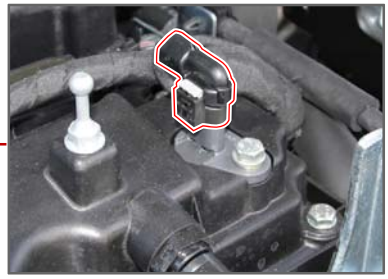
2

2. Remove the connector from its holder with a remover.

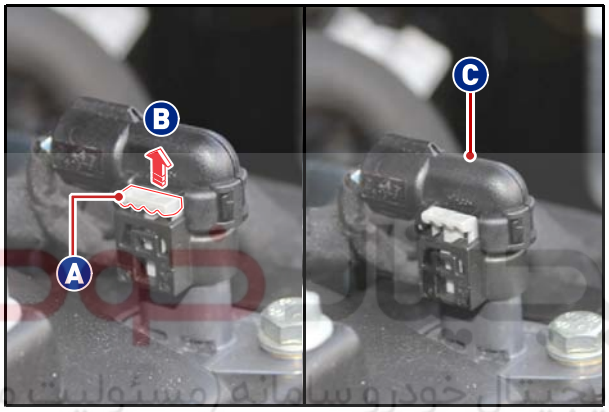
Modification basis	
Application basis	
Affected VIN	

3





3. Disconnect the camshaft position sensor connector.



- Pull up the lock (A) of camshaft toward direction (B), then disconnect the connector by pushing the lock (C).

4

4. Disconnect the ignition coil connectors (No.1 to No.4) in order.

5

5. Unscrew the mounting bolt (10 mm) from the ignition coil.

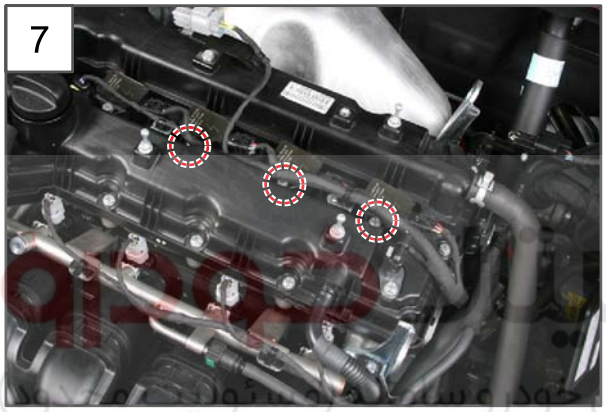
Tightening torque 7.8 ± 0.6Nm

Modification basis	
Application basis	
Affected VIN	

6

6. Pull the ignition coil straight upward to remove it.

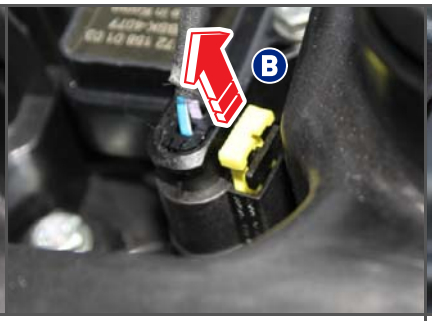
7



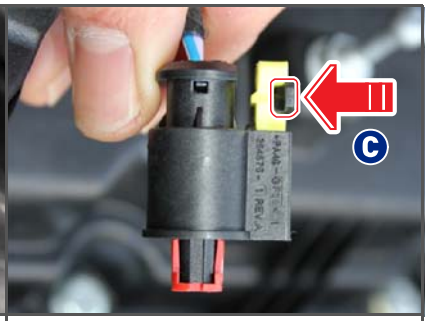
7. With same manner, remove the remaining ignition coils (No.2 to No.4) in order.

8

8. Disconnect the OCV connector.



Pull up the lock (A) of OCV connector toward direction (B).



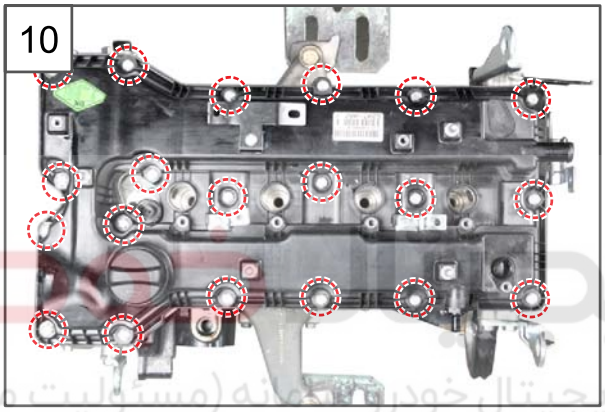
Disconnect the connector by pushing lock (C).

Modification basis	
Application basis	
Affected VIN	

9

9. Release the each clamps from the Blow-by hose and PCV hose, and remove the hoses.

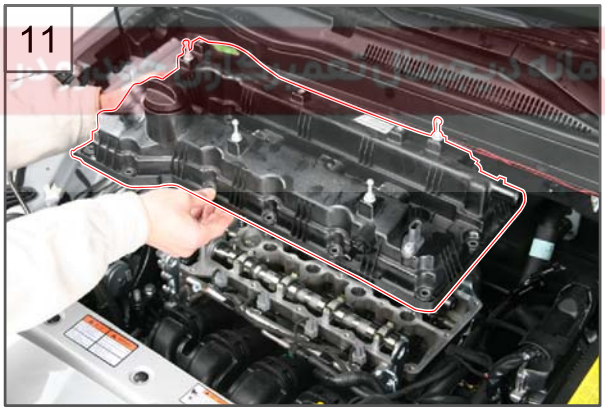
10



10. Unscrew 20 bolts (10 mm) from the cylinder head cover.

Tightening torque 10.0 ± 1.0Nm

11



11. Remove the cylinder head cover.

12

12. Take off the gasket from the cylinder head cover.

Modification basis	
Application basis	
Affected VIN	

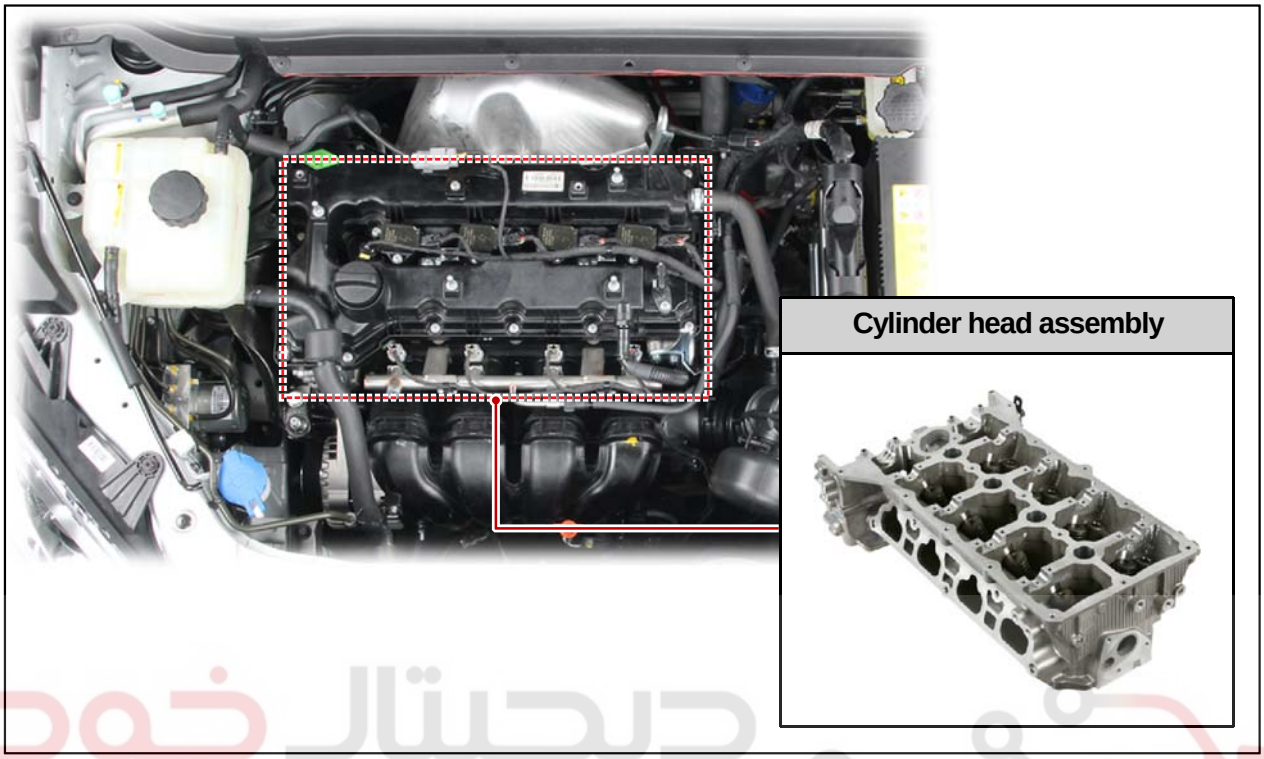
13

13.Install the cylinder head cover in the reverse order of removal.

Cylinder head cover gasket

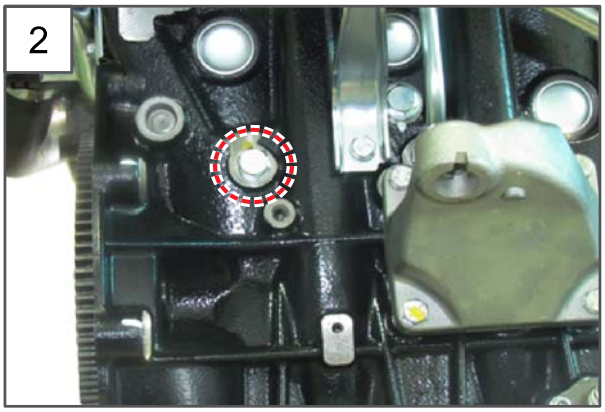
Modification basis	
Application basis	
Affected VIN	

S.G.N.
1211-01 CYLINDER HEAD



1. Remove the drain plug at the bottom of radiator and drain the coolant in radiator completely.

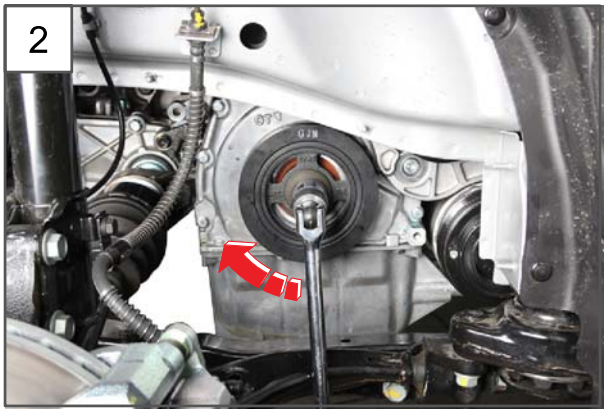
NOTE
Refer to Chapter "Engine Cooling".



- Remove the screw bolt (A) on the cylinder block and drain the coolant in cylinder block completely.

Modification basis	
Application basis	
Affected VIN	

2

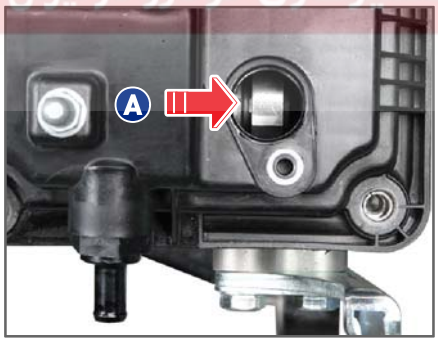


2. Align the timing marks.

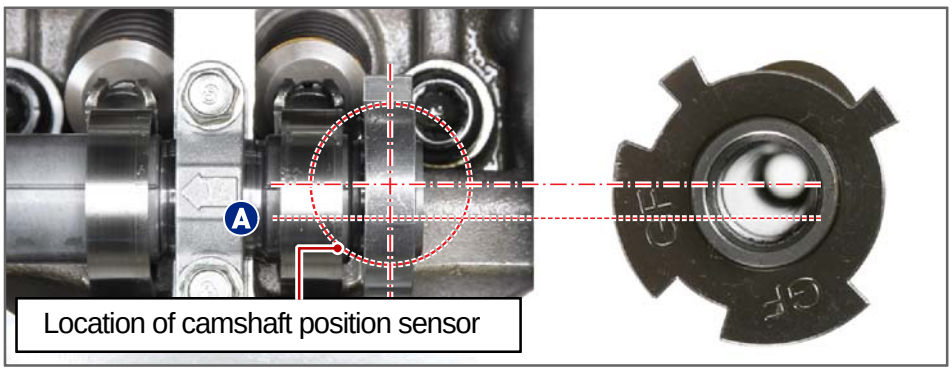
- To align them, turn the crankshaft center bolt counterclockwise.

- Timing marks on timing gear case cover and crankshaft pulley

Checking the timing on top of the engine



Remove the camshaft position sensor and check the location (A) of camshaft position gear.



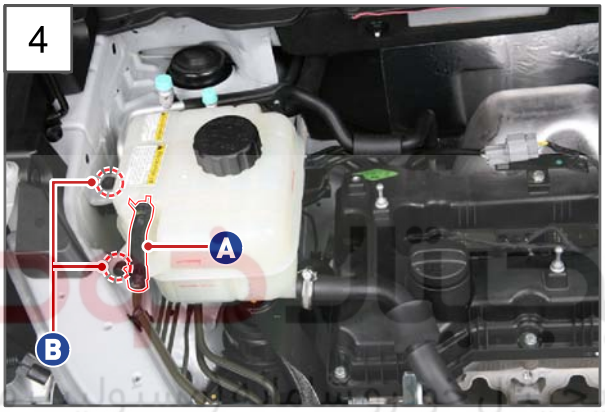
Location of camshaft position sensor

Modification basis	
Application basis	
Affected VIN	

3

3. Support the bottom of the oil pan with a floor jack.

4

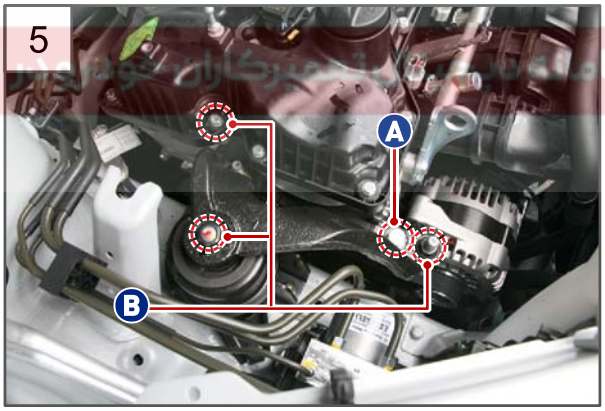


4. Remove the deaeration hose (A) and unscrew two bolts (B, 10 mm).

CAUTION

Do not hte coolant to make contact with the body paintwork and engine.

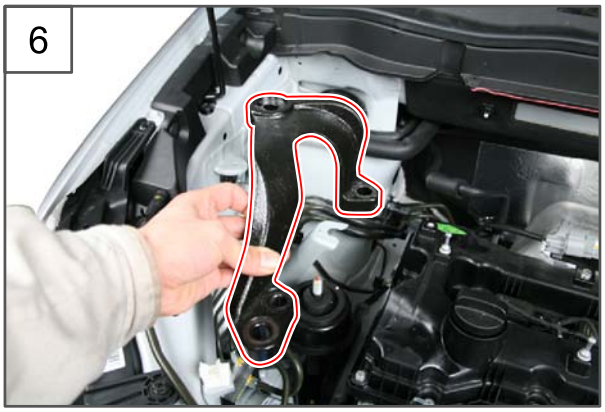
5



5. Unscrew the bolt (A, 17 mm) and three nuts (B, 17 mm) from the LH mounting bracket.

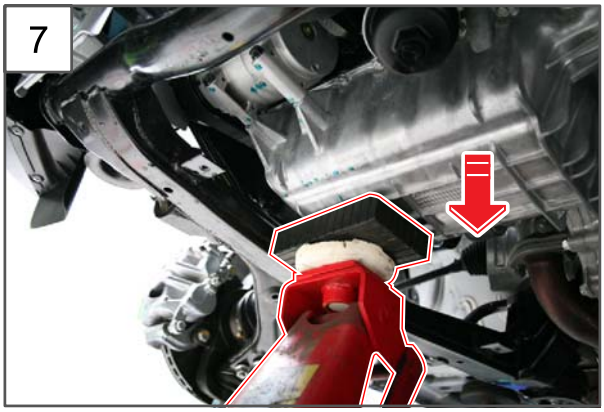
Tightening torque 68.6 ~ 88.2Nm

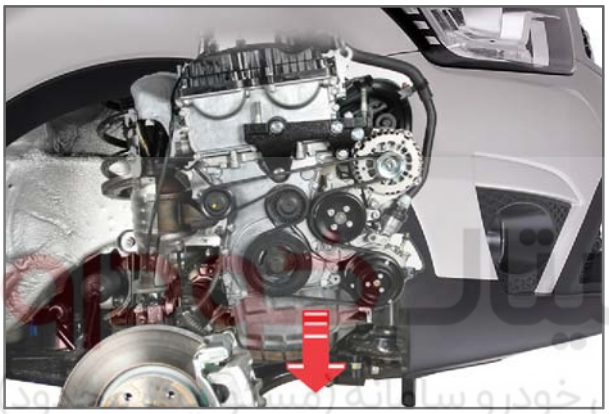
6



6. Remove the LH mounting bracket.

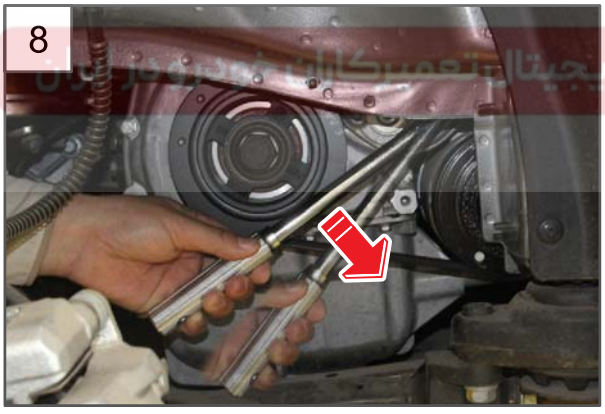
7





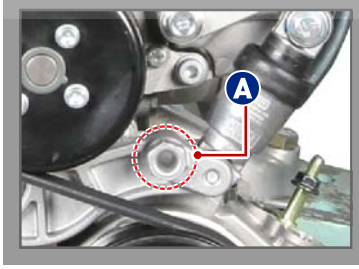
7. Slowly lower the floor jack as it goes without any overload to emgine mountings.

8



8. Release the tension by turning the hydraulic tensioner adjust bolt (A) counterclockwise.

NOTE



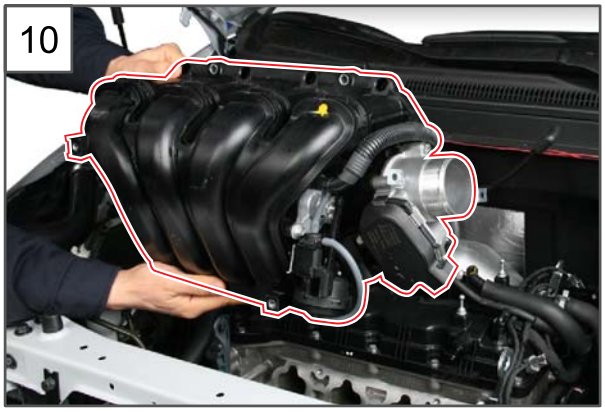
Carry out the work using a hinge handle connecting rod, if necessary.

9

9. Remove the fan belt.

Modification basis	
Application basis	
Affected VIN	

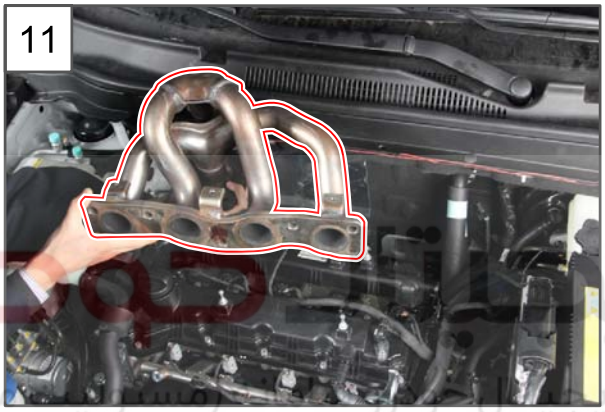
10



10.Remove the intake manifold assembly.

NOTE
Refer to Chapter "Intake System".

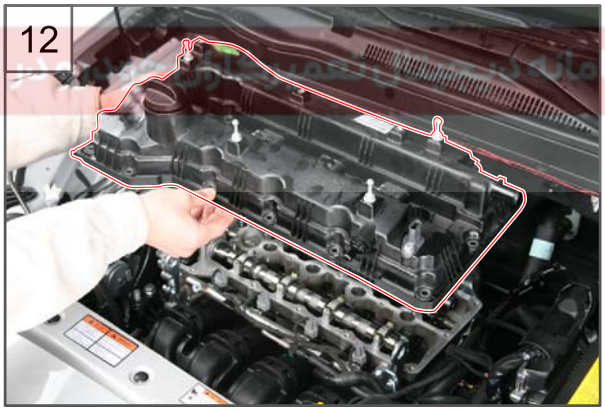
11



11.Remove the exhaust manifold assembly.

NOTE
Refer to Chapter "Exhaust System".

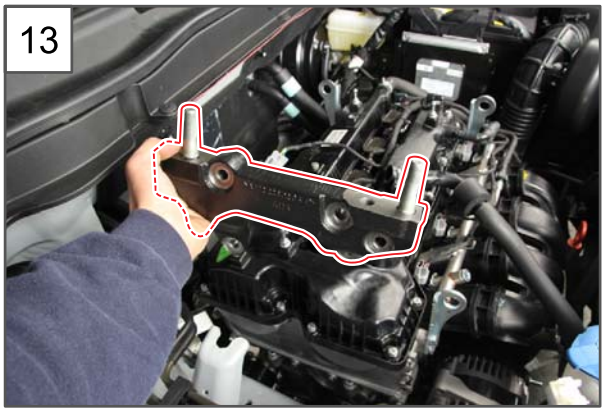
12



12.Remove the cylinder head cover.

NOTE
Refer to Section "Cylinder Head Cover" in this chapter.

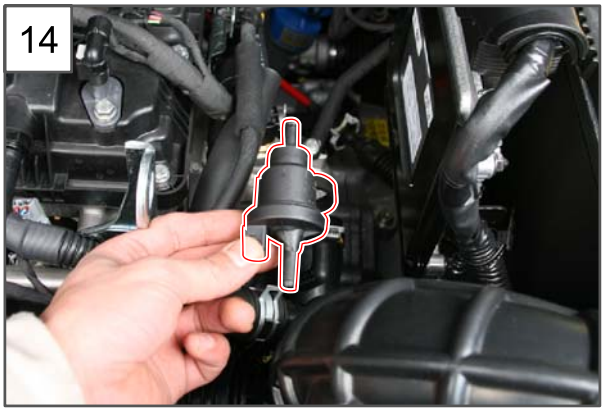
13



13.Remove the engine mount lower.

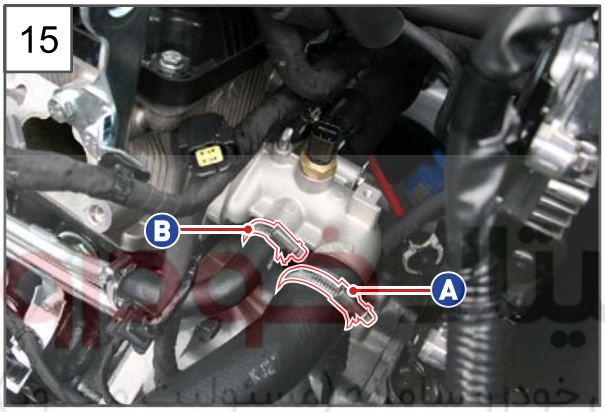
NOTE
Refer to Section "Engine Mounting" in this chapter.

14



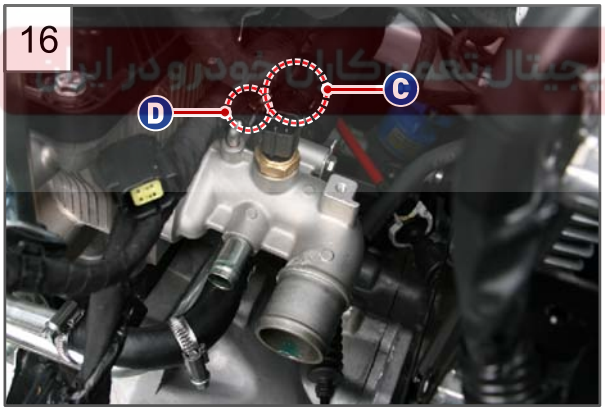
14.Remove the purge control solenoid valve.

15



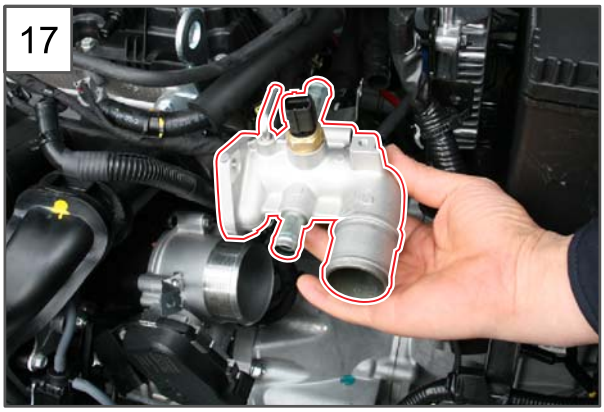
15.Release the coolant outlet hose clamp (A) and the bypass hose clamp (B), and separate the hoses.

16



16.Release the heater cabin outlet hose clamp (C) and the hose clamp (D) to coolant reservoir, and separate the hoses.

17



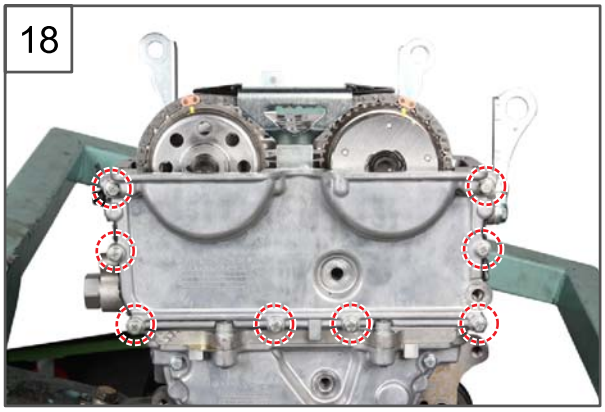
17.Remove the coolant outlet port.

NOTE

Refer to Chapter "Engine Cooling".

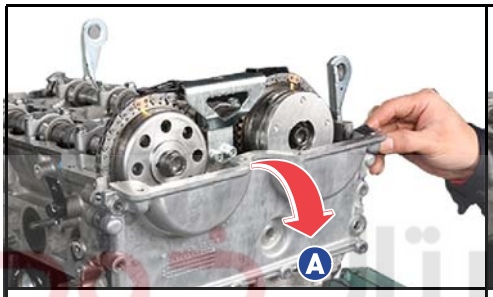
Modification basis	
Application basis	
Affected VIN	

18

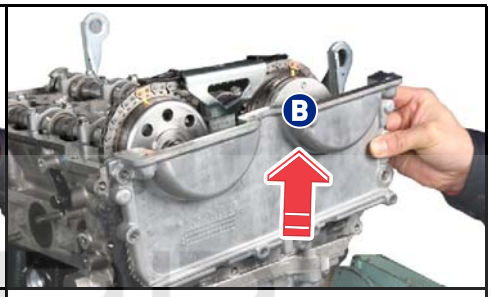


18.Unscrew eight bolts (10 mm) from the front cover.

Tightening torque 10.0 ± 1.0Nm

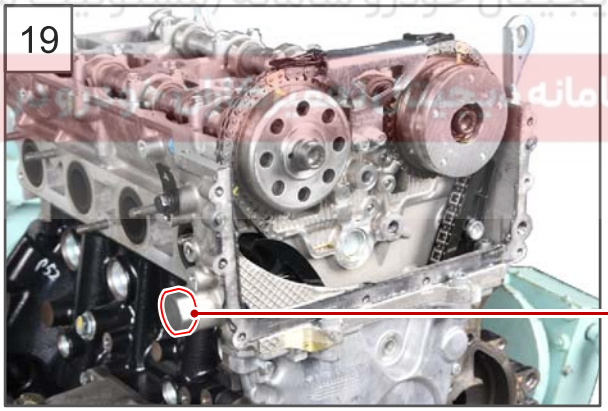


Pull the front cover to direction (A).



Pull up the front cover to direction (B) to remove it.

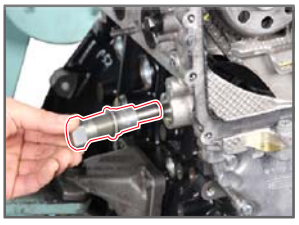
19



19.Remove the auto tensioner with a spanner (27 mm).

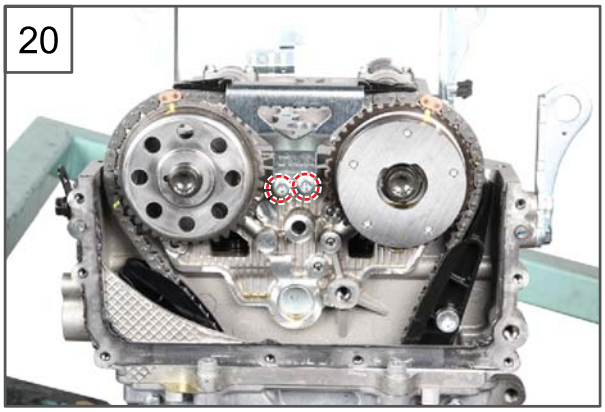
Tightening torque 65.0 ± 5.0Nm

CAUTION



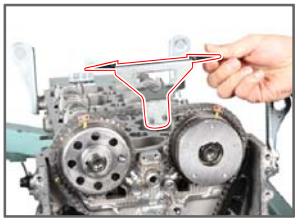
Replace the gasket with new one.

20



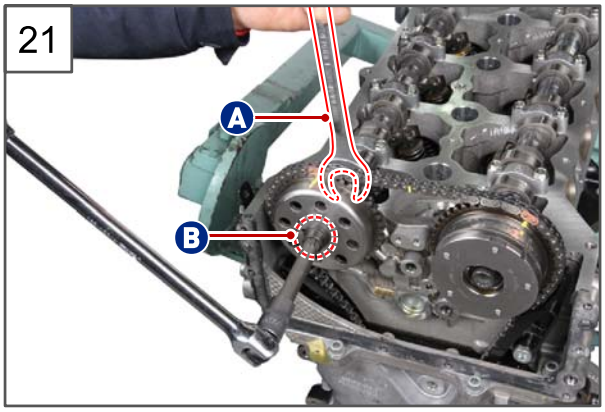
20.Unscrew two hexagon bolts (5 mm) on the front side of cylinder head and remove the upper rail.

Tightening torque 10.0 ± 1.0Nm



Modification basis	
Application basis	
Affected VIN	

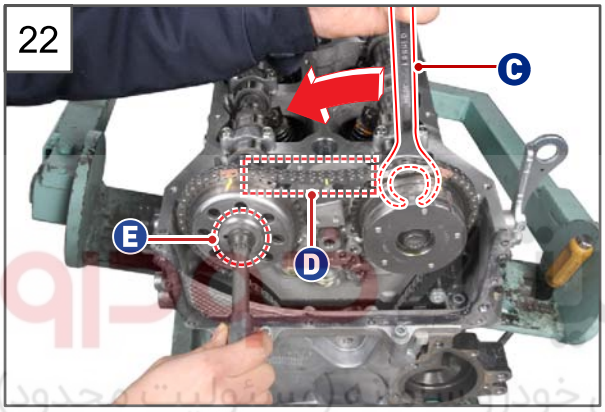
21



21. Hold the octagon spanner seat on the exhaust camshaft with a spanner (A, 30 mm) and loosen the center bolt (14 mm) from the exhaust camshaft.

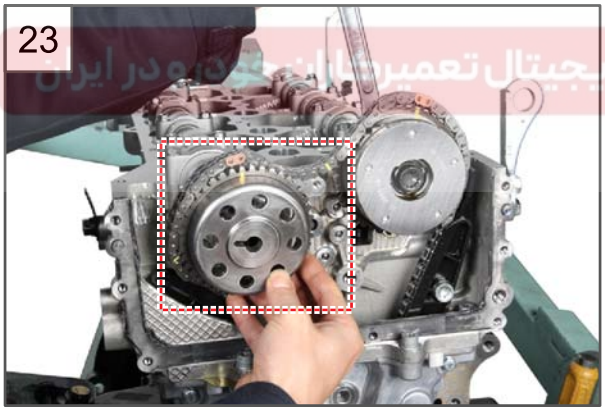
Tightening torque 110 ± 10Nm

22

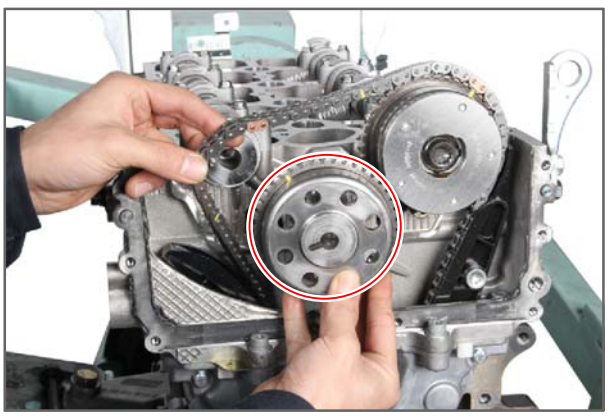


22. To release the tension of the timing chain (D), turn the octagon spanner seat on the intake camshaft counterclockwise with a spanner (C, 30 mm), and remove the loosened center bolt (E) from the exhaust camshaft.

23

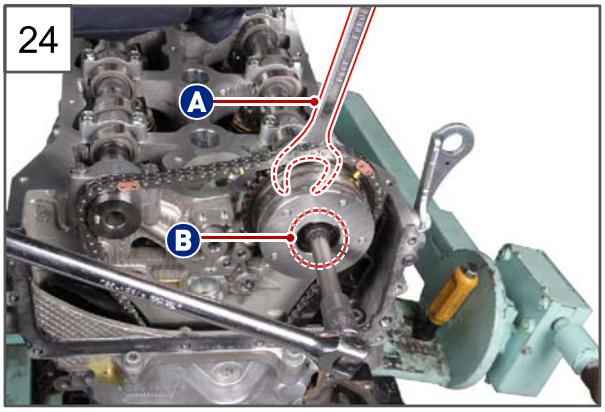


23. Pull out the exhaust camshaft sprocket with silence chain from the exhaust camshaft.



- Separate the exhaust camshaft sprocket with the silence chain.

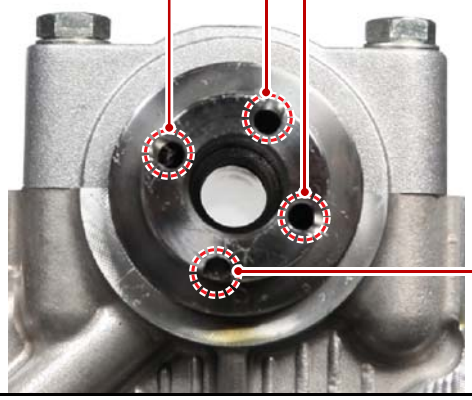
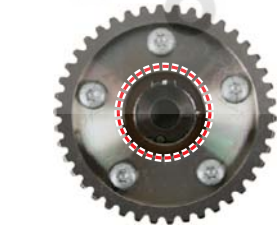
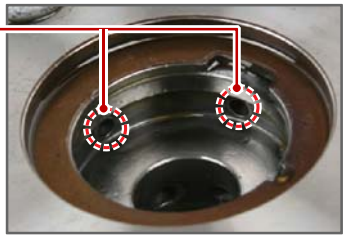
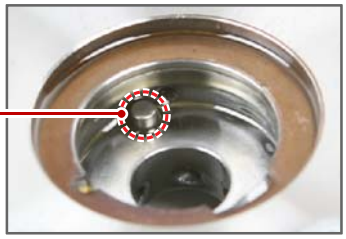
Modification basis	
Application basis	
Affected VIN	



24. Hold the octagon spanner seat on the intake camshaft with a spanner (A, 30 mm) and unscrew the center bolt (B, 14 mm) from the intake camshaft.

Tightening torque 110 ± 10Nm

- Remove the intake camshaft sprocket.

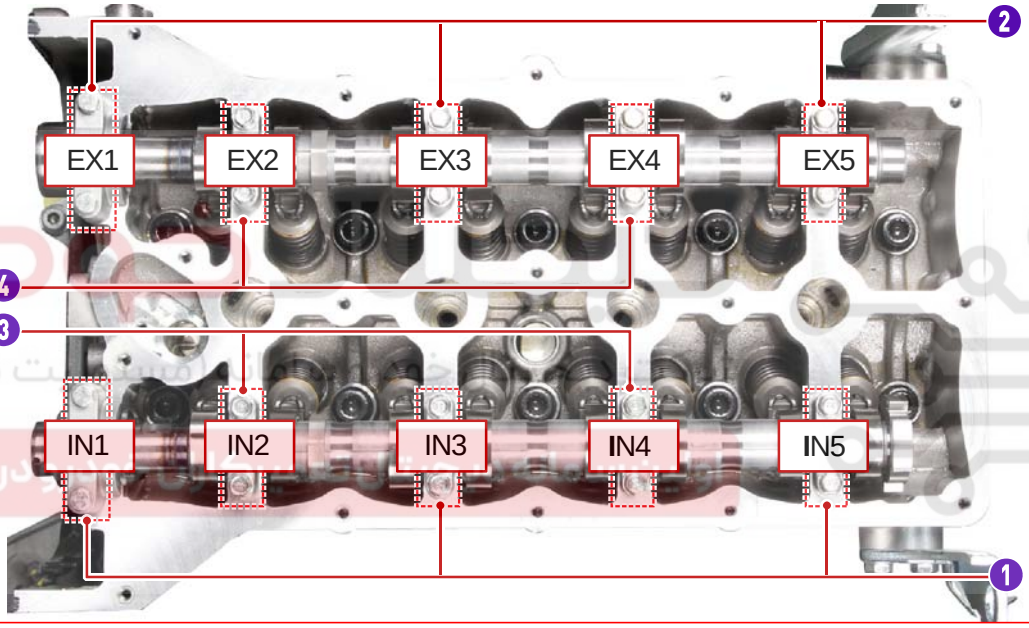
Intake camshaft	Intake camshaft sprocket
	  

Modification basis	
Application basis	
Affected VIN	

25.Remove the camshaft bearing caps according to the numerical order in the figure below.

Tightening torque 10.0 ± 1.0Nm

(1) Intake camshaft bearing cap: IN1, IN3, IN5
(2) Exhaust camshaft bearing cap: EX1, EX3, EX5
(3) Intake camshaft bearing cap: IN2, IN4
(4) Exhaust camshaft bearing cap: EX2, EC4



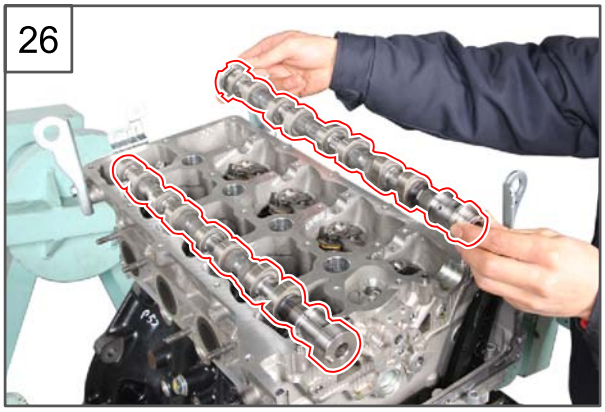
CAUTION

Unscrew the camshaft bearing cap bolts slowly in two or more steps according to the specified sequence.

- Remove the camshaft bearing caps.

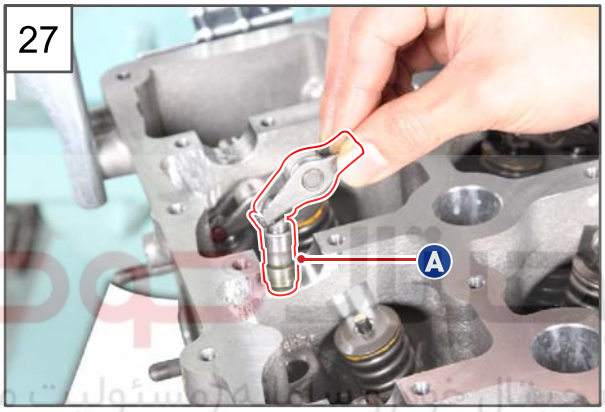
Modification basis	
Application basis	
Affected VIN	

26



26.Remove the intake and exhaust camshafts.

27



27.Remove the finger follower and HLA device (A).

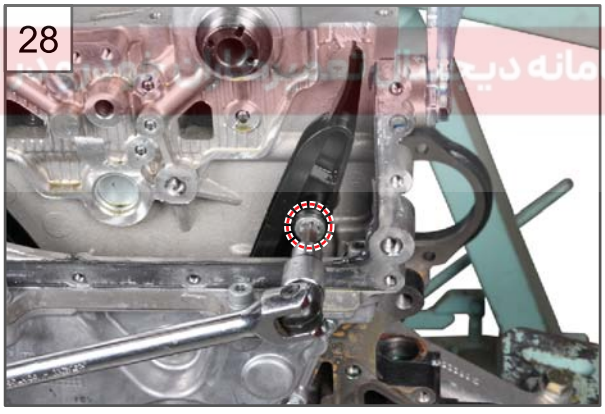
CAUTION

If the removed finger follower and HLA device is easily compressed, it means that the oil has been drained. In this case, replace it with a new one.

NOTE

Apply the engine oil on it before installation.

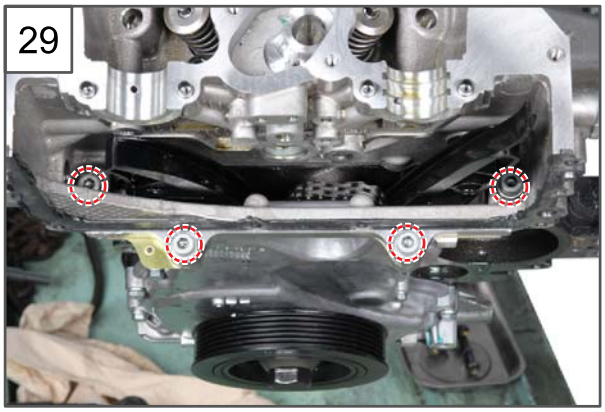
28



28.Unscrew the upper bolt (T50) on clamping rail.

Tightening torque 25.0 ± 2.5Nm

29



29.Unscrew four TGCC bolts (6 mm) on cylinder head.

Tightening torque 25.0 ± 2.5Nm

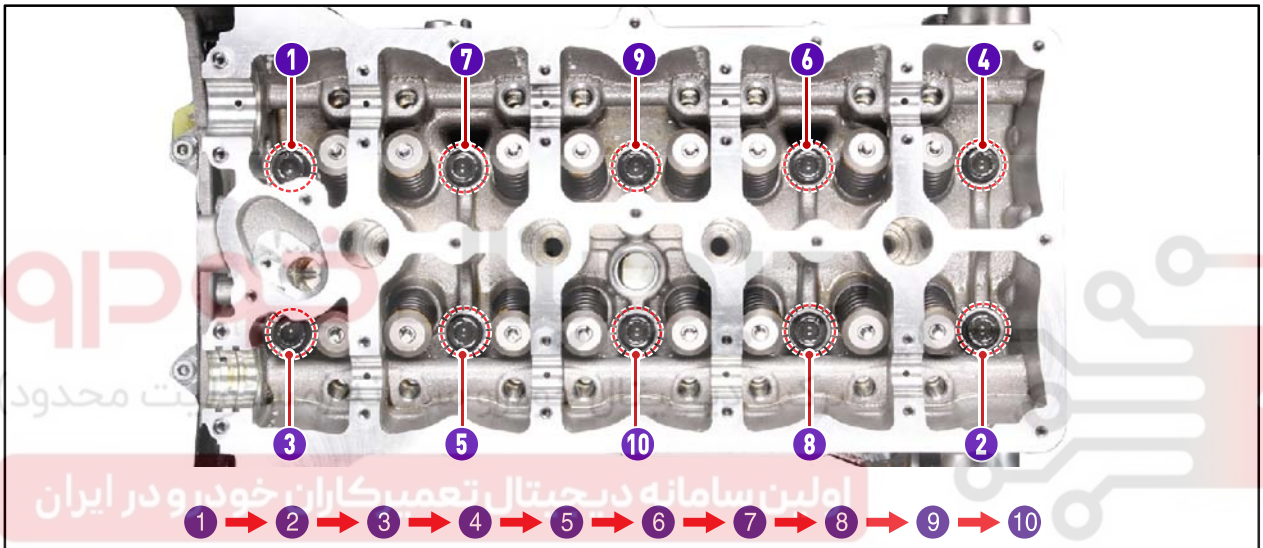
Modification basis	
Application basis	
Affected VIN	

30

30.Unscrew 10 cylinder head bolts (13 mm) in numerical order in the figure below.

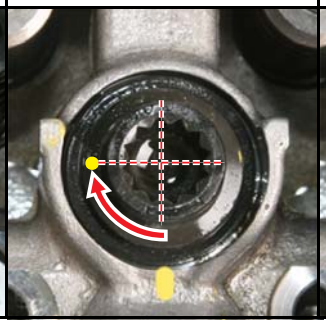
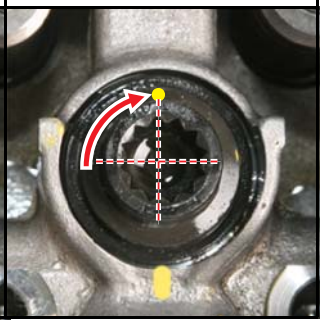
Cylinder head bolt wrench

14 mm star-bit socket

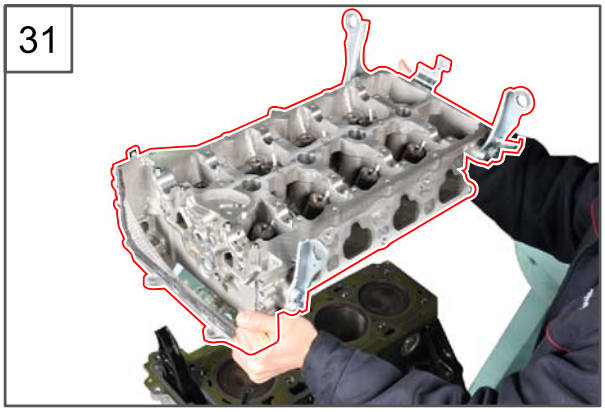


CAUTION

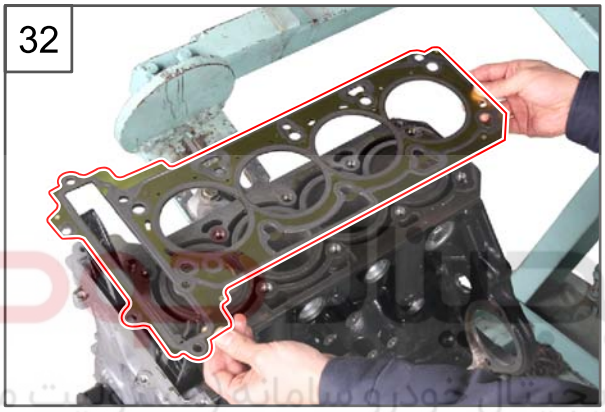
- Unscrew the bolts in two or more steps.
- Apply the engine oil on the thread of cylinder head bolts.

Tightening sequence of cylinder head bolt (angle tightening)			
Torque wrench 55 Nm	Paint marking (on cylinder head and head bolt)	1st angle tightening 90˚±10 ˚	2nd angle tightening 90˚±10 ˚
			

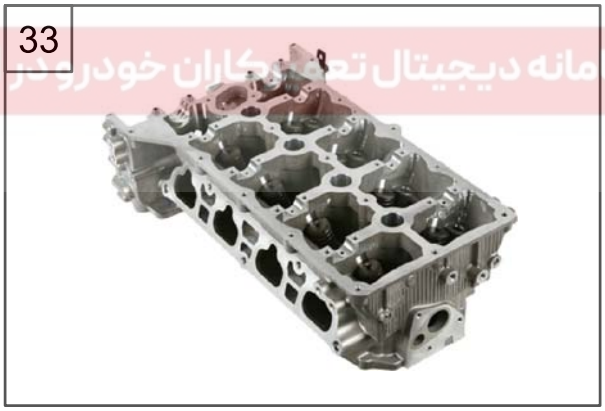
Modification basis	
Application basis	
Affected VIN	



31.Remove the cylinder head assembly.



32.Remove the cylinder head gasket from the cylinder head.



33.Install the cylinder head assembly in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

S.G.N. 1116-01

ENGINE ASSEMBLY (G20DF)

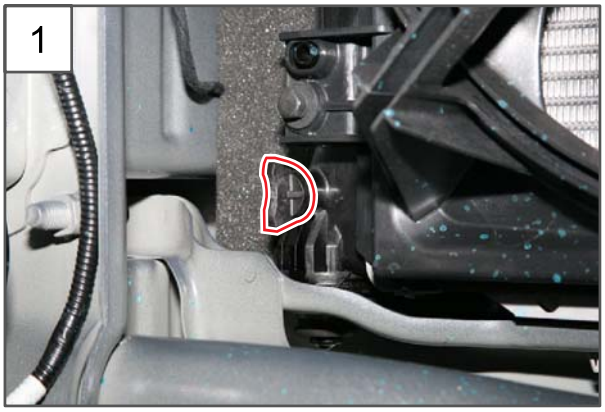
Preceding work

- Disconnect the negative cable from the battery.
- Remove the engine acoustic cover.
- Remove the front and rear under covers.
- Remove the front tires.
- Collect the refrigerant from the air conditioner. (Refer to Chapter "Air Conditioner".)

Engine Assembly

Modification basis	
Application basis	
Affected VIN	

1



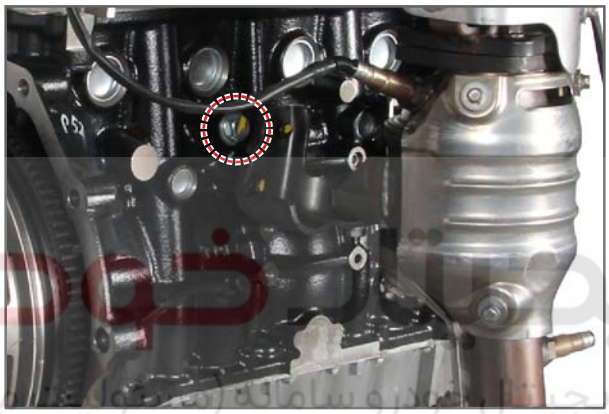
1. Remove the drain plug at the bottom of radiator and drain the coolant in radiator completely.

NOTE

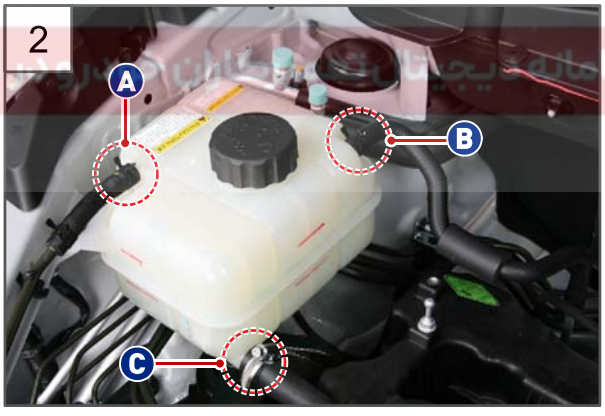
Refer to Chapter "Engine Cooling".

CAUTION

- Scalding hot coolant and steam could be blown out under pressure, which could cause serious injury. Never remove the coolant reservoir cap when the engine and radiator are still hot.
- Drain the coolant into a suitable container and do not spill it on the floor.
- Avoid the coolant to come in contact with your skin or the vehicle body as anti-freeze is included. In case of skin contact, wash thoroughly with plenty of clean water immediately.



2



- Remove the screw bolt (A) on the cylinder block and drain the coolant in cylinder block completely.

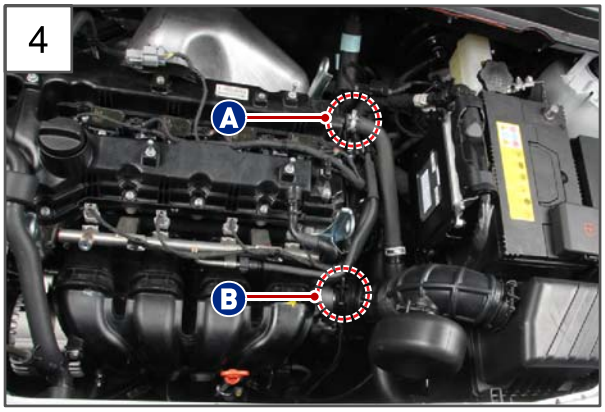
2. Release the clamps and remove the deaeration radiator hose (A), deaeration engine hose (B) and make-up hose (C).

3

3. Unscrew two bolts (10 mm) and remove the coolant reservoir.

Tightening torque 10.0 ± 1.0Nm

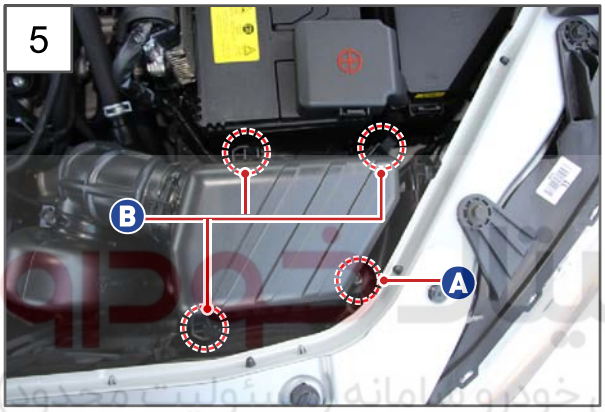
4



4. Release the blow-by hose clamp (A) and the clamp (B) on electronic throttle body.

Tightening torque (B) 6.0 ~ 7.0Nm

5



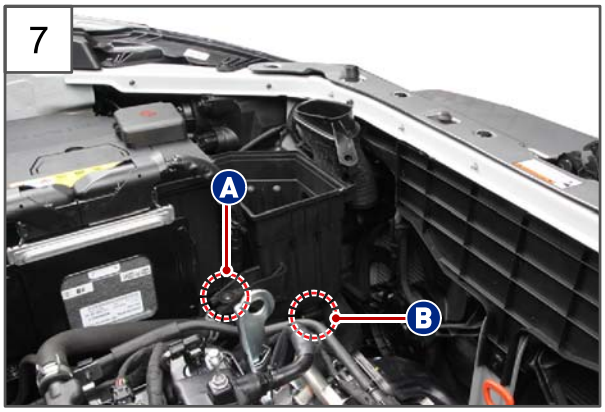
5. Unscrew the bolt (A) and release three clips (B) on air cleaner upper housing.

Tightening torque (A) 10.0 ± 1.0Nm

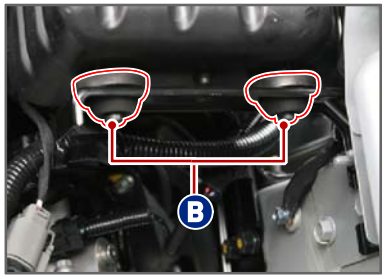
6

6. Remove the air cleaner upper cover with air cleaner assembly hose.

7

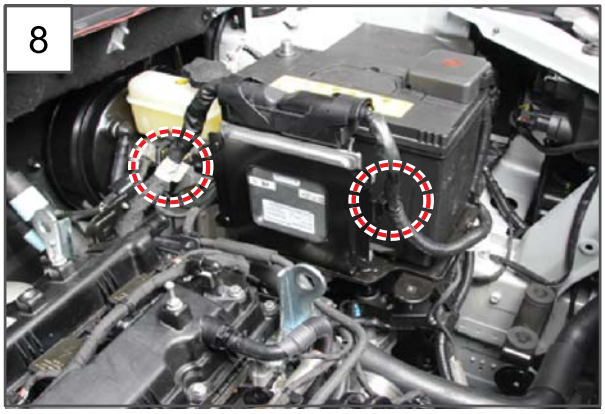


7. Unscrew the air cleaner lower mounting bolt (A) and take off the air cleaner lower housing from the locks (B).



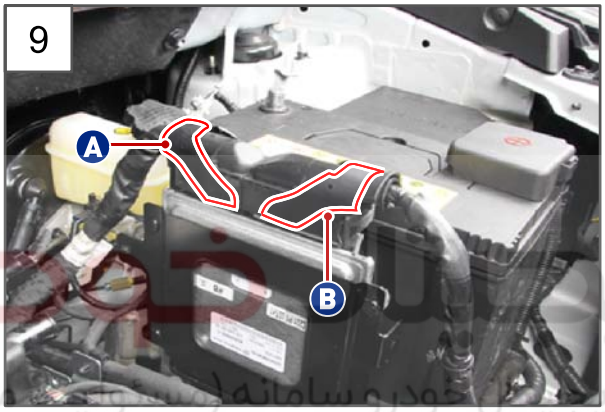
Modification basis	
Application basis	
Affected VIN	

8

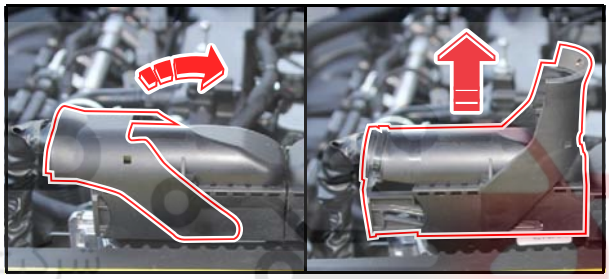


8. Release two clamps from the engine ECU wiring harness.

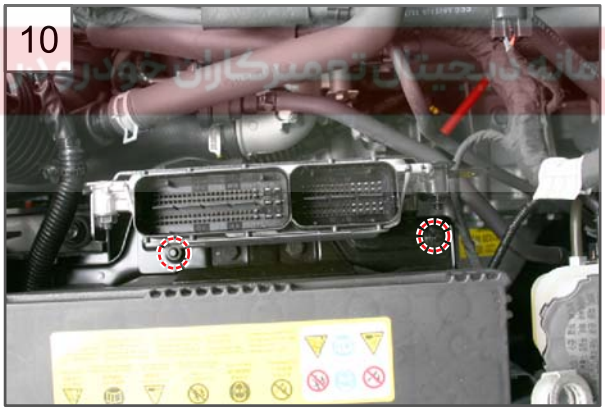
9



9. Disconnect the engine ECU connectors (A, B).



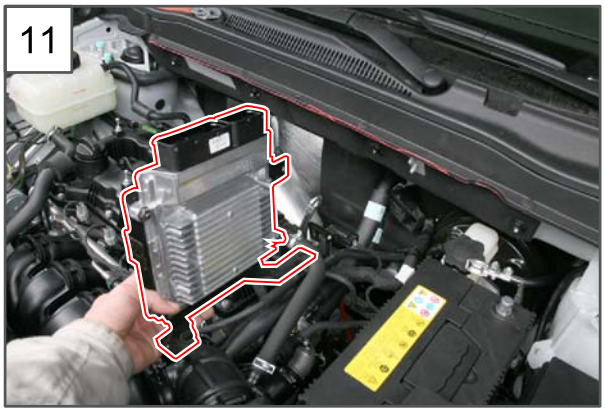
10



10. Unscrew two nuts (12 mm) from the engine ECU bracket.

Tightening torque 9.0 ~ 10.0Nm

11



11. Remove the engine ECU assembly.

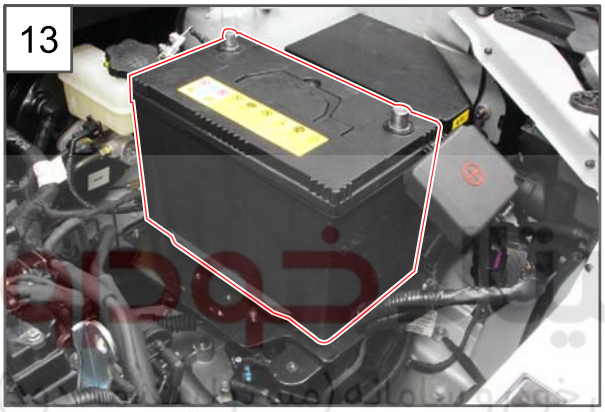
Modification basis	
Application basis	
Affected VIN	

12

12.Unscrew two bolts (12 mm) and remove the battery holder.

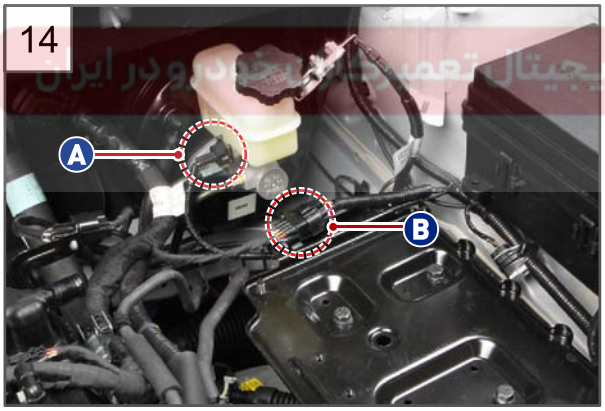
Tightening torque 25.0 ± 2.5Nm

13



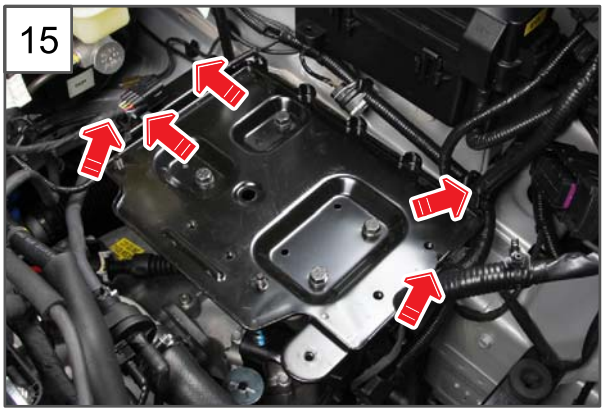
13.Remove the battery.

14



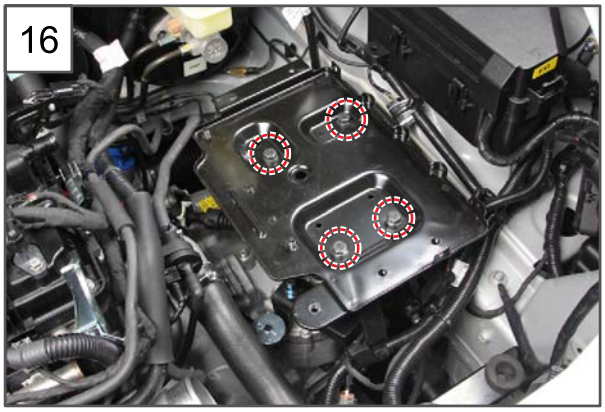
14.Disconnect the connectors (A, B).

15



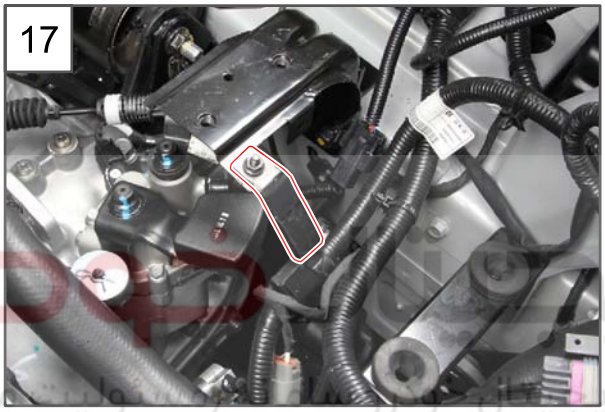
15.Release five clamps (arrows) from the wiring harness to the battery lower bracket.

Modification basis	
Application basis	
Affected VIN	



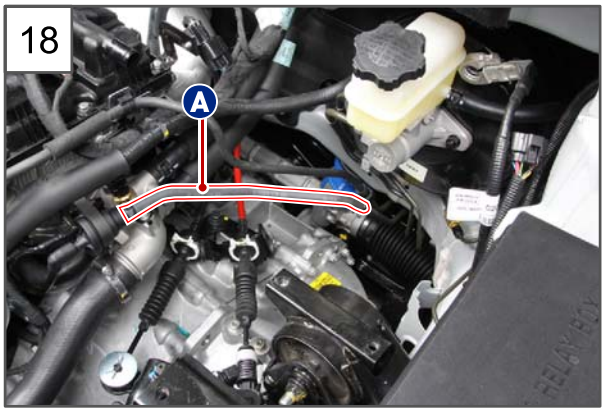
16. Unscrew four bolts (12 mm) and remove the battery lower bracket.

Tightening torque 25.0 ± 2.5Nm



17. Unscrew the nut (10 mm) from the battery B+ bracket.

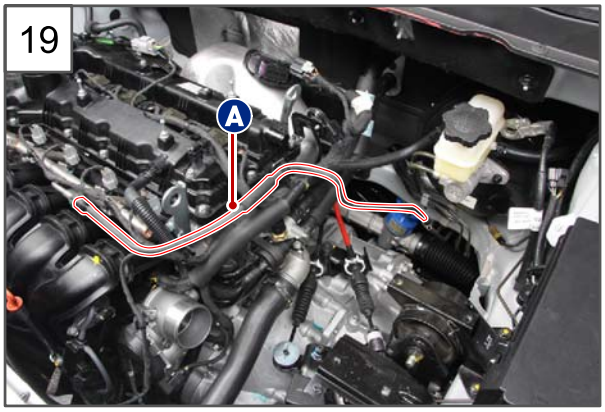
Tightening torque 10.0 ± 1.0Nm



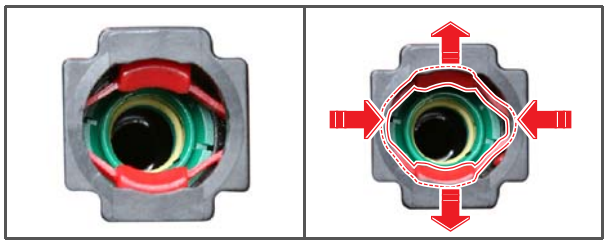
18. Release the clamps at both ends of rubber hose (A) to purge control solenoid valve and remove the rubber hose.

Modification basis	
Application basis	
Affected VIN	

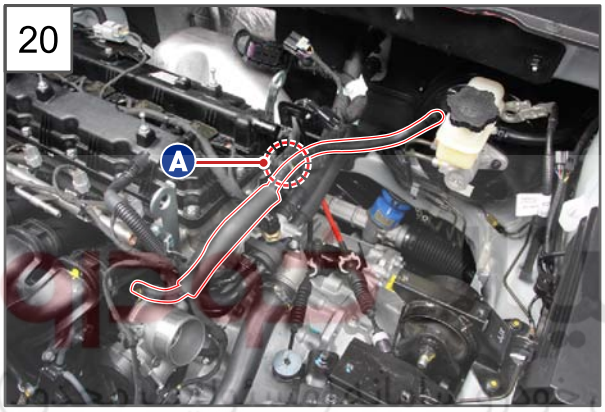
19



19.Disengage the fuel hose (A) to engine by pressing the quick connector.

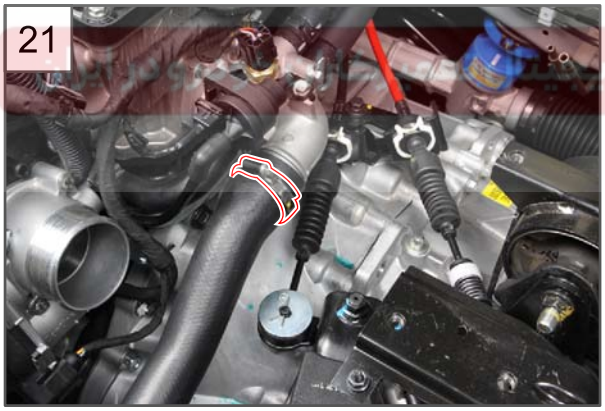


20



20.Release the clamps and remove the vacuum hose (A) to brake booster.

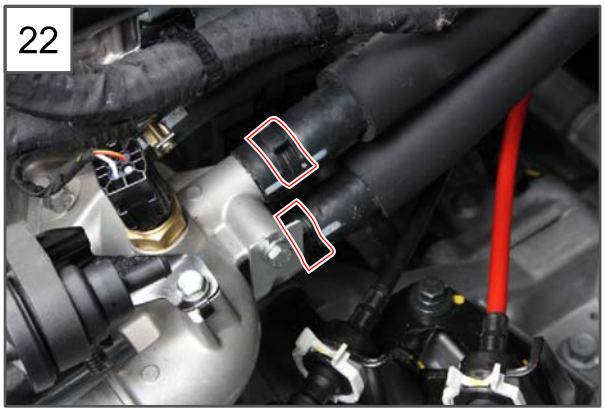
21



21.Release the radiator inlet hose clamp to coolant outlet port and remove the radiator upper hose.

Tightening torque 6.0 ~ 7.0Nm

22

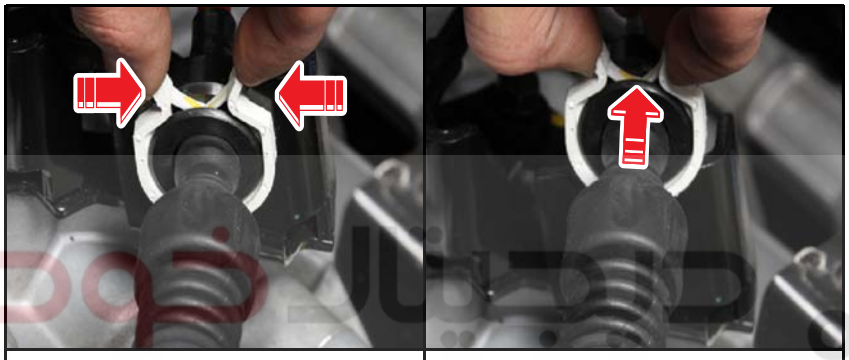


22.Release the clamps and remove the heater cabin inlet and outlet hoses.

Modification basis	
Application basis	
Affected VIN	

23

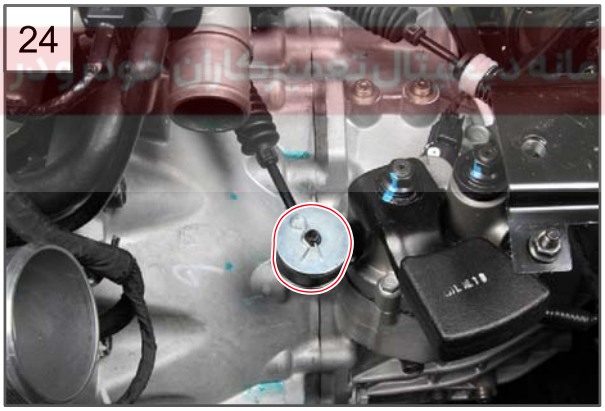
23.Remove the tansaxle cable holder.



Press the holder.

Pull it out upward.

24



24.Remove the transaxle shift cable.

Pull out the twist pin.

Remove the shift cable stopper washer.

Remove the shift cable.

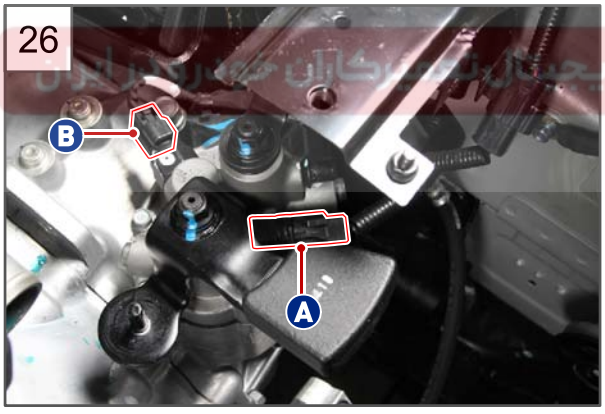
Modification basis	
Application basis	
Affected VIN	

25

25.Diengage the transaxle selector cable link rod.

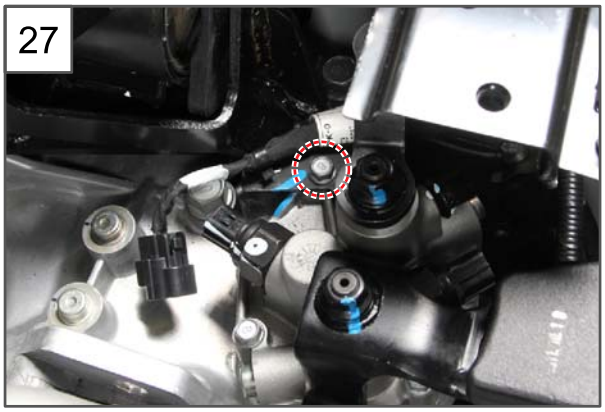
- Disengage the selector cable with a hand remover.

26



26.Disconnect the transaxle switch connector (A) and the backup lamp switch connector (B).

27



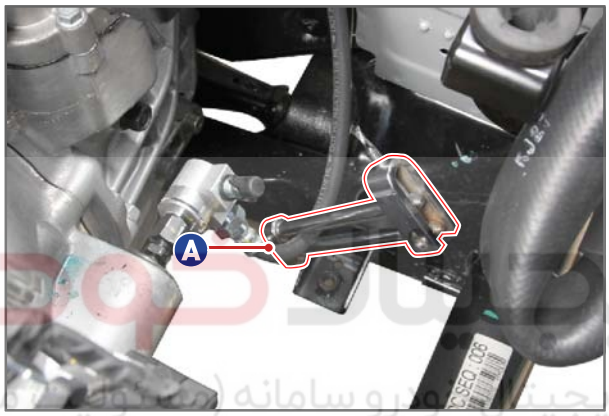
27.Unscrew the bolt (10 mm) and remove the connector bracket.

Tightening torque 9.0 ~ 10.0Nm

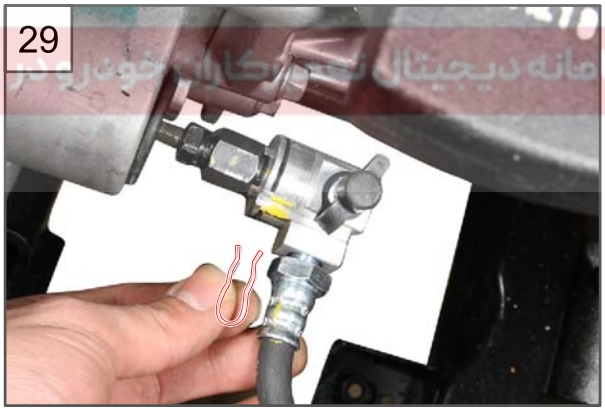
Modification basis	
Application basis	
Affected VIN	

28

28.Set up the special service tool (A) on the clutch hose of concentric slave cylinder.

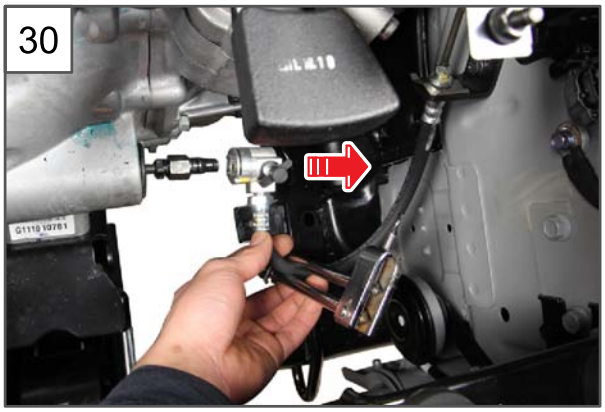


29



29.Pull out the lock pin (A) from the concentric slave cylinder.

30

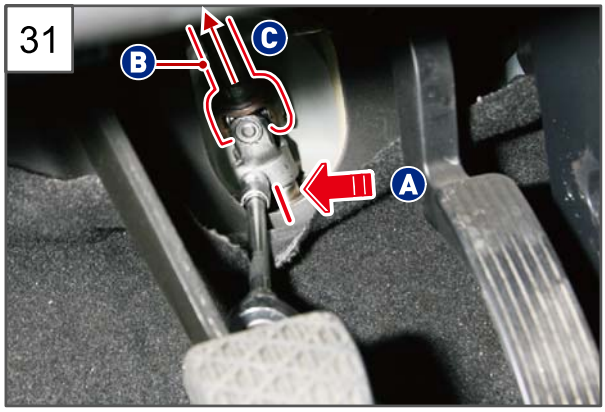


30.Remove the concentric slave cylinder by pulling it to arrow direction.

CAUTION

- Make sure not to spill out the clutch oil inside.
- If the oil has been spilled out, wipe it out immediately.

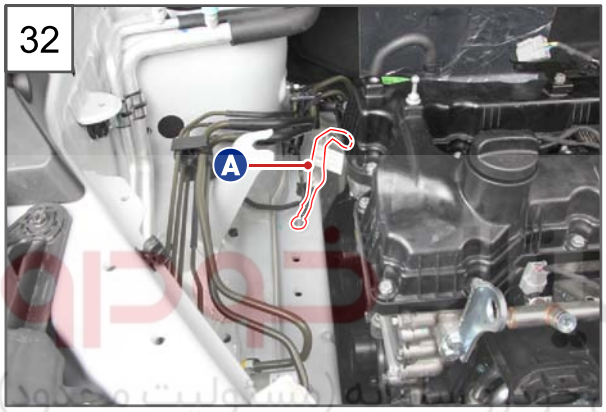
31



31. Unscrew the mounting bolt (A) in cabin and separate the steering column lower shaft (B) by sliding it upward (C).

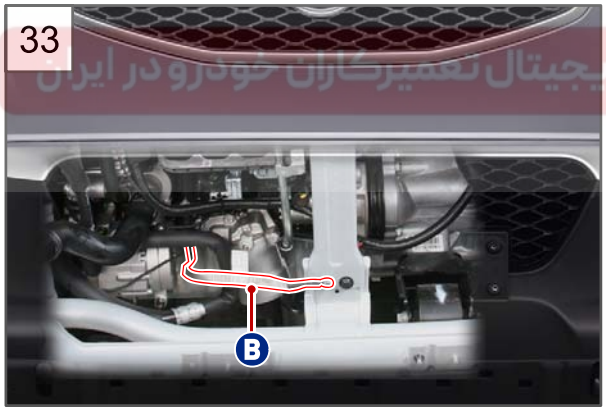
Tightening torque 19.6 ~ 24.5Nm

32

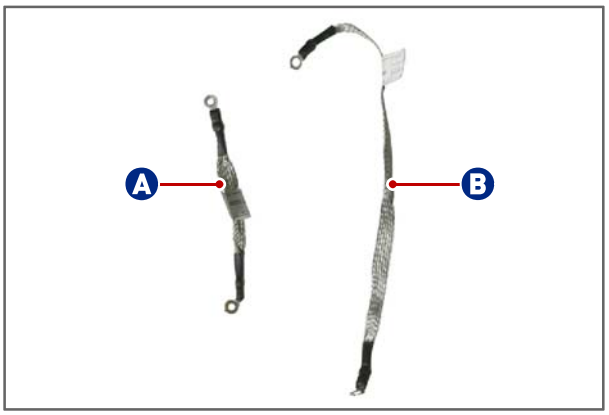


32. Unscrew the bolt (10 mm) at side body and disconnect the engine ground cable (A).

33



33. Unscrew the bolt (10 mm) at front body and disconnect the engine ground cable (B).



Modification basis	
Application basis	
Affected VIN	

34.Unscrew the bolt (12 mm) on the front brake hose.

Tightening torque 9.8 ~ 12.8Nm

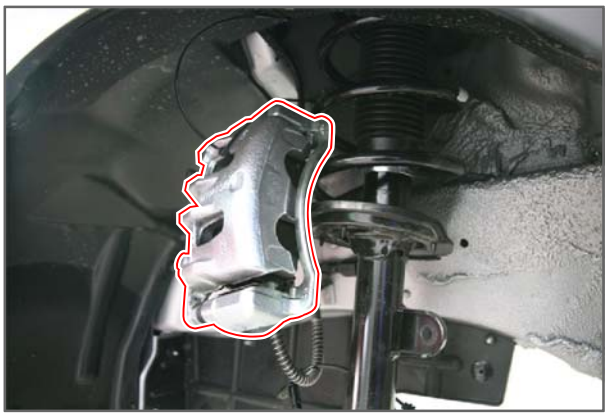
NOTE

Perform the same process at other side.

35.Remove the front caliper assembly.

- Unscrew two bolts (19 mm) from the front caliper assembly.

Tightening torque 83.3 ~ 102.9Nm



- Secure the removed front caliper assembly to the shock absorber spring.

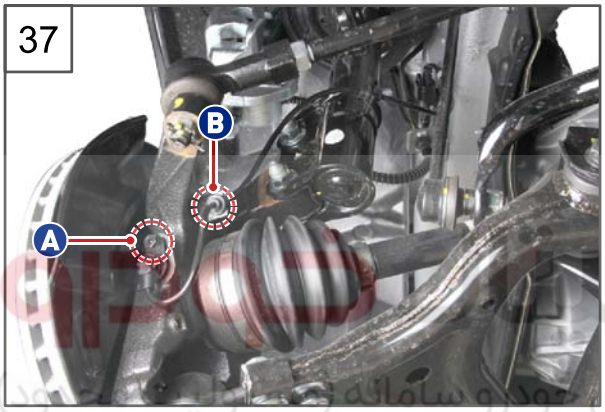
Modification basis	
Application basis	
Affected VIN	

36

36.Unscrew the upper nut (17 mm) and remove the stabilizer bar link.

Tightening torque 49.0 ~ 68.6Nm

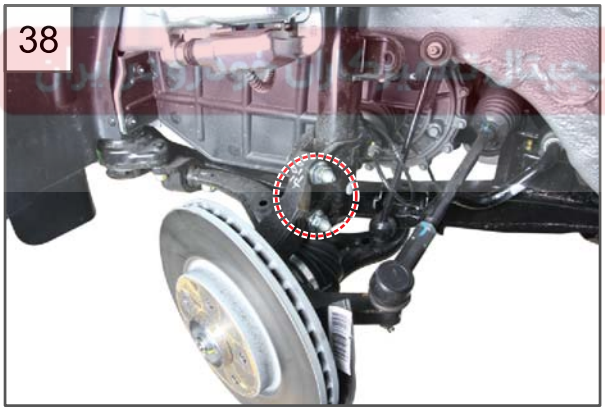
37



37.Unscrew the bolt (A, 10 mm) on the front wheel speed sensor and remove the clamp (B).

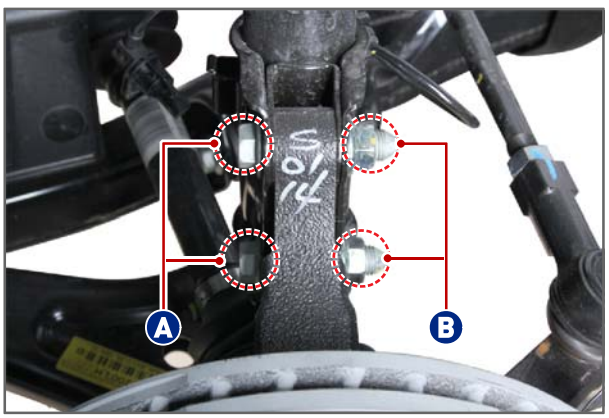
Tightening torque (A) 9.8 ~ 12.8Nm

38



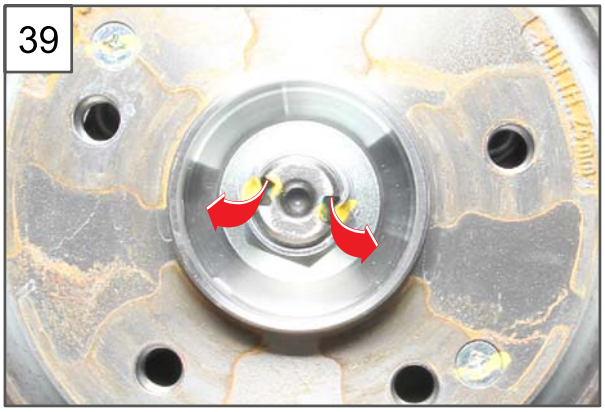
38.Unscrew two bolts (A, 17 mm) and two nuts (B, 19 mm) for shock absorber on damper strut.

Tightening torque 137.2 ~ 156.8Nm



Modification basis	
Application basis	
Affected VIN	

39



39.Unlock the washer and unscrew the nut (30 mm).

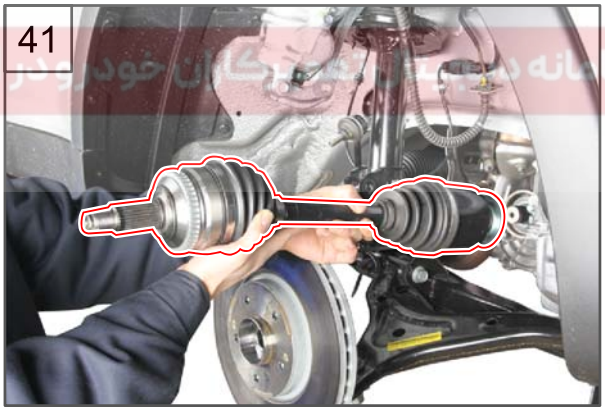
40

40.Remove the front left drive shaft.

NOTE

Refer to Chapter "Drive Shaft" in "CHASSIS".

41

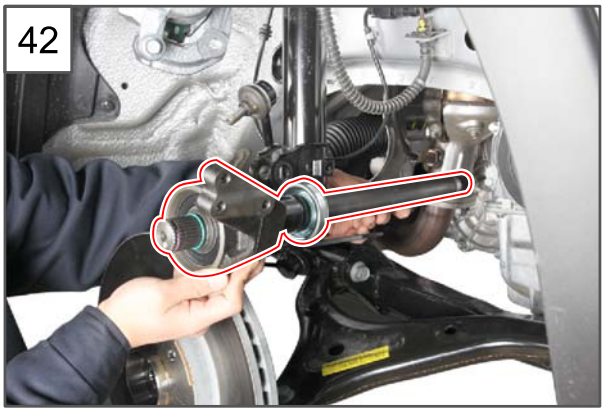


41.Remove the front right drive shaft.

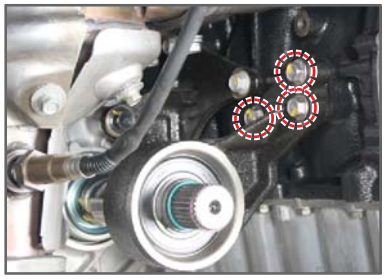
NOTE

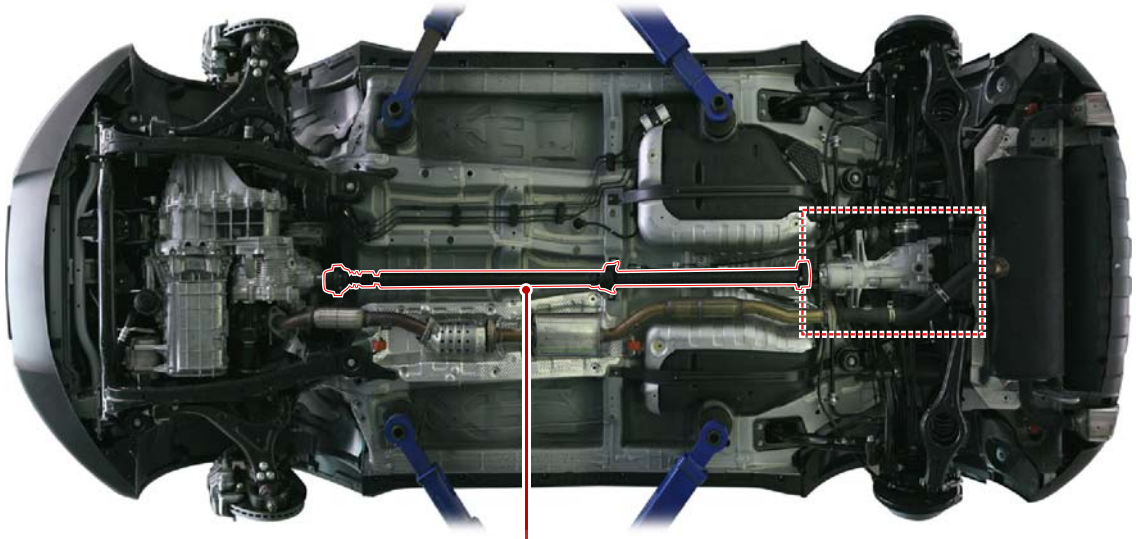
Refer to Chapter "Drive Shaft" in "CHASSIS".

42



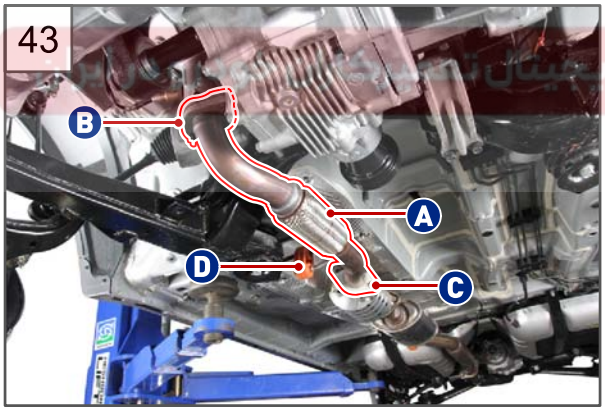
42.Unscrew three bolts (14 mm) and remove the intermediate shaft.





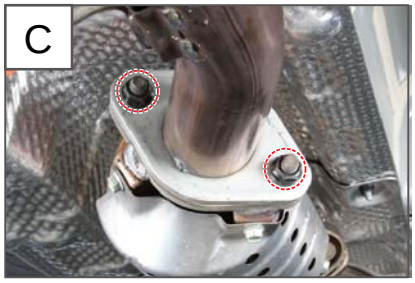
NOTE

Refer to Chapter "Propeller Shaft" in "CHASSIS".

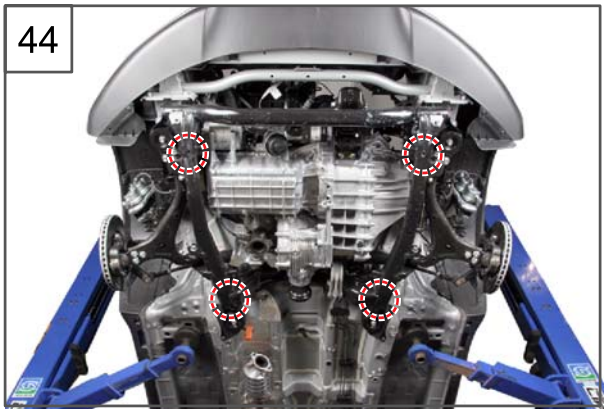


43.Remove the No.1 exhaust pipe (A).

- Unscrew the nut (B): MCC to No.1 exhaust pipe
- Unscrew the nut (C): UCC to No.1 exhaust pipe
- Disengage the support hanger (D) and remove No.1 exhaust pipe.

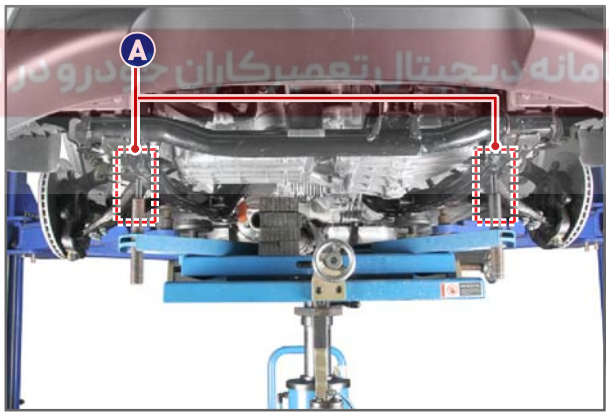


Modification basis	
Application basis	
Affected VIN	

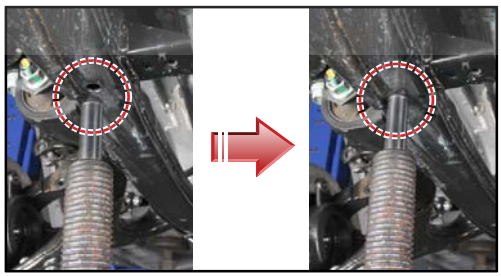


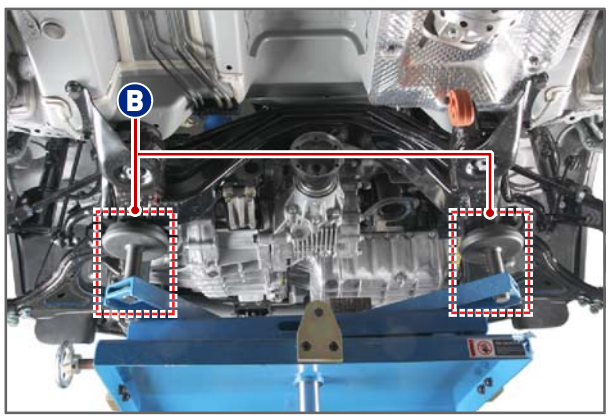
44.Place the special service tool (sub frame jack) at the specified jack-up points of front sub frame.

- Engine & transmission jack (HJ-450)



- Firlmy support the front side of sub frame by placing the engine & transmission jack (HJ-450) in both grooves (A).

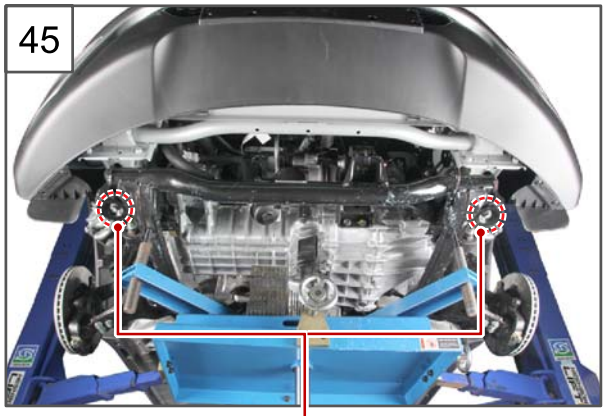


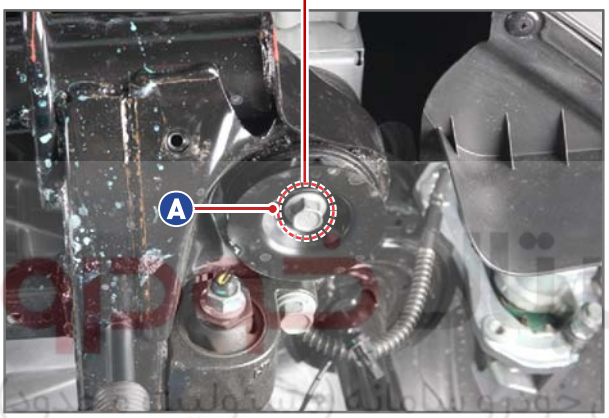


- Firlmy support the rear side of sub frame by placing the engine & transmission jack (HJ-450) at flat surfaces (B).

Modification basis	
Application basis	
Affected VIN	

45

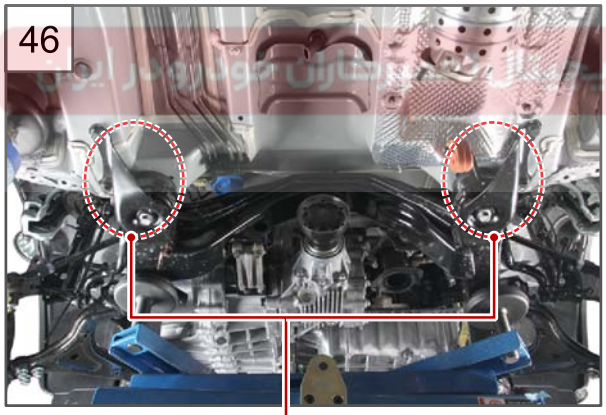


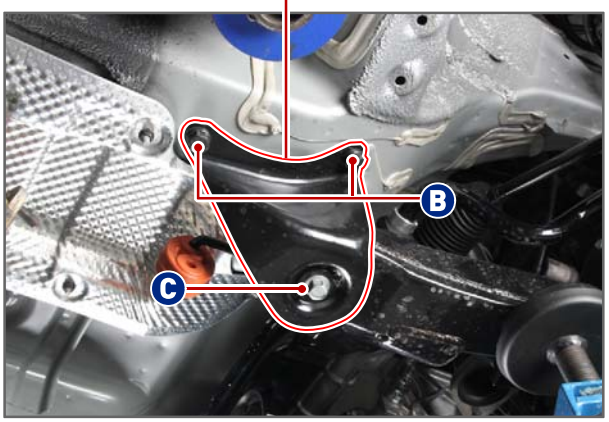


45.Unscrew two bolts (A, 17 mm) from the front side of front sub frame.

Tightening torque (A) 88.2 ~ 107.8Nm

46





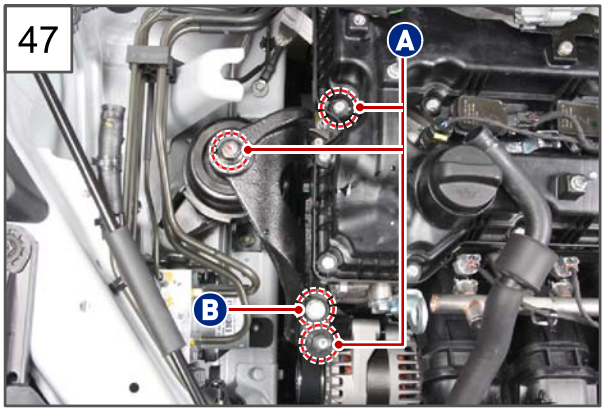
46.Unscrew four mounting cover bolts (B, 17 mm) and two mounting bolts (C, 17 mm) from the rear side of front sub frame.

Tightening torque (B) 88.2 ~ 107.8Nm

Tightening torque (C) 88.2 ~ 107.8Nm

Modification basis	
Application basis	
Affected VIN	

47

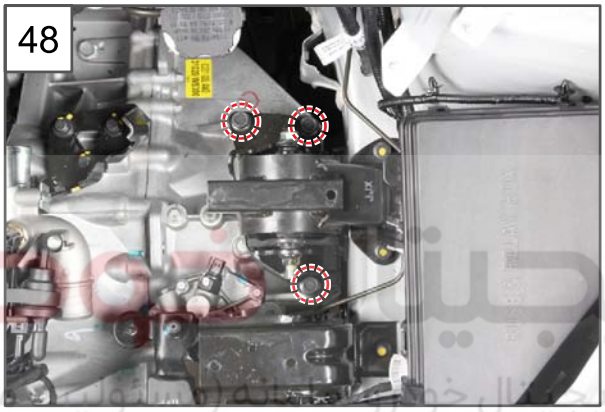


47.Unscrew the bolt (A, 17 mm) and three nuts (B, 17 mm) from the LH mounting bracket.

Tightening torque (A) 55.0 ± 5.0Nm

Tightening torque (B) 55.0 ± 5.0Nm

48

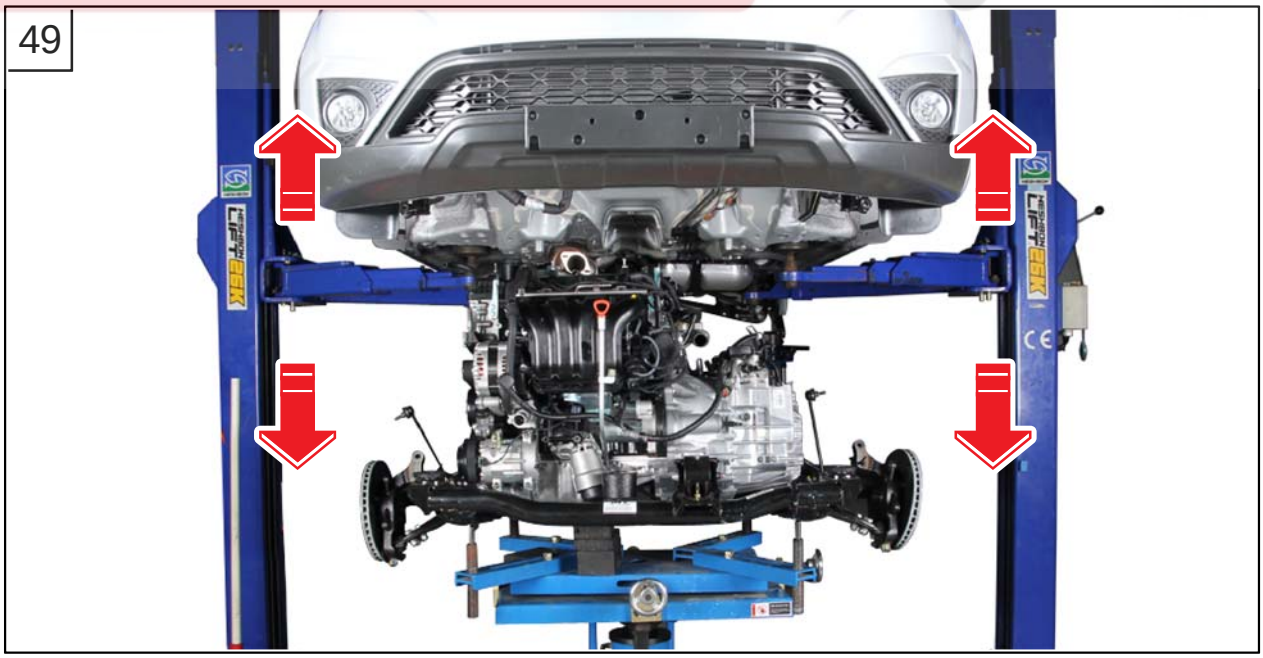


48.Unscrew three bolts (17 mm) from the RH mounting bracket.

Tightening torque 55.0 ± 5.0Nm

49.Lower the sub frame jack slowly by being careful not to interfere with other components in the engine compartment.

49



Modification basis	
Application basis	
Affected VIN	

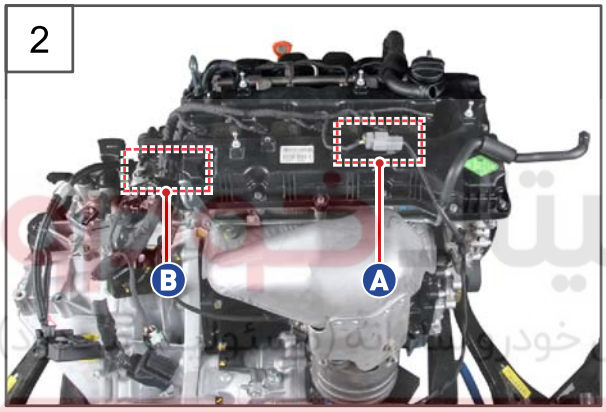
S.G.N.
1128-01 ENGINE OVERHAUL

1) Preceding Works

1

1. Remove the sub frame assembly.
   - Remove the engine and transaxle module. Make sure that it does not interfere with the
   - surrounding parts in the engine compartment.

2



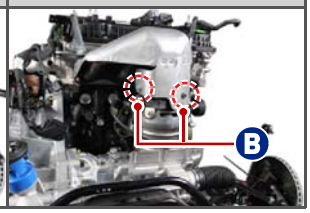
2. Disconnect the front and rear oxygen sensor connectors.

Rear connector	Front connector
	

3

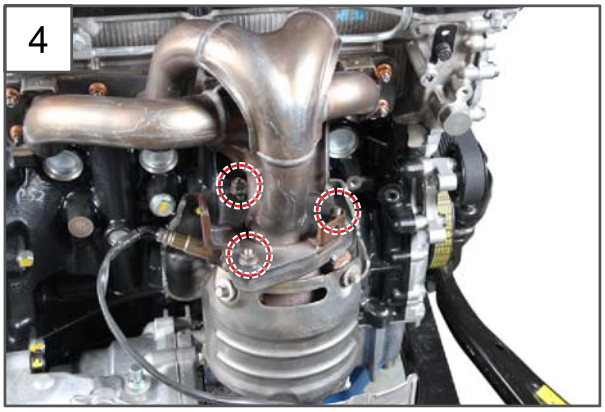
3. Unscrew five bolts (10 mm) and remove the heat protector.

Tightening torque 10.0 ± 1.0Nm

Upper bolt	Lower bolt
	

Modification basis	
Application basis	
Affected VIN	

4



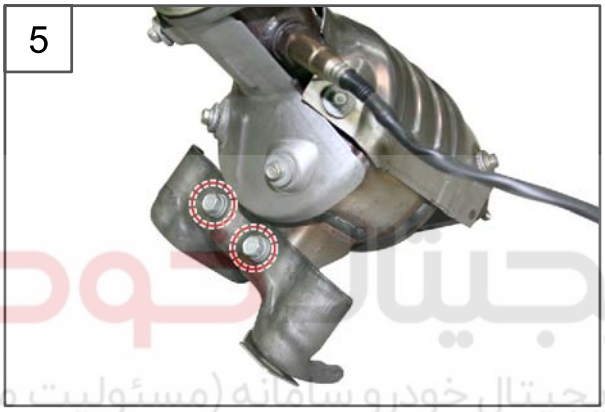
4. Unscrew the WCC complete mounting nuts (12 mm) from the exhaust manifold.

Tightening torque 40.0 ± 5.0Nm

CAUTION

Replace the nuts with new ones.

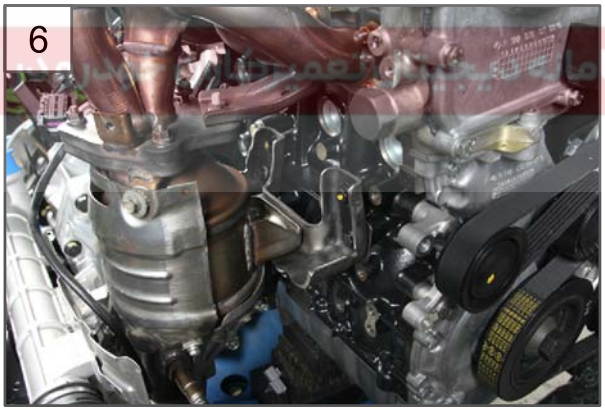
5



5. Loosen two lower bolts (12 mm) on the WCC complete.

Tightening torque 40.0 ± 5.0Nm

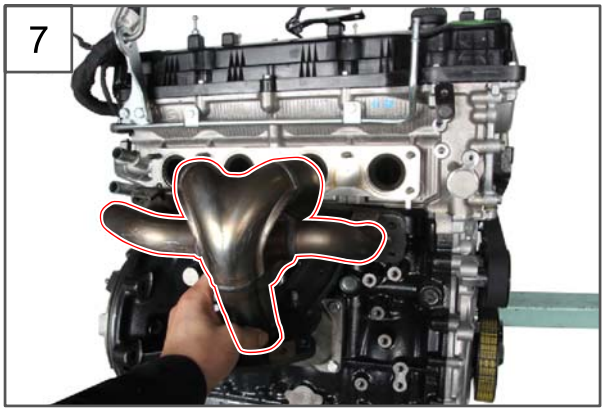
6



6. Unscrew four bolts (12 mm) from the bracket and remove the WCC complete with bracket.

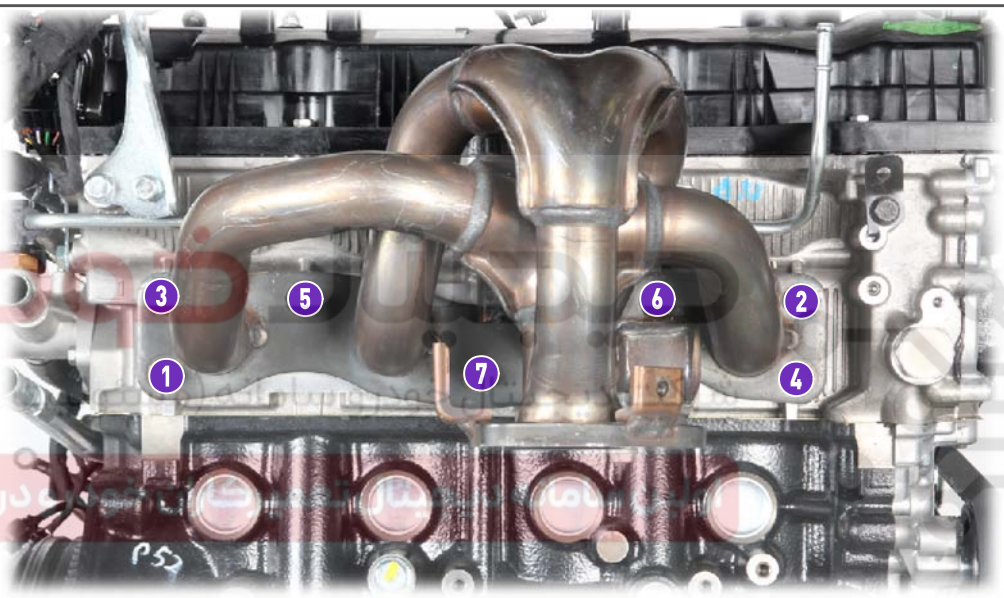
Tightening torque 40.0 ± 5.0Nm

7



7. Unscrew 7 exhaust manifold bolts (12 mm) in numerical order in the figure below.

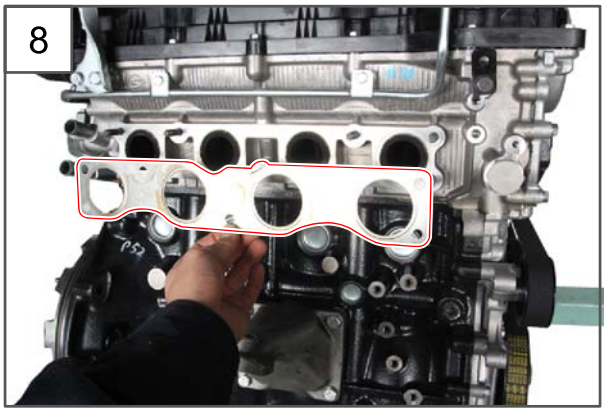
Tightening torque 15.0 ± 1.5Nm



1 → 2 → 3 → 4 → 5 → 6 → 7

Unscrew the exhaust manifold bolts slowly in two or more steps according to the specified sequence.

8



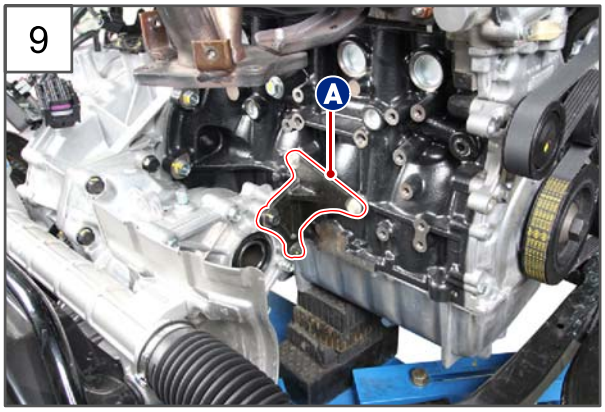
8. Take off the exhaust manifold gasket.

CAUTION

Replace the gasket with new one.

Modification basis	
Application basis	
Affected VIN	

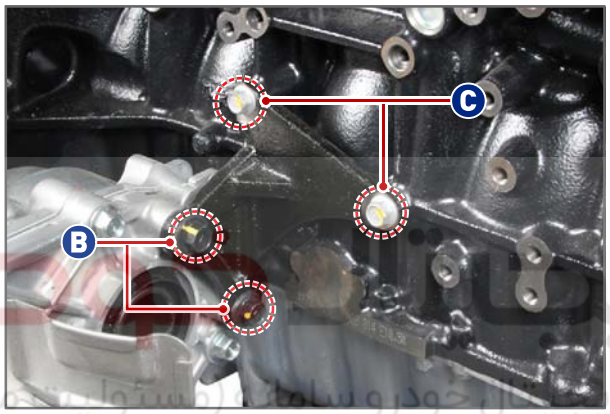
9



9. Unscrew the bolt (B), (C) and remove the PTU bracket (A).

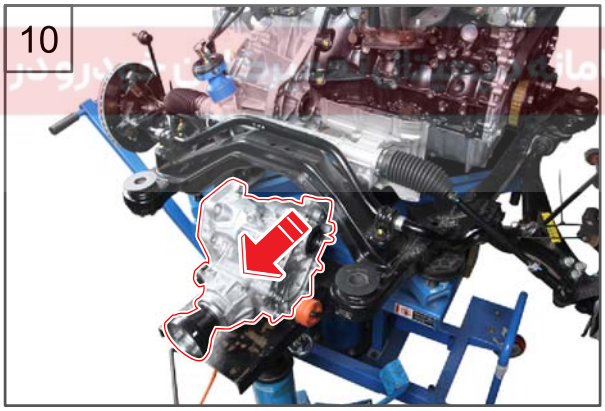
NOTE

Refer to Chapter "Axle" in "CHASSIS".



- Unscrew two bolts (B, 14 mm) and two bolts (C, 12 mm).

10



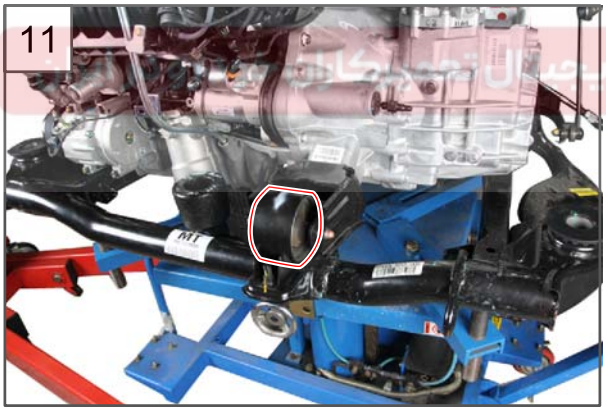
10.Remove the PTU assembly.

NOTE

Refer to Chapter "Axle" in "CHASSIS".

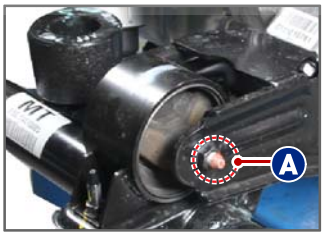
Unscrew the transaxle mounting bolts and remove the engine assembly with transaxle from the front sub frame.

11

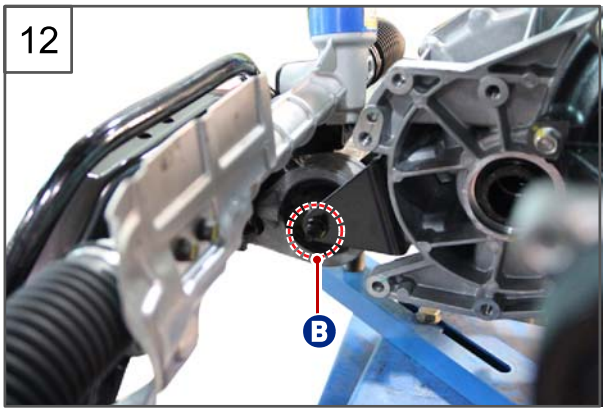


11.Unscrew the through bolt (A) at front side of transaxle.

Tightening torque 68.6 ~ 88.2Nm



12

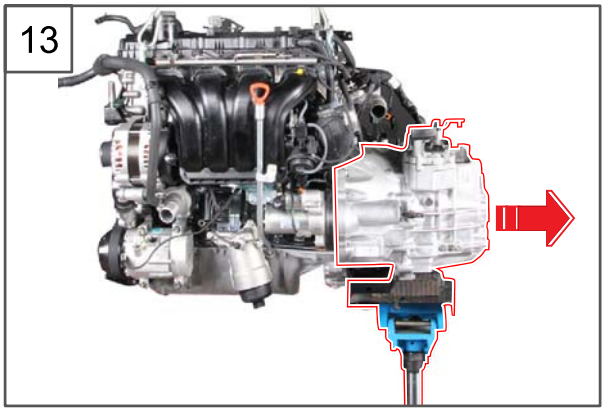


12.Unscrew the through bolt (B) at rear side of transaxle.

Tightening torque 68.6 ~ 88.2Nm

Modification basis	
Application basis	
Affected VIN	

13



13.Secure the engine assembly with the engine crane and the transmission jack, and remove the transaxle assembly.

NOTE
Refer to Chapter "Manual Transaxle" in "CHASSIS".

14

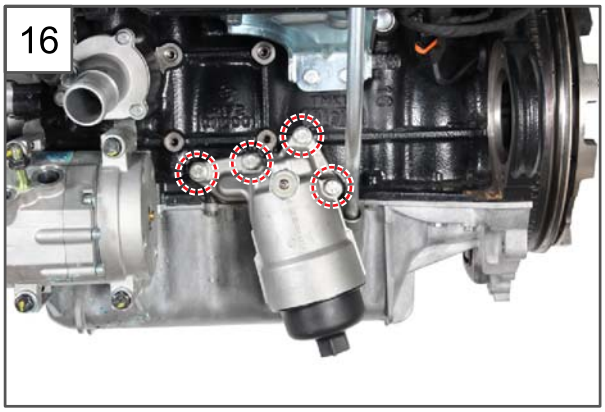
14.Remove the clutch pressure plate.

NOTE
Refer to Chapter "Manual Transaxle" in "CHASSIS".

15

15.Disconnect the oil pressure switch connector.

16



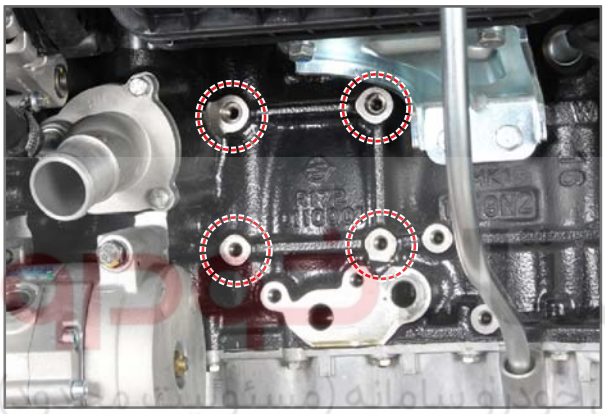
16.Unscrew four bolts (13 mm) and remove the oil filter assembly.

Tightening torque 25.0 ± 2.5Nm

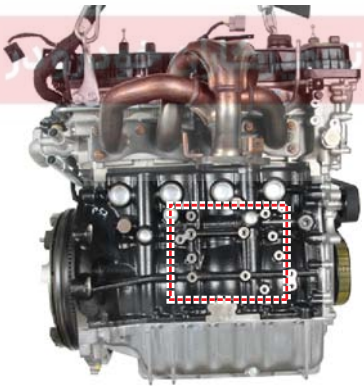
CAUTION
Make sure not to spill out the engine oil through the oil supply lines.

17

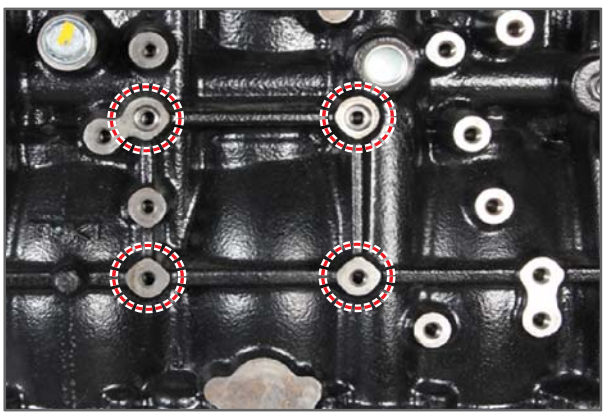
17.Install the left mounting bracket.

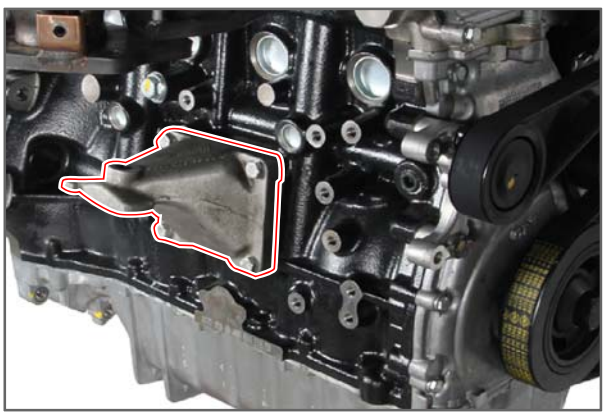


18



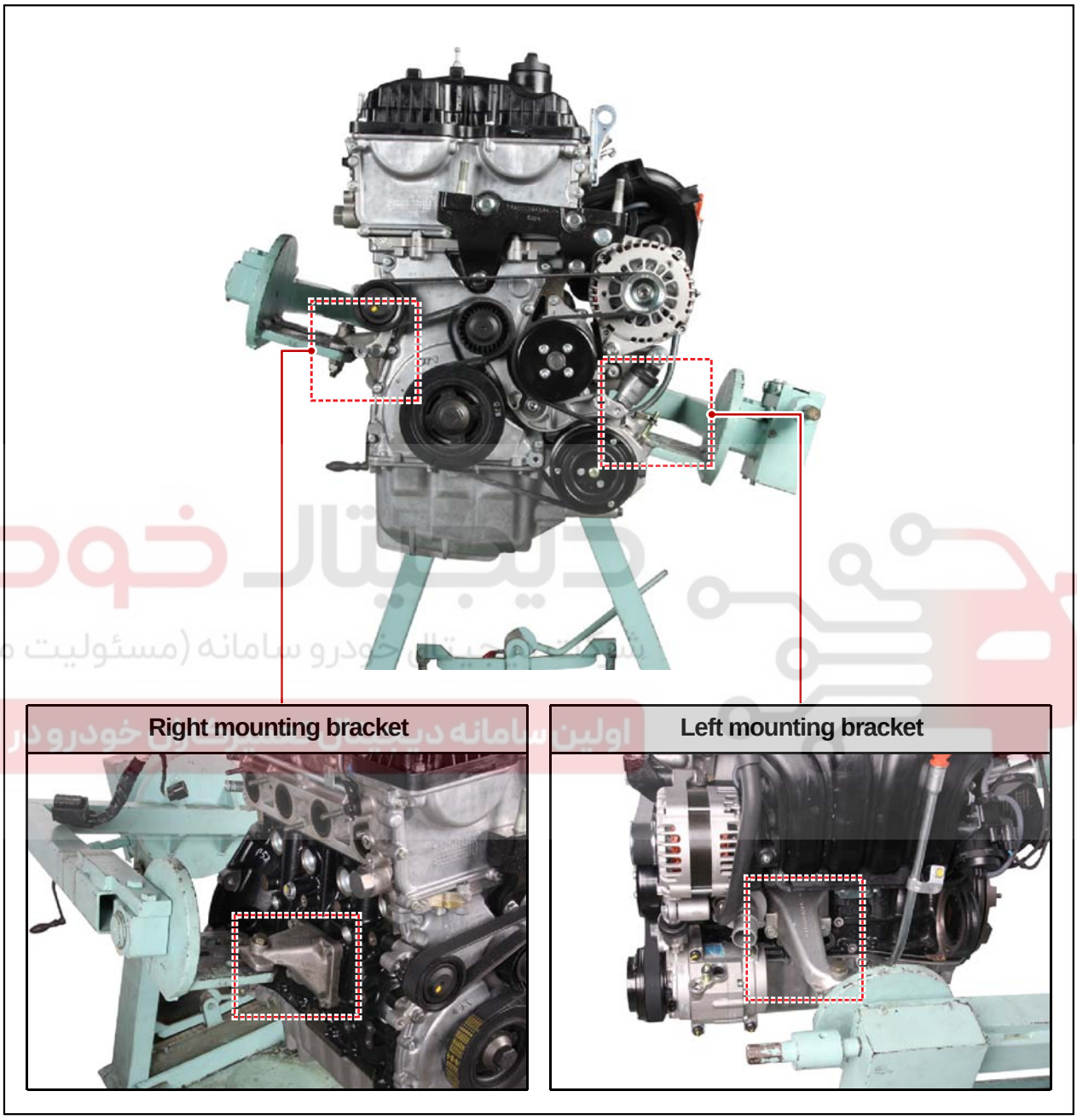
18.Install the right mounting bracket.





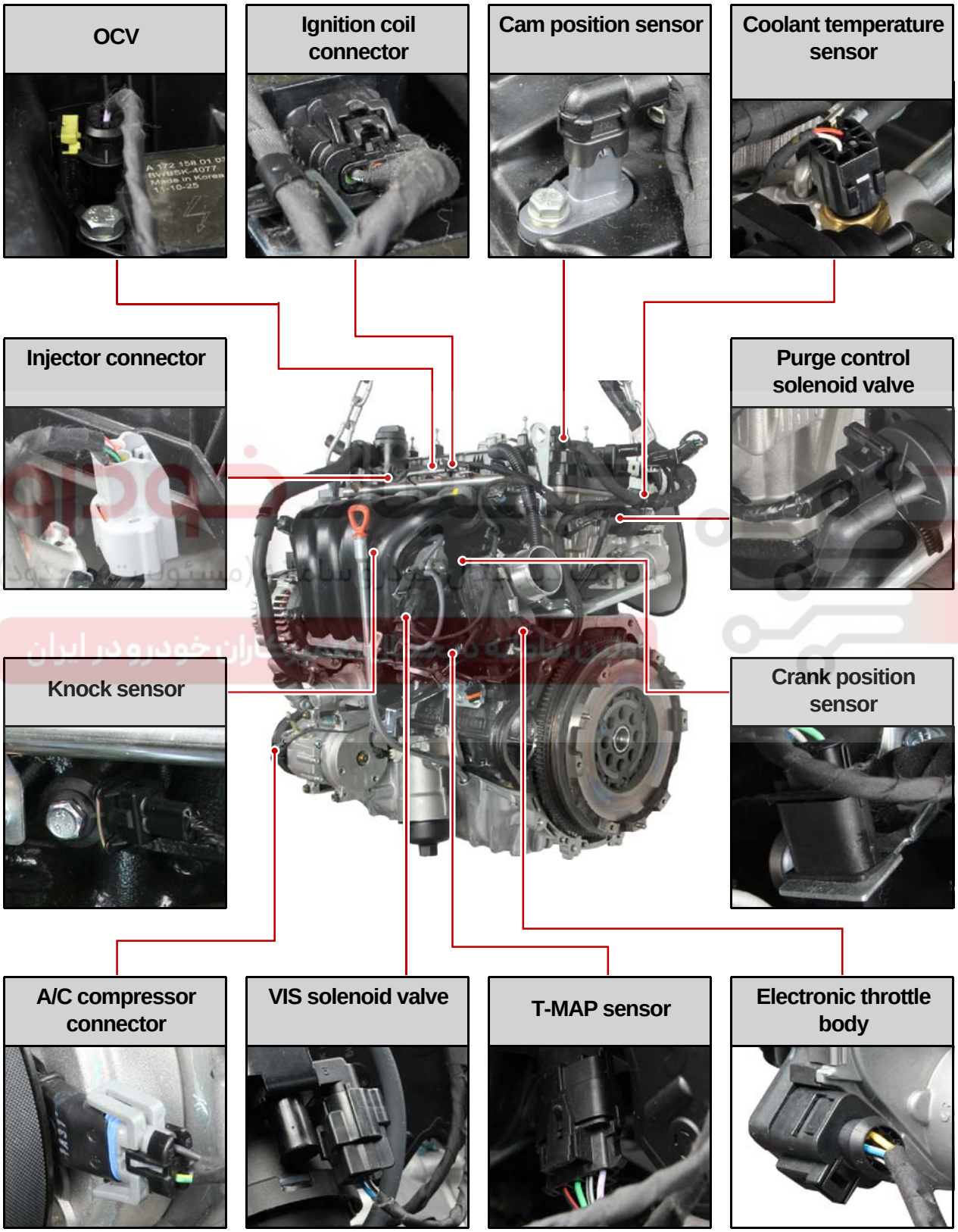
Modification basis	
Application basis	
Affected VIN	

19.Set the engine assembly on the engine stand.



2) Disassembly

1. Remove the engine wiring harnesses.



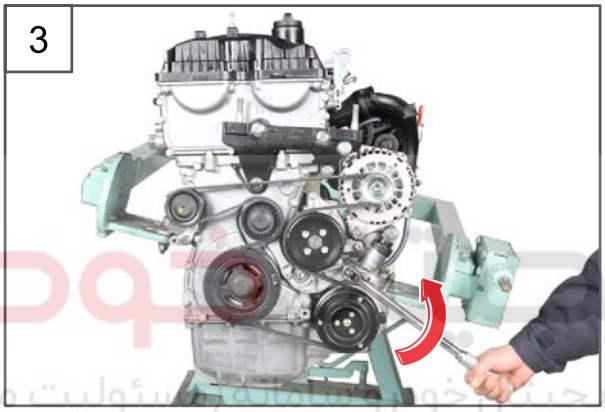
Modification basis	
Application basis	
Affected VIN	

2

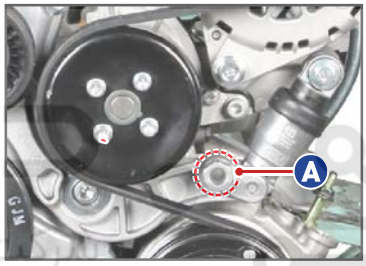
2. Loosen four bolts (hexagon L-wrench, 5 mm) on the water pump pulley.

Tightening torque 10.0 ± 1.0Nm

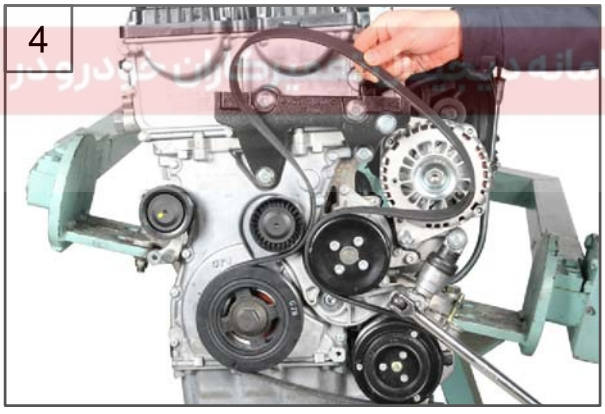
3



3. Release the tension by turning the hydraulic tensioner adjust bolt (A) counterclockwise.

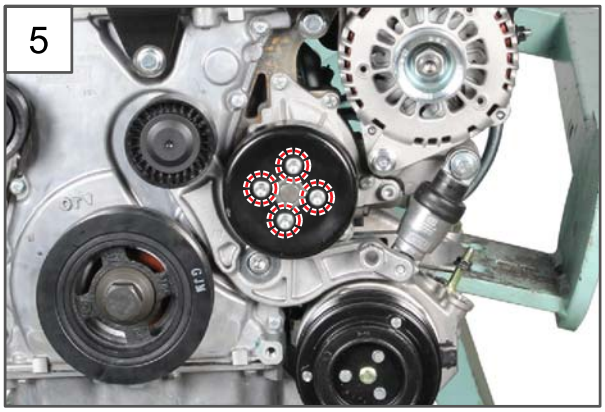


4



4. Remove the fan belt.

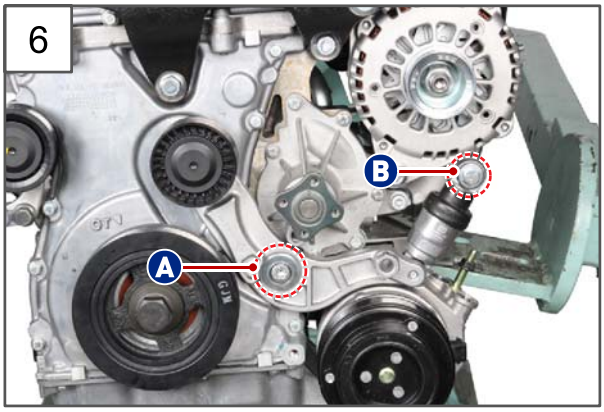
5



5. Unscrew four loosened bolts (5 mm) and remove the water pump pulley.

Modification basis	
Application basis	
Affected VIN	

6

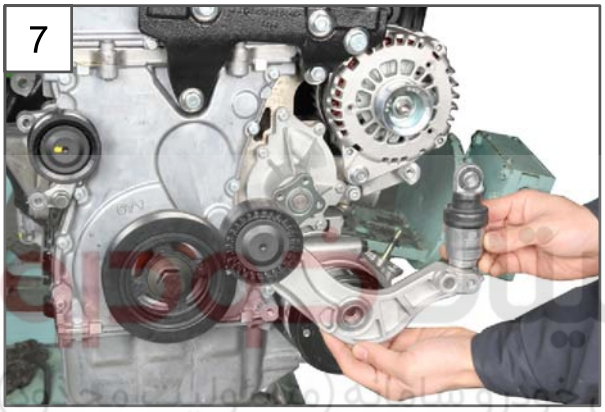


6. Unscrew the bolt (A, 8 mm) from the hydraulic tensioner pivot and the upper bolt (B, 13 mm) from the hydraulic tensioner.

Tightening torque (A) 82.0 ± 5.0Nm

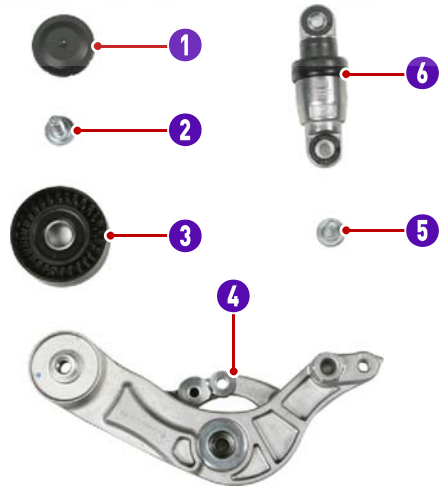
Tightening torque (B) 32.0 ± 3.2Nm

7



7. Remove the hydraulic tensioner assembly.

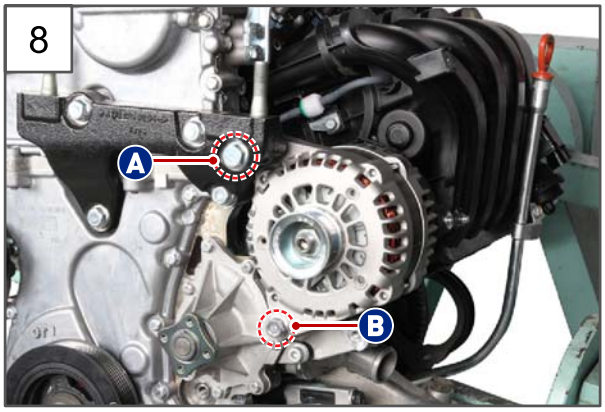
Components



No	Name
1	Tensioner pulley cap
2	Tensioner pulley bolt
3	Tensioner pulley
4	Lever arm
5	Hydraulic tensioner bolt
6	Hydraulic tensioner

Modification basis	
Application basis	
Affected VIN	

8

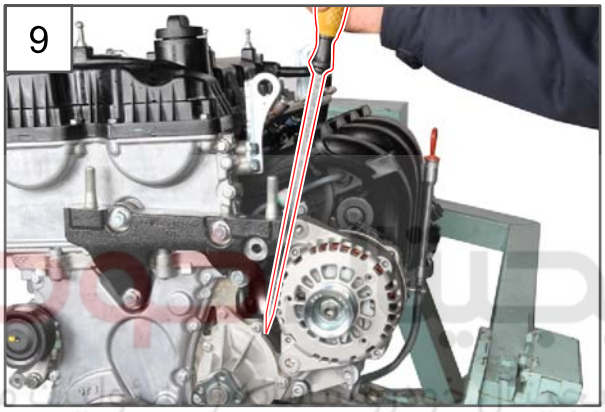


8. Unscrew the upper mounting bolt (A, 17 mm) and the lower mounting bolt (B, 15 mm).

Tightening torque (A) 45.0 ± 4.5Nm

Tightening torque (B) 45.0 ± 4.5Nm

9

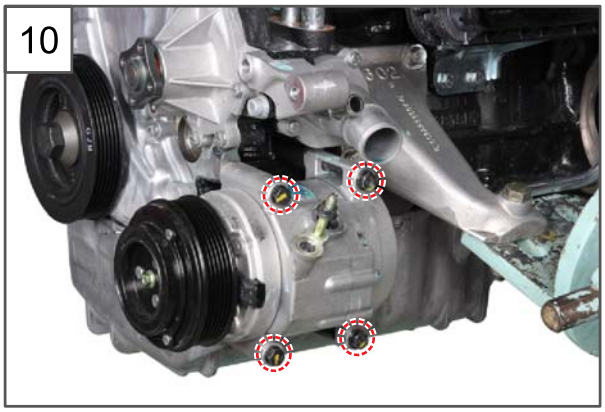


9. Pull the alternator outward with a long screwdriver and remove the alternator.

NOTE

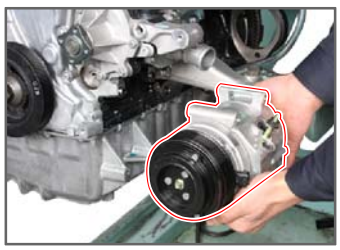
To make the reassembly easy, slide the bushing in bracket to arrow direction (A).

10



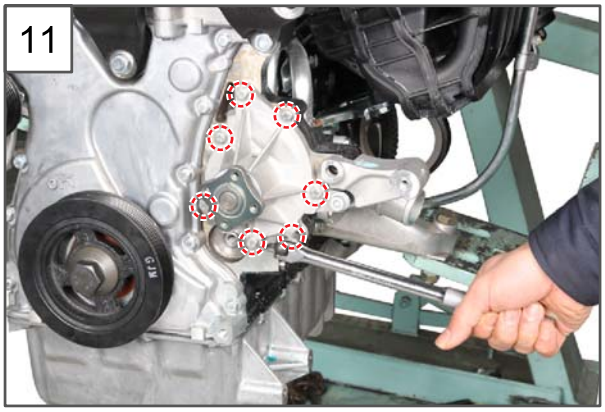
10. Unscrew four bolts (13 mm) and remove the air conditioner compressor.

Tightening torque 25.0 ± 2.5Nm



Modification basis	
Application basis	
Affected VIN	

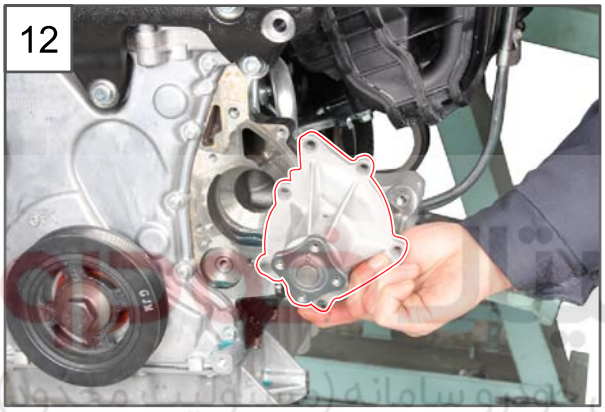
11



11.Unscrew 7 bolts (10 mm) on the water pump assembly.

Tightening torque 10.0 ± 1.0Nm

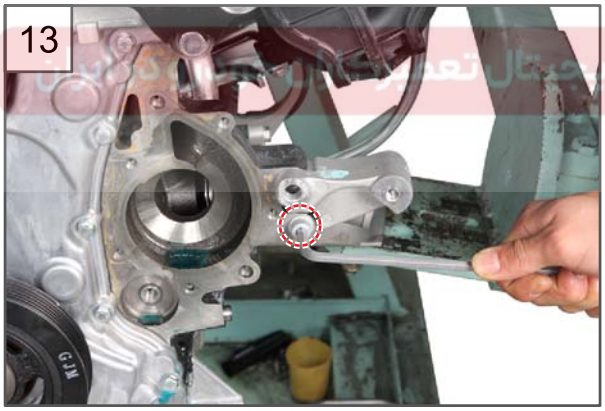
12



12.Remove the water pump assembly.

CAUTION
Make sure not to spill out the coolant through the coolant lines.

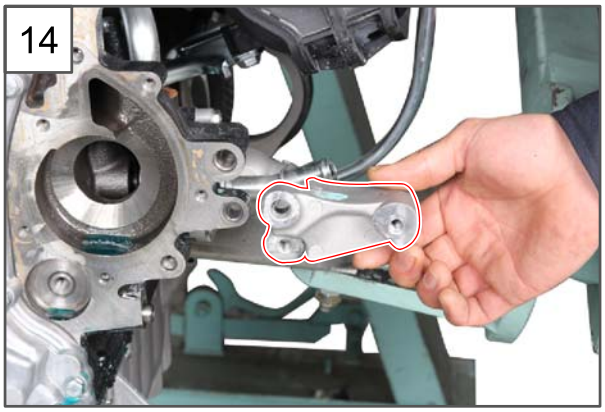
13



13.Unscrew the upper bracket mounting bolt (6 mm) of hydraulic auto tensioner.

Tightening torque 25.0 ± 2.5Nm

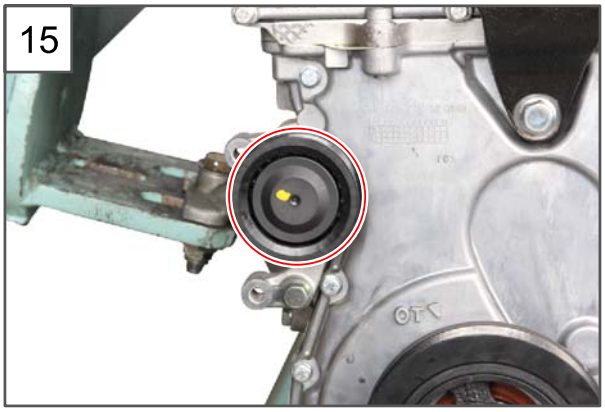
14



14.Remove the bracket.

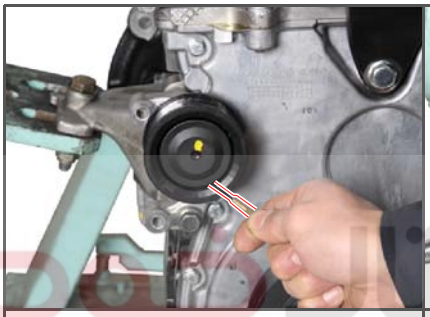
Modification basis	
Application basis	
Affected VIN	

15

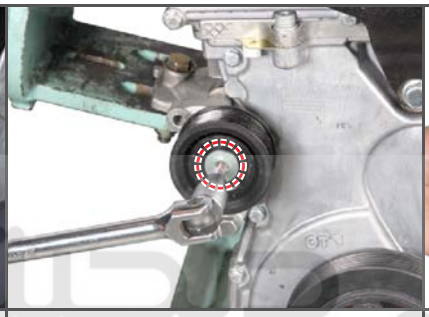


15.Remove the EPS idler pulley.

Tightening torque 25.0 ± 2.5Nm



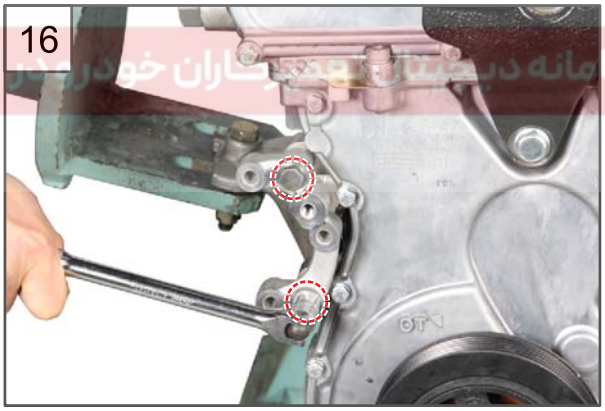
Pry off the idler pulley cover with a flat blde screwdriver.



Unscrew the idler pulley bolt (T-50).

Remove the idler pulley.

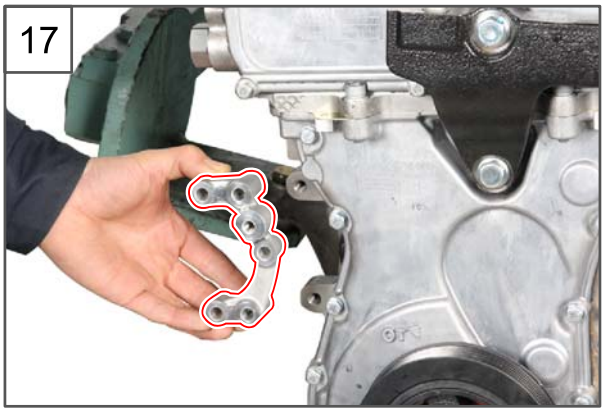
16



16.Unscrew two bolts (13 mm) from the EPS idler pulley bracket.

Tightening torque 30.0 ± 3.0Nm

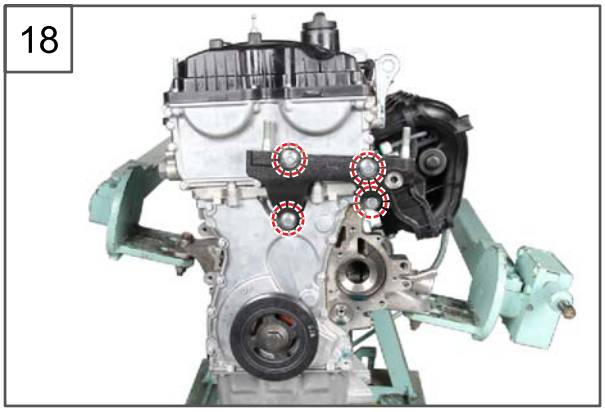
17



17.Remove the EPS idler pulley bracket.

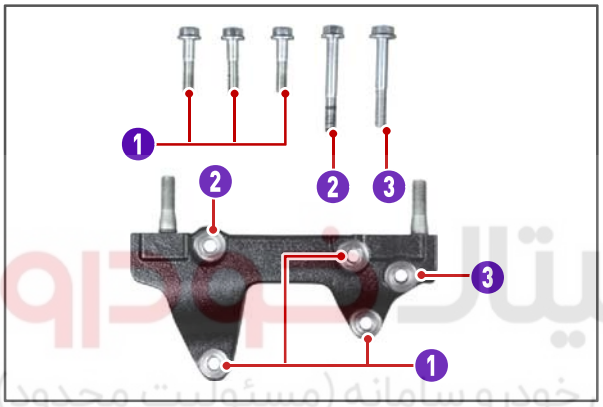
Modification basis	
Application basis	
Affected VIN	

18



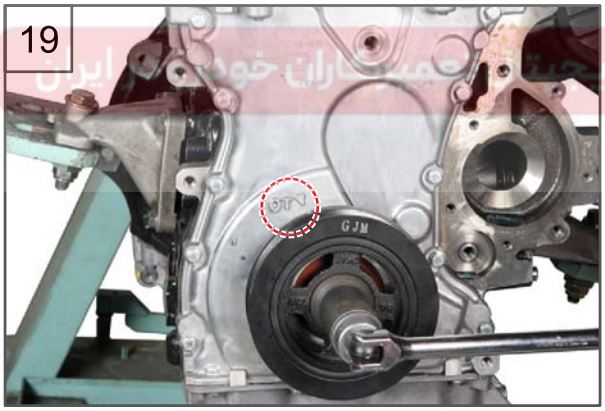
18.Unscrew four bolts (15 mm) and remove the lower engine mounting bracket.

Tightening torque 60.0 ± 6.0Nm



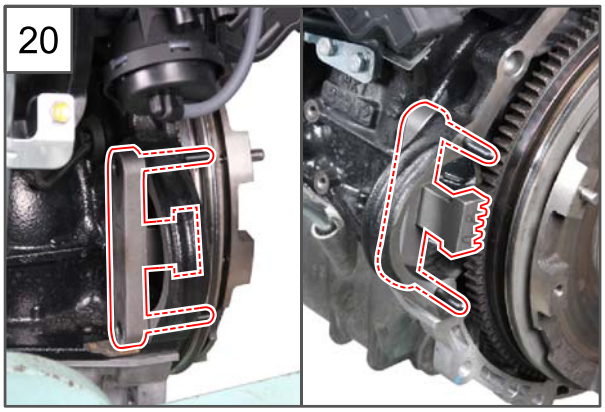
No	Name	Bolt size
1	Lower bolt	M10 * 45
2	Lower bolt	M10 * 77
3	Alternator bolt	M10

19



19.Align the timing marks by turning the crankshaft pulley counterclockwise.

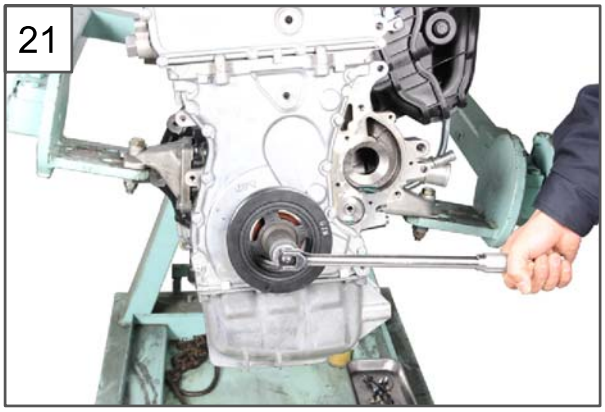
20



20.Lock the flywheel with the special service tool.

Modification basis	
Application basis	
Affected VIN	

21

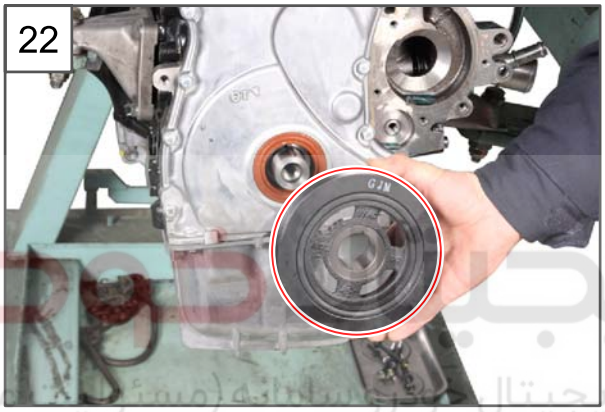


21.Unscrew the center bolt (27 mm) from the crankshaft pulley.

Tightening torque (1) 200 + 20Nm

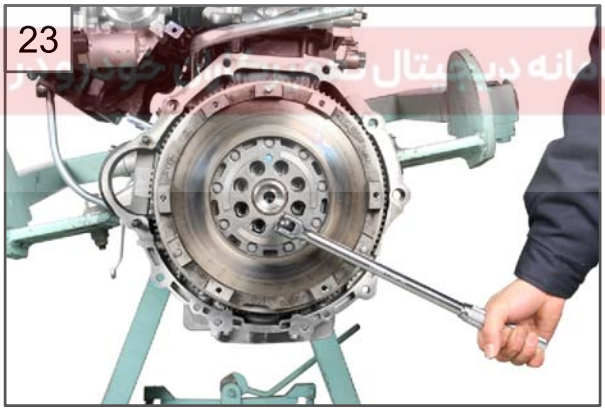
Tightening torque (2) 90° + 10°

22



22.Remove the crankshaft pulley.

23



23.Lock the flywheel with the special service tool and unscrew six bolts (T55).

Tightening torque (1) 45.0 + 5.0Nm

Tightening torque (2) 90° + 10°

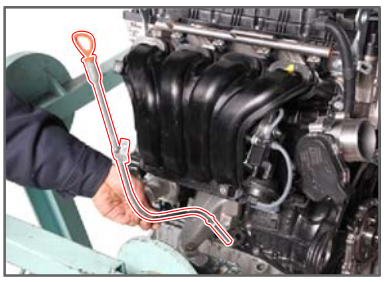
24

24.Remove the flywheel assembly.

Modification basis	
Application basis	
Affected VIN	

25

25.Unscrew the bolt (10 mm) and remove the oil dipstick gauge.

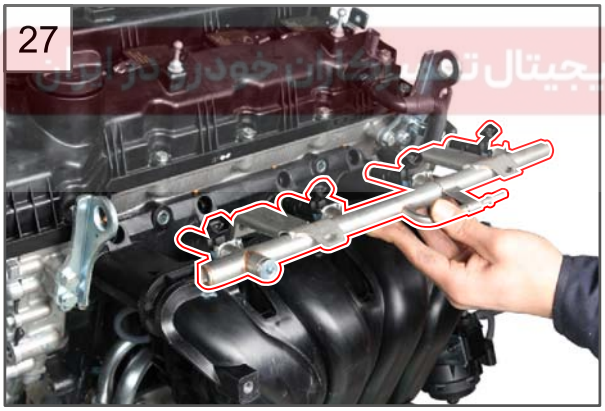


26

26.Unscrew two bolts (6 mm) from the fuel rail.

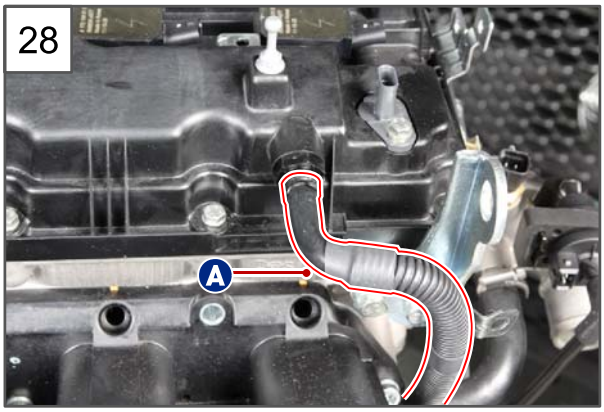
Tightening torque 25.0 ± 2.5Nm

27



27.Remove the fuel rail assembly.

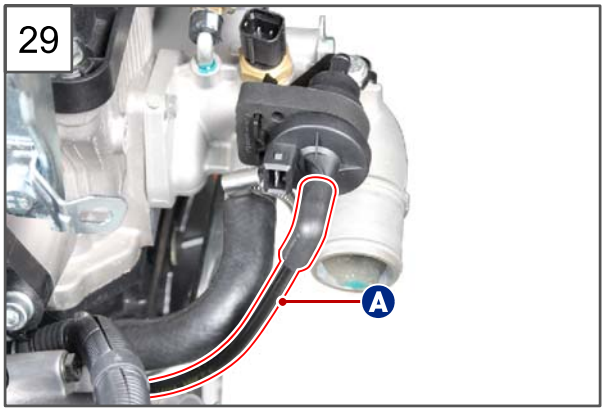
28



28.Remove the PCV valve hose (A).

Modification basis	
Application basis	
Affected VIN	

29



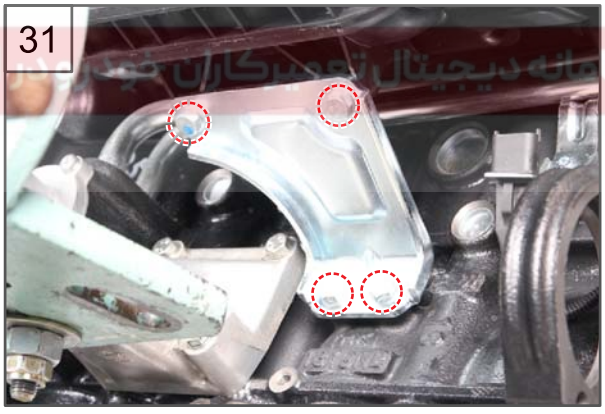
29.Remove the vacuum hose (A) between purge control solenoid valve and intake manifold.

30

30.Unscrew three upper bolts (6 mm) from the intake manifold.

Tightening torque 25.0 ± 2.5Nm

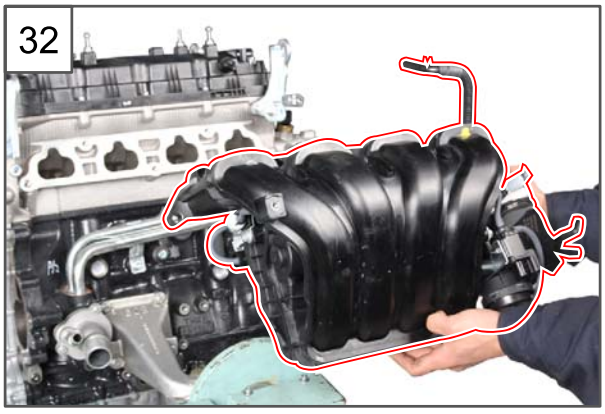
31



31.Unscrew four bolts (13 mm) from the intake manifold lower bracket.

Tightening torque 25.0 ± 2.5Nm

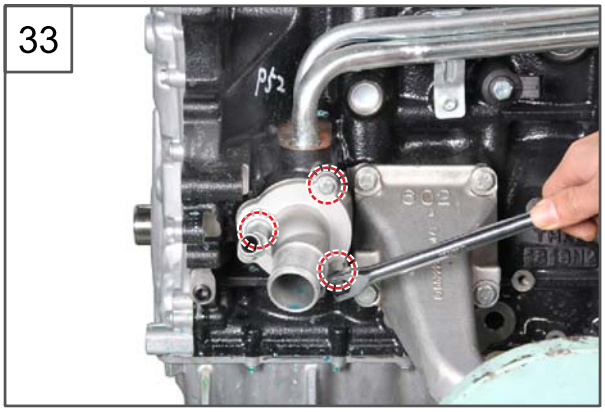
32



32.Remove the intake manifold assembly.

Modification basis	
Application basis	
Affected VIN	

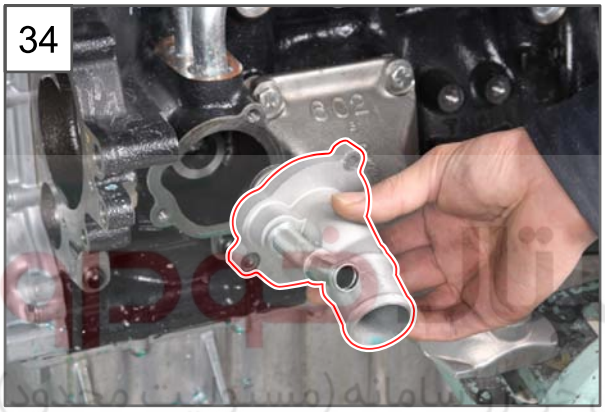
33



33.Unscrew three bolts (10 mm) from the thermostat.

Tightening torque 10.0 ± 1.0Nm

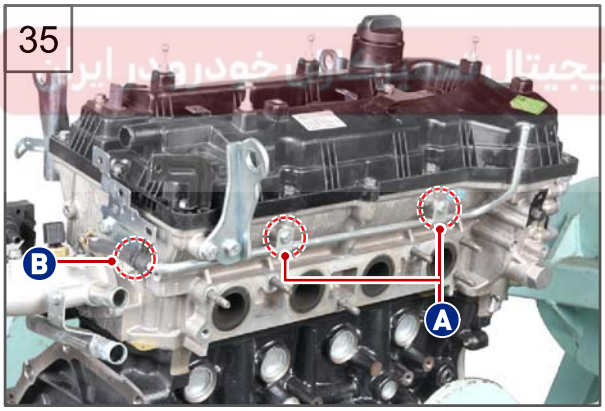
34



34.Remove the thermostat.

CAUTION
Make sure not to spill out the coolant through the coolant lines.

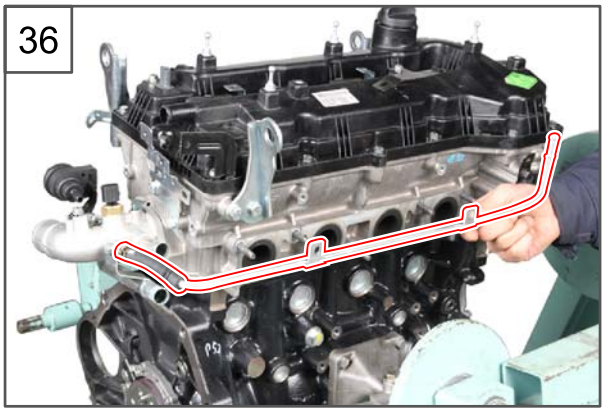
35



35.Unscrew two bolts (A, 10 mm) and release the clamp (B) on the deaeration engine hose.

Tightening torque 10.0 ± 1.0Nm

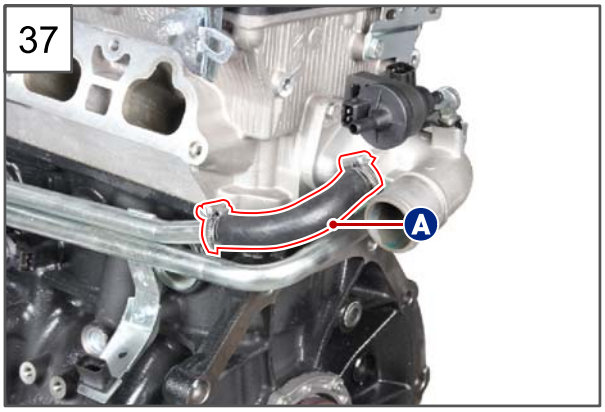
36



36.Remove the deaeration engine hose.

Modification basis	
Application basis	
Affected VIN	

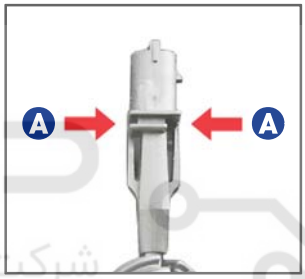
37



37.Remove the coolant outlet port and coolant hose (A) to coolant pipe.

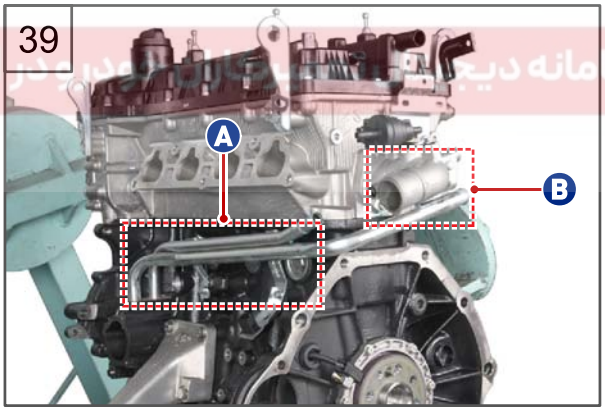
38

38.Disconnect the crankshaft position sensor connector.



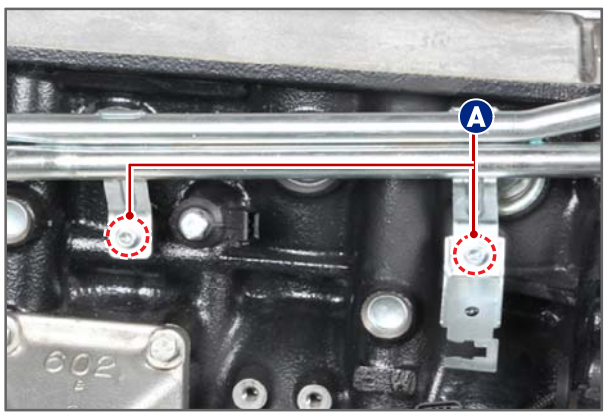
Press the locks (A) and remove it from the bracket.

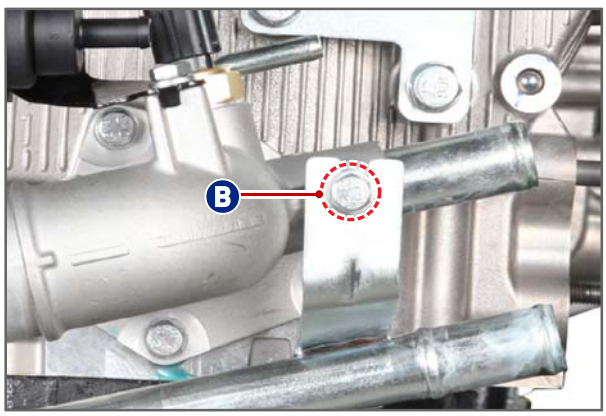
39



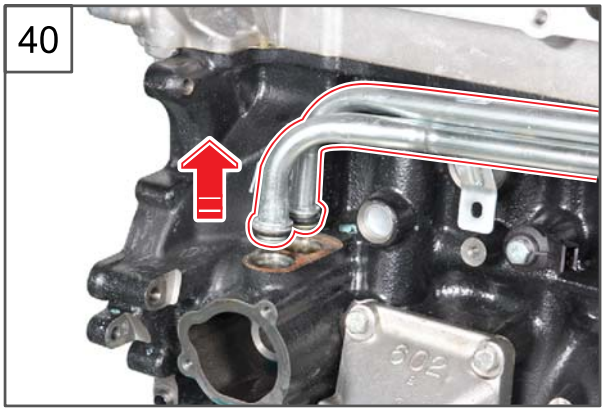
39.Unscrew two bolts (A, 5 mm) and one bolt (B, 10 mm) and remove the coolant pipe.

Tightening torque 10.0 ± 1.0Nm

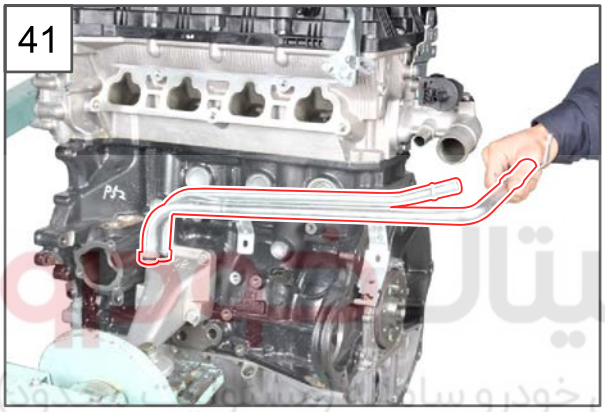




Modification basis	
Application basis	
Affected VIN	



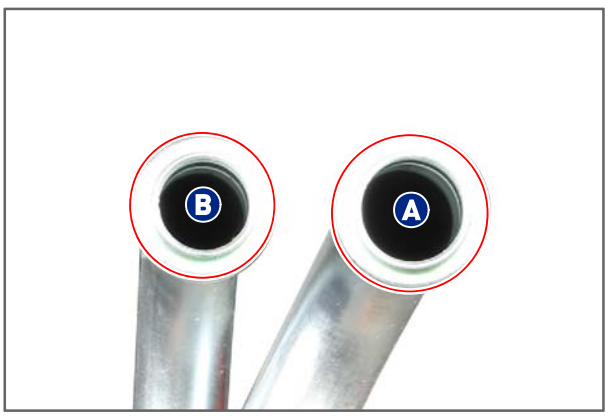
40.Separate the coolant pipes from the thermostat housing.



41.Remove the coolant pipes.

CAUTION

Replace the O-rings in coolant pipe with new ones.



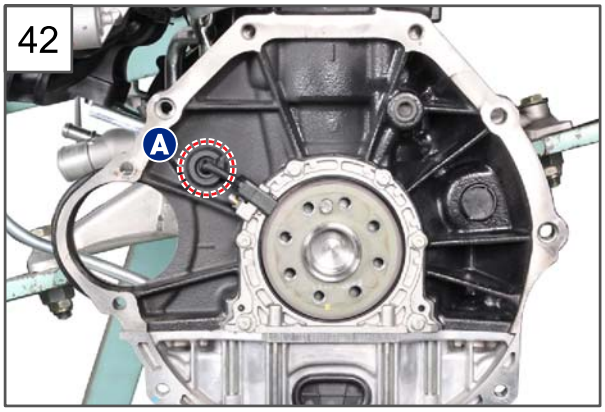
NOTE

O-ring can be identified by diameter

- A (large): for heater return pipe
- B (small): for coolant bypass pipe

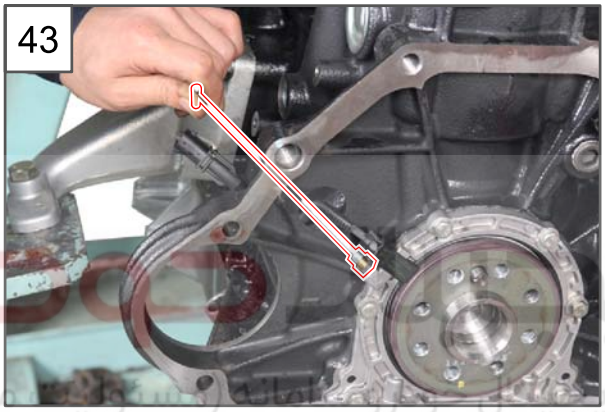
Modification basis	
Application basis	
Affected VIN	

42



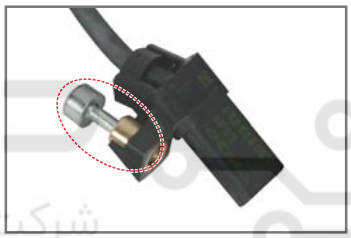
42.Remove the dust cover (A) on the crankshaft position sensor.

43

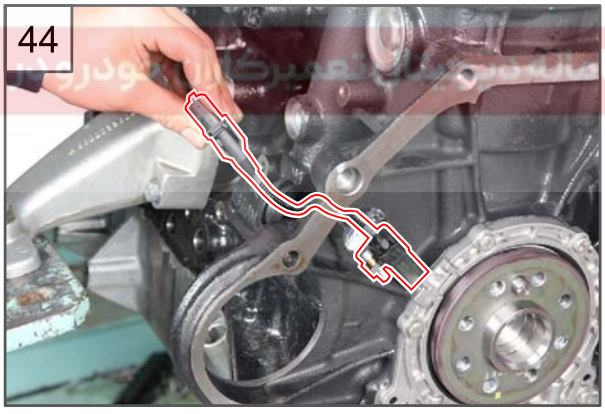


43.Unscrew the bolt (4 mm) from the crankshaft position sensor.

Tightening torque 10.0 ± 1.0Nm



44



44.Remove the crankshaft position sensor.

45

45.Remove the trigger ring.

CAUTION
Do NOT keep the trigger ring near the magnetic attach driver and any magnet.

Modification basis	
Application basis	
Affected VIN	

46

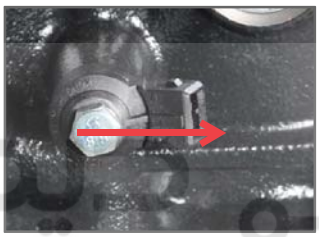
46.Unscrew the bolt (13 mm) on the knock sensor.

Tightening torque 25.5 ± 5.0Nm

47

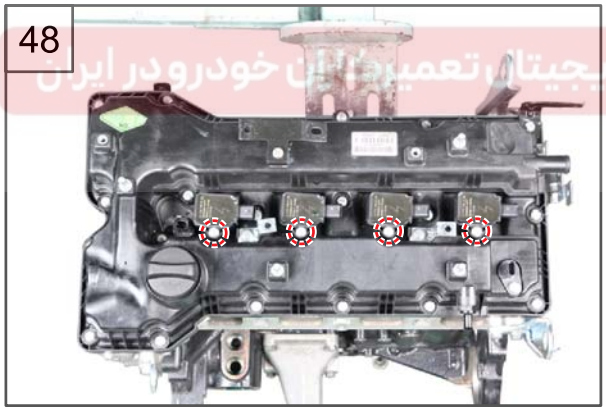
47.Remove the knock sensor.

CAUTION



When installing, place the connector facing to 3 o'clock.

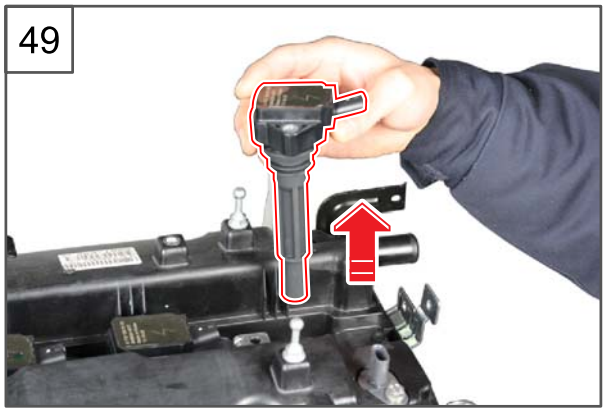
48



48.Unscrew four bolts (10 mm) from the ignition coil.

Tightening torque 7.8 ± 0.6Nm

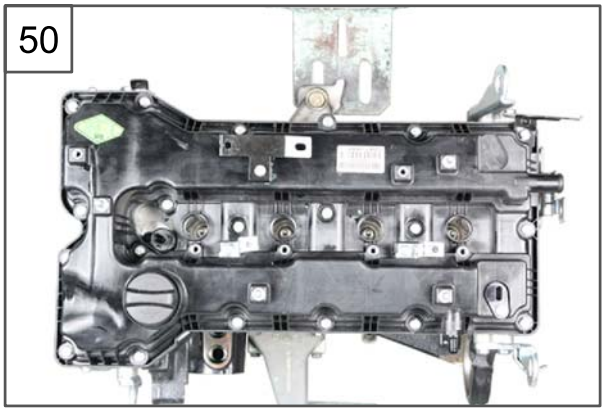
49



49.Remove the ignition coils.

Modification basis	
Application basis	
Affected VIN	

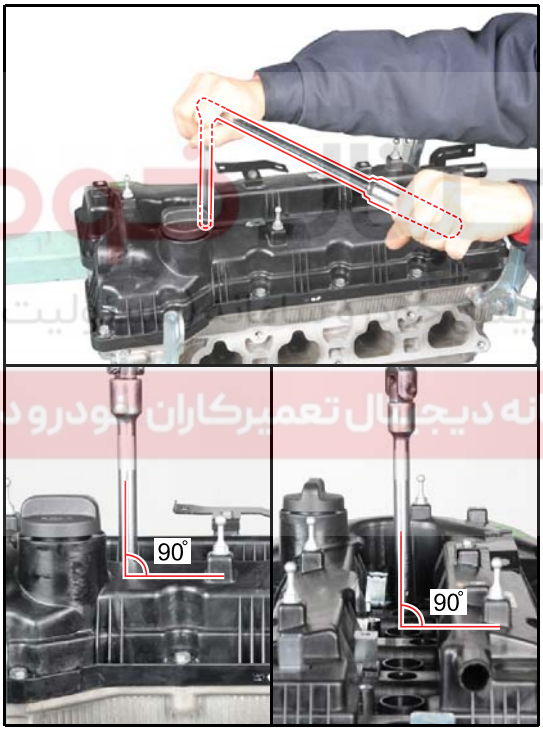
50



50.Remove the spark plug from each cylinder.

Tightening torque 25.5 ± 5.0Nm

Cautions when removing the spark plug



CAUTION

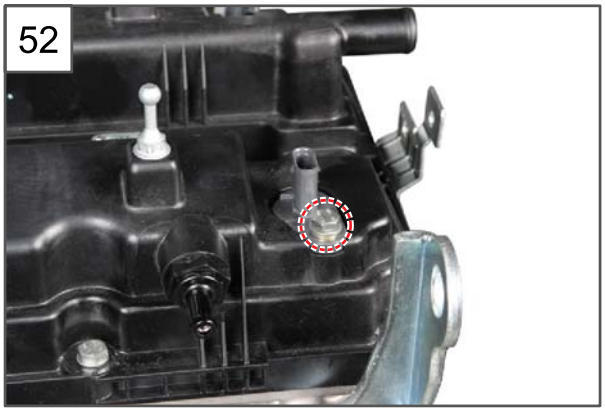
To prevent the spark plug from damaging during removal, the tool should be used in perpendicular.

51

51.Remove the spark plug.

Modification basis	
Application basis	
Affected VIN	

52



52.Unscrew the camshaft position sensor mounting bolt (10 mm) on the cylinder head cover.

Tightening torque 12.0 ± 2.0Nm

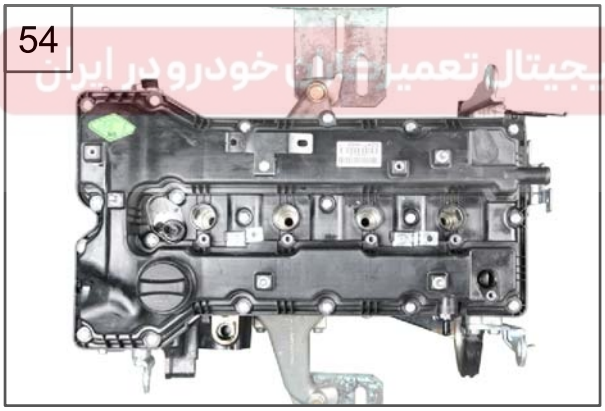
53

53.Remove the camshaft position sensor.

CAUTION

Apply the engine oil on the O-ring and turn the camshaft position sensor right and left when installing it.

54



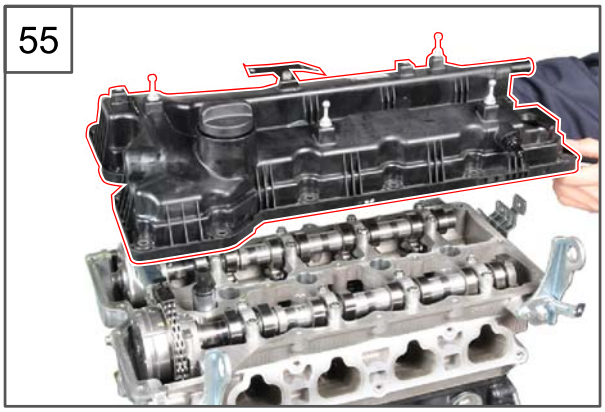
54.Unscrew 20 cylinder head cover bolts in diagonal sequence from outside.

Tightening torque 10.0 ± 1.0Nm

CAUTION

To prevent the cylinder head ciover from damaging and distorting, unscrew the bolts slowly in two or more steps.

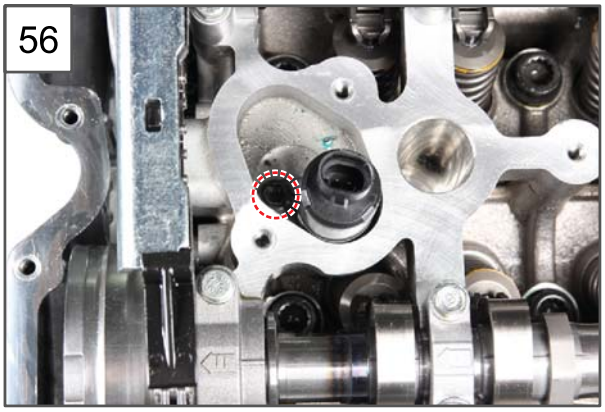
55



55.Remove the cylinder head cover.

Modification basis	
Application basis	
Affected VIN	

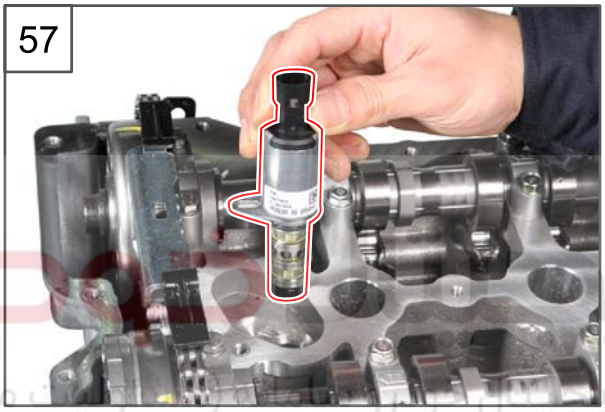
56



56.Unscrew the OCV mounting bolt (8 mm).

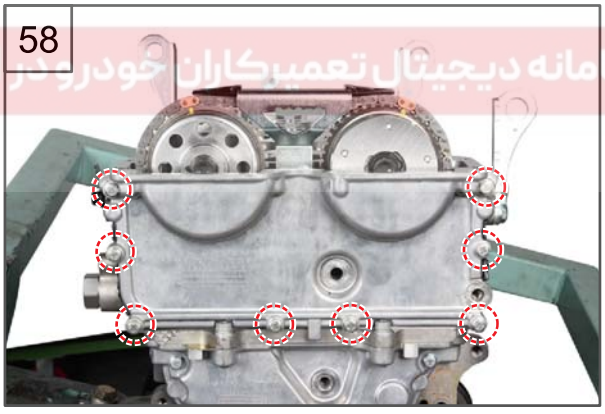
Tightening torque 8.0 ± 1.0Nm

57



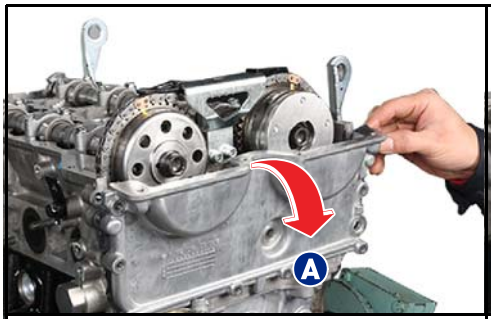
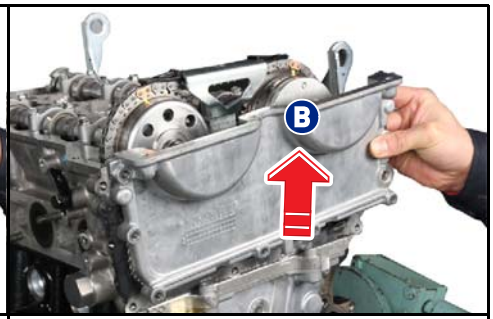
57.Remove the OCV from the cylinder head.

58



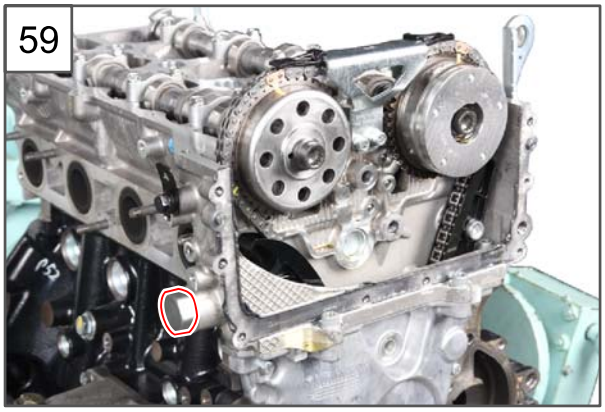
58.Unscrew eight bolts (10 mm) from the front cover.

Tightening torque 10.0 ± 1.0Nm

	
Pull the front cover to direction (A).	Remove the front cover by pullimg it upward (B).

Modification basis	
Application basis	
Affected VIN	

59



59.Release the auto tensioner with a spanner (27 mm).

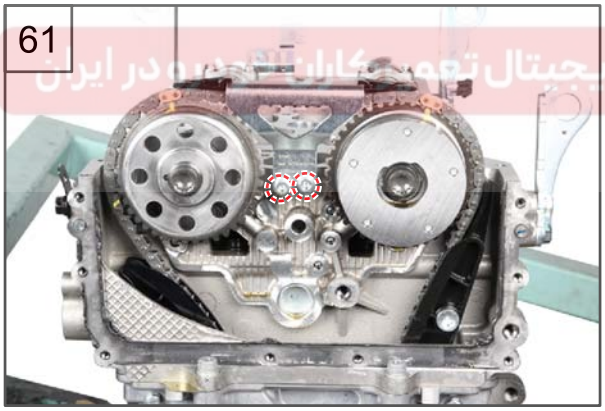
Tightening torque 65.0 ± 5.0Nm

60

60.Remove the chain tensioner.

CAUTION
Replace the gasket on the auto tensioner with new one.

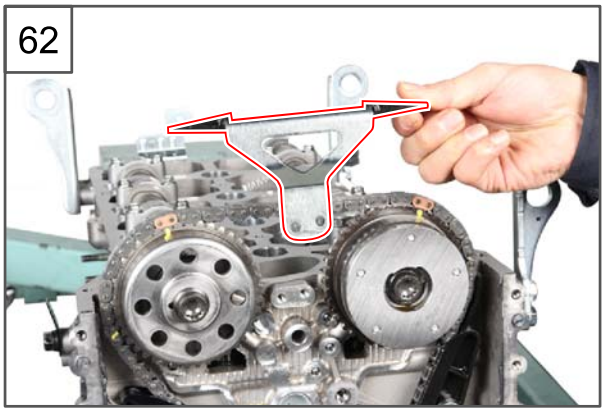
61



61.Unscrew two upper rail bolts (5 mm) from the front side of cylinder head.

Tightening torque 10.0 ± 1.0Nm

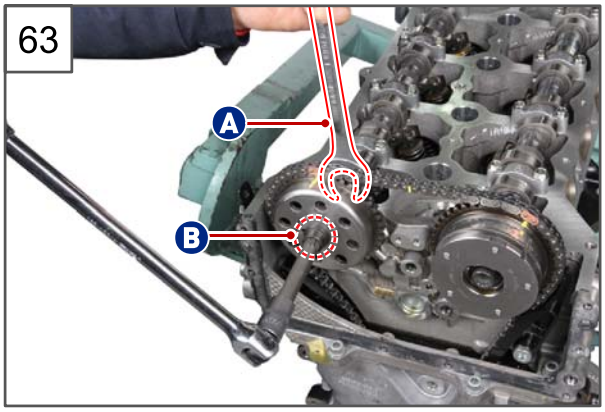
62



62.Remove the upper rail.

Modification basis	
Application basis	
Affected VIN	

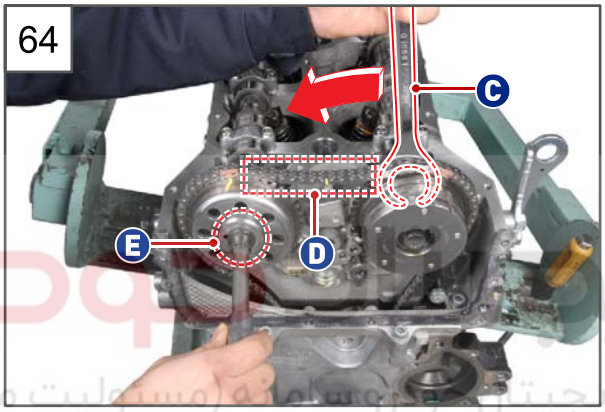
63



63.Hold the octagon spanner seat on the exhaust camshaft with a spanner (A, 30 mm) and loosen the center bolt (14 mm) from the exhaust camshaft.

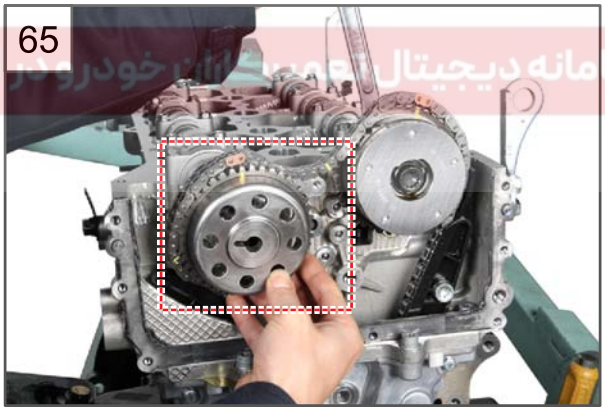
Tightening torque 110 ± 10Nm

64



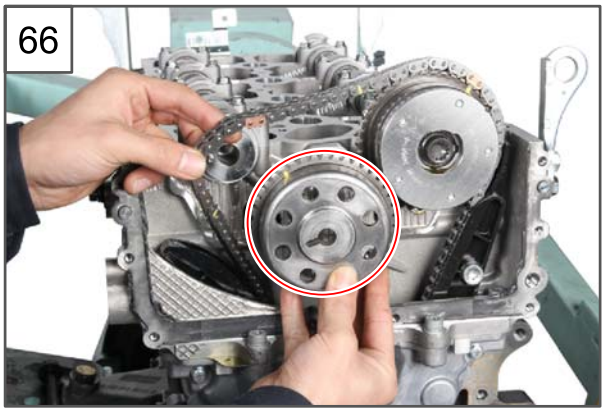
64.To release the tension of the timing chain (D), turn the octagon spanner seat on the intake camshaft counterclockwise with a spanner (C, 30 mm), and remove the loosened center bolt (E) from the exhaust camshaft.

65



65.Pull out the exhaust camshaft sprocket with silence chain from the exhaust camshaft.

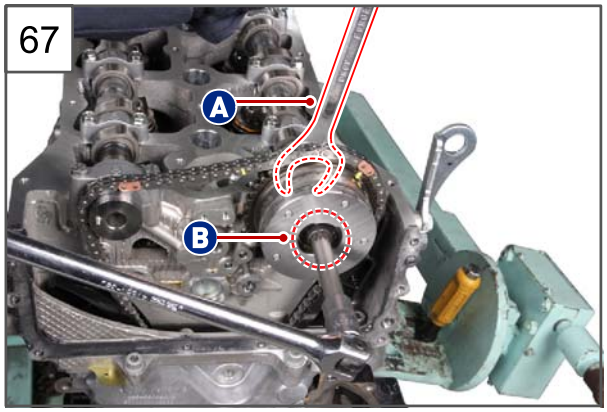
66



66.Separate the exhaust camshaft sprocket with the silence chain.

Modification basis	
Application basis	
Affected VIN	

67

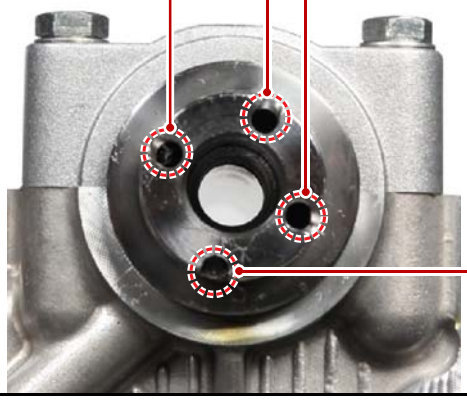
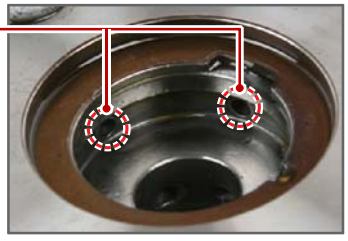
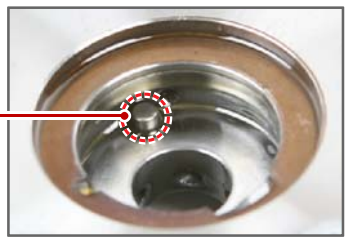


67.Hold the octagon spanner seat on the intake camshaft with a spanner (A, 30 mm) and unscrew the center bolt (B, 14 mm) from the intake camshaft.

Tightening torque 110 ± 10Nm

68

68.Remove the intake camshaft sprocket.

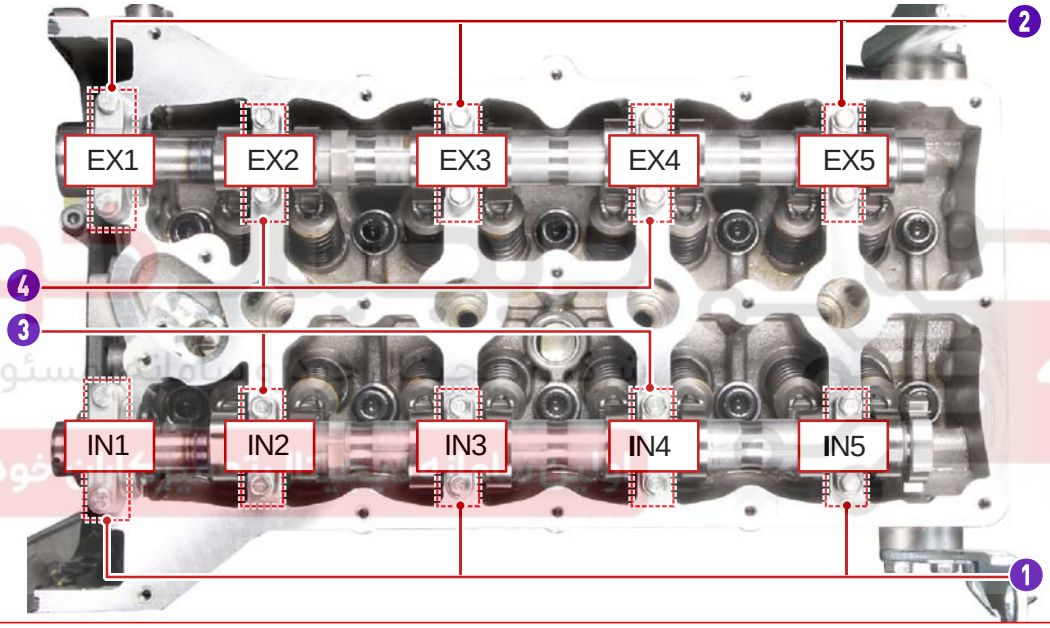
Intake camshaft	Intake camshaft sprocket
	  

Modification basis	
Application basis	
Affected VIN	

69. Remove the camshaft bearing caps according to the numerical order in the figure below.

Tightening torque 10.0 ± 1.0Nm

(1) Intake camshaft bearing cap: IN1, IN3, IN5
(2) Exhaust camshaft bearing cap: EX1, EX3, EX5
(3) Intake camshaft bearing cap: IN2, IN4
(4) Exhaust camshaft bearing cap: EX2, EC4



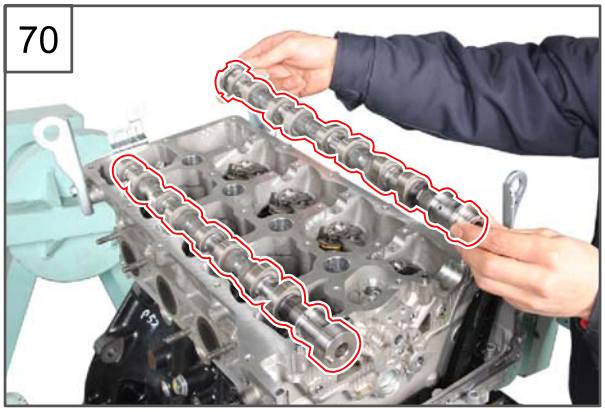
CAUTION

Unscrew the camshaft bearing cap bolts slowly in two or more steps according to the specified sequence.

- Remove the camshaft bearing caps.

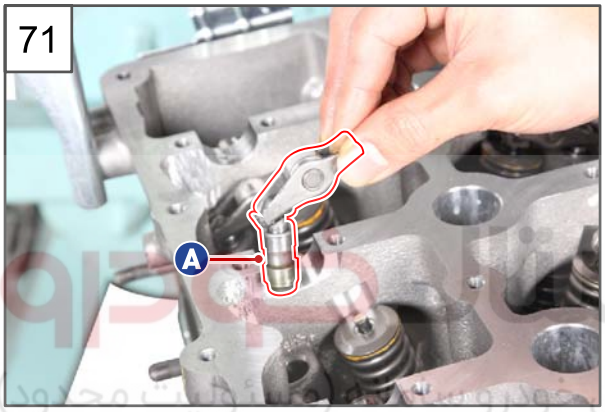
Modification basis	
Application basis	
Affected VIN	

70



70.Remove the intake and exhaust camshafts.

71



71.Remove the finger follower and HLA device (A).

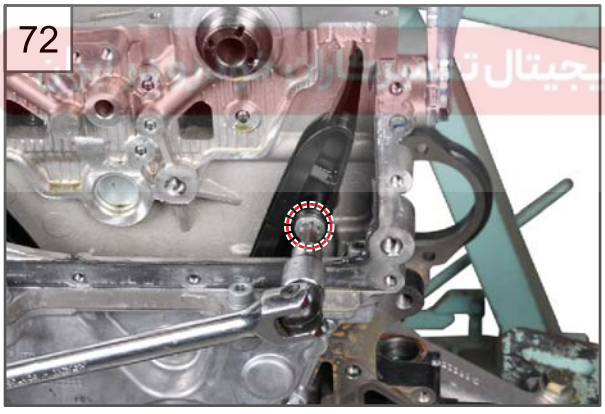
CAUTION

If the removed finger follower and HLA device is easily compressed, it means that the oil has been drained. In this case, replace it with a new one.

NOTE

Apply the engine oil on it before installation.

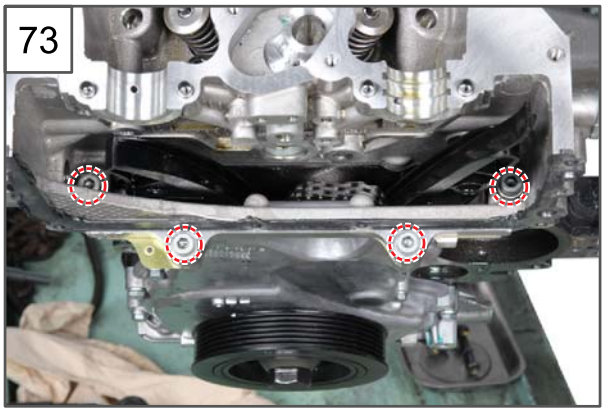
72



72.Unscrew the upper bolt (T50) on clamping rail.

Tightening torque 25.0 ± 2.5Nm

73



73.Unscrew four TGCC bolts (6 mm) on cylinder head.

Tightening torque 25.0 ± 2.5Nm

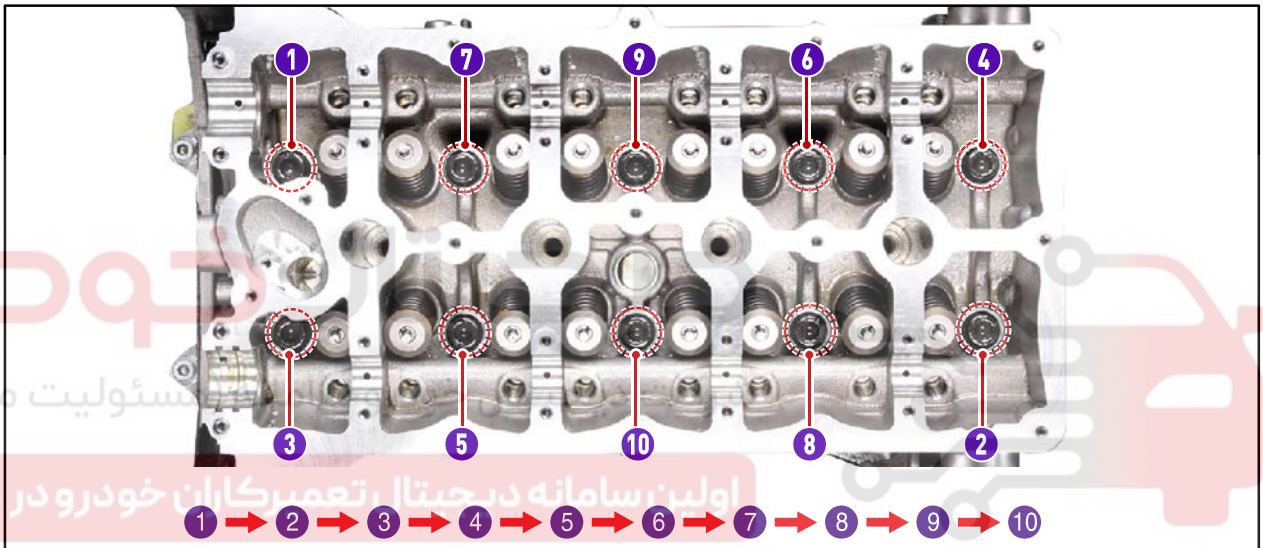
Modification basis	
Application basis	
Affected VIN	

74

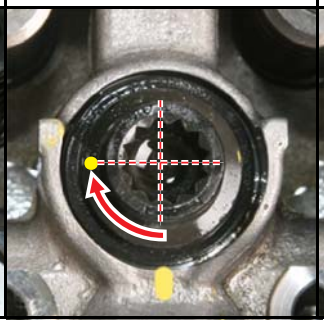
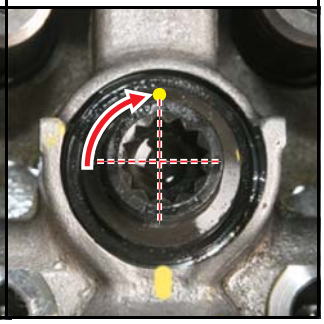
74.Unscrew 10 cylinder head bolts (13 mm) in numerical order in the figure below.

Cylinder head bolt wrench

14 mm star-bit socket

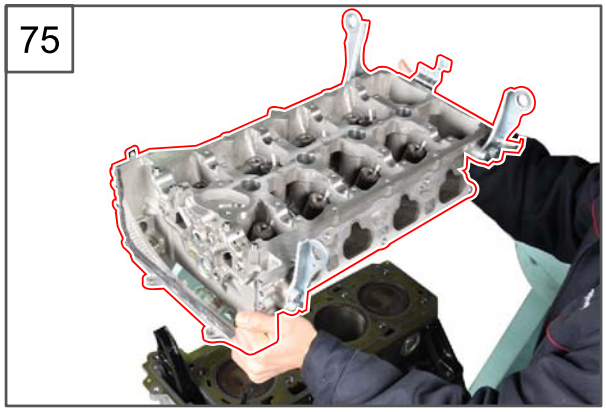


CAUTION
- Unscrew the bolts in two or more steps.
- Apply the engine oil on the thread of cylinder head bolts.

Tightening sequence of cylinder head bolt (angle tightening)			
Torque wrench 55 Nm	Paint marking (on cylinder head and head bolt)	1st angle tightening 90°±10 °	2nd angle tightening 90°±10 °
			

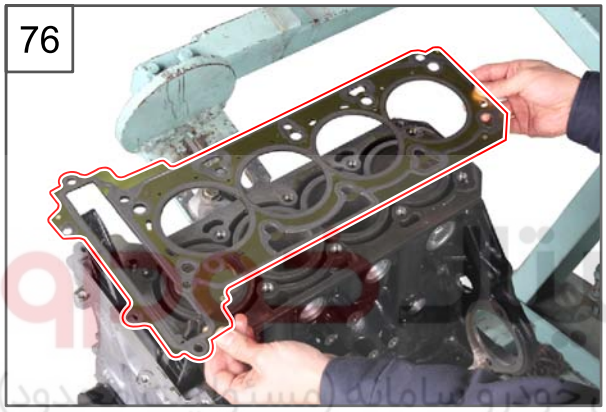
Modification basis	
Application basis	
Affected VIN	

75



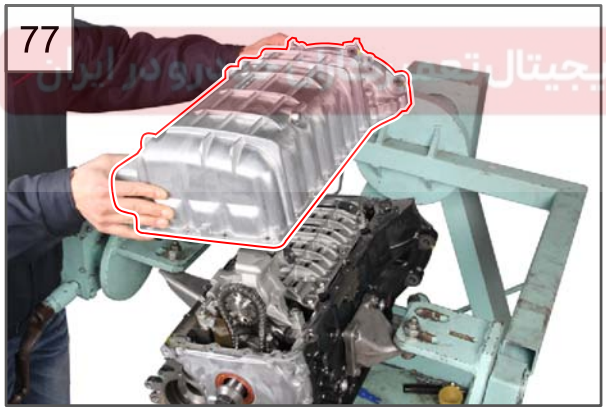
75.Remove the cylinder head assembly.

76



76.Remove the cylinder head gasket from the cylinder head.

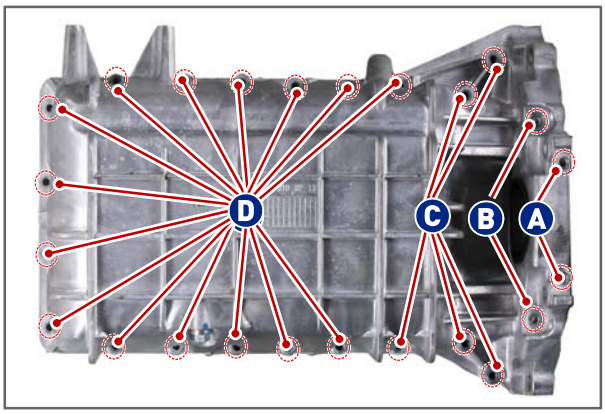
77



77.Unscrew the engine oil pan bolts in diagonal sequence from outside.

CAUTION

To prevent the oil pan from damaging and distorting, unscrew the bolts slowly in two or more steps.



- Unscrew the bolts starting from outside in diagonal sequence.
- Tighten the bolts starting from inside in diagonal sequence.

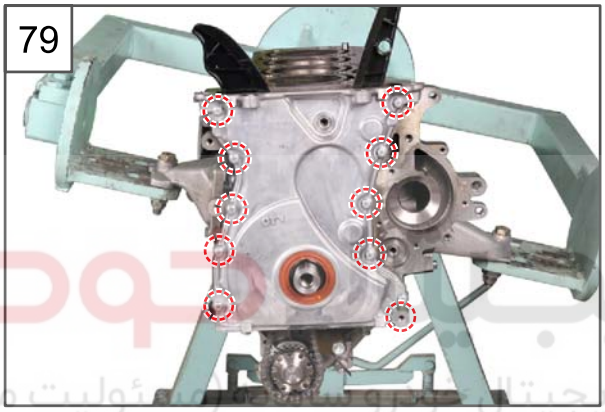
		Tightening torque
A	M6*1.0*00 2EA	10.0±1.0 Nm
B	M6*1.0*85 2EA	10.0±1.0 Nm
C	M6*1.0*35 4EA	10.0±1.0 Nm
D	M6*1.0*20 16EA	10.0±1.0 Nm

Modification basis	
Application basis	
Affected VIN	

78

78.Remove the front cover oil seal.

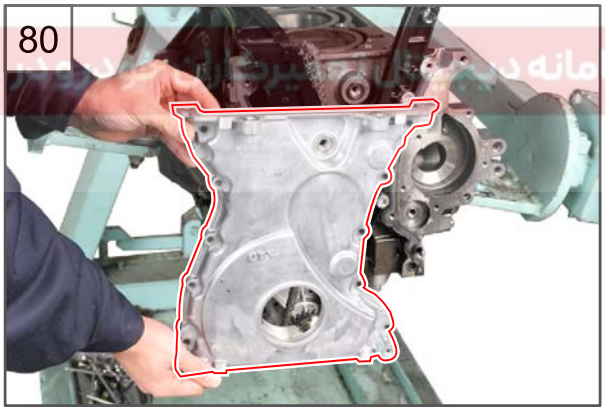
79



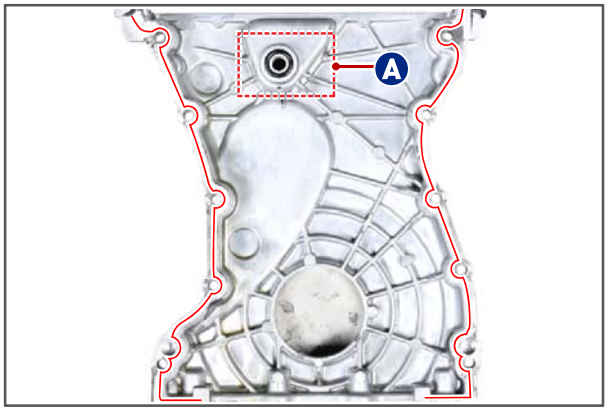
79.Unscrew 10 bolts (10 mm) from the timing gear case cover (TGCC).

Tightening torque 10.0 ± 1.0Nm

80



80.Remove the timing gear case cover (TGCC).

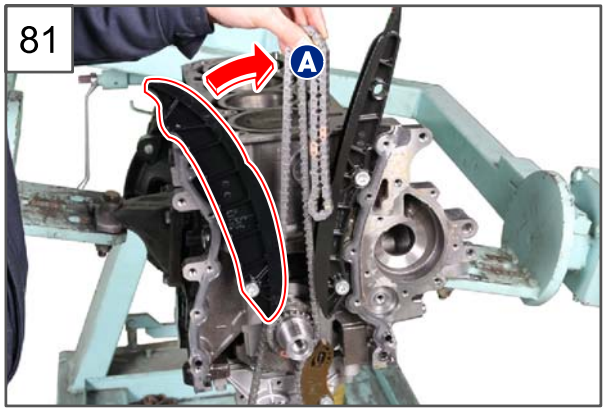


CAUTION

Apply the liquid gasket on the mating surface of timing gear case cover and replace the O-ring with new one before installing it.

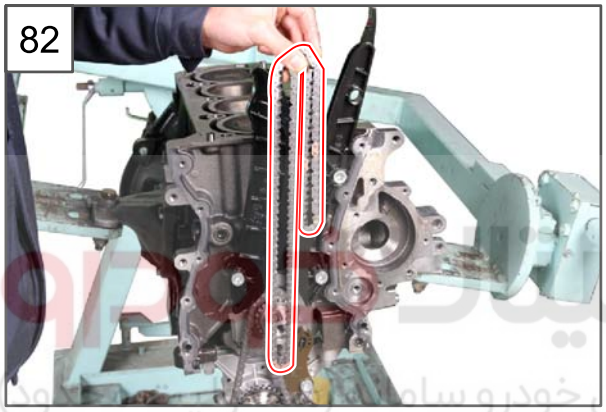
Modification basis	
Application basis	
Affected VIN	

81



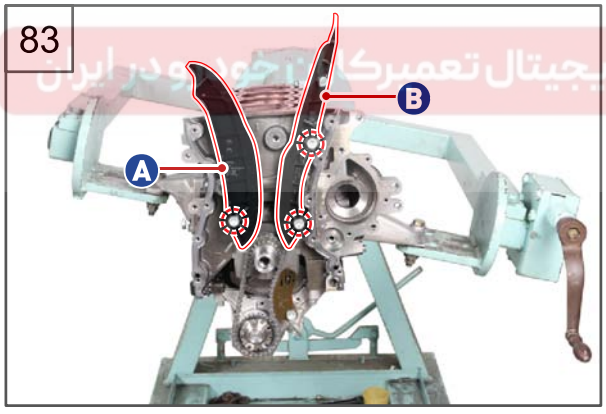
81.Push the tensioner guide rail to arrow direction (A).

82



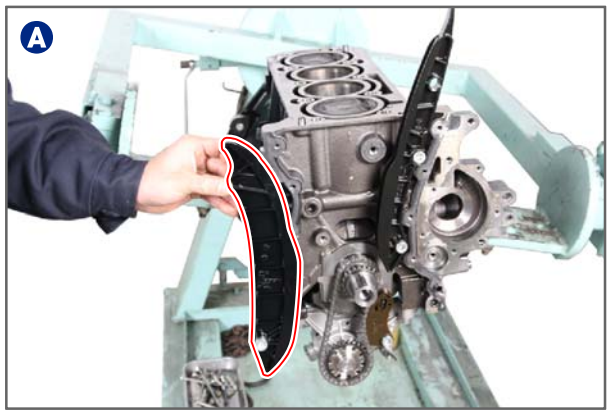
82.Remove the timing chain.

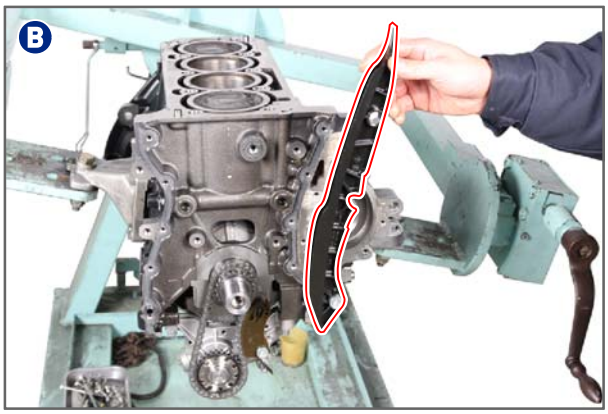
83



83.Unscrew three shoulder bolts (T50) and remove the tensioner guide rail (A) and the clamping rail (B).

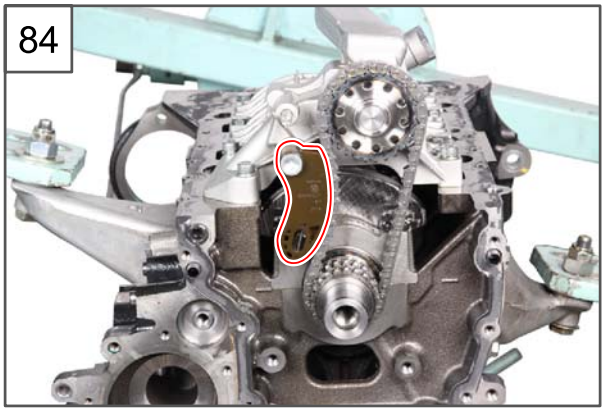
Tightening torque 32.0 ± 3.2Nm



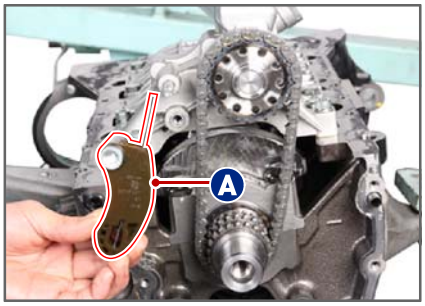


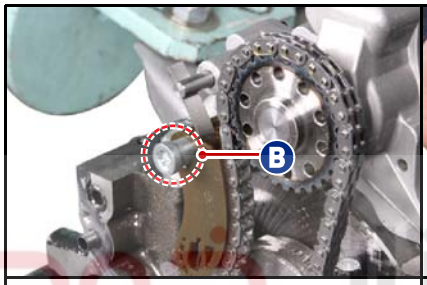
Modification basis	
Application basis	
Affected VIN	

84

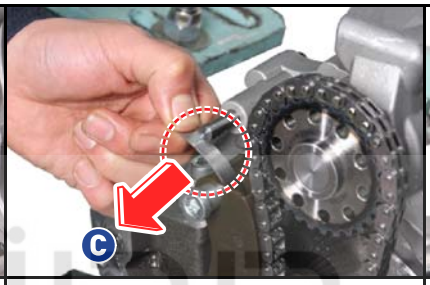


84.Remove the oil pump chain tensioner (A).

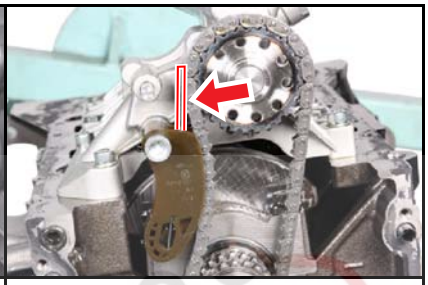




Loose the oil pump drive bolt by 10 mm (B)

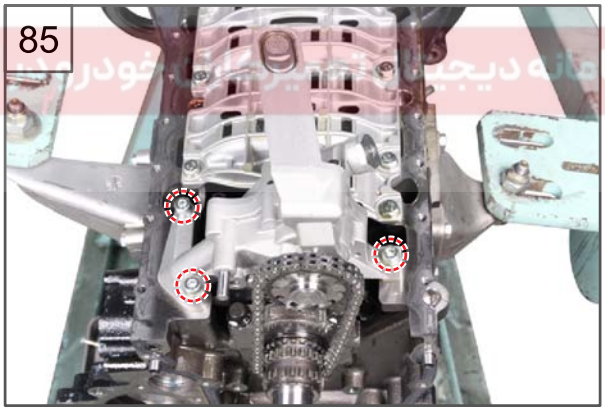


Release the tension by separating the leaf spring to arrow direction (C).



Location of leaf spring after relieving the tension

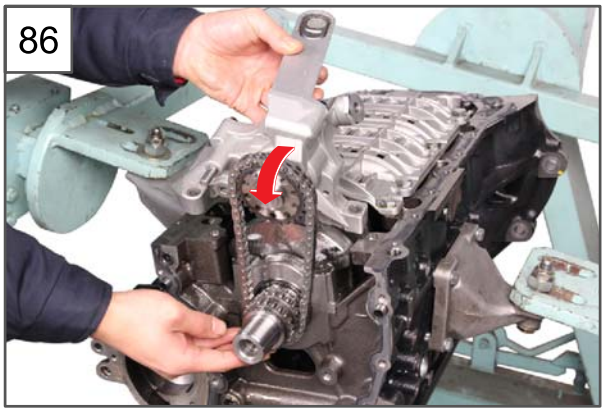
85



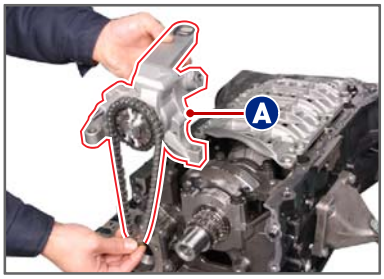
85.Unscrew three bolts (6 mm) from the oil pump assembly.

Tightening torque 25.0 ± 2.5Nm

86

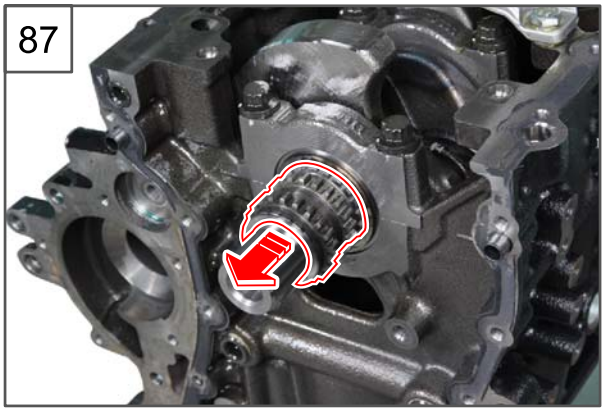


86.Remove the oil pump assembly with the oil pump chain (A).

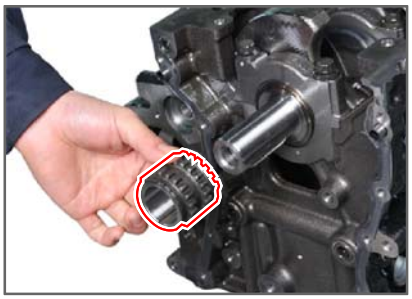


Modification basis	
Application basis	
Affected VIN	

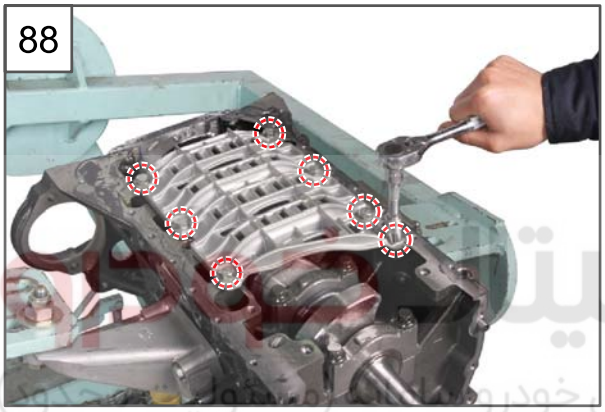
87



87.Remove the chain sprocket from the crankshaft.



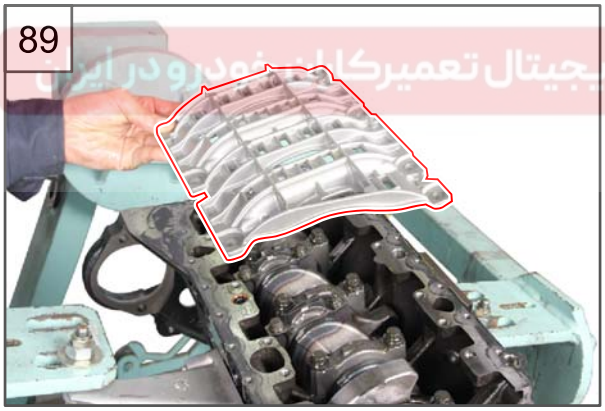
88



88.Unscrew seven bolts (13 mm) from the ladder frame.

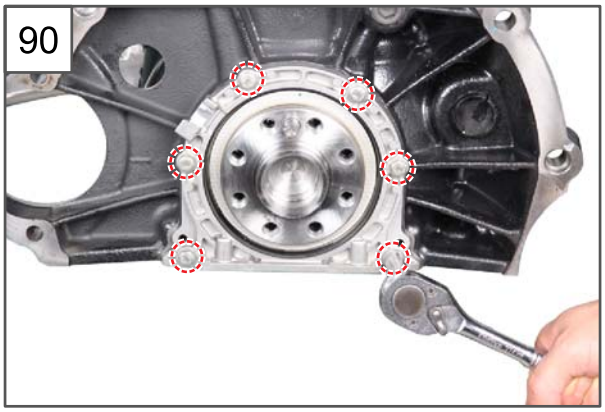
Tightening torque 21.0 ± 2.0Nm

89

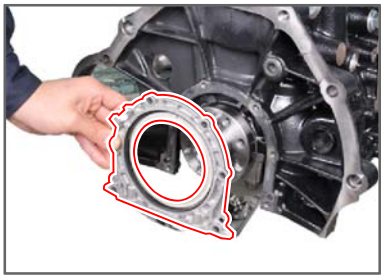


89.Remove the ladder frame.

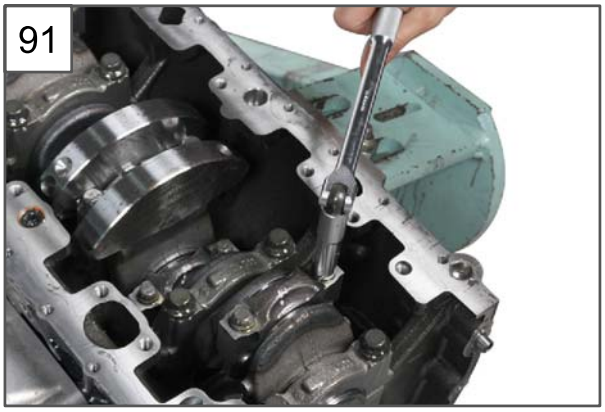
90



90.Unscrew six bolts (10 mm) and remove the crankshaft rear seal.



Modification basis	
Application basis	
Affected VIN	

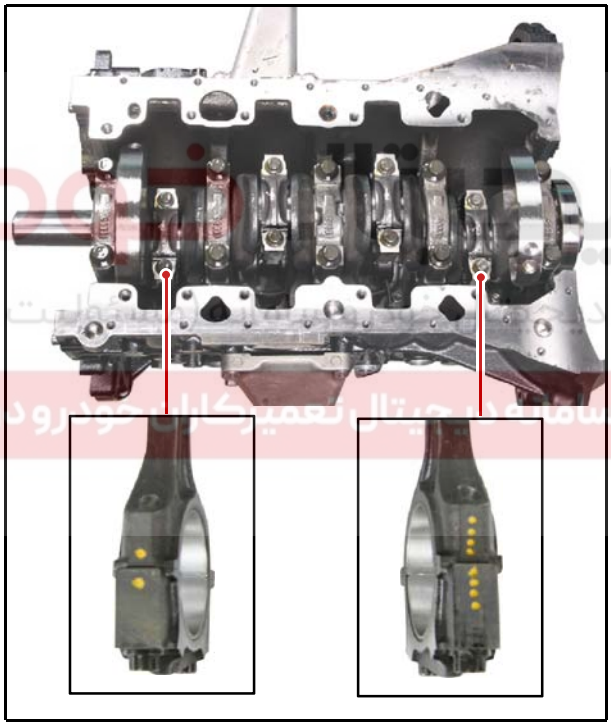


91. Unscrew eight connecting rod lower bearing cap bolts (10 mm) and remove the piston assembly.

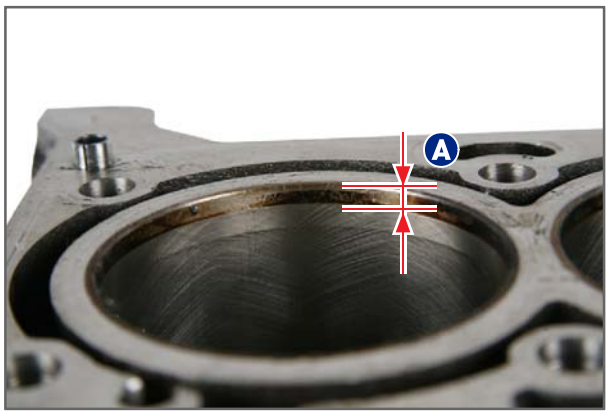
Tightening torque (1) 40.0 + 5.0Nm

Tightening torque (2) 90° + 10 °

Preceding works before removing the piston assembly

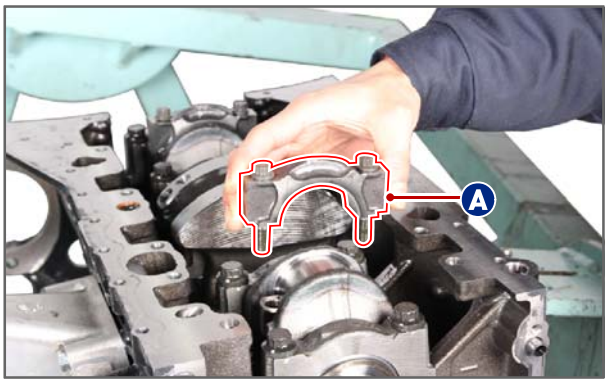


Place the match marks on connecting rod and lower bearing cap.

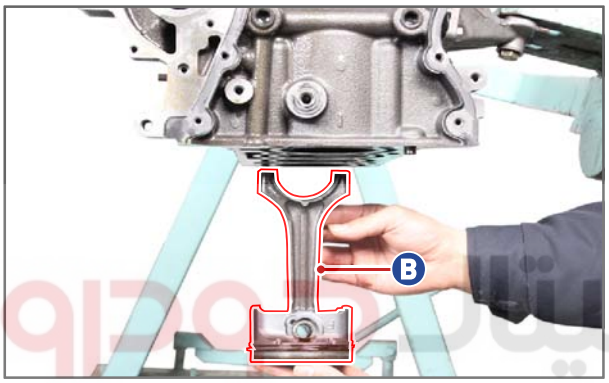


Completely remove the carbon residue on the top surface of cylinder block (A).

Modification basis	
Application basis	
Affected VIN	



- Unscrew No.1 and No.4 bearing cap bolts (A) and remove the piston assembly (B).



- Rotate the crankshaft 180° and remove the No.2 and No.3 piston assembly.

Piston assembly

- Remove the snap ring from the piston and pull out the piston pin.
- Separate the piston and connecting rod. Remove the piston ring from the piston and
- store them together.

CAUTION
Replace the piston, bearing and snap ring with new one.

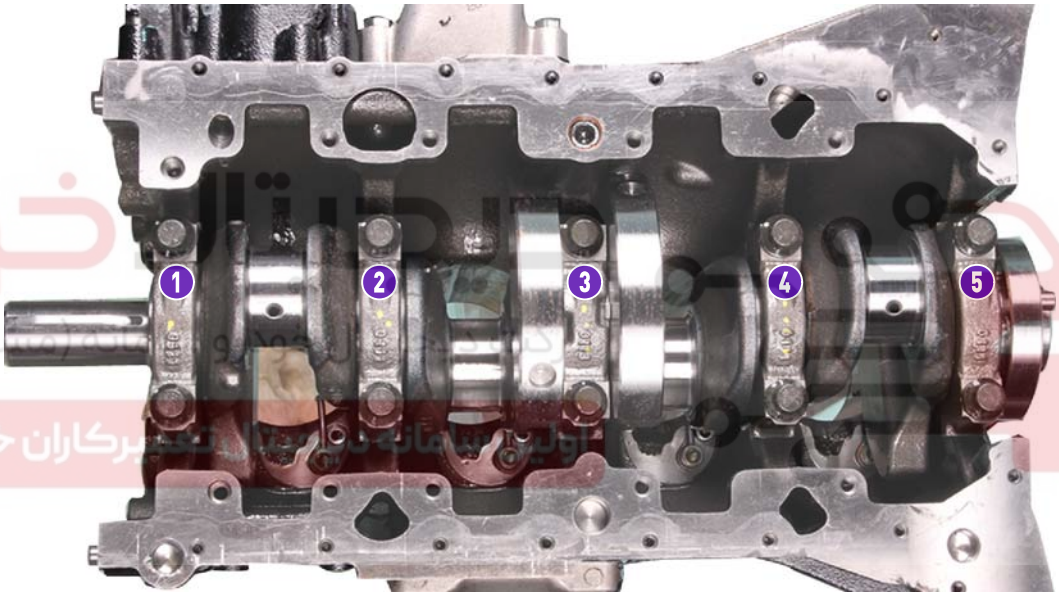
	Part name
1	Piston
2	Connecting rod
3	Connecting rod cap
4	Connecting rod upper bearing
5	Connecting rod lower bearing
6	Piston pin
7	Snap ring
8	Top ring
9	Second ring
10	Oil ring

Modification basis	
Application basis	
Affected VIN	

92.Remove the crankshaft main bearing caps according to the numerical order in the figure below.

Tightening torque (1) 55.0Nm

Tightening torque (2) 90°



1 → 5 → 2 → 4 → 3

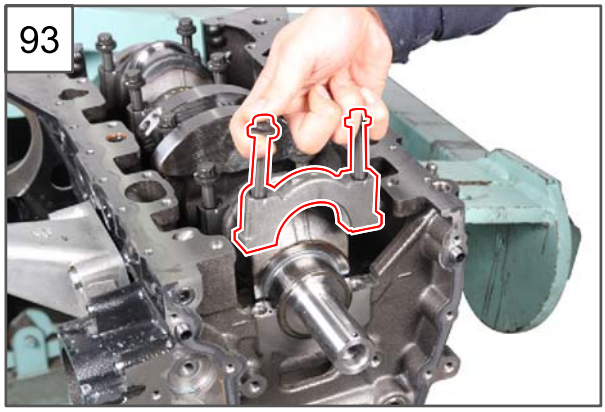
CAUTION

- Unscrew the bolts slowly in two or more steps according to the specified sequence.

NOTE

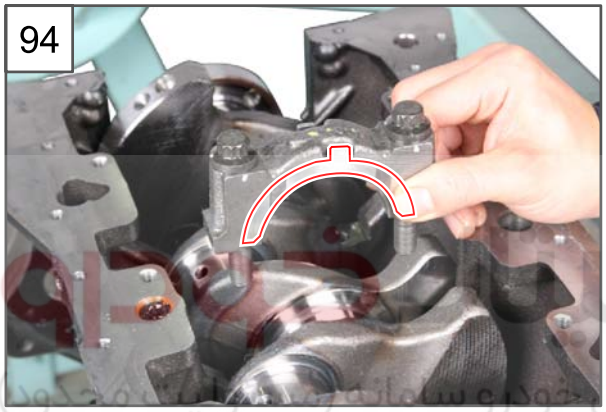
Place the match mark on each bearing cap.

93



93.Remove the main bearing caps.

94



94.Remove the thrust bearing in No.3 main journal bearing cap.

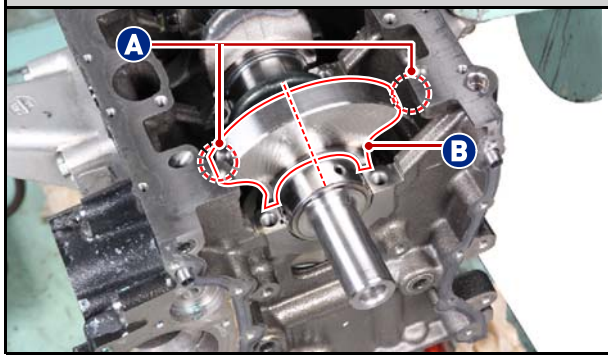
CAUTION

The oil groove on the thrust bearing should face outward.

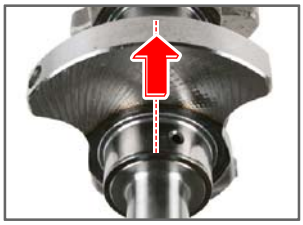
95

95.Remove the crankshaft.

Cautions when removing the crankshaft



To avoid the interference at point (A), the center line of (B) should face upward.

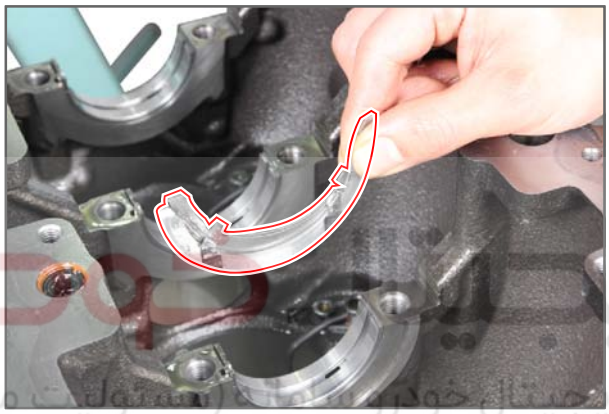


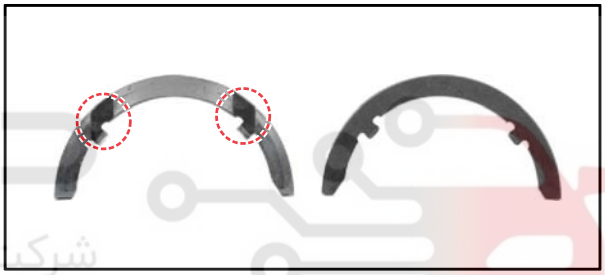
Modification basis	
Application basis	
Affected VIN	

96

96.Remove the thrust bearing in No.3 main journal.

CAUTION
The oil groove on the thrust bearing should face outward.



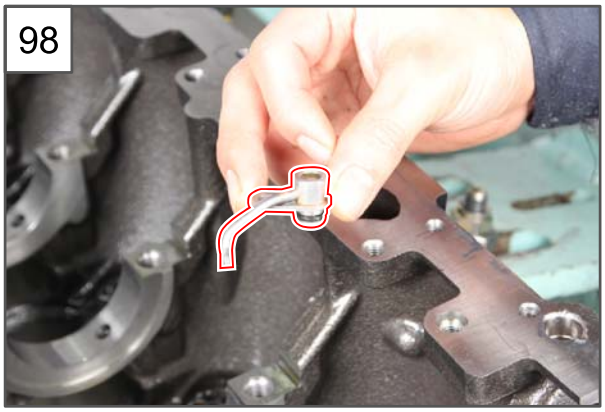


97

97.Unscrew the bolt (4 mm) from the oil jet.

Tightening torque 10.0 ± 1.0Nm

98



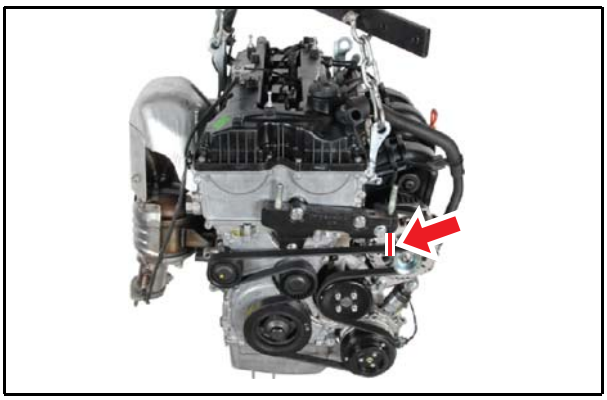
98.Remove the oil jet.

CAUTION
Replace the O-ring with new one.

Modification basis	
Application basis	
Affected VIN	

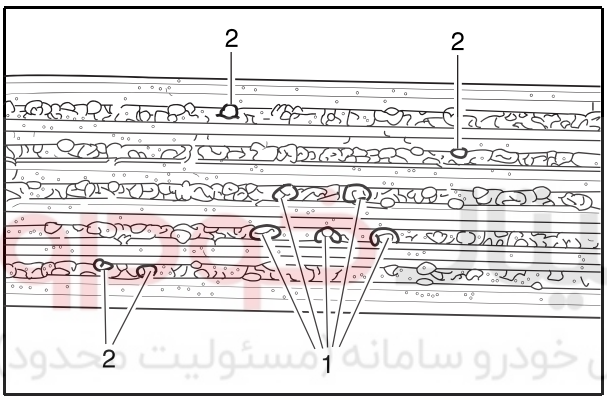
3) Inspection

(1) V-Belt

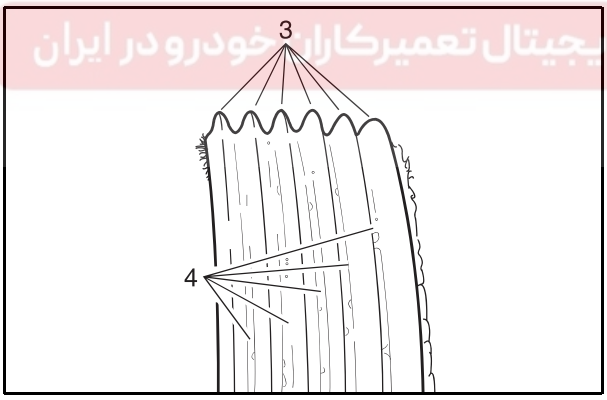


Put a chalk mark on the belt.
Check the belt for any damage by rotating the crankshaft pulley.

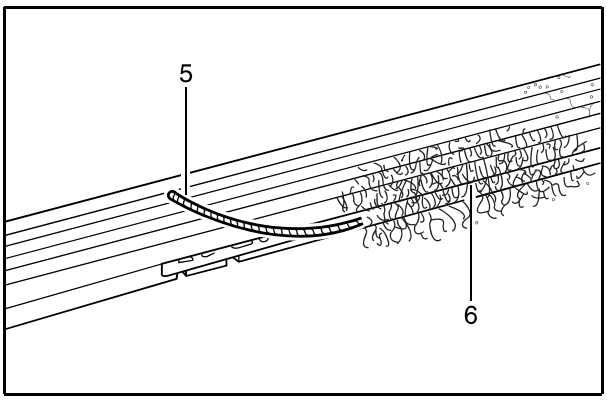
CAUTION
Replace the belt if any damage is found as described below:



1. Rubber piece in the belt rib base
2. Dust or sand

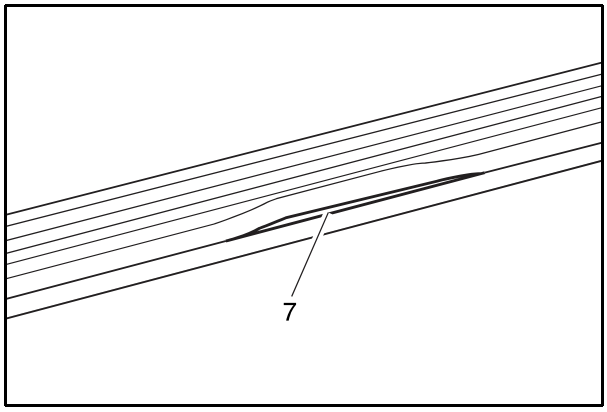


3. Rib shaped in wedge
4. Exposed belt cord on the rib base

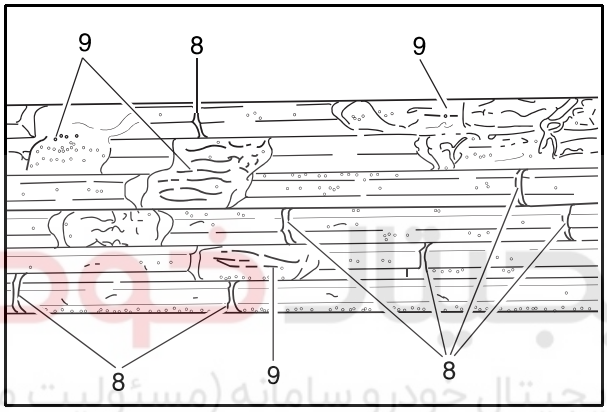


5. Torn tension cord
6. Worn outer tension cord

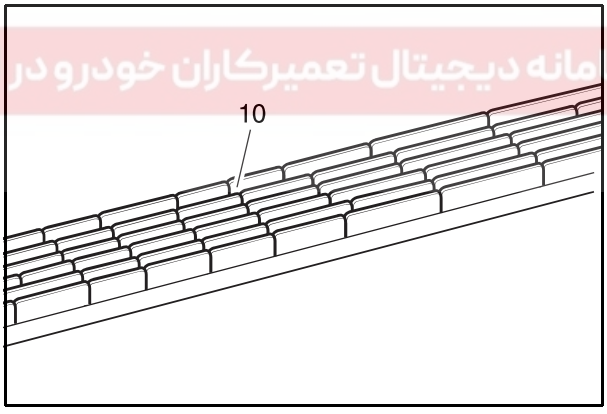
Modification basis	
Application basis	
Affected VIN	



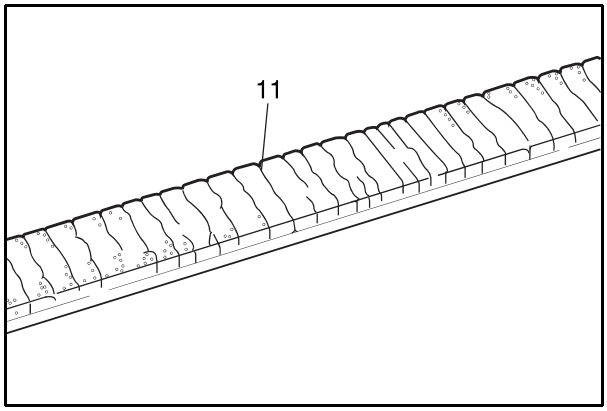
7. Stripped rib on belt base



8. Cracked rib in lateral direction
9. Torn rib



10.Cracked rib in several lateral directions



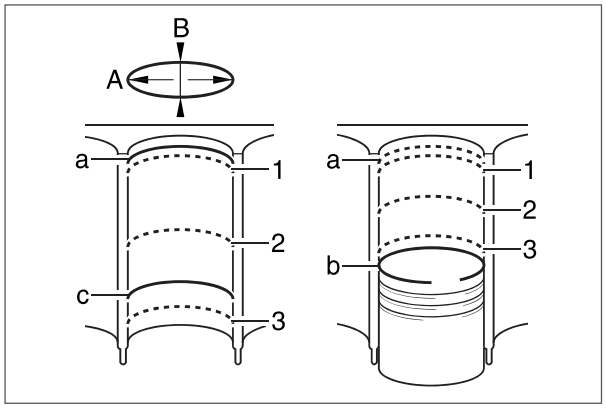
11.Crack on back side of belt in lateral direction

Modification basis	
Application basis	
Affected VIN	

(2) Cylinder Block

▶ Measuring Cylinder Block Bore

1. Wipe out the cylinder bore.
2. Measure the bore size in axial direction and vertical direction on 3 points (1, 2, 3) with a bore gauge.

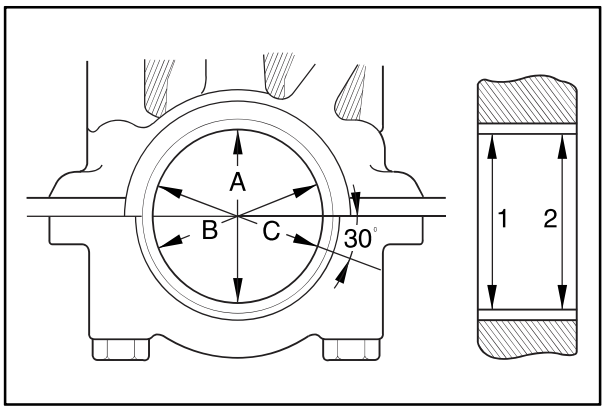


Measuring points 1, 2, 3
A. Axial direction
B. Vertical direction
a. Piston position at TDC
b. Piston position at BTDC
c. Oil ring position between TDC and BTDC

Modification basis	
Application basis	
Affected VIN	

(3) Crankshaft

▶ Measuring Crankshaft Bearing Bore



Measure the bore of the crankshaft bearing with a bore gauge.

CAUTION

- Measure the values at 2 points (1, 2). Measure the values at the A, B and C as shown in the figure.
- If the average value of B and C is less than the value of A, then it can be used as actual average value. If the average value of B and C is greater than the value of A, then the value of A can be used as actual average value.

▶ Measuring Crankshaft Journal

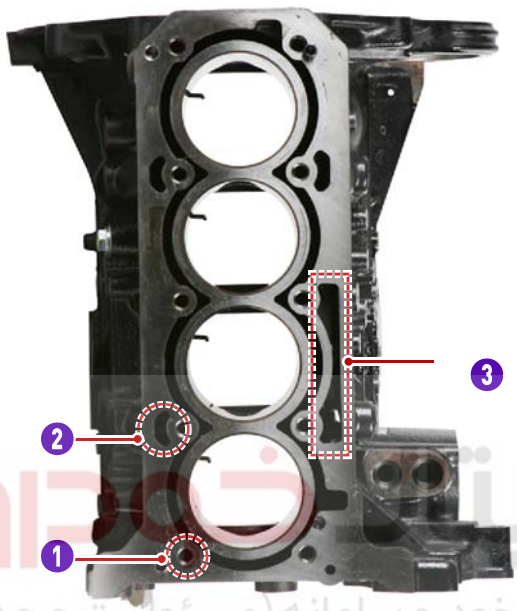
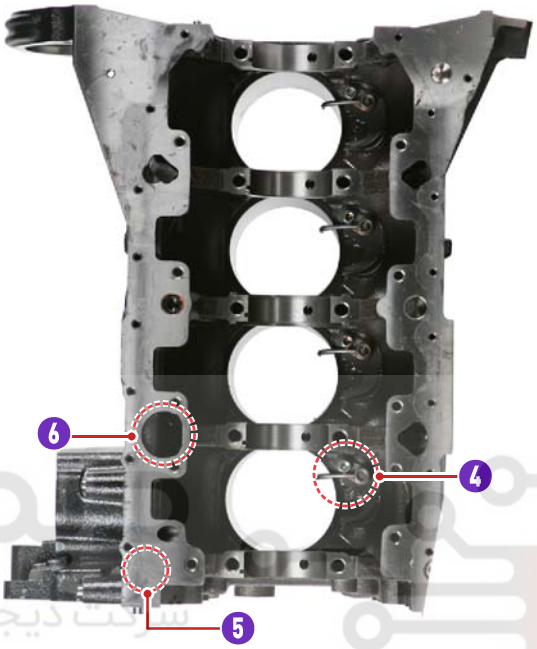
Measure the bore of the crankshaft bearing journal with a micro meter.

CAUTION

- Measure the values at 3 points (A, B, C) and calculate the average value.
- If the average values of the bearing bore and journal diameter are not within the specified range, replace the bearing shell.

4) Reassembly

1. Clean the cylinder bore, connecting rod, connecting rod bearing shell and piston thoroughly with compressed air.

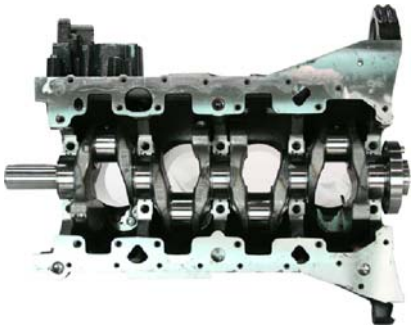
Top of cylinder block	Bottom of cylinder block
	
1. Head bolt seat 2. Oil return groove 3. Oil return groove	4. Oil jet 5. Number of crankshaft main bearing 6. Oil return groove

CAUTION

The oil spray nozzle injects the oil to the inside of the piston. Make sure that the oil spray nozzle pipe does not contact with the connecting rod.

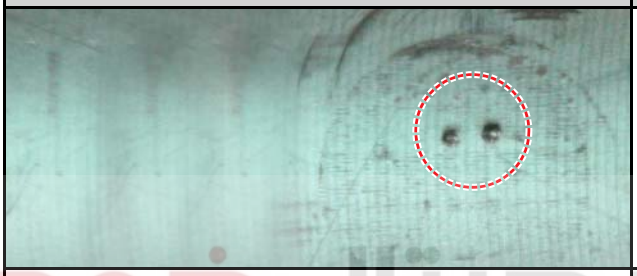
Modification basis	
Application basis	
Affected VIN	

▶ Selection of crankshaft main bearing

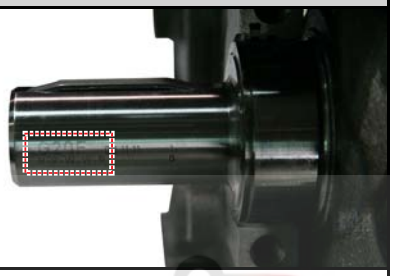


2. Select the crankshaft main bearing.
   A. There are five punch marks on the bottom of the cylinder block (oil pan mating surface). These punch marks match to the mounting locations of each main bearing. Therefore, select the crankshaft upper main bearing according to these punch marks.
   B. Select the lower main bearing that is engaged to the crankshaft bearing cap by the mark on the crankshaft sprocket mounting surface.

Bottom of cylinder block



Crankshaft sprocket installing surface



Engine name	G	2	0	D	F
Main journal bearing	R	R	W	W	R
	#1	#2	#3	#4	#5

Pin punch mark	Color	Diameter of crankshaft main journal in cylinder block (mm)
*	Blue	62.500 ~ 62.506
**	Yellow	62.506 ~ 62.513
***	Red	62.513 ~ 62.519

Mark	Color	Diameter of crankshaft main journal (mm)
B	Blue	57.960 ~ 57.965
Y	Yellow	57.955 ~ 57.960
R	Red	57.950 ~ 57.955
W	White	57.945 ~ 57.950
V	Violet	57.940 ~ 57.945

Crankshaft lower bearing

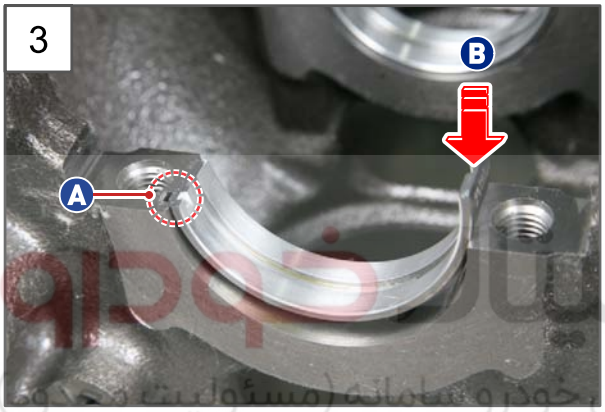
Crankshaft lower bearing

Modification basis	
Application basis	
Affected VIN	

2

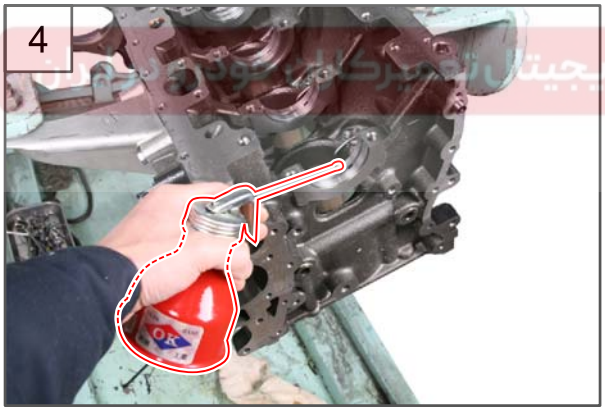
2. Place the crankshaft upper bearing shell.

3



3. Check the color of new main bearing shell and match it to the key groove (A) of the cylinder block. Install the bearing with the oil groove (B) aligned.

4



4. Apply the engine oil to the upper bearing shell.

CAUTION

Make sure the oil holes of the cylinder block body are aligned with the oil holes of the bearing.

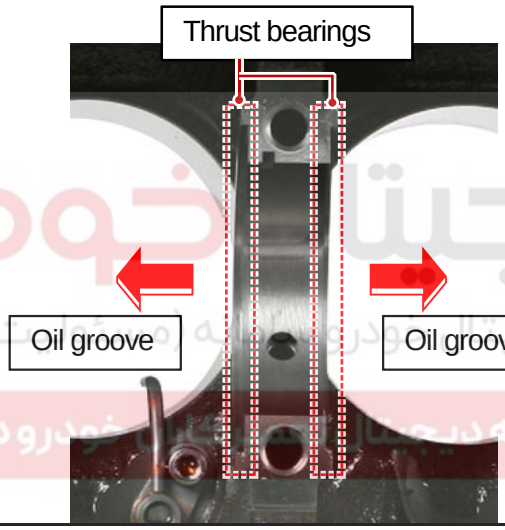
5

5. Fit the crankshaft to the cylinder block.

Modification basis	
Application basis	
Affected VIN	

6

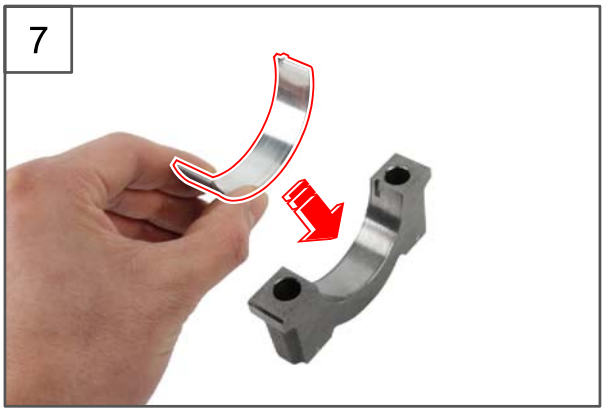
6. Install the upper thrust bearing to the No.3 main journal.

No.3 main journal	Thrust bearing
	

CAUTION

- The oil groove (A) of thrust bearing should face outward.
- Remove any foreign material on the thrust bearing and surroundings.
- Apply the engine oil before installation.

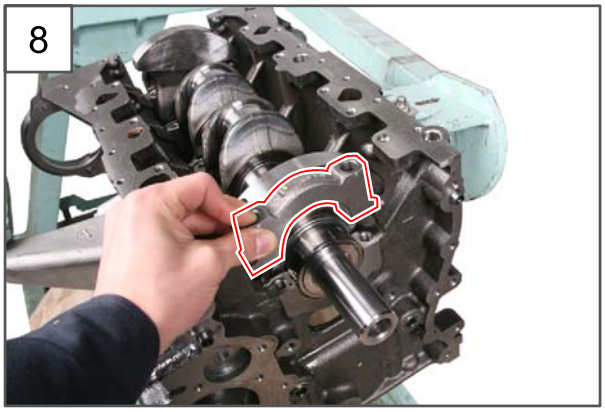
7



7. Check the color of new main bearing shell in each main journal bearing cap, and install the main journal bearing shell.

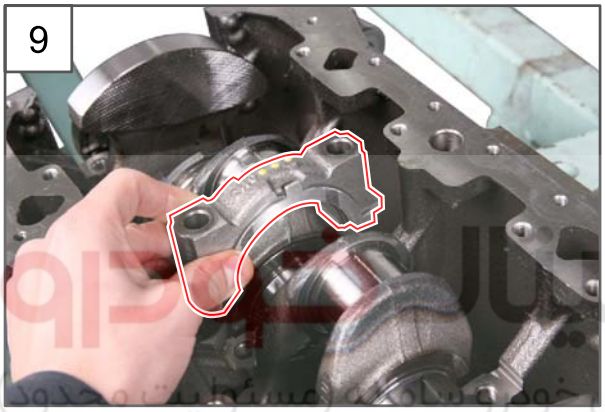
Modification basis	
Application basis	
Affected VIN	

8

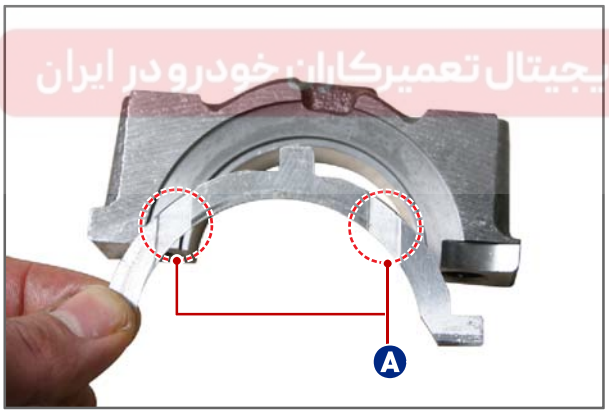


8. Put the bearing cap on each main journal bearing.

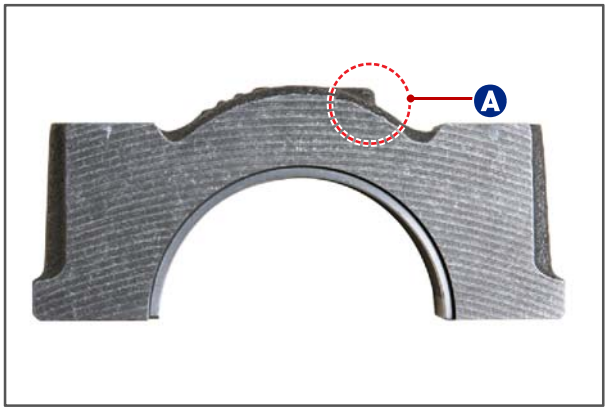
9



9. Install No.3 main journal bearing cap with thrust bearing.



- The oil groove of No.3 main journal thrust bearing should face outward.



CAUTION

Install the main journal bearing cap so that the part (A) of faces the pin punch mark on cylinder block.

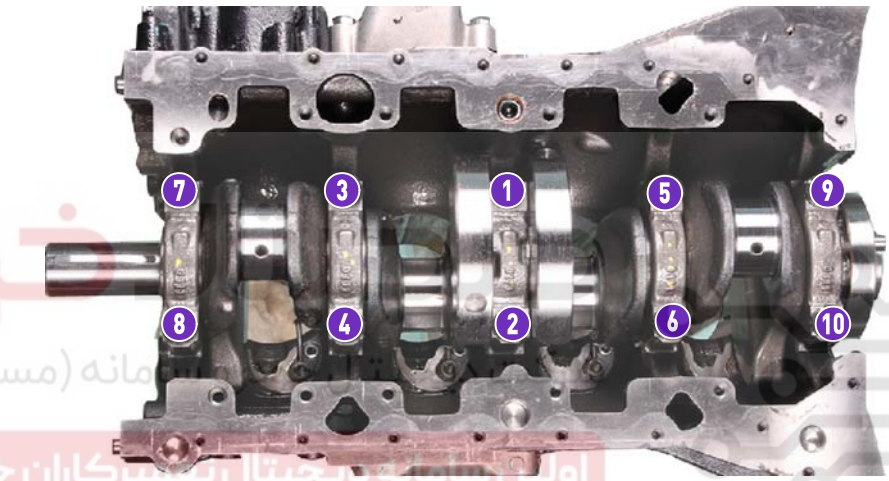
Modification basis	
Application basis	
Affected VIN	

10

10.Tighten 10 main journal bearing cap bolts (13 mm) to the specified tightening torque and angle in numerical order in the figure below.

Tightening torque (1) 55.0Nm

Tightening torque (2) 90°

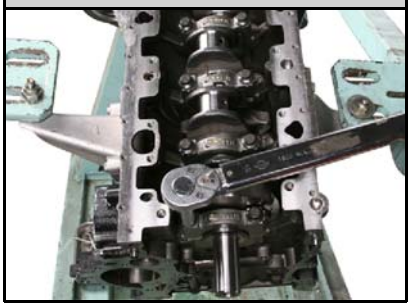
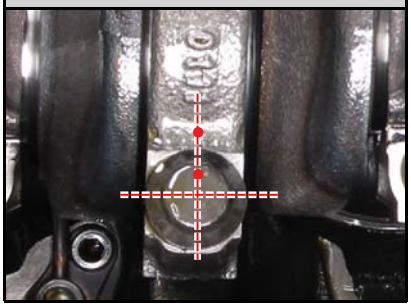
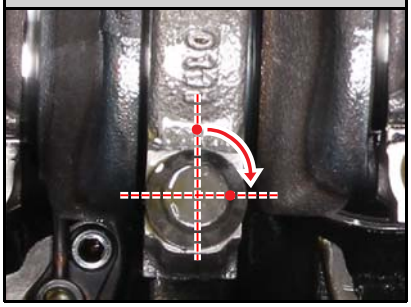


1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → 9 → 10

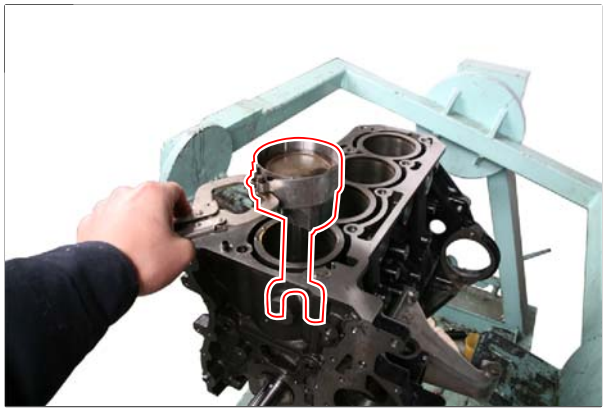
CAUTION

- Tighten the bolts in two or more steps according to the specified sequence.
- The main journal bearing cap bolt is not reusable. Replace the bolts with new ones.

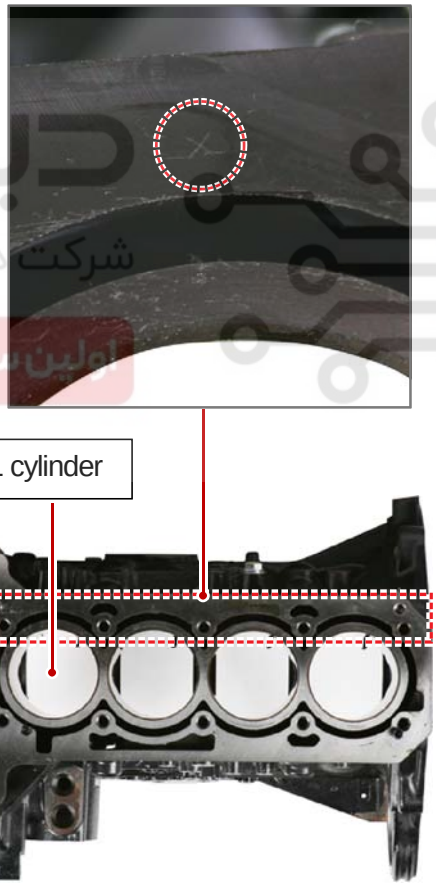
Tightening sequence of main journal bearing cap bolt (angle tightening)

Torque wrench 55Nm	Paint marking	Angle tightening 90°
		

Modification basis	
Application basis	
Affected VIN	



11.Install the piston assembly.

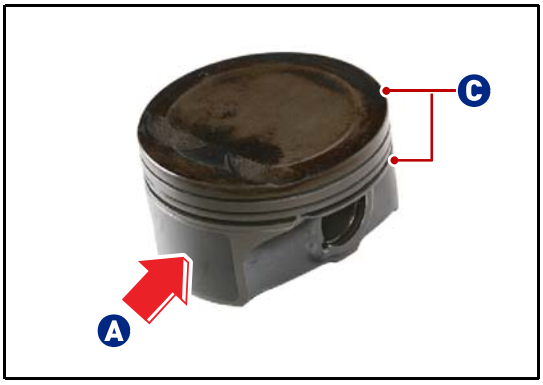
Assembly mark	
Top surface of piston	Top surface of cylinder block
	

NOTE

- The marking (A) on top surface of piston should face toward No.1 cylinder.
- The marking (B) on top of should face toward marking (C) on top surface of cylinder block.

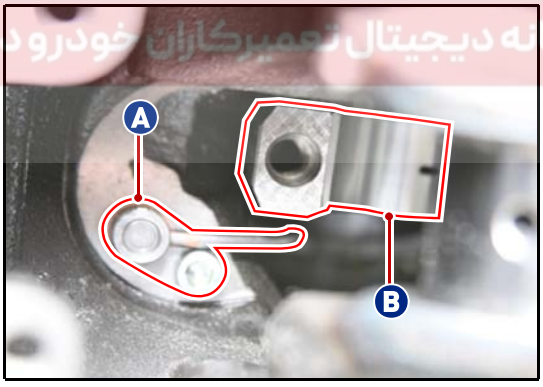
Modification basis	
Application basis	
Affected VIN	

Cautions when installing the piston assembly



- Apply the engine oil on piston surface, piston ring (B) and connecting rod bearing before installing the piston assembly.
- Stagger the piston rings so that the ring end gaps are approx. 180 deg apart.

CAUTION
Make sure to install the piston and shell at the correct locations.

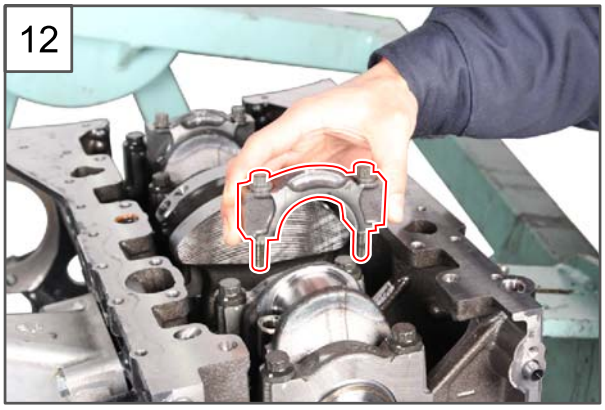


Pay particular attention that the connecting rod (B) does not contact with the oil jet (A) when installing the piston assembly.

Conrod_UPR	Conrod_LWR Grade	Clearance
Red	Blue	0.005~0.050
Yellow	Yellow	0.005~0.050
Blue	Red	0.005~0.050

There is no oversize piston. Select the connecting rod bearing according to the color combination in table.

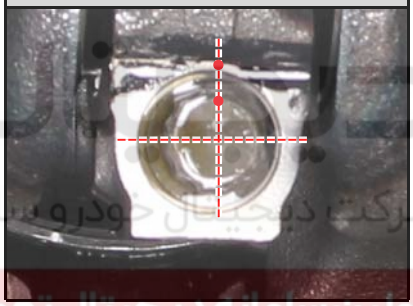
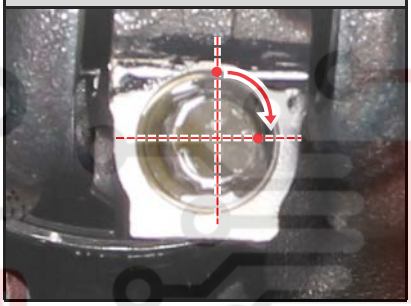
12



12.Install No.1 and No.4 connecting rod caps.

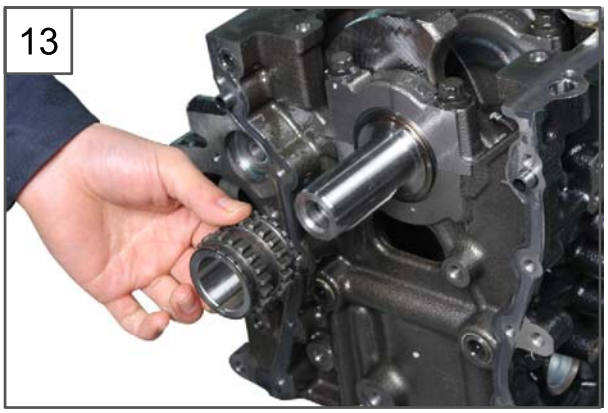
CAUTION
Make sure to install the bearing cap and sheel on correct location.

Tightening sequence of connecting rod cap bolt (angle tightening)

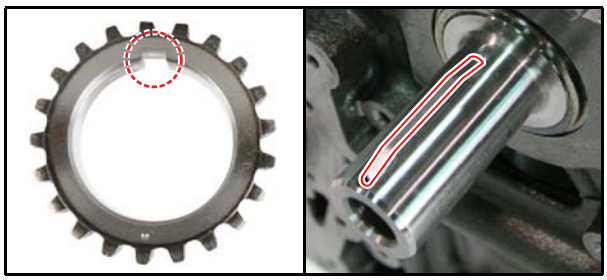
Torque wrench 40 + 5Nm	Paint marking	Angle tightening 90° + 10°
		

CAUTION
- Tighten the bolts in two or more steps according to the specified sequence.

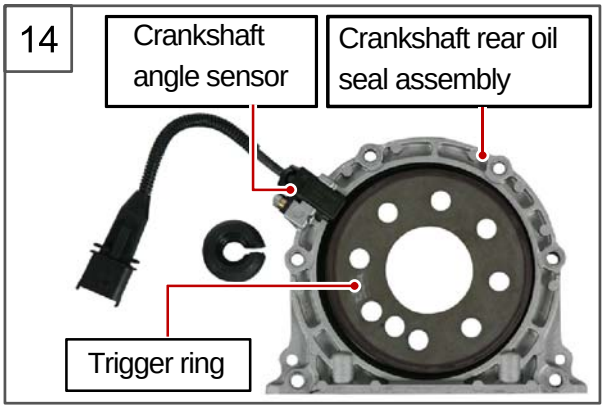
13



13.Align the woodruff key and groove, and install the crankshaft sprocket onto the crankshaft.



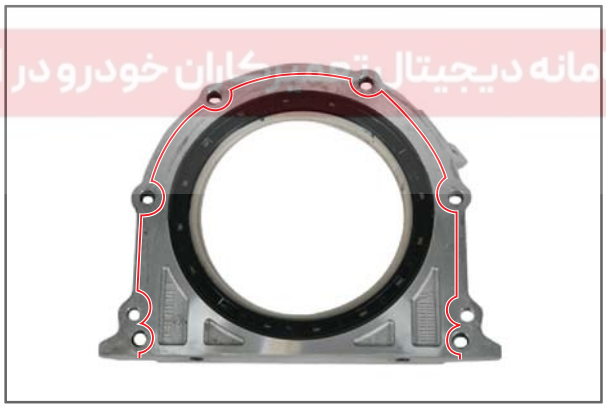
Modification basis	
Application basis	
Affected VIN	



14.Install the crankshaft rear oil seal assembly.

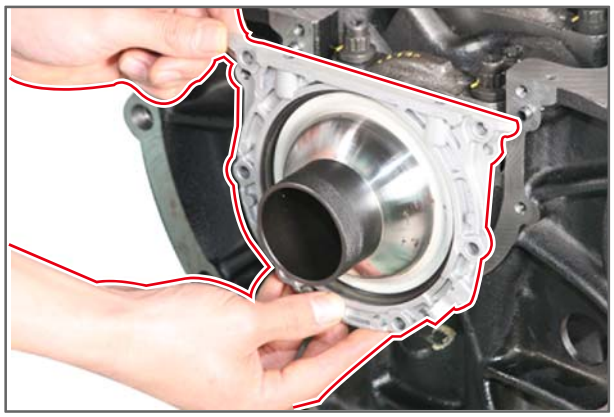
CAUTION
Do NOT keep the trigger ring near the magnetic attach driver and any magnet.

A. Set up the special service tool (W99 110 120A)



B. Apply the sealant on the crankshaft rear oil seal assembly.

C. Slide in the crankshaft rear oil seal on the crankshaft, and measure the height difference between crankshaft rear oil seal assembly and cylinder block. If the difference is in the specified value, tighten the bolts to the specified tightening torque.



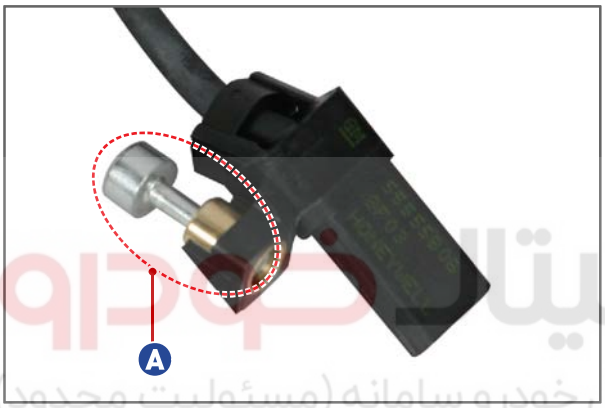
Height difference	below 0.2 mm

Tightening torque 10 ± 1.0Nm

D. Install the crankshaft position sensor.

Tool	5 mm hexagon L-wrench

Tightening torque 10 ± 1.0Nm

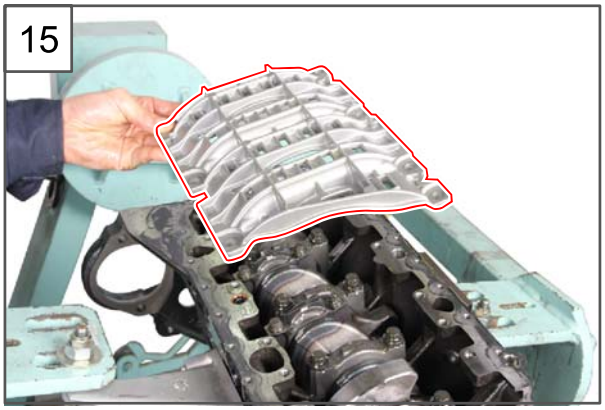


E. Install the crankshaft position sensor dust cover (A) with wiring.

F. Measure the air gap in crankshaft position sensor with a thickness gauge.

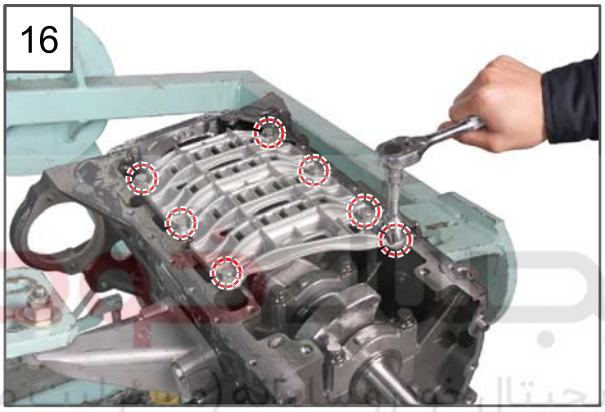
Modification basis	
Application basis	
Affected VIN	

15



15.Place the ladder frame on the position.

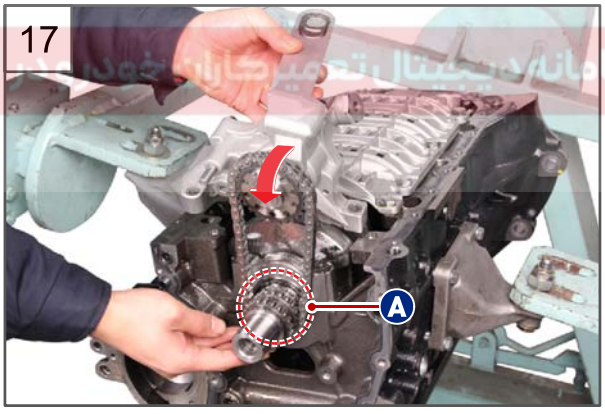
16



16.Tighten seven bolts (13 mm) to the ladder frame.

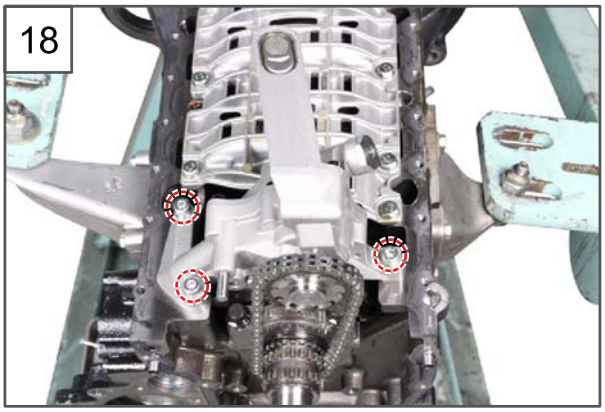
Tightening torque 21.0 ± 2.0Nm

17



17.Tilt the oil pump assembly as shown in the figure and slide the lower chain bush in the crankshaft sprocket (A).

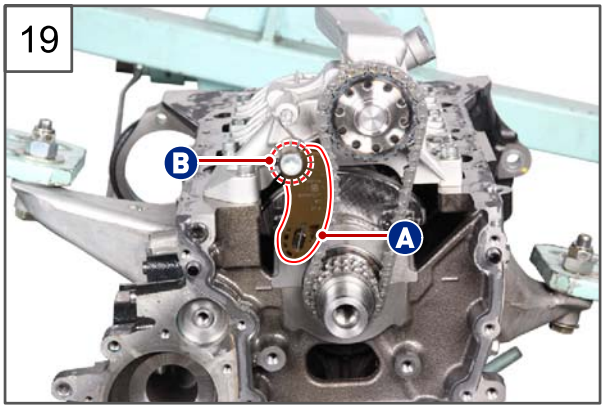
18



18.Tighten three bolts to the oil pump assembly.

Tightening torque 25.5 ± 2.5Nm

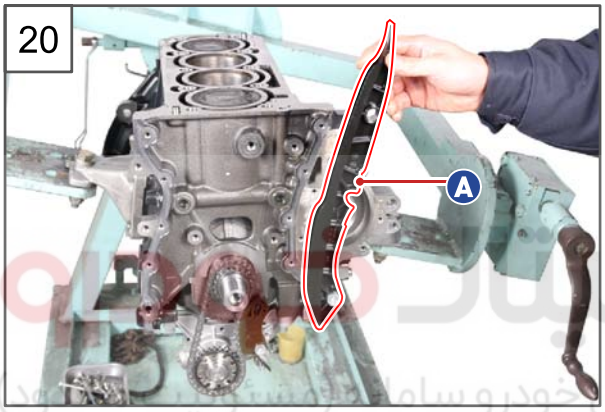
19



19.Install the oil pump chain tensioner (A) and tighten the shoulder bolt (B, T50) to the specified tightening torque.

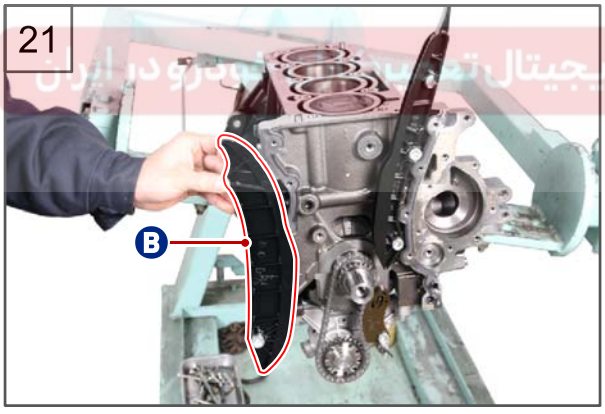
Tightening torque 25.0 ± 2.5Nm

20

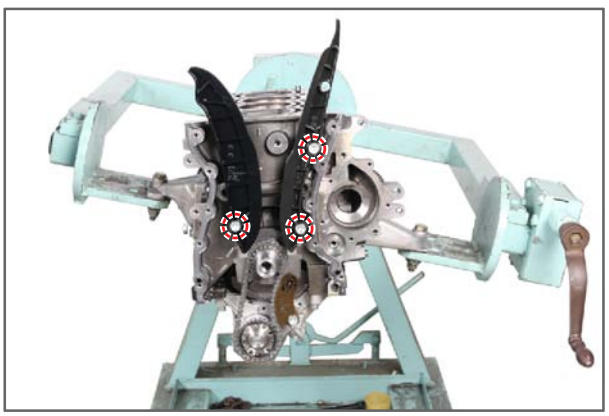


20.Install the clamping rail.

21



21.Install the tensioner guide rail (B).

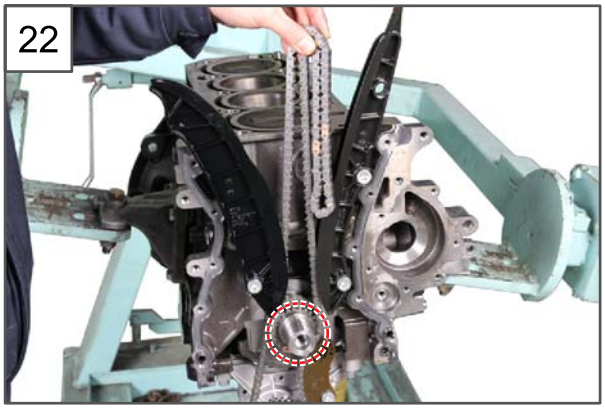


- Tighten three bolts (T50) to the tensioner guide rail and clamping rail to the specified tightening torque.

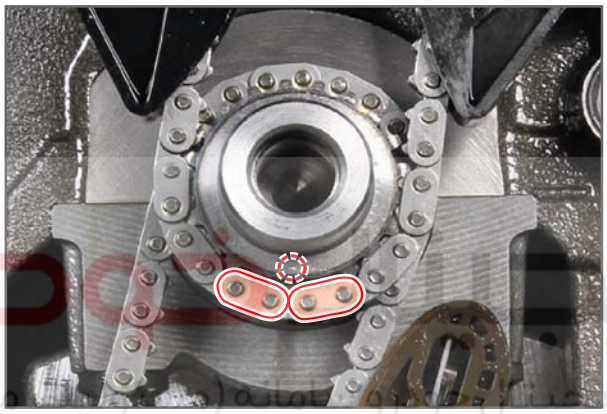
Tightening torque 25.0 ± 2.5Nm

Modification basis	
Application basis	
Affected VIN	

22



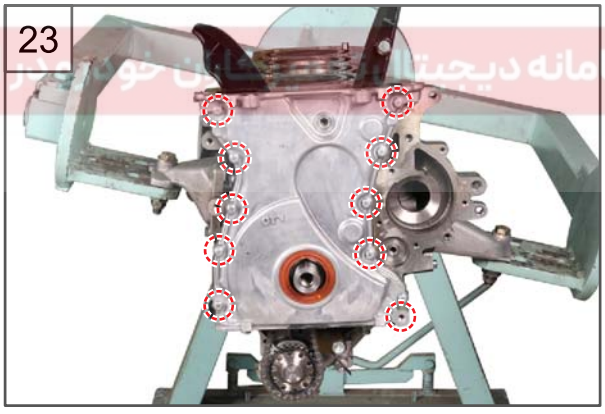
22.Align the timing marks on timing chain and crankshaft sprocket, and install the sprocket.



NOTE

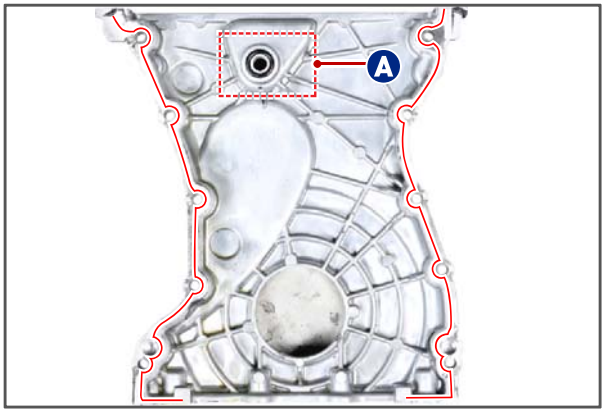
The timing mark on the sprocket should be between two golden marks on timing chain.

23



23.Tighten 10 bolts (10 mm) to the timing gear case cover (TGCC) to the specified tightening torque.

Tightening torque 10.0 ± 1.0Nm

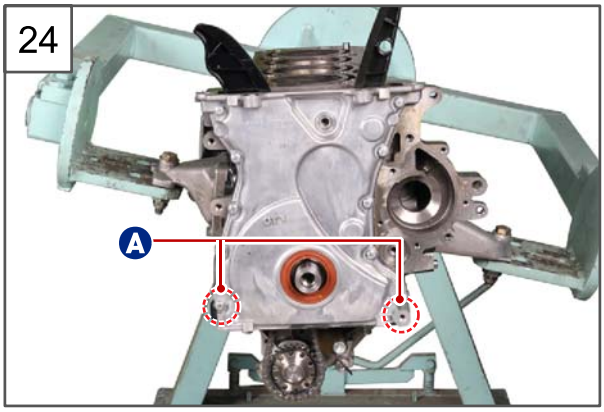


CAUTION

Apply the liquid gasket on the mating surface on the timing gear case cover and replace the O-ring (A) with new one.

Modification basis	
Application basis	
Affected VIN	

24

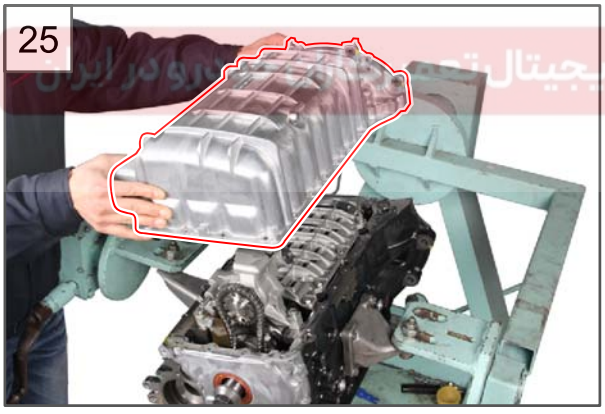


24.Install the timing gear case cover and measure the height difference at point (A).

Height difference	Below 0.2 mm

Make sure not to spill out the engine oil when installing the oil pan.

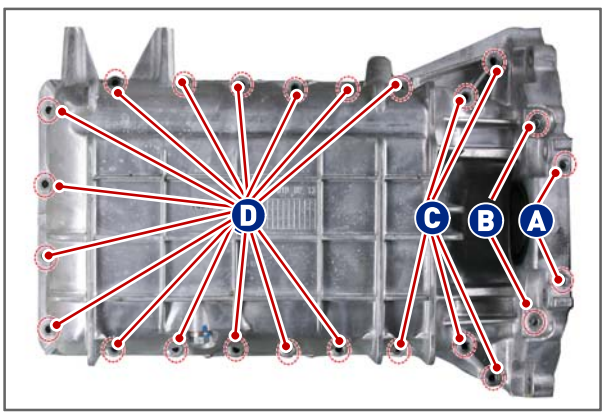
25



25.Install the engine oil pan assembly.

CAUTION

To prevent the oil pan from damaging and distorting, tighten the bolts slowly in two or more steps.



- Tighten the bolts starting from inside in diagonal sequence.

		Tightening torque
A	M6*1.0*00 2EA	10.0±1.0 Nm
B	M6*1.0*85 2EA	10.0±1.0 Nm
C	M6*1.0*35 4EA	10.0±1.0 Nm
D	M6*1.0*20 16EA	10.0±1.0 Nm

Modification basis	
Application basis	
Affected VIN	

▶ **Location of sealant**

CAUTION

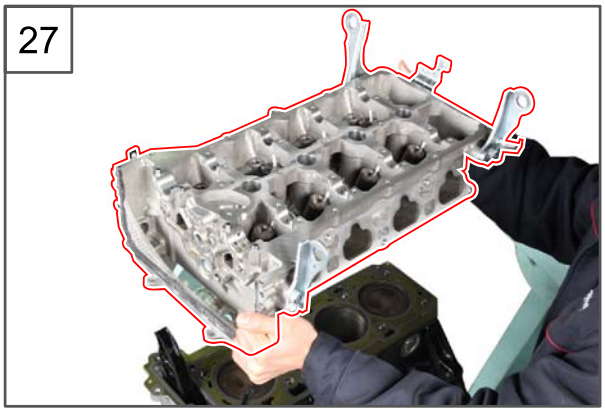
Make sure not to spill out the engine oil from the oil pan.

- Wash out the oil pan to remove the foreign material.
- Evenly apply the specified sealant (661 989 56 A0) on the oil pan.
- Tighten the bolts to the specified tightening torque.

26

26.Install new cylinder head gasket.

27



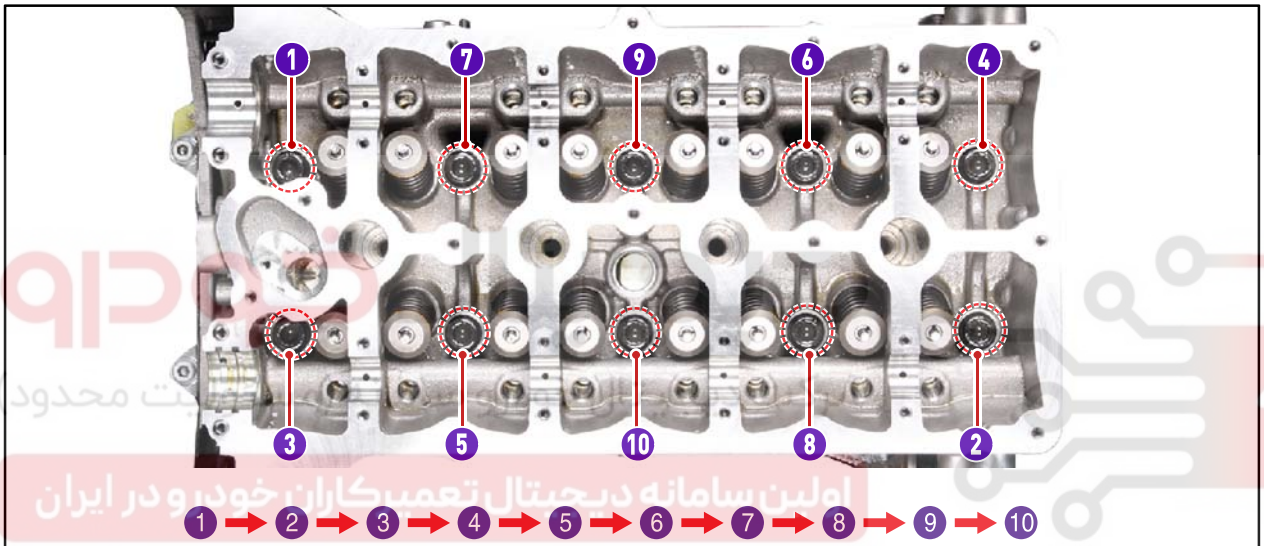
27.Place the cylinder head assembly onto the cylinder block.

28

28.Tighten 10 cylinder head bolts (13 mm) in numerical order in the figure below.

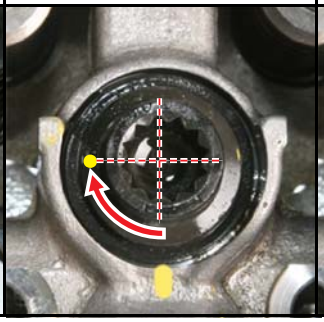
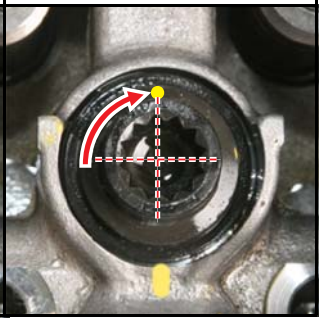
Cylinder head bolt wrench

14 mm star-bit socket



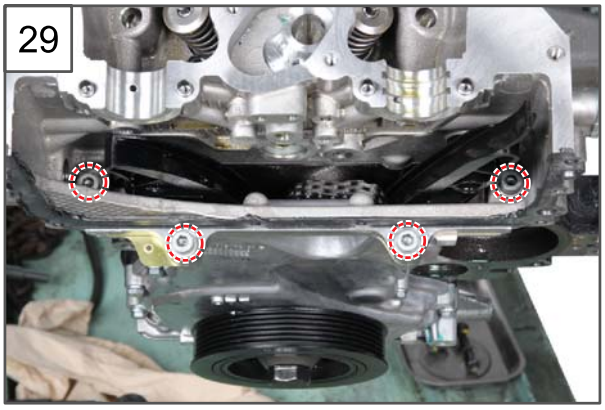
CAUTION

- Tighten the bolts in two or more steps.
- Apply the engine oil on the thread of cylinder head bolts.
- Do not reuse the cylinder head bolt.

Tightening sequence of cylinder head bolt (angle tightening)			
Torque wrench 55 Nm	Paint marking (on cylinder head and head bolt)	1st angle tightening 90˚±10 ˚	2nd angle tightening 90˚±10 ˚
			

Modification basis	
Application basis	
Affected VIN	

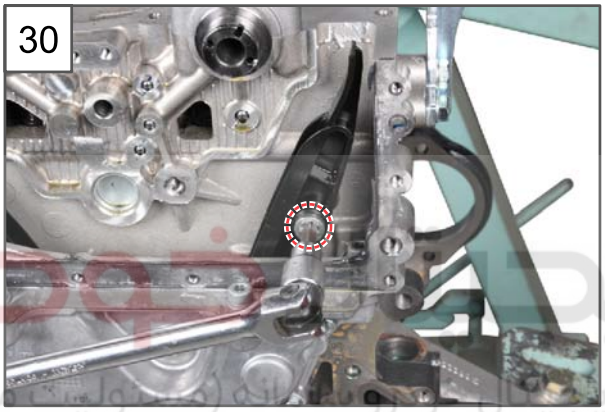
29



29. Tighten four TGCC bolts (6 mm) in cylinder head side to the specified tightening torque.

Tightening torque 25.0 ± 2.5Nm

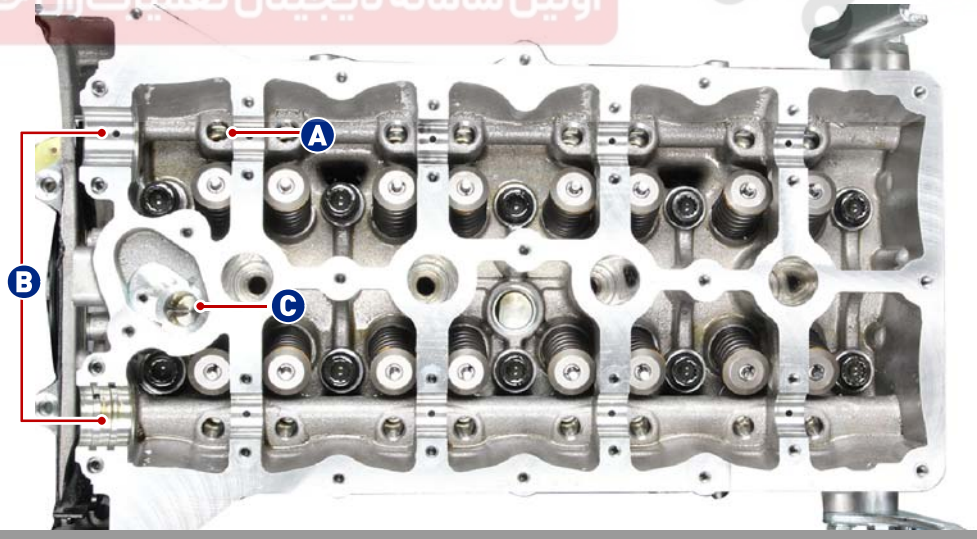
30



30. Tighten the clamping rail upper mounting bolt (T50) on cylinder head to the specified tightening torque.

Tightening torque 25.0 ± 2.5Nm

Applying engine oil after installing the cylinder head assembly

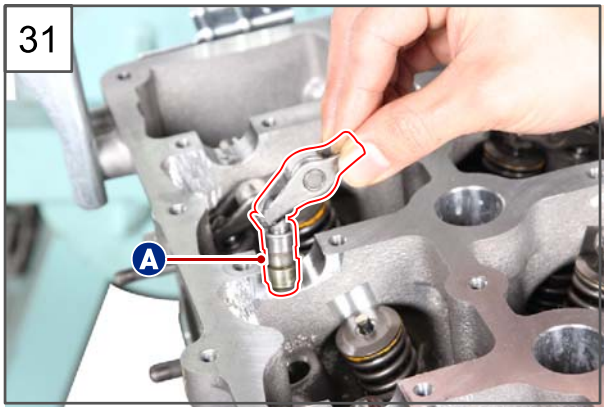


NOTE

A. Finger follower and HLA connection
B. Intake/Exhaust camshaft connection
C. OCV connection

Modification basis	
Application basis	
Affected VIN	

31



31.Install the finger follower and HLA device (A).

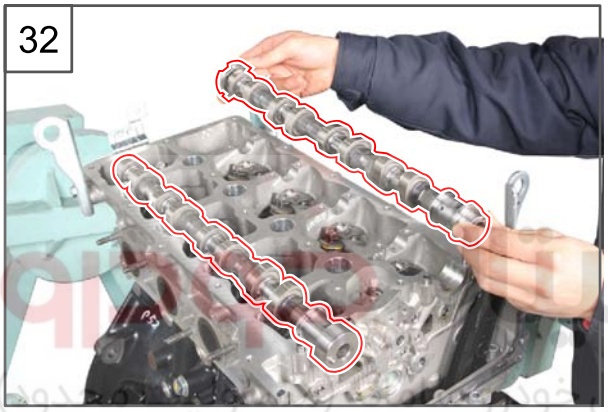
CAUTION

If the removed finger follower and HLA device is easily compressed, it means that the oil has been drained. In this case, replace it with a new one.

NOTE

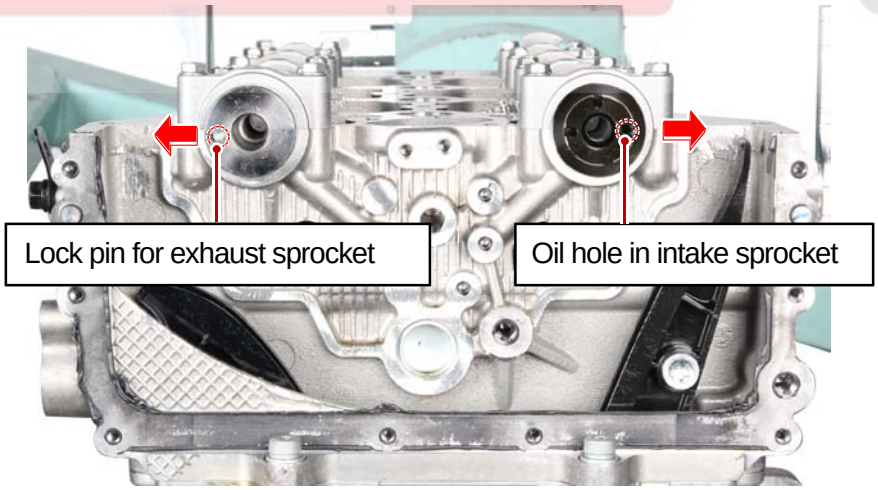
Apply the engine oil on it before installation.

32



32.Install the intake and exhaust camshafts.

Correct installation of camshafts



NOTE

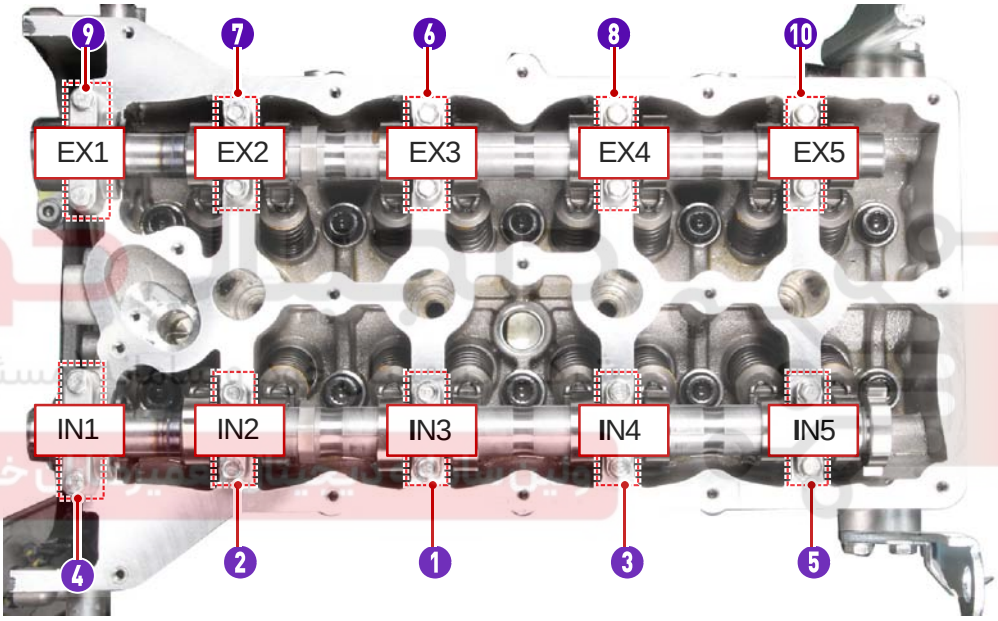
Exhaust camshaft: the lock pin should face toward exhaust manifold.
Intake camshaft: the locking groove should face toward bottom and the oil hole should be parallel with the cylinder head surface.

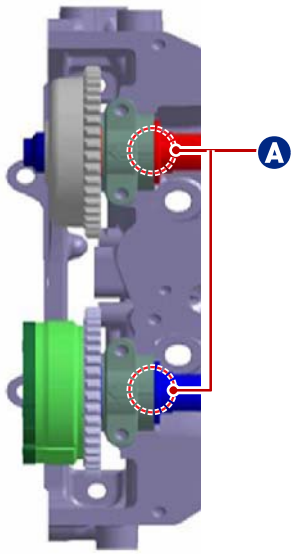
Modification basis	
Application basis	
Affected VIN	

33

33. Tighten the camshaft bearing cap bolts in numerical order in the fugure below to the specified tightening torque.

Tightening torque 10.0 ± 1.0Nm



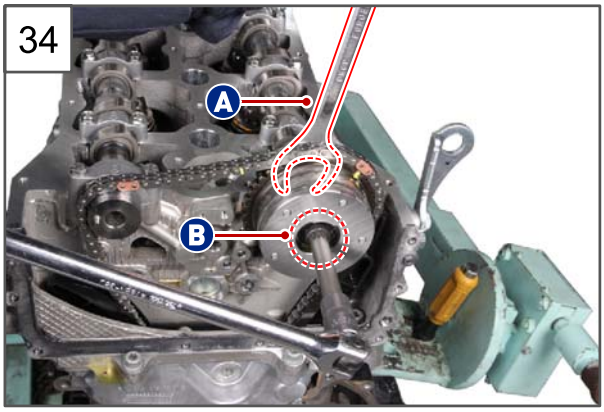


CAUTION

- Tighten the camshaft bearing cap bolts slowly in two or more steps according to the specified sequence.
- The arrow mark on the camshaft bearing cap should face toward intake/exhaust camshaft sprockets.
- Use only the specified camshaft bearing cap bolt.
  IN/EX 1 : M6 X 1.0 X 35 (4ea)
- IN/EX 2~5 : M6 X 1.0 X 30 (16ea)
- Align the mark on the camshaft flange with the timing mark (A) on the camshaft bearing cap.
-

Modification basis	
Application basis	
Affected VIN	

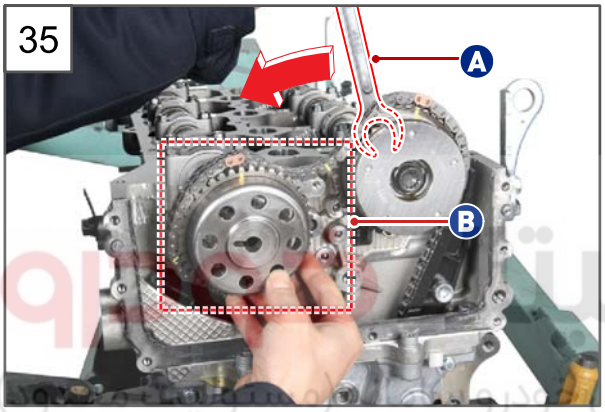
34



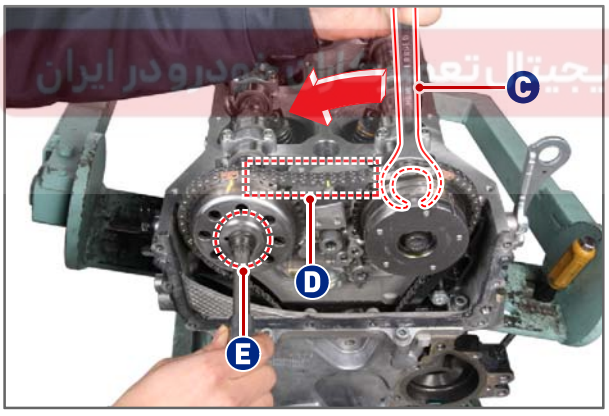
34. Hold the octagon spanner seat on the exhaust camshaft with a spanner (A, 30 mm) and tighten the center bolt (14 mm) to the specified tightening torque.

Tightening torque 110 ± 10Nm

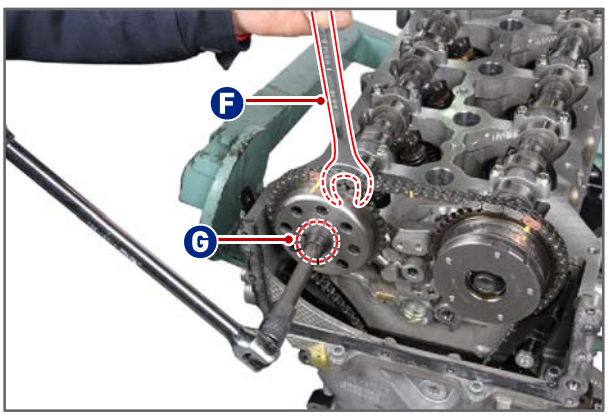
35



35. Install the exhaust camshaft sprocket (B) on the exhaust camshaft while pulling the octagon spanner seat on the intake camshaft counterclockwise with a spanner (30 mm).



- To release the tension of the timing chain (D), turn the octagon spanner seat on the intake camshaft counterclockwise with a spanner (C, 30 mm), and tighten the center bolt (E) until the exhaust sprocket is seated in position.



- Hold the octagon spanner seat on the exhaust camshaft with a spanner (30 mm) and tighten the exhaust camshaft center bolt (G, 14 mm) to the specified tightening torque.

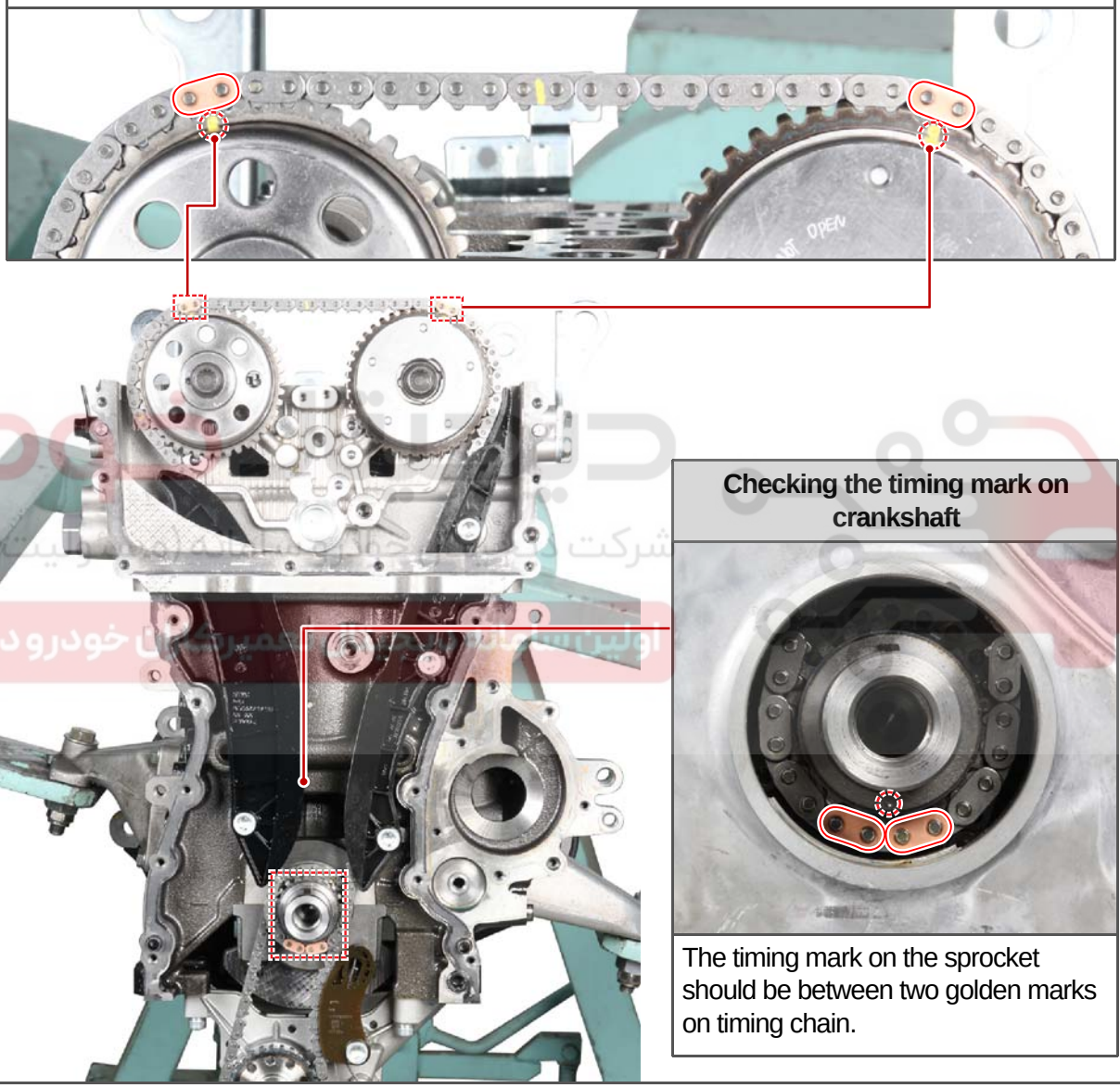
Tightening torque 110 ± 10Nm

Modification basis	
Application basis	
Affected VIN	

Checking the timing marks

Checking the timing marks on intake/exhaust camshafts

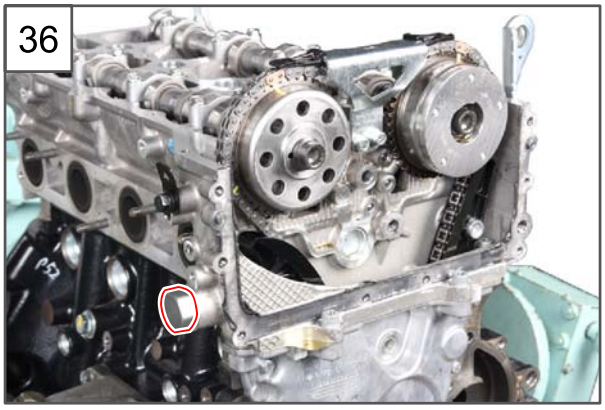
The golden mark on the silence chain should be matched with the timing mark on intake/exhaust camshaft.



Checking the timing mark on crankshaft

The timing mark on the sprocket should be between two golden marks on timing chain.

36

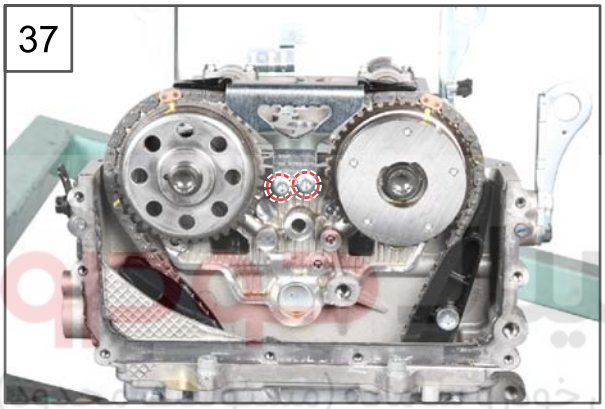


36.Tighten the auto tensioner with a spanner (27 mm) to the specified tightening torque.

Tightening torque 65.0 ± 5.0Nm

CAUTION
Replace the gasket with new one.

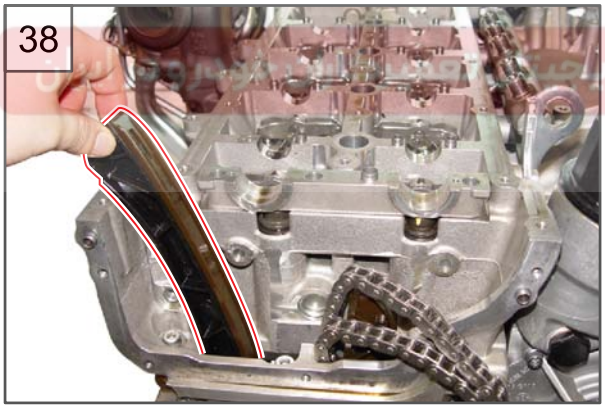
37



37.Place the upper rail and tighten two bolts (5 mm) to the specified tightening torque.

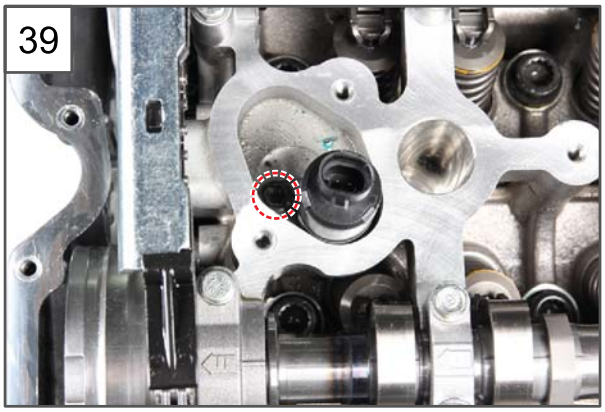
Tightening torque 10.0 ± 1.0Nm

38



38.Insert the OCV on the cylinder head.

39

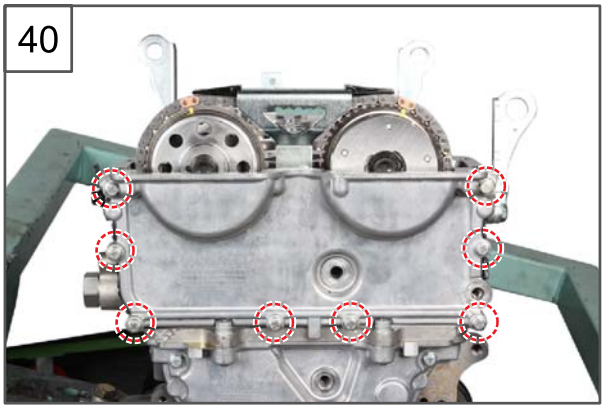


39.Tighten the OCV bolt (8 mm) to the specified tightening torque.

Tightening torque 8.0 ± 1.0Nm

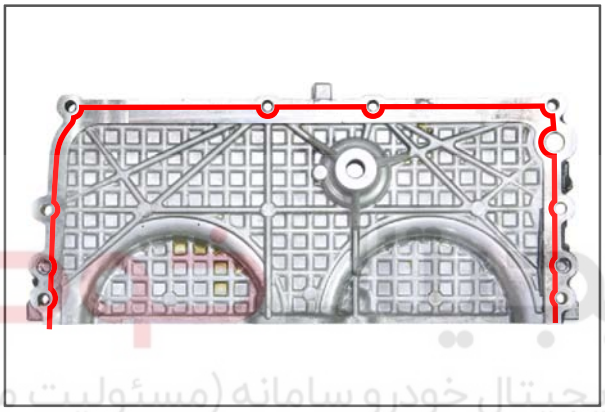
Modification basis	
Application basis	
Affected VIN	

40



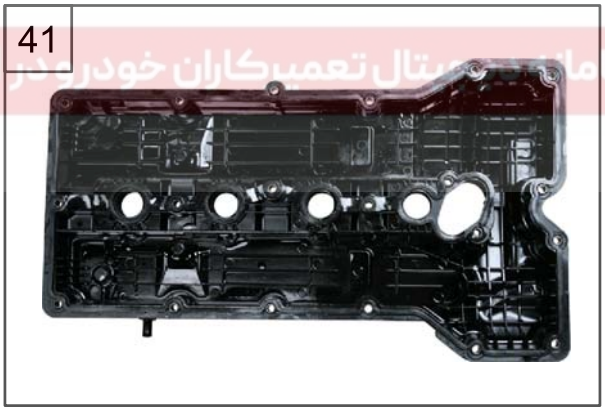
40.Tighten eight front cover bolts (10 mm) to the specified tightening torque.

Tightening torque 10.0 ± 1.0Nm



- Sealant location on front cover

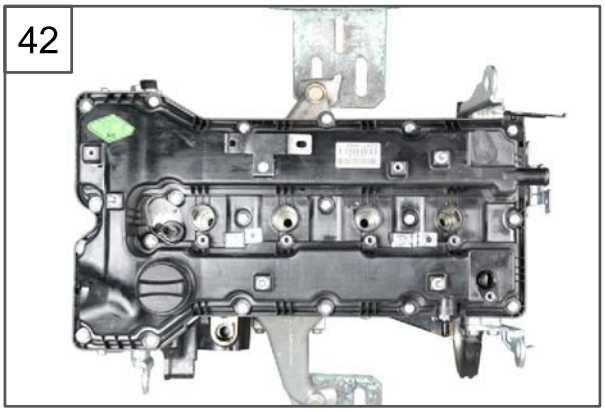
41



41.Install new gasket on the cylinder head cover.

Gasket on cylinder head cover

42



42.Tighten 20 cylinder head cover bolts in diagonal sequence from inside.

Tightening torque 10.0 ± 1.0Nm

CAUTION

To prevent the cylinder head ciover from damaging and distorting, tighten the bolts slowly in two or more steps.

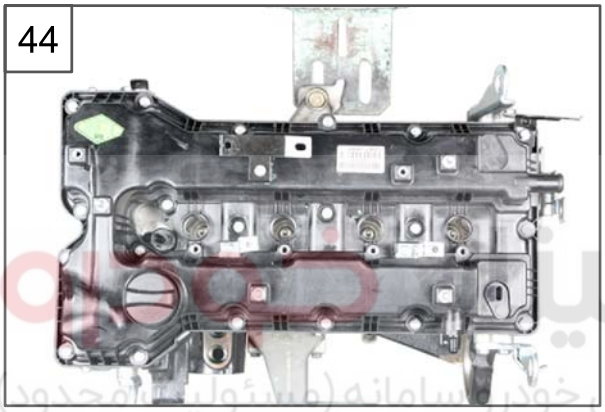
43

43.Install the camshaft position sensor.

CAUTION

Apply the engine oil on the O-ring and turn the camshaft position sensor right and left when installing it.

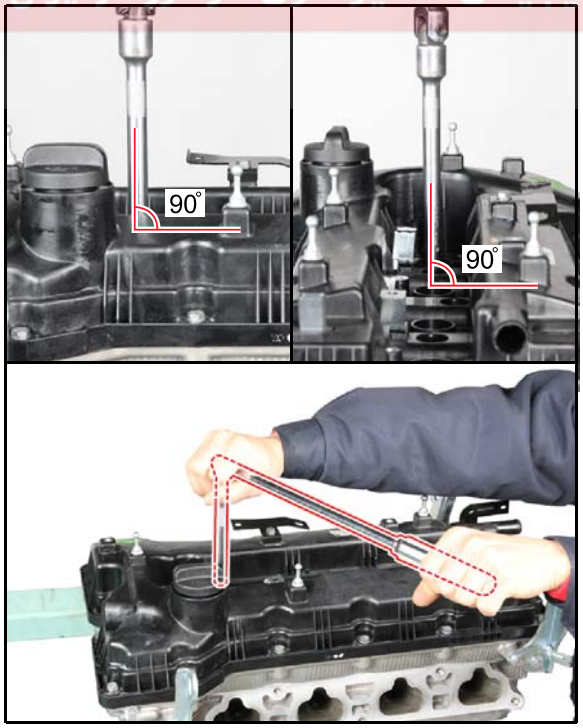
44



44.Install the spark plug in each cylinder.

Tightening torque 25.5 ± 5.0Nm

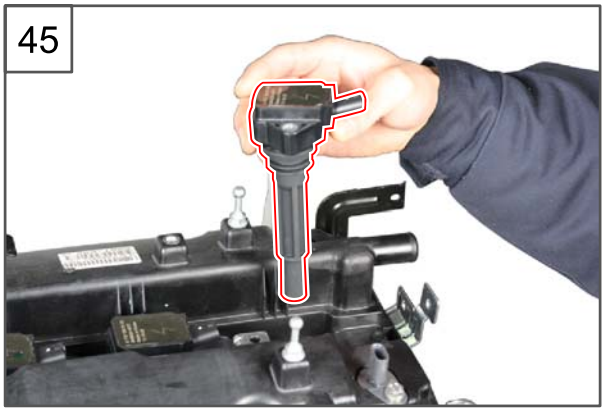
Cautions when installing the spark plug



CAUTION

To prevent the spark plug from damaging during installtion, tighten the spark plug by hand temporarily, then tight it again with the tool.
The tool should be used in perpendicular.

Modification basis	
Application basis	
Affected VIN	

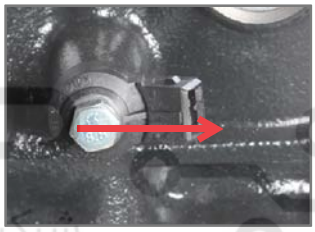


45.Install the ignition coil to the specified tightening torque.

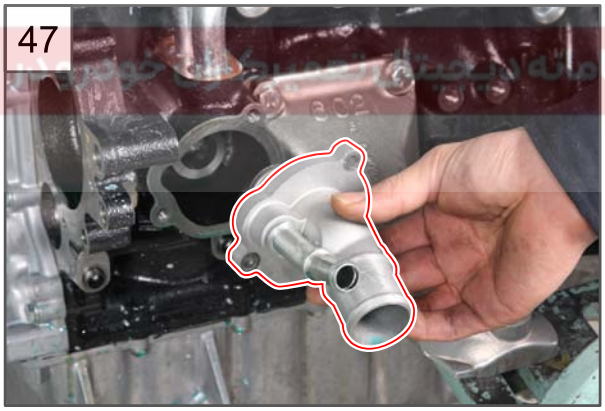
Tightening torque 7.8 ± 0.6Nm

46.Install the knock sensor to the specified tightening torque.

CAUTION



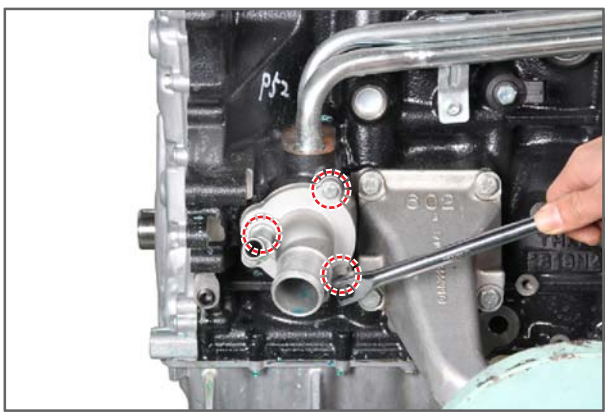
When installing, place the connector facing to 3 o'clock.



47.Install the thermostat.

CAUTION

Replace the O-ring with new one.

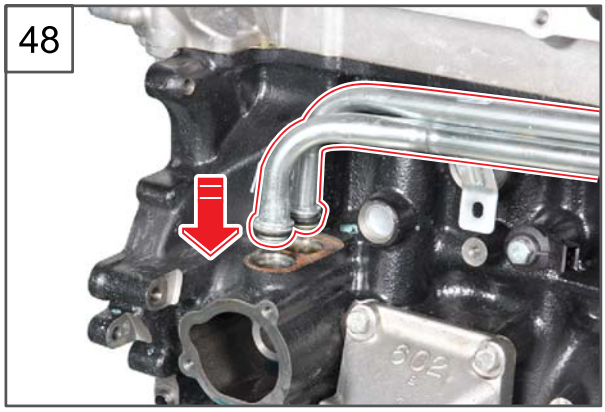


- Tighten three bolts (10 mm) to the specified tightening torque.

Tightening torque 10.0 ± 1.0Nm

Modification basis	
Application basis	
Affected VIN	

48

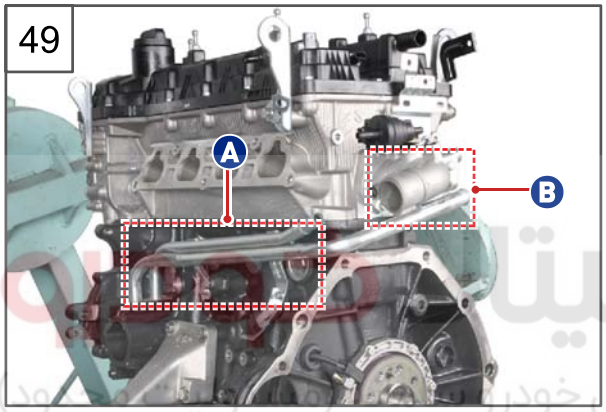


48.Install the coolant pipes to the thermostat housing.

CAUTION

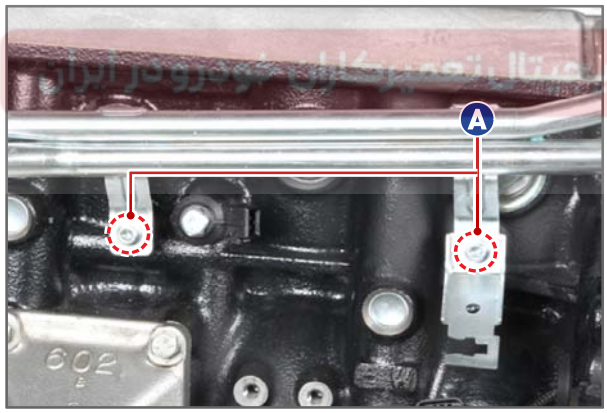
Replace the O-rings with new ones.

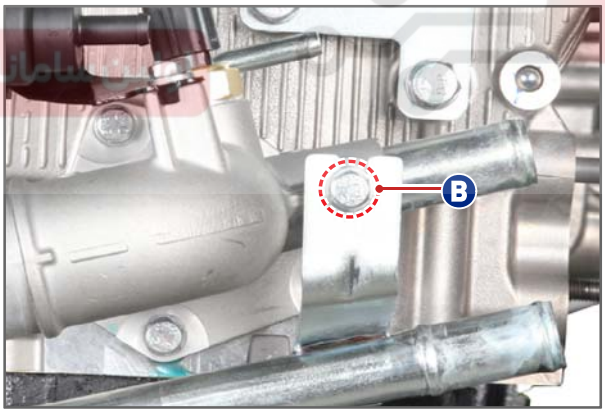
49



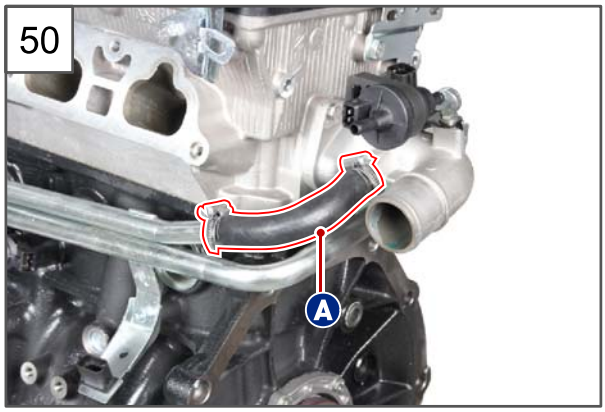
49.Tighten two bolt (A, 5 mm) and one bolt (B, 10 mm) to the coolant pipes to the specified tightening torque.

Tightening torque 10.0 ± 1.0Nm





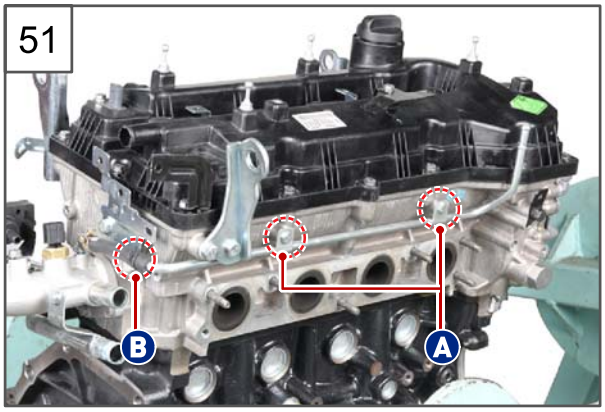
50



50.Install the coolant outlet port and the hose (A).

Modification basis	
Application basis	
Affected VIN	

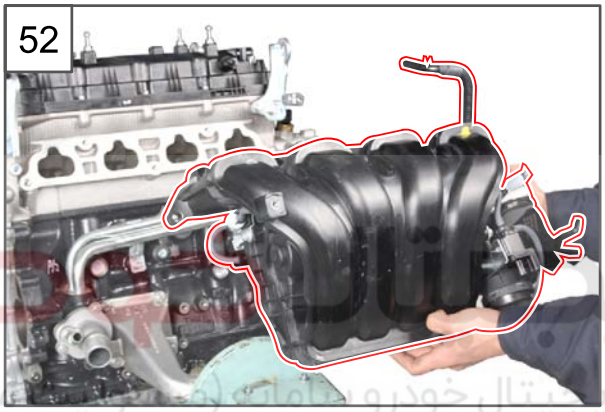
51



51. Tighten two bolts (A, 10 mm) and clamp (B) to the deaeration hose to the specified tightening torque.

Tightening torque 10.0 ± 1.0Nm

52



52. Install the intake manifold assembly.

- Temporarily tighten four bolts (13 mm) to the intake manifold lower bracket and place the inatke manifold on the bracket.

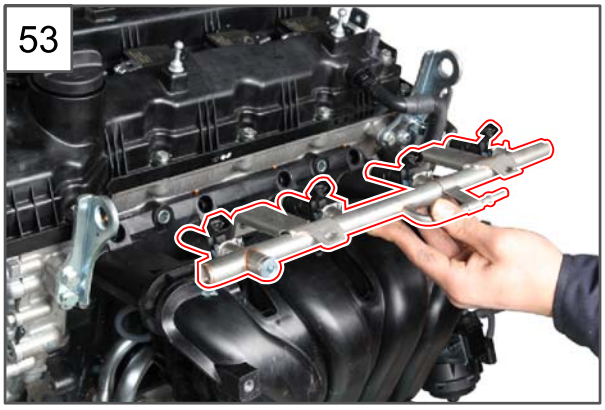
Tightening torque 25.0 ± 2.5Nm

- Tighten three upper bolts (6 mm) to the intake manifold, then tighten the lower bracket bolts to the specified tightening torque.

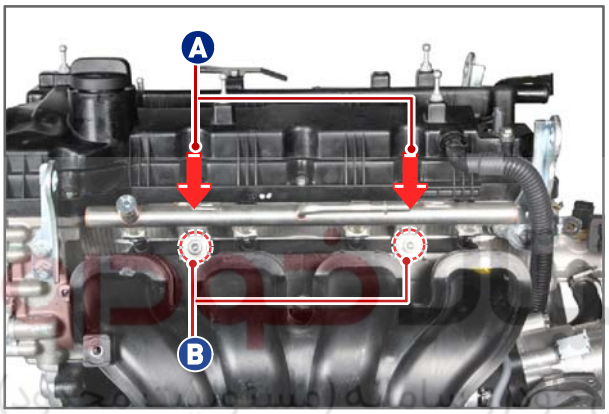
Tightening torque 25.0 ± 2.5Nm

Modification basis	
Application basis	
Affected VIN	

53



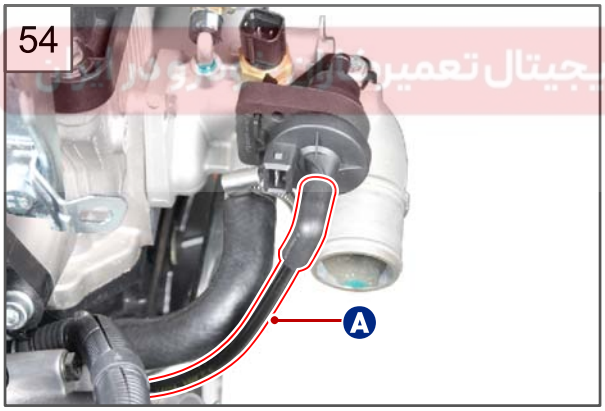
53.Install the fuel rail assembly.



- Place the fuel rail assembly in position by pushing down both ends (A), and tighten two bolts (B, 6 mm) to the specified tightening torque.

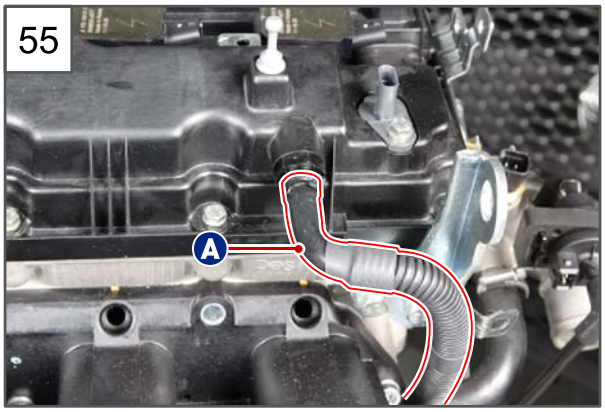
Tightening torque 25.0 ± 2.5Nm

54



54.Install the vacuum hose (A) between purge control solenoid valve and intake manifold.

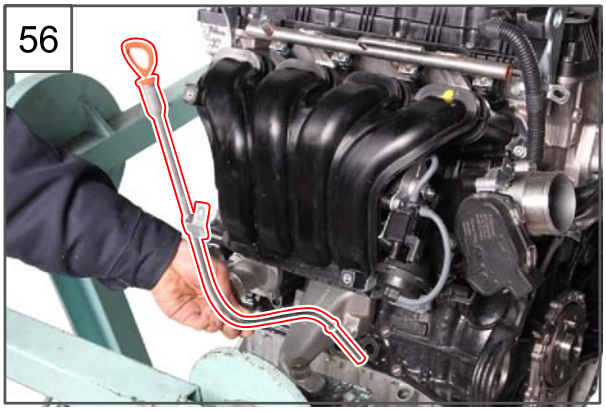
55



55.Install the PCV valve hose (A).

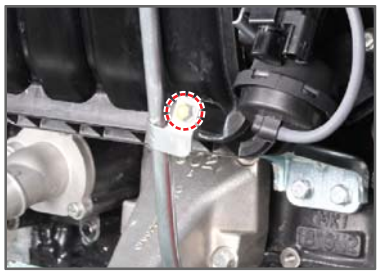
Modification basis	
Application basis	
Affected VIN	

56



56.Install the oil dipstick gauge.

Tightening torque 10.0 ± 1.0Nm

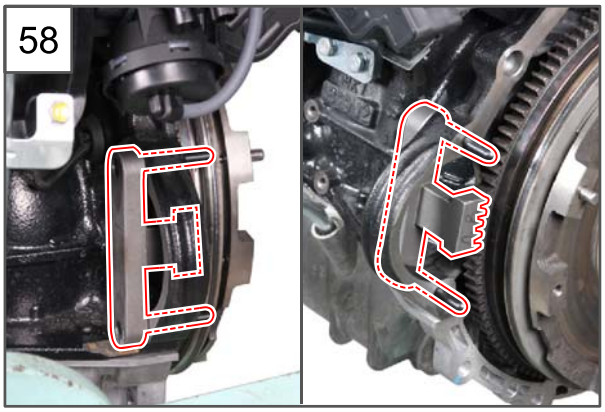


CAUTION
Replace the O-ring on the oil dipstick gauge with new one.

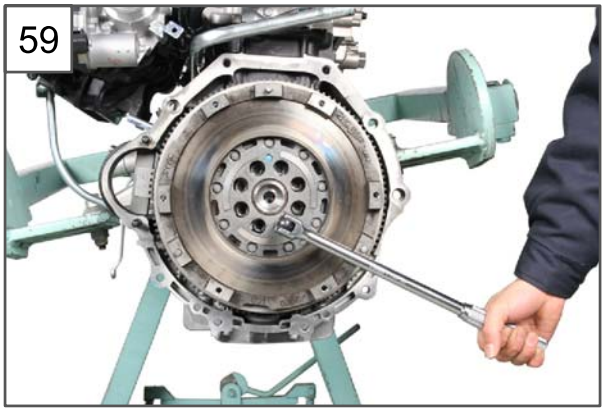
57

57.Place the flywheel assembly and tighten the bolts temporarily.

58



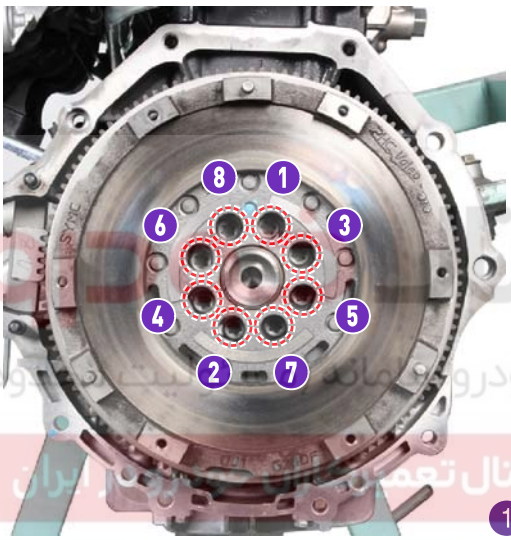
58.Lock the flywheel with the special service tool.



59.Tighten eight flywheel bolts (T55) in numerical order in the figure below.

Tightening torque (1) 45.0 + 5.0Nm

Tightening torque (2) 90° + 10°

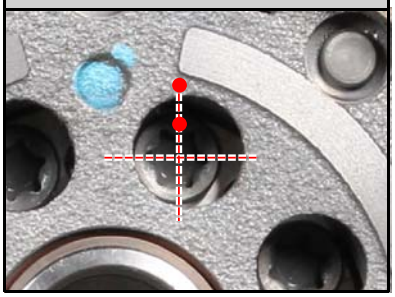
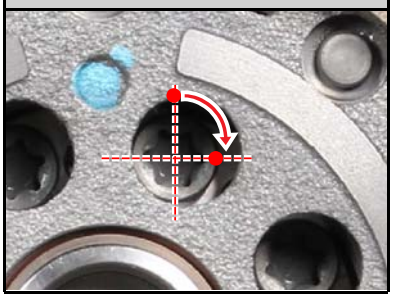


CAUTION

- Tighten the bolts in two or more steps.

1 → 2 → 3 → 4 → 5 → 6 → 7 → 8

Tightening sequence of flywheel bolt (angle tightening)

Torque wrench 45.0 ± 5.0Nm	Paint marking	Angle tightening 90°
		

Modification basis	
Application basis	
Affected VIN	

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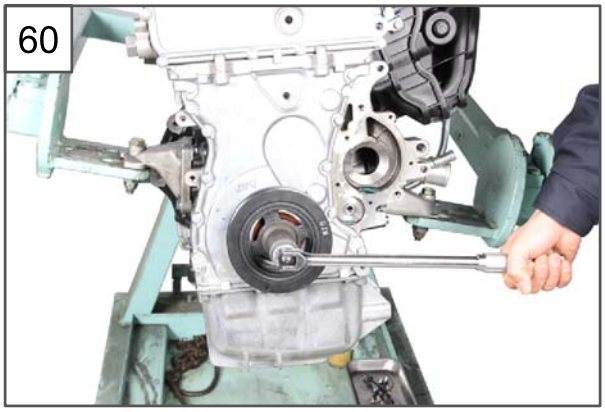
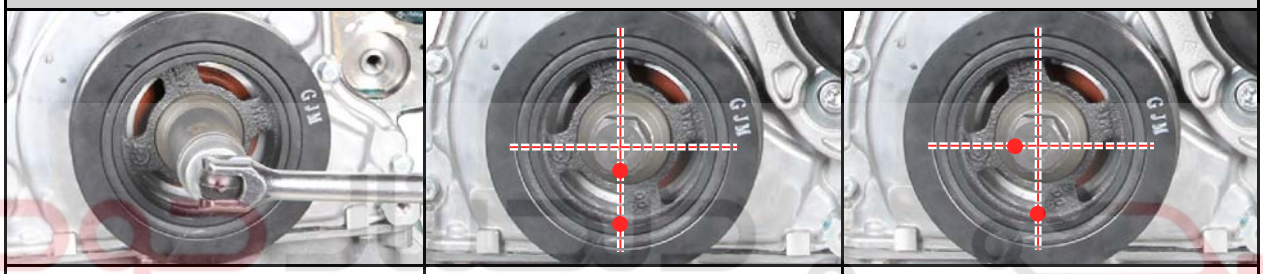


60. Install the crankshaft pulley and tighten the center bolt (27 mm) to the specified tightening torque.

Tightening torque (1) 200 + 20Nm

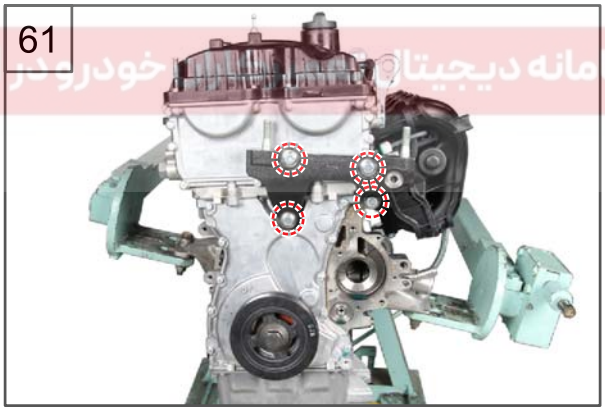
Tightening torque (2) 90° + 10°

Tightening sequence of crankshaft center bolt



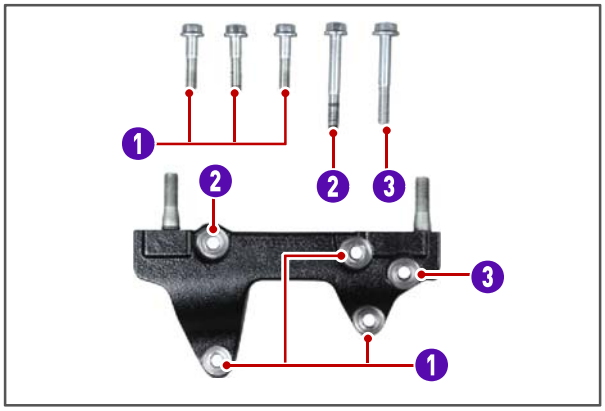
Torque wrench 200 + 20 Nm	Paint marking	Angle tightening 90° + 10 °

61



61. Tighten the engine lower mounting bracket bolts (15 mm) to the specified tightening torque.

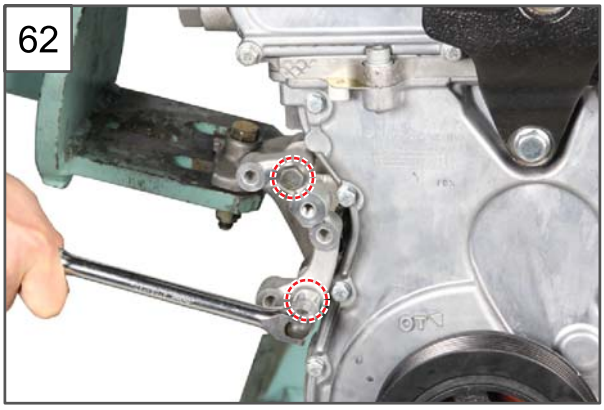
Tightening torque 60.0 ± 6.0Nm



	Name	Bolt size
1	Lower bolt	M10 * 45
2	Lower bolt	M10 * 77
3	Alternator bolt	M10

Modification basis	
Application basis	
Affected VIN	

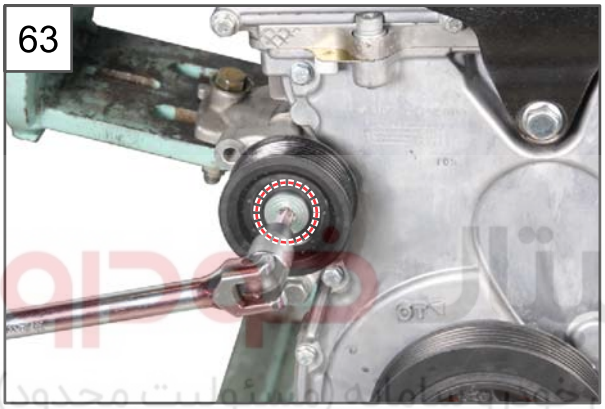
62



62.Install the ESP idler pulley bracket.

Tightening torque 25.0 ± 2.5Nm

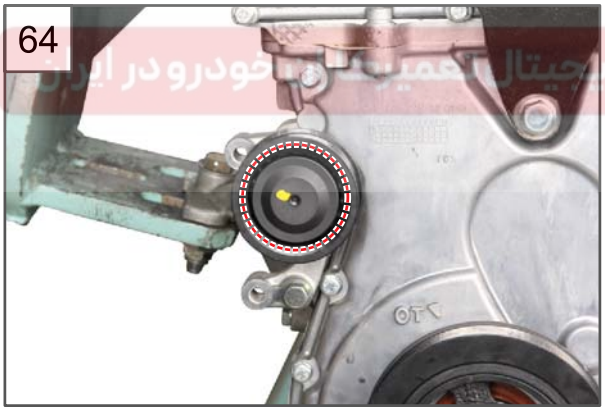
63



63.Tighten the bolt (T50) to the EPS idler pulley to the specified tightening torque.

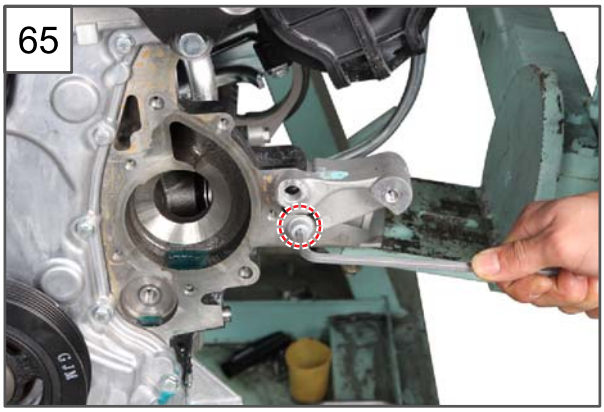
Tightening torque 25.0 ± 2.5Nm

64



64.Install the EPS idler pulley cap.

65

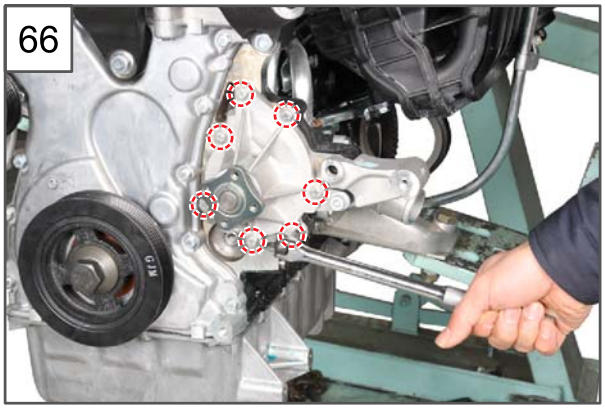


65.Install the hydraulic auto tensioner upper bracket.

Tightening torque 25.0 ± 2.5Nm

Modification basis	
Application basis	
Affected VIN	

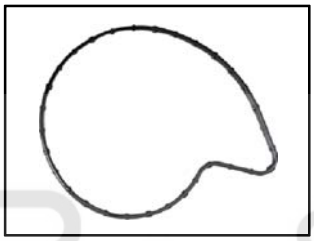
66



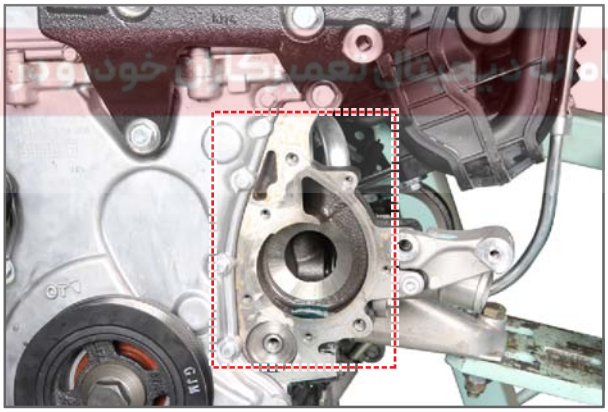
66.Install the water pump assembly.

Tightening torque 10.0 ± 1.0Nm

CAUTION



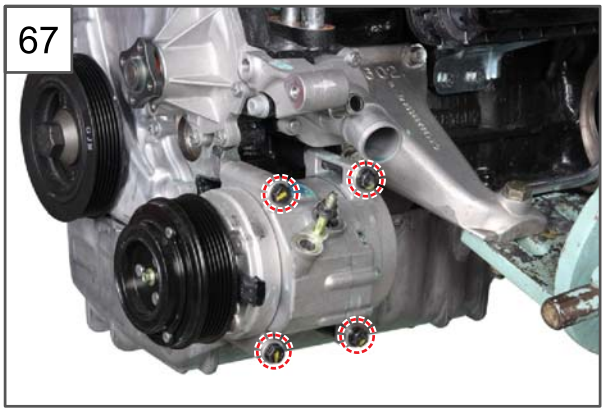
Replace the sealing on the water pump with new one.



CAUTION

Remove the foreign material from the mating surface on cylinder block before installation.

67

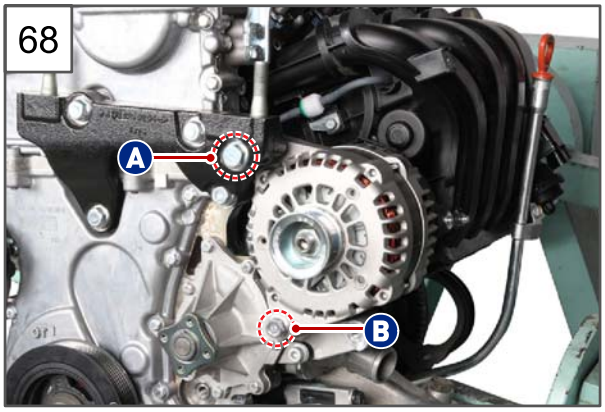


67.Install the air conditioner compressor.

Tightening torque 25.0 ± 2.5Nm

Modification basis	
Application basis	
Affected VIN	

68

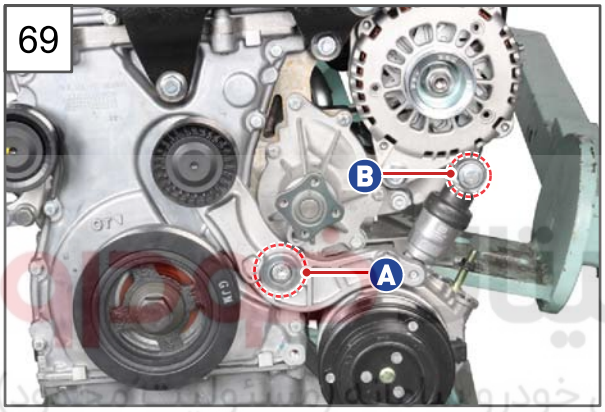


68.Install the alternator.

Tightening torque (A) 45.0 ± 4.5Nm

Tightening torque (B) 45.0 ± 4.5Nm

69

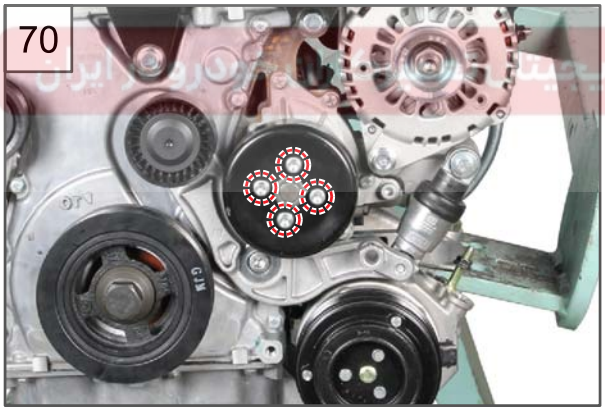


69.Install the hydraulic tensioner assembly.

Tightening torque (A) 82.0 ± 5.0Nm

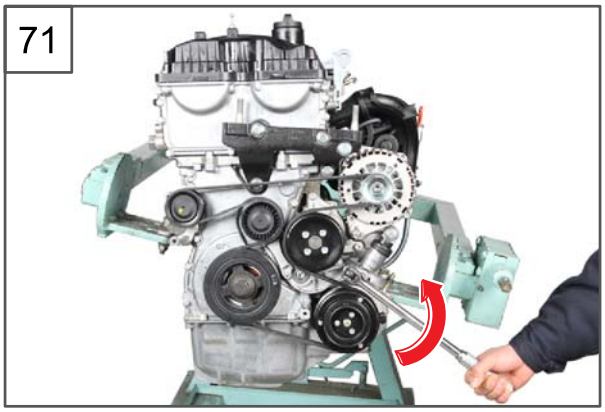
Tightening torque (B) 25.0 ± 2.5Nm

70

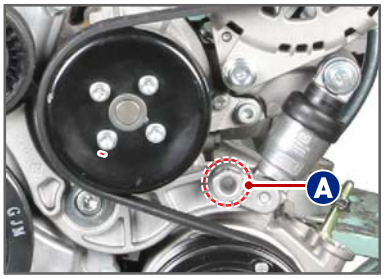


70.Install the water pump pulley.

71



71.Release the tension by turning the hydraulic tensioner adjust bolt counterclockwise, and install the fan belt.



Modification basis	
Application basis	
Affected VIN	