TROUBLESHOOTING

Symptom	Probable cause	Remedy
Low compression	Damaged cylinder head gasket	Replace gasket
	Worn or damaged piston rings	Replace rings
	Worn piston or cylinder	Repair or replace piston and/or cylinder block
	Worn or damaged valve seat	Repair or replace valve and/or seat ring
Oil pressure drop	Low engine oil level	Check engine oil level
	Faulty oil pressure switch	Replace
	Clogged oil filter	Replace
	Worn oil pump gears or cover	Replace
	Thin or diluted engine oil	Change and find out cause
	Oil relief valve stuck (open)	Repair
	Excessive bearing clearance	Replace
High oil pressure	Oil relief valve stuck (closed)	Repair
Excessive engine vibration	Loose engine mounting bolt	Retighten
	Loose transmission mounting bolt	Retighten
	Loose cross member bolt	Retighten
	Broken transmission mounting rubber	Replace
	Broken engine mounting rubber	Replace
Noisy valves	Thin or diluted engine oil (low oil pressure)	Change
	Worn or damaged valve stem or valve guide	Replace
Connecting rod and/main beaing noise	Insufficient oil supply	Check engine oil level
	Thin or diluted engine oil	Change and find out cause
	Excessive bearing clearance	Replace
Low coolant level	Leakage of coolant	
	Damaged radiator core joint	Replace
	Corroded or cracked hoses (radiator hose, heater hose, etc)	Replace
	Faulty radiator cap valve or setting of spring	Replace
	Faulty thermostat	Replace
	Faulty engine coolant pump	Replace
Clogged radiator	Foreign material in coolant	Replace
Abnormally high coolant temperature	Faulty thermostat	Replace
	Faulty radiator cap	Replace
	Restricted of flow in cooling system	Replace
	Loose or missing drive belt	Adjust or replace

SPECIFICATIONS

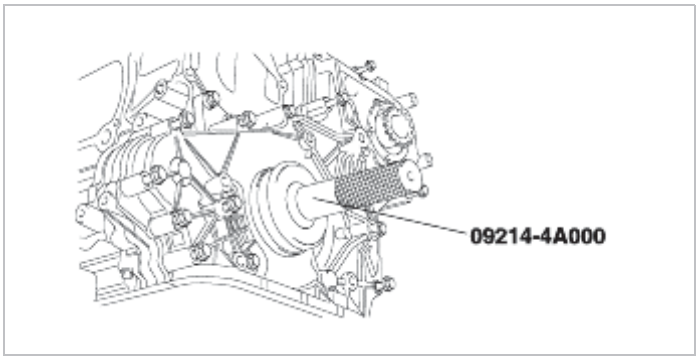
DESCRIPTION	SPECIFICATION	LIMIT
General		
Type	In-line, DOHC	
Number of cylinders	4	
Bore	91 mm (3.58 in)	
Stroke	96 mm (3.78 in)	
Total displacement	2497 cc (121.5 cu.in)	
Compression ratio	17.7 : 1	
Firing order	1-3-4-2	
Valve timing		
Intake valve		
Opens (BTDC)	8°	
Closes (ABDC)	38°	
Exhaust valve		
Opens (BBDC)	52°	
Closes (ATDC)	8°	
Cylinder head		
Flatness of gasket surface	0.15 mm (0.0059 in)	
Camshaft		
Cam height (LH)		
Intake	40.163 mm (1.5812 in)	
Exhaust	40.043 mm (1.5765 in)	
Cam height (RH)		
Intake	39.782 mm (1.5662 in)	
Exhaust	40.456 mm (1.5928 in)	
Journal outer Diameter	29.964 ~ 29.980 mm (1.1797 ~ 1.1803 in)	
End play	0.10 ~ 0.20 mm (0.0039 ~ 0.0079 in)	
Valve		
Valve length		
Intake	110.55 mm (4.352 in)	
Exhaust	110.55 mm (4.352 in)	
Stem outer diameter		
Intake	6.965 ~ 6.980 mm (0.2742 ~ 0.2748 in)	
Exhaust	6.935 ~ 6.950 mm (0.2730 ~ 0.2736 in)	
Face angle	45°	
Thickness of valve head (margin)		
Intake	1.8 ~ 2.0 mm (0.071 ~ 0.079 in)	
Exhaust	1.8 ~ 2.0 mm (0.071 ~ 0.079 in)	

REPLACEMENT

TIMING CHAIN LOWER FRONT COVER OIL SEAL

1. With the timing chain lower front cover oil seal installed, install the oil seal using the special tool (09214-4A000).

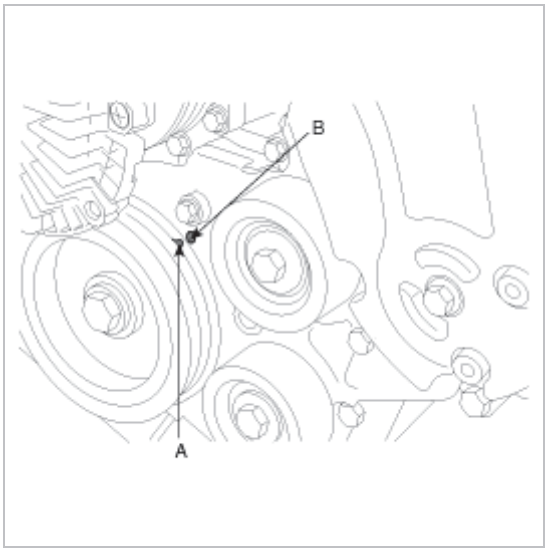
> NOTICE
>
> Apply engine fluid to the circumference of oil seal lip.



DISASSEMBLY

TIMING CHAIN "C"

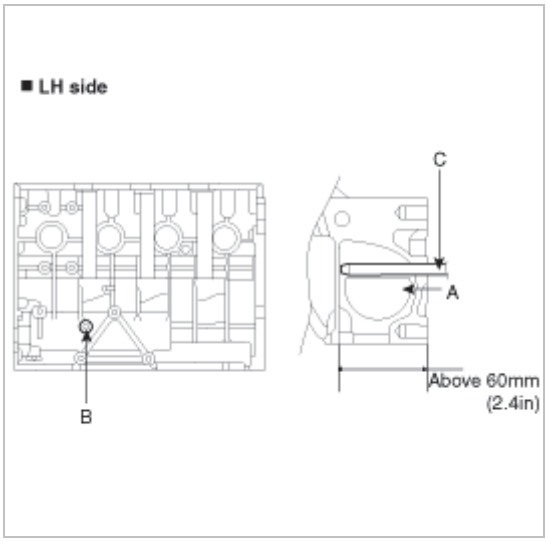
1. Rotate the crankshaft pulley to align the timing mark(A) with TDC(B), in which No.1 piston locates at the top dead center of compression stroke.



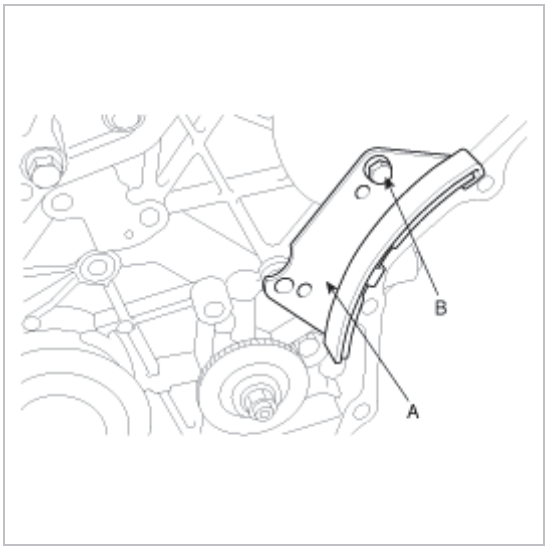
2. Remove the timing chain upper front cover(A).

NOTICE

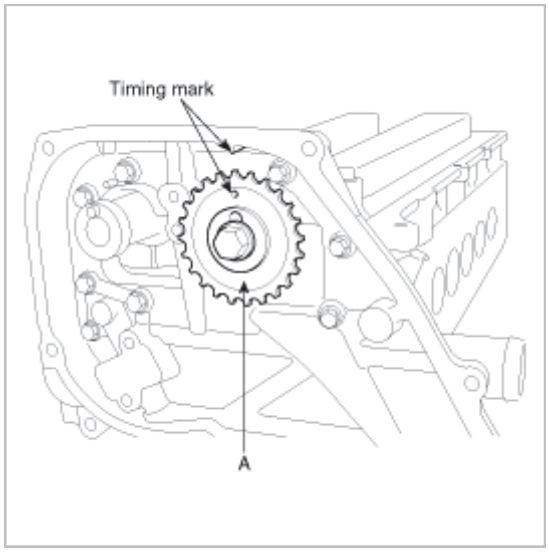
When the screwdriver (or bolt) depth is about 25-30mm(1-1.2in), rotate LH balance shaft sprocket 1 revolution. And insert the screwdriver (or bolt) again to check whether it slides more than 60mm(2.4in).



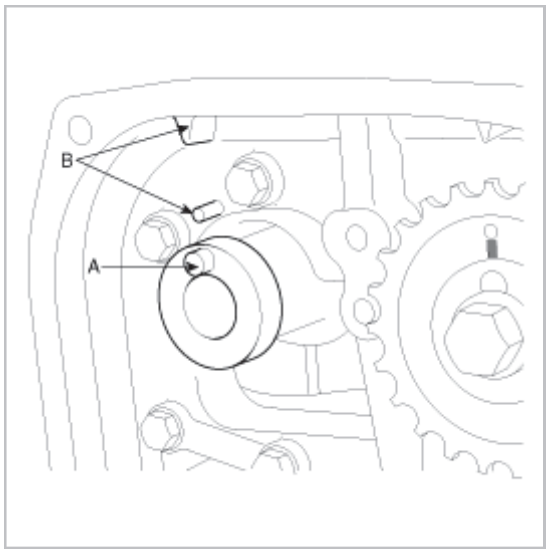
6. Assemble the upper bolt of timing chain guide "A"(A) tentatively.



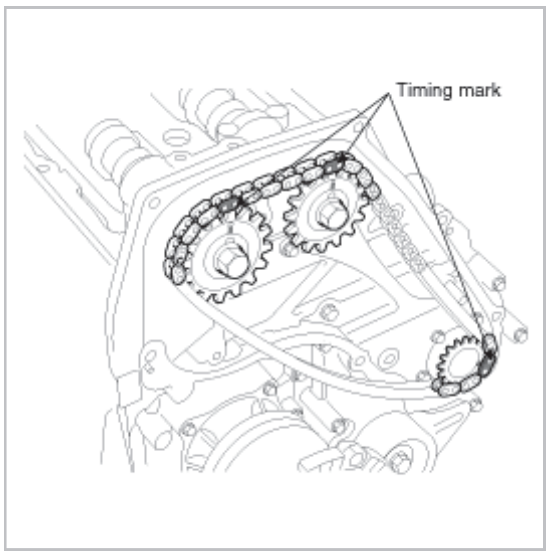
7. Align the timing marks of sprocket and chain when high-pressure pump sprocket is not installed to pump.
8. Using the chain connected to the high-pressure pump sprocket, install as the timing marks of LH balance shaft sprocket(A) and crankshaft sprocket align with each other.



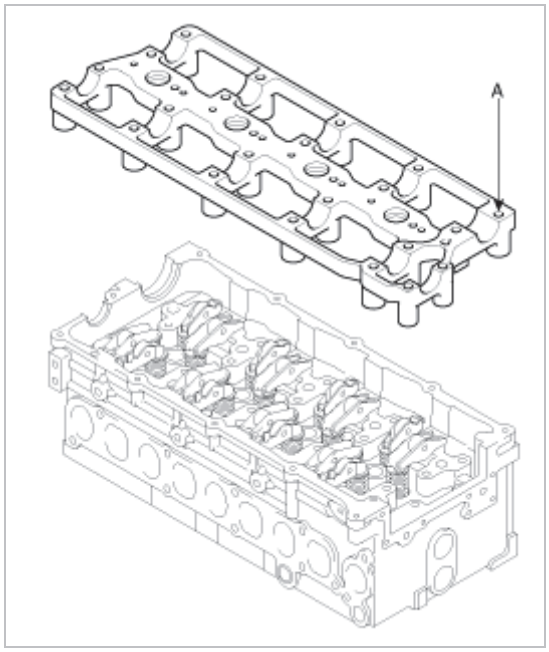
6. Align the RH camshaft dowel pin(A) with the timing mark(B) of the timing chain upper under cover.



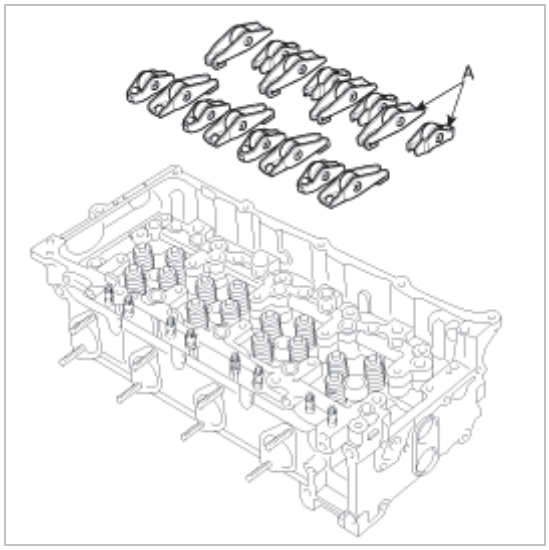
7. Align the timing marks of sprocket and chain when RH camshaft sprocket is not installed to the camshaft.
8. Using the chain connected to the RH camshaft sprocket, install as the timing marks of high-pressure pump sprocket and LH camshaft sprocket align with each other.



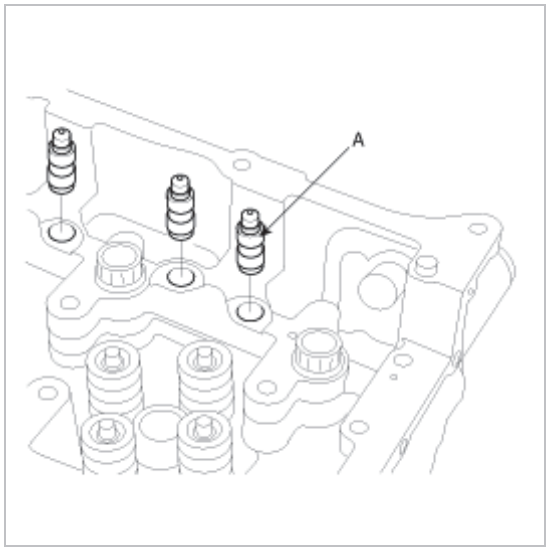
9. Assemble the RH camshaft sprocket to the RH camshaft tentatively.
10. Install the timing chain guide "C(1)(A), C(2)(B)".



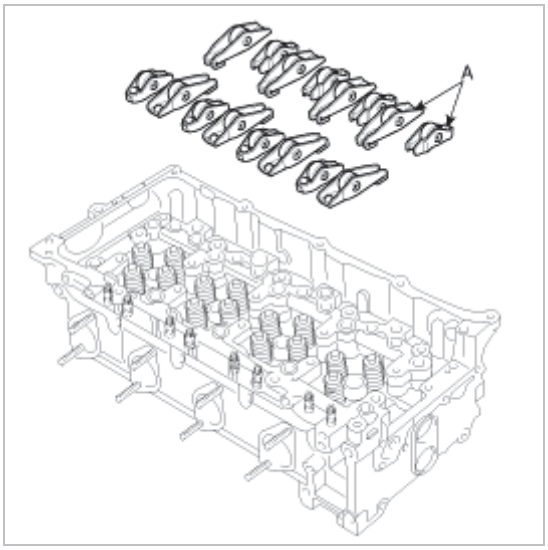
5. Remove the cam follow(A).



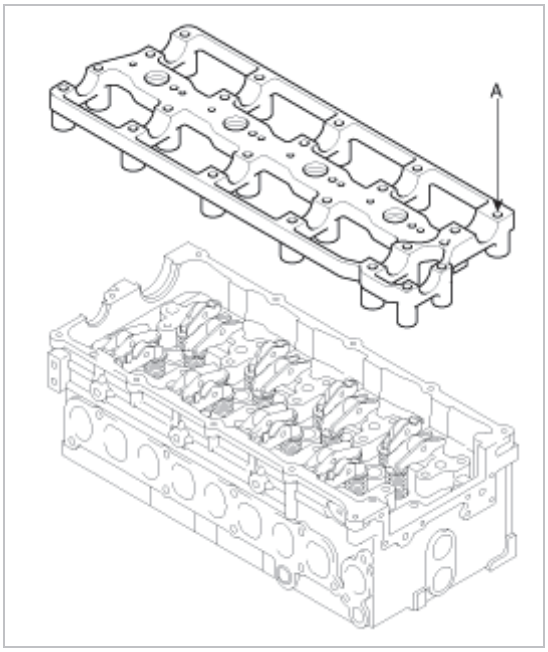
6. Remove the HLA(A).



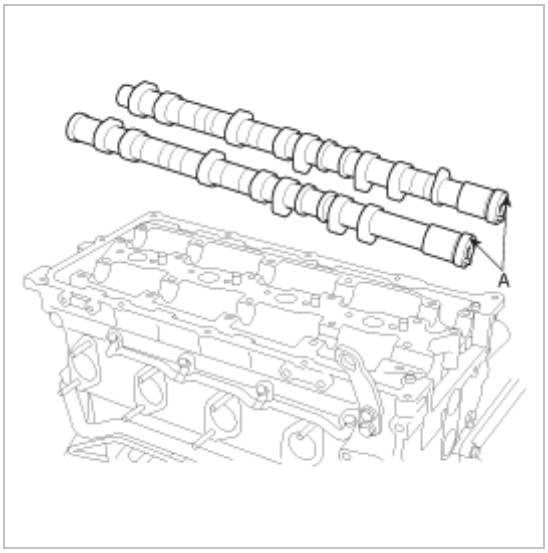
7. Remove the cylinder head bolts(A).



7. Install the camshaft carrier (A) on the cylinder head.

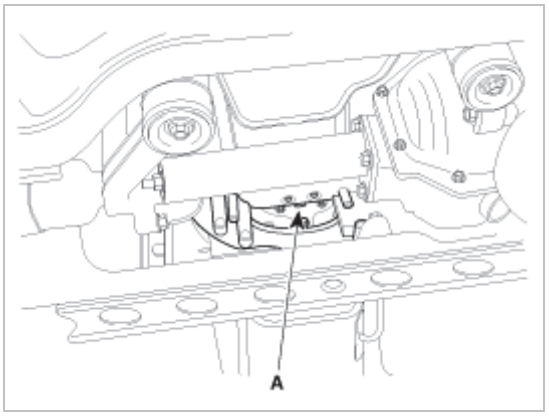


8. Install the camshaft (A) on the camshaft carrier.

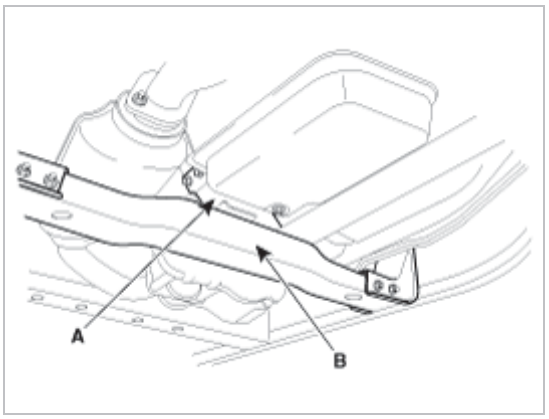


CAUTION

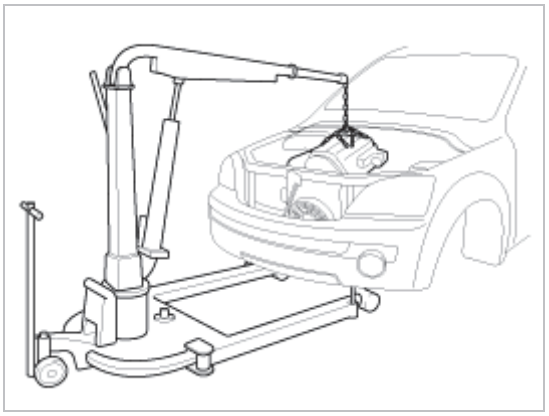
In assembling camshaft cap, all pistons to be in the middle position between TDC and BDC not to interfere



40. Remove the starter.
41. Remove the transmission housing fixing bolts.
42. Remove the transmission mounting(A) and the cross member(B) after support the transmission by using a jack.



43. Remove the transmission from the vehicle.
44. Remove the engine mounting.
45. Remove the engine assembly from engine room, by using a engine crane.



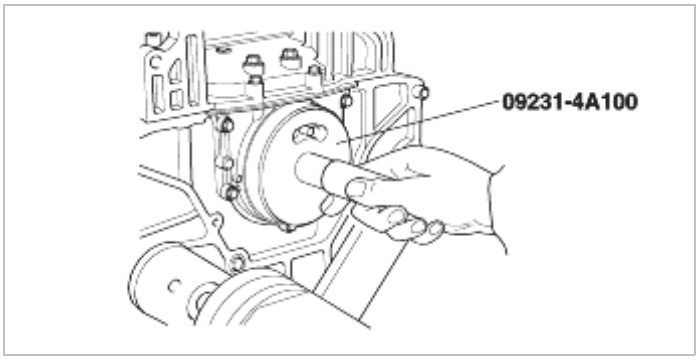
INSTALLATION (A/T EQUIPPED VEHICLE)

1. Install the engine assembly to engine room, by using a engine crane.
2. Install the engine mounting(A).

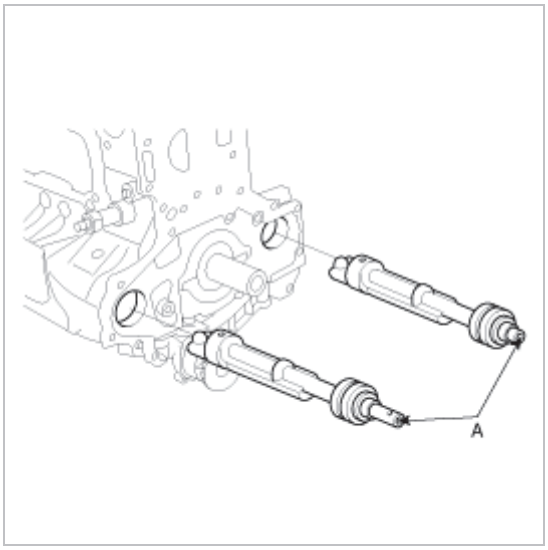
Tightening torque
68.6-88.3 N.m (7.0- 9.0 kgf.m, 50.6-65.1 lb-ft)

2. Temporarily install a new rear oil seal to the oil seal case and install the special tool (09231-4A100) through the rear oil seal case.

> **NOTICE**
>
> Apply engine fluid to the circumference of oil seal lip.



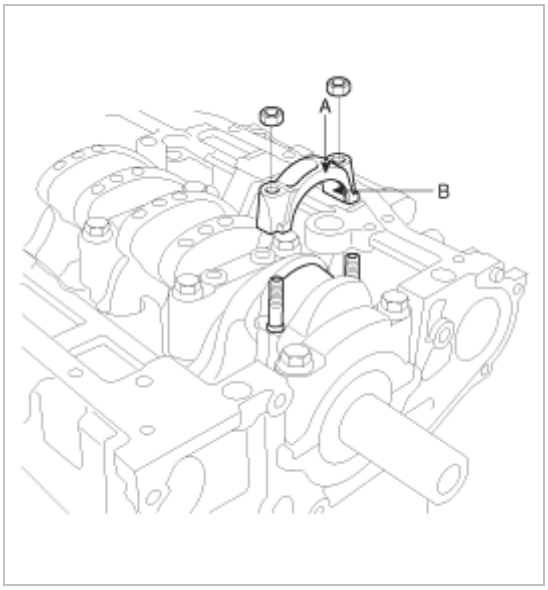
3. Apply engine fluid to the balance shaft journal and balance shaft bearing (bush).
4. Install the balance shaft(A) into cylinder block.



5. Install the oil pump.
6. Apply sealant on the timing chain lower under cover after clean foreign material. And Install the bet plate (A).

Bolt	Size	Quantity	Tightening torque N.m (kgf.m, lb-ft)
A	6 x 14	4 EA	9.8-11.8 (1.0-1.2, 7.2-8.7)
B	8 x 22	1 EA	19.6-26.5 (2.0-2.7, 14.5-19.5)
C	8 x 30	1 EA	19.6-26.5 (2.0-2.7, 14.5-19.5)
D	8 x 40	1 EA	19.6-26.5 (2.0-2.7, 14.5-19.5)

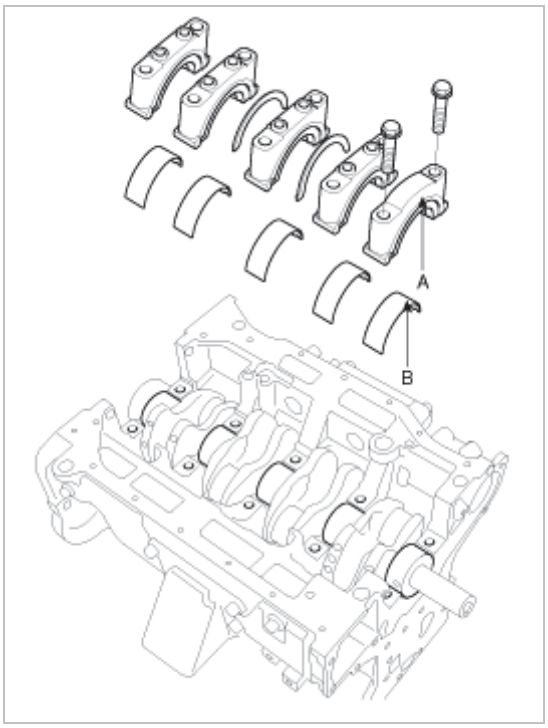
* Bolts size = Diameter x Length



NOTICE

Mark the connecting rod bearing caps to be able to reassemble in the original position and direction.

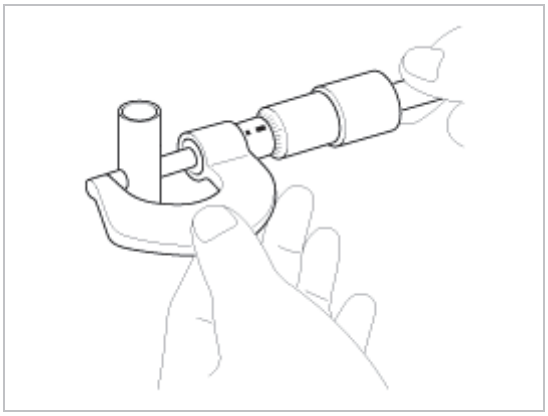
2. Remove the piston and connecting rod assembly from the cylinder block.
3. Remove the main bearing cap (A) and bearing (B).



4. Remove the clank shaft (A) from cylinder block.

CAUTION

Clank shaft being careful not to damage the journals.

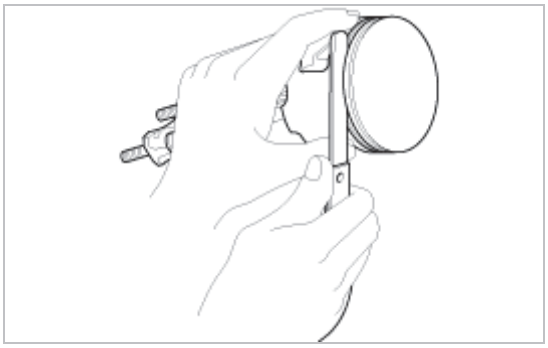


Piston pin outer diameter :
32.993-32.998 mm (1.2989-1.2991 in)
Piston pin hole inner diameter :
33.014-33.019mm (1.2998-1.3000 in)
Connecting rod small-end inner diameter :
33.020-33.033 mm (1.3000-1.3005 in)

PISTON RING

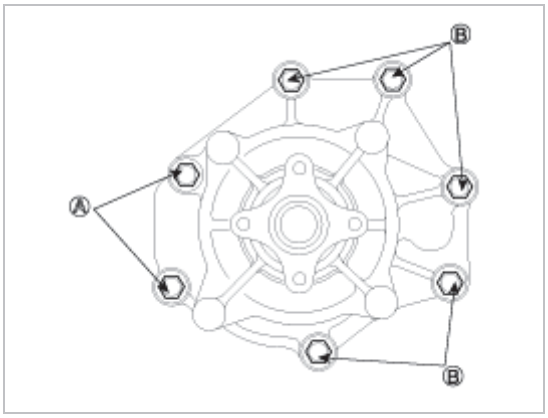
1. Check each piston ring for breakage, damage and abnormal wear. Replace the defective rings.
2. When the piston requires replacement, its ring should also be replaced.
3. Measure the clearance between piston ring and ring groove.

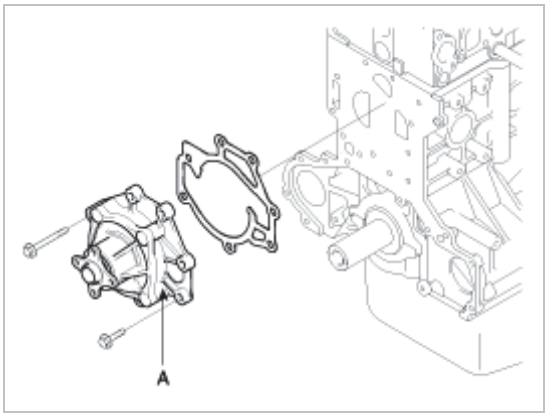
Piston ring side clearance :
No.2 ring : 0.05-0.09 mm (0.0020-0.0035 in)
Oil ring : 0.04-0.08 mm (0.0016-0.0031 in)



4. Place a piston ring in the cylinder bore and set it square by pushing it down with piston.

Eng gap :
No.1 ring : 0.25-0.40 mm (0.0098-0.0157 in)
No.2 ring : 0.50-0.70 mm (0.0197-0.0276 in)
Oil ring : 0.20-0.40 mm (0.0079-0.0157 in)



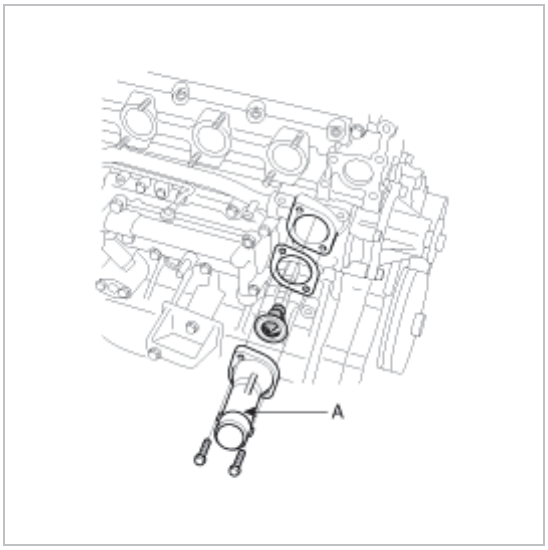


2. Install the cooling fan.
3. Install the drive belt.
4. Install the radiator cowl upper cover.
5. Refill the engine coolant.

THERMOSTAT

1. Check that the flange of the thermostat is correctly seated in the socket of the thermostat housing.
2. Install the inlet fitting (A).

Tightening torque :
Engine coolant inlet fitting bolt :
19.6 - 26.5 N.m(2.0-2.7kgf.m, 14.5-19.5 lb-ft)

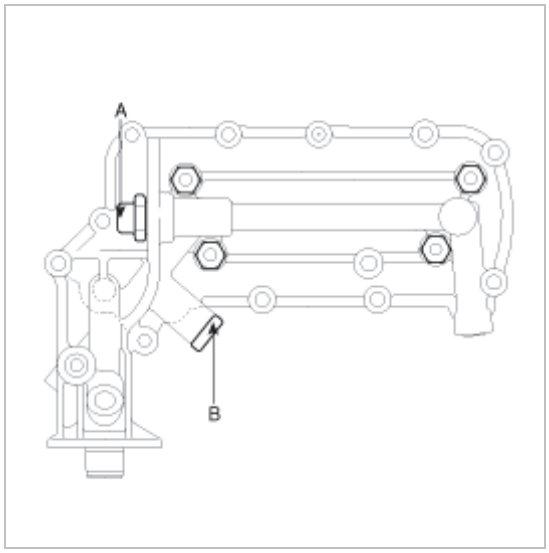


3. Refill the coolant.

OIL COOLER

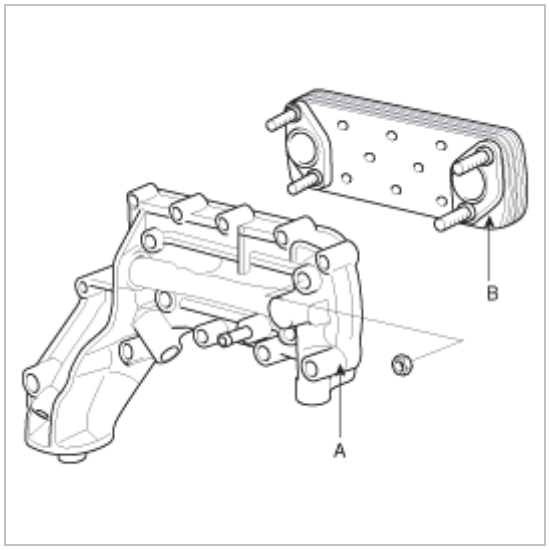
1. Install the oil cooler by-pass valve (A) and the relief valve (B) to the oil cooler cover.

Tightening torque :
Oil cooler by-pass valve :
49.0 ~ 58.8 N.m (5 ~ 6kgf.m, 36.2 ~ 43.4lb-ft)
Relief valve plug :
39.2 ~ 49.0 N.m (4 ~ 5 kgf.m, 28.9 ~ 36.2 lb-ft)



2. Install the oil cooler (B) to oil cooler cover (A).

Tightening torque :
17.7 ~ 24.5 N.m (1.8 ~ 2.5 kgf.m, 13.0 ~ 18.1lb-ft)

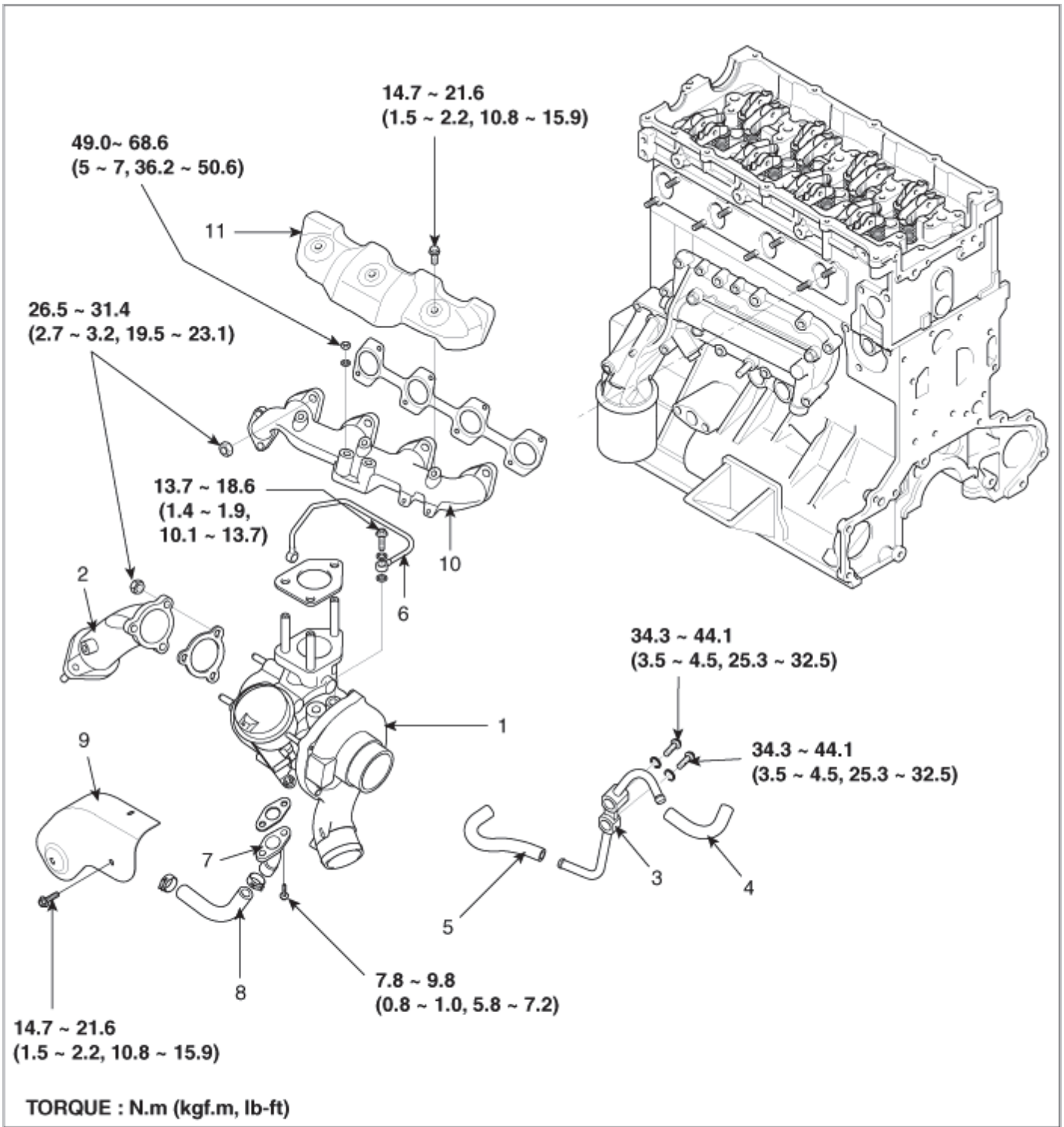


3. Install the oil cooler assembly (A) to the cylinder block with new gasket.

Bolt	Size	Quantity	Tightening torque N.m (kgf.m, lb-ft)
A	8 x 35	8 EA	19.6-25.5 (2.0-2.6, 14.5-18.8)
B	8 x 60	3 EA	(2.0-2.6, 14.5-18.8)

* Bolts size = Diameter x Length

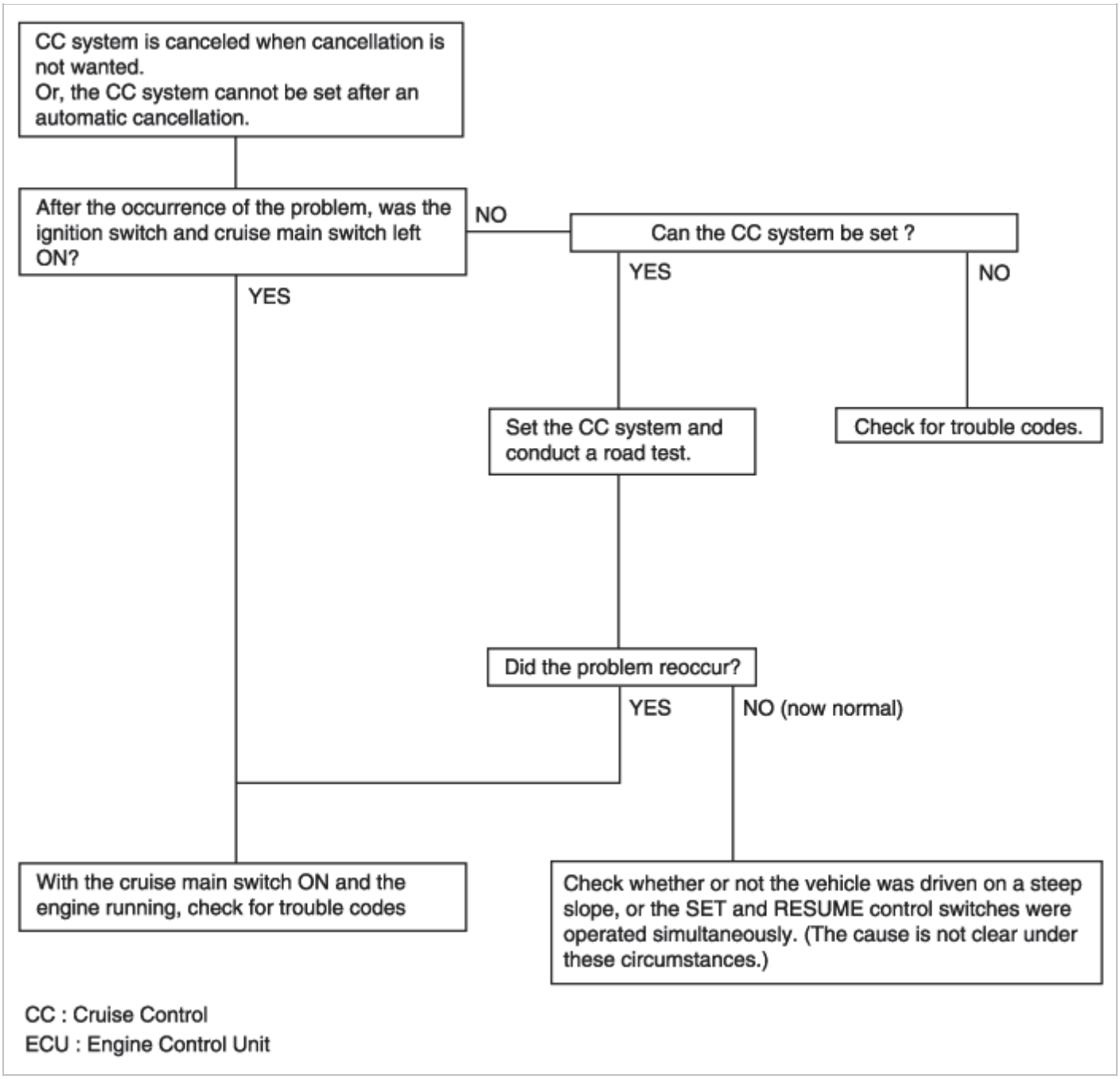
COMPONENTS



1. Turbo charger assembly
2. Turbo charger outlet fitting
3. Turbo charger coolant pipe
4. Turbo charger coolant inlet hose
5. Turbo charger coolant outlet hose
6. Turbo charger oil inlet pipe
7. Turbo charger oil outlet pipe
8. Turbo charger oil outlet hose
9. Heater protector
10. Exhaust manifold
11. Heater protector

TROUBLE SYMPTOM CHARTS

TROUBLE SYMPTOM 1



CC : Cruise Control
ECU : Engine Control Unit

TROUBLE SYMPTOM 2

Trouble symptom	Probable cause	Remedy
The set vehicle speed varies greatly upward or downward "Surging" (repeated alternating acceleration and deceleration) occurs after setting	Malfunction of the vehicle speed sensor circuit	Repair the vehicle speed sensor system, or replace the part
	Malfunction of ECM	Check input and output signals at ECM

TROUBLE SYMPTOM 3

Trouble symptom	Probable cause	Remedy