EM-2

Engine Mechanical System

General Information

SPECIFICATIONS

Description		Specifications	Limit
General			
Туре		In-line, Double Overhead Camshaft	
Number of cylinder		4	
Bore		82mm (3.228in)	
Stroke		93.5mm (3.681in)	
Total displacement		1975cc (120.52cu.in)	
Compression ratio		10.1 : 1	
Firing order		1 - 3 - 4 - 2	
Valve timing			•
	Opens (ATDC)	11°	
Intake valve	Closes (ABDC)	59°	
	Opens (BBDC)	42°	
Exhaust	Closes (ATDC)	6°	
Valve			
	Intake	114.34mm (4.5016in)	
Valve length	Exhaust 2010 000	116.8mm (4.598in)	
	Intake	5.965 ~ 5.98mm (0.2348 ~ 0.2354in)	
Stem outer diameter	Exhaust	5.950 ~ 5.965mm (0.2343 ~ 0.2348in)	
Face angle thickness	of valve head (Margin))	
Intake		1.6±0.15mm (0.0630±0.0059in)	0.8mm (0.031in
Exhaust		1.8±0.15mm (0.0709±0.0059in)	1.0mm (0.039in
Valve stem to valve g	uide clearance		•
Intake		0.02 ~ 0.05mm (0.0008 ~ 0.0019in)	0.10mm (0.0039 in)
Exhaust		0.035 ~ 0.065mm (0.0014 ~ 0.0026in)	0.13mm(0.0051 n)
Valve guide			
Installed dimension o-	Intake	45.8~46.2mm (1.8031~1.8189in)	
uter diameter Exhaust		52.8~53.2mm (2.0787~2.0945in)	
Service oversize		0.05, 0.25, 0.50mm (0.002, 0.010, 0.020in) oversize	
Valve seat			
Width of post south of	Intake	1.1 ~ 1.5mm (0.043 ~ 0.059in)	
Width of seat contact	Exhaust	1.3 ~ 1.7mm (0.051 ~ 0.066in)	

General Information

Description

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Oversize		0.3, 0.6mm (0.012, 0.024in) oversize	
Valve spring			
Free length		48.86mm (1.9236in)	
Load		18.8k±0.9kg/39.0mm(41.4±2.0lb/1.5354in) 41.0±1.5kg/30.5mm(90.4±3.3lb/1.2008in)	
Squarences		1.5° or less	
Valve clearance			·
	Intake	0.20mm (0.0079in)	0.17~0.23mm (0.0067~0.0091 in)
Cold (20°C[68°F])	Exhaust	0.28mm (0.0110in)	0.25~0.31mm (0.0098~0.0122 in)
Hot (80°C[176°F]) : o	Intake	0.29mm (0.0114in)	
nly for reference	Exhaust	0.34mm (0.0134in)	
Cylinder head	•	00	
Flatness of gasket sur	face	Max. 0.03mm (0.0012in)	0.06mm(0.0024i n)
Flatness of manifold m	nounting surface	Max. 0.15mm (0.0059in)	0.03mm(0.0012i n)
Oversize rework dime	nsions of valve seat hole		-
درو در ایران ماطرا	0.3mm (0.012in) O.S.	33.300 ~ 33.325mm (1 .3110 ~ 1.3120in)	
Intake	0.6mm (0.024in) O.S.	33.600 ~ 33.625mm (1.3228 ~ 1.3238in)	
Exhaust	0.3mm (0.012in) O.S.	28.800 ~ 28.821mm (1.1338 ~ 1.1346in)	
Exhaust	0.6mm (0.024in) O.S.	29.100 ~ 29.121mm (1.1456 ~ 1.1465in)	
Oversize rework dime	nsions of valve guide hole	(both intake and exhaust)	
0.05mm (0.002in) O.S		11.05 \sim 11.068mm (0.435 \sim 0.4357in)	
0.25mm (0.010in) O.S		11.25 ~ 11.268mm (0.443 ~ 0.4436in)	
0.50mm (0.020in) O.S		11.50 ~ 11.518mm (0.453 ~ 0.4535in)	
Cylinder block			
Cylinder bore		82.00 ~ 82.03mm (3.2283 ~ 3.2295in)	
Out-of-round and tape	r of cylinder bore	Less than 0.01mm (0.0004in)	
Clearance with piston (To set limits to new par- ts)		0.02 ~ 0.04mm (0.0008 ~ 0.0016in)	
Piston			
Outer diameter (To se	t limits to new parts)	81.97 ~ 82.00mm (3.2271 ~ 3.2283in)	
Service oversize		0.25, 0.50mm (0.010, 0.020in) oversize	

Specifications

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EM-3

Limit

EM-4

Engine Mechanical System

Side clearance No.1 0.04 ~ 0.08mm (0.0015 ~ 0.003tin) 0.1mm (0.004in) End gap No.1 0.20 ~ 0.35mm (0.0079 ~ 0.0138in) 1mm (0.039in) Oil ring side rail 0.20 ~ 0.52mm (0.0146 ~ 0.0208in) 1mm (0.039in) Service oversize 0.25, 0.50mm (0.0078 ~ 0.0236in) 1mm (0.039in) Service oversize 0.25, 0.50mm (0.010, 0.020in.) oversize Piston pin Outer diameter 20.001 ~ 20.006mm (0.7874 ~ 0.7876in) Hole clearance Hole inner diameter 20.001 ~ 20.006mm (0.7874 ~ 0.7876in) Hole clearance Connecting rod small end inner diameter 19.974 ~ 19.985mm (0.7864 ~ 0.7868in) Connecting rod Bend 0.05mm (0.0020in) or less Twist 0.1mm (0.004in) or less Connecting rod Connecting rod big end to crankshaft side clea- 0.100 ~ 0.250mm (0.0009 ~ 0.0017in) 0.4mm(0.0157in) Y Oli clearance (To seat limits to new parts) 0.024 ~ 0.042mm (0.0009 ~ 0.0017in) 0.4mm(0.0157in) Y Cannecting rod bearing 1ntake 44.618mm (1.7566in) 27in) Z Can height Intake 0.024 ~ 0.042mm (0.0009 ~ 0.0017in) Y Y Y <th colspan="2">Description</th> <th>Specifications</th> <th>Limit</th>	Description		Specifications	Limit
Side clearance No.2 0.03 ~ 0.07mm (0.0012 ~ 0.0027in) End gap No.1 0.20 ~ 0.35mm (0.0079 ~ 0.0138in) 1mm (0.039in) Oli ring side rail 0.20 ~ 0.55mm (0.0078 ~ 0.0236in) 1mm (0.039in) Service oversize 0.25, 0.50mm (0.010, 0.020in.) oversize Piston pin Outer diameter 20.001 ~ 20.006mm (0.07874 ~ 0.7876in) Hole 0.0306mm (0.07874 ~ 0.7876in) Hole inner diameter 20.016 ~ 20.021mm (0.7880 ~ 0.7882in) Imm (0.039in) Connecting rod small end inner diameter 19.974 ~ 19.985mm (0.0004 ~ 0.0008in) Connecting rod small end inner diameter Bend 0.05mm (0.0020in) or less Twist 0.10m (0.0020in) or less Connecting rod big end to crankshaft side clearance 0.100 ~ 0.250mm (0.0039 ~ 0.010in) 0.4mm(0.0157in neace Connecting rod bearing 0.024 ~ 0.042mm (0.0009 ~ 0.0017in) 0.4mm(0.017in neace 0.27mm (0.0010) 0.4mm(0.017in neace Cam height Intake 44.618mm (1.7566in) 44.518mm(1.75 27in) 44.418mm (1.74 87in) Jourmal outer diameter 2.8mm (1.0203n) 0.1mm(0.0039in) 0.1mm(0.0039in) 0.1mm(0.0039in) 0.1mm(0.0039in) 0.1mm(0.0039in) 0.1mm(0.0039in	Piston ring			
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End gap No.2 0.37 ··· 0.52mm (0.0146 ··· 0.0205in) 1mm (0.039in) Oli ring side rail 0.20 ··· 0.60mm (0.0078 ··· 0.0236in) 1mm (0.039in) Service oversize 0.25, 0.50mm (0.010, 0.020in.) oversize Piston pin Outer diameter 20.001 ·· 20.006mm (0.7874 ·· 0.7876in) Hole inner diameter Hole inner diameter 20.001 ·· 20.006mm (0.7874 ·· 0.7882in) Hole inner diameter Connecting rod small end inner diameter 19.974 ·· 19.985mm (0.0004 ·· 0.0008in) Imm (0.0012 ·· 0.0007 ·· 0.0008in) Connecting rod small end inner diameter 19.974 ·· 19.985mm (0.0039 ·· 0.010in) 0.4mm (0.0167in rance Bend 0.05mm (0.0020in) or less Imm (0.0167in rance Imm (0.0039 ·· 0.010in) Connecting rod baaring 0.024 ·· 0.042mm (0.0009 ·· 0.0017in) 0.4mm (0.0167in rance Imm (0.0167in rance Oil clearance (To seat limits to new parts) 0.024 ·· 0.042mm (0.0009 ·· 0.0017in) 0.4mm (0.0167in rance Imm (0.0167in rance Cam height Intake 44.618mm (1.7566in) 44.518mm (1.757in) S7in) Jourmal outer diameter 28mm (1.1023in) Imm (1.74 rance) S7in) Jatest rance) 1.017 ··· 0.2mm (0.0004 ·· 0.0024in) rance)			0.03 ~ 0.07mm (0.0012 ~ 0.0027in)	
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Service oversize 0.25, 0.50mm (0.010, 0.020in.) oversize Piston pin	Епа дар	No.2	0.37 \sim 0.52mm (0.0146 \sim 0.0205in)	1mm (0.039in)
Piston pin	Oil ring side rail		0.20 \sim 0.60mm (0.0078 \sim 0.0236in)	1mm (0.039in)
Outer diameter 20.001 ~ 20.006mm (0.7874 ~ 0.7876in) Hole inner diameter 20.016 ~ 20.021mm (0.7880 ~ 0.7882in) Hole clearance 0.010 ~ 0.020mm (0.0004 ~ 0.0008in) Connecting rod small end inner diameter 19.974 ~ 19.985mm (0.7864 ~ 0.7868in) Connecting rod 0.05mm (0.0020in) or less Bend 0.05mm (0.0020in) or less Twist 0.1mm (0.004in) or less Connecting rod big end to crankshaft side clea- 0.100 ~ 0.250mm (0.0039 ~ 0.010in) Connecting rod bearing 0.024 ~ 0.042mm (0.0009 ~ 0.0017in) Undersize 0.024 ~ 0.042mm (0.0009 ~ 0.0017in) Undersize 0.25mm (1.7566in) A4.518mm (1.75 27(n) Cam height Intake 44.618mm (1.7566in) Exhaust 44.518mm (1.7527in) 44.418mm (1.74 87(n) Jourmal outer diameter 28mm (1.1023in) 0.1mm(0.0039in) Bearing oil clearance 0.02 ~ 0.061mm (0.0040 ~ 0.0079in) 0.1mm(0.0039in) End play 0.1 ~ 0.2mm (0.0040 ~ 0.0079in) 0.1mm(0.0039in) End play 0.1 ~ 0.2mm (0.0040 ~ 0.0079in) 0.1mm(0.0039in) Journal outer diameter 44.946 ~ 44.966	Service oversize		0.25, 0.50mm (0.010, 0.020in.) oversize	
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Connecting rod small end inner diameter $19.974 \sim 19.985 \text{mm} (0.7864 \sim 0.7868in)$ Connecting rod Bend $0.05 \text{mm} (0.0020in)$ or less Twist $0.1 \text{mm} (0.004in)$ or less Connecting rod big end to crankshaft side clea- $0.100 \sim 0.250 \text{mm} (0.0039 \sim 0.010in)$ $0.4 \text{mm} (0.0157in nrace)$ Connecting rod bearing 0.024 ~ 0.042 mm (0.0009 ~ 0.0017in) $0.4 \text{mm} (0.0157in nrace)$ Oil clearance (To seat limits to new parts) $0.024 \sim 0.042 \text{mm} (0.0009 \sim 0.0017in)$ $0.4 \text{mm} (0.0157in nrace)$ Camshaft Intake $44.618 \text{mm} (1.7566in)$ $44.518 \text{mm} (1.7527in)$ Cam height Intake $44.518 \text{mm} (1.7527in)$ $44.418 \text{mm} (1.74 \text{mm} (0.0008 ~ 0.0024in))$ Jourmal outer diameter $28 \text{mm} (1.1023in)$ $0.1 \text{mm} (0.0008 \text{m} 0.0024in)$ $0.1 \text{mm} (0.0039in n)$ Bearing oil clearance $0.02 \sim 0.061 \text{mm} (0.0008 \sim 0.0024in)$ $0.1 \text{mm} (0.0039in n)$ $0.1 \text{mm} (0.0008 \text{m} 0.0079in)$ Crankshaft $0.1 \sim 0.2 \text{mm} (0.0004 \sim 0.0079in)$ $0.1 \text{mm} (0.0004 \text{m} 0.0079in)$ $0.030 \text{mm} (0.001 \text{m} 0.0012in)$ $0.030 \text{mm} (0.001 \text{m} 0.0012in)$ Beand $0.03 \text{mm} (0.0012in)$ or less $0.030 \text{mm} (0.0012in)$ or less $0.030 \text{mm} (0.001 \text{m} 2in)$ $0.030 \text{mm} (0.001 \text{m} 2in)$ <	Hole inner diameter		20.016 \sim 20.021mm (0.7880 \sim 0.7882in)	
Connecting rod 0.05mm (0.0020in) or less Bend 0.05mm (0.0020in) or less Twist 0.1mm (0.004in) or less Connecting rod big end to crankshaft side clearance 0.100 ~ 0.250mm (0.0039 ~ 0.010in) 0.4mm(0.0157in) Connecting rod bearing 0.100 ~ 0.250mm (0.0009 ~ 0.0017in) 0.4mm(0.0157in) 0.100 ~ 0.250mm (0.0009 ~ 0.0017in) Connecting rod bearing 0.024 ~ 0.042mm (0.0009 ~ 0.0017in) 0.4mm(0.0157in) 0.100 ~ 0.25mm (0.01in) Camshaft Intake 44.618mm (1.7566in) 44.518mm(1.75 ~ 27in) Cam height Intake 44.518mm (1.7527in) 44.418mm (1.74 ~ 87in) Jourmal outer diameter 28mm (1.1023in) 0.1mm(0.0039in) 0.1mm(0.0039in) Bearing oil clearance 0.02 ~ 0.061mm (0.0008 ~ 0.0024in) 0.1mm(0.0039in) Bearing oil clearance 0.12 ~ 0.2mm (0.0040 ~ 0.0079in) 0.1mm(0.0039in) Crankshaft	Hole clearance		0.010 \sim 0.020mm (0.0004 \sim 0.0008in)	
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Connecting rod big end to crankshaft side clearance $0.100 \sim 0.250 \text{mm} (0.0039 \sim 0.010 \text{in})$ $0.4 \text{mm} (0.0157 \text{in})$ Connecting rod bearing $0.024 \sim 0.042 \text{mm} (0.0009 \sim 0.0017 \text{in})$ $0.4 \text{mm} (0.0157 \text{in})$ Oil clearance (To seat limits to new parts) $0.024 \sim 0.042 \text{mm} (0.0009 \sim 0.0017 \text{in})$ $0.4 \text{mm} (0.0157 \text{in})$ Undersize $0.024 \sim 0.042 \text{mm} (0.0009 \sim 0.0017 \text{in})$ $44.518 \text{mm} (1.75 \text{cr})$ Cam heightIntake $44.618 \text{mm} (1.7566 \text{in})$ $44.518 \text{mm} (1.75 \text{cr})$ Cam heightIntake $44.518 \text{mm} (1.7527 \text{in})$ $44.418 \text{mm} (1.74 \text{s7})$ Journal outer diameter $28 \text{mm} (1.1023 \text{in})$ $0.1 \text{mm} (0.0038 \sim 0.0024 \text{in})$ $0.1 \text{mm} (0.0039 \text{in})$ Bearing oil clearance $0.02 \sim 0.061 \text{mm} (0.0008 \sim 0.0024 \text{in})$ $0.1 \text{mm} (0.0039 \text{in})$ End play $0.1 \sim 0.2 \text{mm} (0.0040 \sim 0.0079 \text{in})$ $0.1 \text{mm} (0.0039 \text{in})$ Diract diameter $44.946 \sim 44.966 \text{mm} (1.7695 \sim 1.7703 \text{in})$ $1000000000000000000000000000000000000$	Bend		0.05mm (0.0020in) or less	
rance) Connecting rod bearing 0.024 ~ 0.042mm (0.0009 ~ 0.0017in)) Oil clearance (To seat limits to new parts) 0.024 ~ 0.042mm (0.0009 ~ 0.0017in)) Undersize 0.25mm (0.01in)) Camshaft 0.25mm (0.01in)) Cam height Intake 44.618mm (1.7566in) 44.518mm(1.75 27in) Cam height Intake 44.518mm (1.7527in) 44.418mm (1.74 87in) Journal outer diameter 28mm (1.1023in) (0.1mm(0.0039in)) Bearing oil clearance 0.02 ~ 0.061mm (0.0008 ~ 0.0024in) 0.1mm(0.0039in)) End play 0.1 ~ 0.2mm (0.0040 ~ 0.0079in) (0.1mm(0.0039in)) Crankshaft 9 9 (0.1 ~ 0.2mm (0.0040 ~ 0.0079in)) Pin outer diameter 44.946 ~ 44.966mm (1.7695 ~ 1.7703in) 1 Journal outer diameter 56.942 ~ 56.962mm (2.2418 ~ 2.2426in) 9 Bend 0.03mm (0.0012in) or less 0.030mm (0.001 Qut-of-round, taper of journal and pin 0.01mm (0.0004in) or less 0.030mm (0.001	Twist		0.1mm (0.004in) or less	0
Oil clearance (To seat limits to new parts) 0.024 ~ 0.042mm (0.0009 ~ 0.0017in) Undersize 0.024 ~ 0.042mm (0.0009 ~ 0.0017in) Camshaft 44.518mm (0.01in) Cam height Intake 44.618mm (1.7566in) Exhaust 44.518mm (1.7527in) 44.418mm (1.74 87in) Journal outer diameter 28mm (1.1023in) 44.418mm (0.0039in 0.002 ~ 0.061mm (0.0008 ~ 0.0024in) Bearing oil clearance 0.02 ~ 0.061mm (0.00040 ~ 0.0079in) 0.1mm(0.0039in 0.0012in) End play 0.1 ~ 0.2mm (0.0040 ~ 0.0079in) 0.1mm(0.0039in 0.0012in) Outer diameter 44.946 ~ 44.966mm (1.7695 ~ 1.7703in) 0.00000000000000000000000000000000000				0.4mm(0.0157in)
Oil clearance (To seat limits to new parts) 0.024 ~ 0.042mm (0.0009 ~ 0.0017in) Undersize 0.25mm (0.01in) Camshaft 44.518mm (1.7566in) Cam height Intake 44.618mm (1.7566in) Exhaust 44.518mm (1.7527in) 44.418mm (1.7487in) Journal outer diameter 28mm (1.1023in) 44.418mm (0.0039in) Bearing oil clearance 0.02 ~ 0.061mm (0.0008 ~ 0.0024in) 0.1mm(0.0039in) End play 0.1 ~ 0.2mm (0.0040 ~ 0.0079in) 0.1mm(0.0039in) Outer diameter 56.942 ~ 56.962mm (2.2418 ~ 2.2426in) 90.030mm (0.0012in) or less Out-of-round, taper of journal and pin 0.01mm (0.0004in) or less 0.030mm (0.0012in)	Connecting rod beari	درو سامانه (مسng	شرکت دیجیتال خود	
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Exhaust 44.518mm (1.7527in) 44.418mm (1.74 87in) Jourmal outer diameter 28mm (1.1023in) 0 Bearing oil clearance 0.02 ~ 0.061mm (0.0008 ~ 0.0024in) 0.1mm(0.0039in) End play 0.1 ~ 0.2mm (0.0040 ~ 0.0079in) 0 Crankshaft Pin outer diameter 44.946 ~ 44.966mm (1.7695 ~ 1.7703in) 0 Journal outer diameter 56.942 ~ 56.962mm (2.2418 ~ 2.2426in) 0 Bend 0.03mm (0.0012in) or less 0.030mm (0.001 2in) Out-of-round, taper of journal and pin 0.01mm (0.0004in) or less 0.030mm (0.001 2in)	Com hairbt	Intake	44.618mm (1.7566in)	```
Bearing oil clearance 0.02 ~ 0.061mm (0.0008 ~ 0.0024in) 0.1mm(0.0039in) End play 0.1 ~ 0.2mm (0.0040 ~ 0.0079in)) Crankshaft Pin outer diameter 44.946 ~ 44.966mm (1.7695 ~ 1.7703in) Journal outer diameter 56.942 ~ 56.962mm (2.2418 ~ 2.2426in) Bend 0.03mm (0.0012in) or less Out-of-round, taper of journal and pin 0.01mm (0.0004in) or less		Exhaust	44.518mm (1.7527in)	
Bearing on clearance 0.02 ~ 0.061mm (0.0008 ~ 0.0024in) 1 End play 0.1 ~ 0.2mm (0.0040 ~ 0.0079in)) Crankshaft 2000 mm (0.0040 ~ 0.0079in) 2000 mm (0.0010 mm (0.0010 mm (0.0010 mm (0.0012in) or less) Pin outer diameter 44.946 ~ 44.966mm (1.7695 ~ 1.7703in) 1 Journal outer diameter 56.942 ~ 56.962mm (2.2418 ~ 2.2426in) 1 Bend 0.03mm (0.0012in) or less 0.030mm (0.0012in) Out-of-round, taper of journal and pin 0.01mm (0.0004in) or less 0.030mm (0.0012in)	Jourmal outer diameter		28mm (1.1023in)	
Crankshaft Pin outer diameter 44.946 ~ 44.966mm (1.7695 ~ 1.7703in) Journal outer diameter 56.942 ~ 56.962mm (2.2418 ~ 2.2426in) Bend 0.03mm (0.0012in) or less Out-of-round, taper of journal and pin 0.01mm (0.0004in) or less	Bearing oil clearance		0.02 ~ 0.061mm (0.0008 ~ 0.0024in)	0.1mm(0.0039in)
Pin outer diameter 44.946 ~ 44.966mm (1.7695 ~ 1.7703in) Journal outer diameter 56.942 ~ 56.962mm (2.2418 ~ 2.2426in) Bend 0.03mm (0.0012in) or less Out-of-round, taper of journal and pin 0.01mm (0.0004in) or less	End play		0.1 ~ 0.2mm (0.0040 ~ 0.0079in)	
Journal outer diameter 56.942 ~ 56.962mm (2.2418 ~ 2.2426in) Bend 0.03mm (0.0012in) or less Out-of-round, taper of journal and pin 0.01mm (0.0004in) or less	Crankshaft			
Bend 0.03mm (0.0012in) or less Out-of-round, taper of journal and pin 0.01mm (0.0004in) or less 0.030mm (0.0012in) 0.030mm (0.0012in)	Pin outer diameter		44.946 ~ 44.966mm (1.7695 ~ 1.7703in)	
Out-of-round, taper of journal and pin 0.01mm (0.0004in) or less 0.030mm (0.001 2in)	Journal outer diameter		56.942 \sim 56.962mm (2.2418 \sim 2.2426in)	
Out-of-round, taper of journal and pin 0.01mm (0.0004in) or less 2in)	Bend		0.03mm (0.0012in) or less	
End play 0.06 ~ 0.260mm (0.0023 ~ 0.010in)	Out-of-round, taper of journal and pin		0.01mm (0.0004in) or less	
	End play		0.06 ~ 0.260mm (0.0023 ~ 0.010in)	

General Information

Description

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2000.		opcomoditorio	
ndersize rework dim- sion of pin 0.25mm (0.010in)		44.725 ~ 44.740mm (1.7608 ~ 1.7614in)	
Undersize rework dim- ension of journal		56.727 ~ 56.742mm (2.2333 ~ 2.2339in)	
Crankshaft bearing	•		
Oil clearance		0.028 ~ 0.046mm (0.0011 ~ 0.0018in)	
Flywheel			
Runout		0.1mm (0.0039in)	0.13mm(0.0051i n)
Cooling method		Water-cooled, pressurized. Forced circulation with el- ectrical fan	
Coolant			
Quantity		6.5~6.6liter (6.87~6.97U.S qts, 5.72~5.81lmp. qts)	
Radiator			
Гуре		Pressurized corrugated fin type	
Radiator cap	· · ·		
Main valve opening pressure		93.16 ~ 122.58kpa(0.95 ~ 1.25kg/cm², 13.51 ~ 17.7 8psi)	
Vacuum valve opening pressure		MAX. 6.86 kpa(0.07kg/cm², 1.00 psi)	
Thermostat			
Гуре	المتعوم بكابات خو	Wax pellet type with jiggle valve	
/alve opening temperat	ture	82°C (177°F)	
/alve closing temperatu	ure	77°C (170.6°F)	
Full-opening temperatur	re	95°C (201°F)	
Coolant pump		Centrifugal type impeller	
Drive belt			
Гуре		V-ribbed belt	
	erature sensor	V-ribbed belt	
Гуре E ngine coolant tempe Гуре	erature sensor	V-ribbed belt Heat-sensitive thermistor type	
Engine coolant tempe	erature sensor		
Engine coolant tempe Type Resistance	erature sensor	Heat-sensitive thermistor type 2.31 \sim 2.59k Ω at 20°C (68°F)	
Engine coolant tempe Type Resistance Dil pump	erature sensor er circumference and fr-	Heat-sensitive thermistor type 2.31 \sim 2.59k Ω at 20°C (68°F)	
Engine coolant tempe Type Resistance Dil pump Clearance between oute ont case.	er circumference and fr-	Heat-sensitive thermistor type 2.31 ~ 2.59kΩ at 20°C (68°F) 0.3222kΩ at 80°C (176°F)	
Engine coolant tempe Type Resistance Dil pump Clearance between oute	er circumference and fr-	Heat-sensitive thermistor type 2.31 ~ 2.59kΩ at 20°C (68°F) 0.3222kΩ at 80°C (176°F) 0.120 ~ 0.185mm (0.0049 ~ 0.0073in)	

Specifications

Limit

EM-5

EM-6

Engine Mechanical System

Description	Specifications	Limit	
Outer gear	0.04 \sim 0.09mm (0.0016 \sim 0.0035in)		
Engine oil pressure at 1500 RPM [Oil temperature is 90 to 110°C 194 to 230°F)]	245KPa (2.5kg/cm², 35.5psi)		
Engine oil			
Oil quantity(Total)	4.1L (4.33US qt, 3.60 lmp.qt) Whe a si or b bly		
Oil quantity (Excluding oil filer)	3.7L (3.91US qt, 3.26Imp.qt)	When replacing an oil pan only	
Oil quantity (Drain and refil including oil filer)	4.0L (4.23US qt, 3.52Imp.qt)		
Relief spring			
Free height	43.8mm (1.725in.)		
Load	3.7kg at 40.1mm (3.15lb/1.578in)		
Air cleaner			
Туре	Dry type		
Element	Unwoven cloth type		
Exhaust pipe			
رو سامانه (مستولیت محد Muffler	Expansion resonance type		
Suspension system	Rubber hangers		
SERVICE STANDRDS	اولین سامانه دیجیت		
Standard value			
Antifreeze	Mixture ratio of anti-freeze in coolant		
Ethylene glycol base for aluminum	50%		

General Information

TIGHTENING TORQUE

Item	Nm	kgf.m	lb-ft
Cylinder Block			
Front engine support bracket bolt and nut	34.3 ~ 49.0	3.5 ~ 5.0	25.3 ~ 36.2
Front roll stopper bracket bolt	68.6 ~ 88.3	7.0 ~ 9.0	50.6 ~ 65.1
Rear roll stopper bracket bolt	68.6 ~ 88.3	7.0 ~ 9.0	50.6 ~ 65.1
Rear engine stopper bracket bolt	39.2 ~ 49.0	4.0 ~ 5.0	28.9 ~ 36.2
Engine Mounting			
Right mounting insulator (large) nut	88.3 ~ 107.9	9.0 ~ 11.0	65.1 ~ 79.6
Right mounting insulator (small) nut	44.1 ~ 58.8	4.5 ~ 6.0	32.5 ~ 43.4
Right mounting bracket to engine nuts and bol- ts	49.0 ~ 63.7	$5.0 \sim 6.5$	36.2 ~ 47.0
Transmission mount insulator nut	88.3 ~ 107.9	9.0 ~ 11.0	65.1 ~ 79.6
Transmission insulator bracket to side member bolt	39.2 ~ 49.0	4.0 ~ 5.0	28.9 ~ 36.2
Rear roll stopper insulator nut	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Rear roll stopper bracket to center member bo- Its	39.2 ~ 49.0	4.0 ~ 5.0	28.9 ~ 36.2
Front roll stopper insulator nut	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Front roll stopper bracket to center member b- olts.	39.2 ~ 49.0	شىر 4.0 ~ 5.0	28.9 ~ 36.2
Main Moving	ين سامانه ديجيت		
Connecting rod cap nut	49.0 ~ 52.0	5.0 ~ 5.3	36.2 ~ 38.3
Crankshaft bearing cap bolt	(27.5~31.4) + (60°~6 4°)	(2.8~3.2) + (60°~64°)	(20.3~23.1) + (60°~6 4°)
Fly wheel M/T bolt	117.7 ~ 127.5	12.0 ~ 13.0	86.8 ~ 94.0
Drive plate A/T bolt	117.7 ~ 127.5	12.0 ~ 13.0	86.8 ~ 94.0
Engine cover	3.9 ~ 5.9	0.4 ~ 0.6	2.9~4.3
Heat protector	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~14.5
Water pipe bracket bolts	11.8 ~ 14.7	1.2 ~ 1.5	8.7 ~ 10.8
Cooling system			
Alternator support bolt and nut	19.6 ~ 24.5	2.0 ~ 2.5	14.5 ~ 18.1
Alternator lock bolt	11.8 ~ 14.7	1.2 ~ 1.5	8.7 ~ 10.8
Alternator brance mounting bolt	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Coolant pump pulley bolts	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Coolant pump bolts	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Coolant temperature sensor	19.6 ~ 39.2	2.0 ~ 4.0	14.5 ~ 28.9
Coolant inlet fitting nuts	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5

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EM-7

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EM-8	B
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Engine Mechanical System

Item	Nm	kgf.m	lb-ft
Thermostat housing bolts and nuts	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
Lubrication system			
Oil filter	11.8 ~ 15.7	1.2 ~ 1.6	8.7 ~ 11.6
Oil pan bolts	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil pan drain plug (Aluminum)	39.2 ~ 49.0	4.0 ~ 5.0	28.9 ~ 36.2
Oil pan drain plug (Steel)	34.3 ~ 44.1	3.5 ~ 4.5	$25.3 \sim 32.5$
Oil screen bolts	14.7 ~ 21.6	1.5 ~ 2.2	10.8 ~15.9
Oil pressure switch	12.7 ~ 14.7	1.3 ~ 1.5	9.4 ~10.8
Intake and Exhaust system			
Air cleaner body mounting bolts	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Resonator mounting bolts	3.9 ~ 5.9	0.4 ~ 0.6	2.9 ~ 4.3
Intake manifold to cylinder head nuts and bolts	15.7 ~ 22.6	1.6 ~ 2.3	11.6 ~ 16.6
Intake manifold stay to cylinder block bolts	17.7 ~ 24.5	1.8 ~ 2.5	13.0 ~ 18.1
Throttle body to surge tank nuts	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
Exhaust manifold to cylinder head nuts	42.2 ~ 53.9	4.3 ~ 5.5	31.1 ~ 39.8
Exhaust manifold cover to exhaust manifold b- olts	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
Oxygen sensor to front muffler	49.0 ~ 58.8	5.0 ~ 6.0	36. <mark>2 ~ 4</mark> 3.4
Oxygen sensor to exhaust manifold	49.0 ~ 58.8	5.0 ~ 6.0	36.2 ~ 4 3.4
Front exhaust pipe to exhaust manifold nuts	29.4 ~ 39.2	3.0 ~ 4.0	21.7 ~ 28.9
Front exhaust pipe bracket bolts	29.4 ~ 39.2	3.0 ~ 4.0	21.7 ~ 28.9
Front exhaust pipe to catalytic converter bolts	39.2 ~ 58.8	4.0 ~ 6.0	$28.9 \simeq 43.4$
Main muffler hanger support bracket bolts	9.8 ~ 14.7	1.0 ~ 1.5	7.2 ~ 10.8
Cylinder head			
Cylinder head bolts - M10	(22.6~26.5) + (60°~6 5°) + (60°~65°)	(2.3~2.7) + (60°~65°) + (60°~65°)	(16.6~19.5) + (60°~6 5°) + (60°~65°)
Cylinder head bolts - M12	(27.5~31.4) + (60°~6 5°) + (60°~65°)	(2.8~3.2) + (60°~65°) + (60°~65°)	(20.3~33.1) + (60°~6 5°) + (60°~65°)
Intake manifold nuts	17.7 ~ 24.5	1.8 ~ 2.5	13.0 ~ 18.1
Exhaust manifold nuts	42.2 ~ 53.9	4.3 ~ 5.5	31.1 ~ 39.8
Cylinder head cover bolts	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Camshaft bearing cap bolts	13.7 ~ 14.7	1.4 ~ 1.5	10.1 ~ 10.8
Oil control valve bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
OCV Filter	40.2 ~ 50.0	4.1 ~ 5.1	29.7 ~ 36.9
CVVT unit to exhaust camshaft bolt	64.7 ~ 76.5	6.6 ~ 7.8	47.7~ 56.4
Rear plate bolts	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2

General Information

Item	Nm	kgf.m	lb-ft
Timing Belt			
Crankshaft pulley bolt	156.9 ~ 166.7	16.0 ~ 17.0	115.7 ~ 123.0
Camshaft sprocket bolt	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Timing belt auto tensioner bolts	22.6 ~ 28.4	2.3 ~ 2.9	16.6 ~ 21.0
Timing belt cover bolts	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Front case bolts	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Timing belt idler bolt	42.2 ~ 53.9	4.3 ~ 5.5	31.1 ~ 39.8

M/T : Manual Transmission

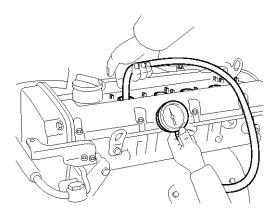
A/T : Automatic Transmission

INSPECTION COMPRESSION PRESSURE

MOTICE

If the there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

- Warm up and stop engine.
 Allow the engine to warm up to normal operating temperature.
- 2. Remove ignition coils.
- 3. Remove spark plugs. Using a 16mm plug wrench, remove the 4 spark plugs.
- 4. Check cylinder compression pressure
 - a. Insert a compression gauge into the spark plug hole.



SHDM16314L

- b. Fully open the throttle.
- c. while cranking the engine, measure the compression pressure.

WNOTICE

Always use a fully charged battery to obtain engine speed of 250 rpm or more.

d. Repeat steps (a) through (c) for each cylinder.

This measurement must be done in as short a time as possible.

Compression pressure :

1421.96 kPa (14.5 kgf/cm², 206.24 psi) **Minimum pressure :** 1274.86 kPa (13.0 kgf/cm², 184.90 psi) **Difference between each cylinder :** 98.07 kPa (1.0 kgf/cm², 14.22 psi) or less

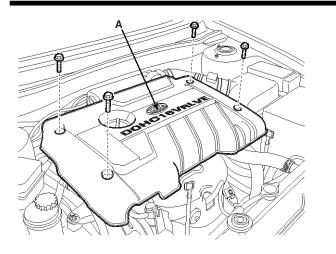
- e. If the cylinder compression in 1 or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression.
 - If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.
 - If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.
- 5. Reinstall spark plugs.
- 6. Install ignition coils.

Timing belt tension adjustment

1. Remove the engine cover (A).

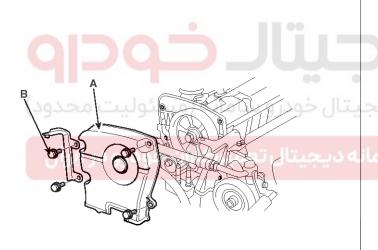
EM-9

EM-10



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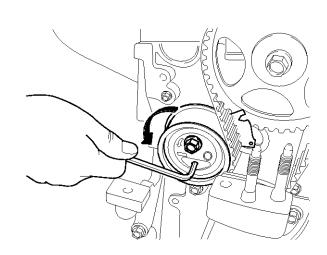
- 2. Remove RH front wheel.
- 3. Remove the RH side cover bolts (B) and cover (A).
- 4. Remove the 4bolts (B) and timing belt upper cover (A).



ECKD105A

5. Using a hex wrench, turn the adjuster counterclockwise to make the indicator of the arm (A) located at the center of the base notch.

Engine Mechanical System



SHDEM7002N

ACAUTION

Do not rotate the adjuster clockwise.

It will result in auto tensioner's functional problem.

6. Tightening tensioner bolt with fixing the indicator not to move.

Tightening torque

Tensioner bolt :

- 22.6 ~ 28.4 Nm (2.3 ~ 2.9 kgf.m, 16.6 ~ 21.0 lb-ft)
- 7. Turn the crankshaft two revolutions in the operating direction (clockwise) and check that the indicator is in the center of base.
- 8. If the indicator is not located at the center of base, slacken the bolt and repeat the above procedure.
- 9. Install the timing belt upper cover (A) with the four bolts (B).

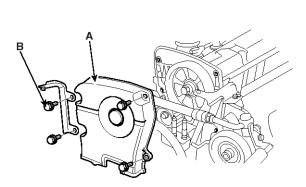
Tightening torque :

 $7.8 \simeq 9.8$ Nm (0.8 \simeq 1.0 kgf.m, 5.8 \sim 7.2 lb-ft)

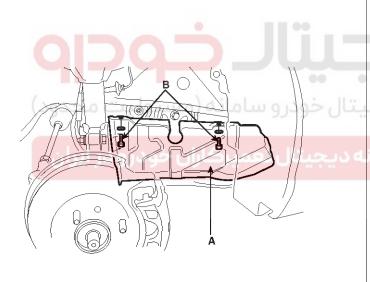
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General Information

EM-11



10. Install the RH side cover (A).



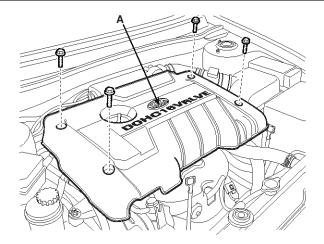
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ECKD105A

- 11.Install RH front wheel.
- 12. Install engine cover (A) with the four bolts.

Tightening torque :

 $7.8 \simeq 11.8$ Nm (0.8 $\simeq 1.2$ kgf.m, 5.8 $\simeq 8.7$ lb-ft)



SLDM16001D

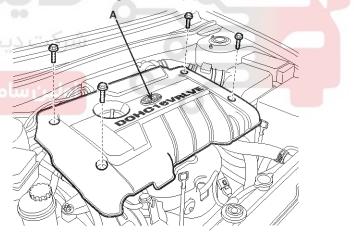
VALVE CLEARANCE INSPECTION AND ADJUSTMENT

MLA (MECHANICAL LASH ADJUSTER)

WNOTICE

Inspect and adjust the valve clearance when the engine is cold (Engine coolant temperature : $20^{\circ}C\pm5^{\circ}C$) and cylinder head is installed on the cylinder block.

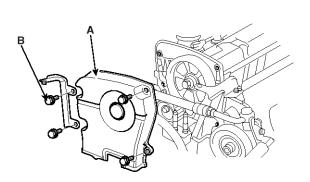
1. Remove the engine cover (A).



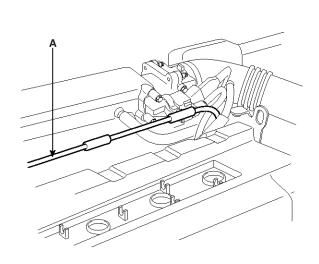
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2. Remove the upper timing belt cover (A).

EM-12

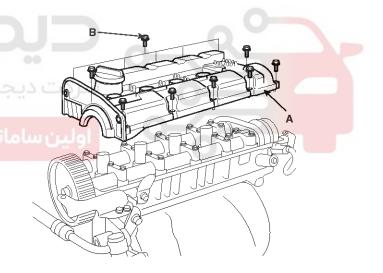


Engine Mechanical System



SHDM16301D

d. Loosen the cylinder head cover bolts (B) and then remove the cover (A) and gasket.



ECKD113A

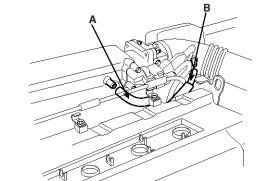
- 4. Set No. 1 cylinder to TDC/compression.
 - a. Turn the crankshaft pulley and align its groove with the timing mark "T" of the lower timing belt cover.

ECKD105A

- a. Loosen the upper timing cover bolts and then remove the cover.
- 3. Remove the cylinder head cover.
 - a. Disconnect the spark plug cables and do not pull on the spark plug by force.

WNOTICE

- Pulling on or bending the cables may damage the connductor inside.
- b. Disconnect the P.C.V hose (A) and the breather hose (B) from the cylinder head cover.



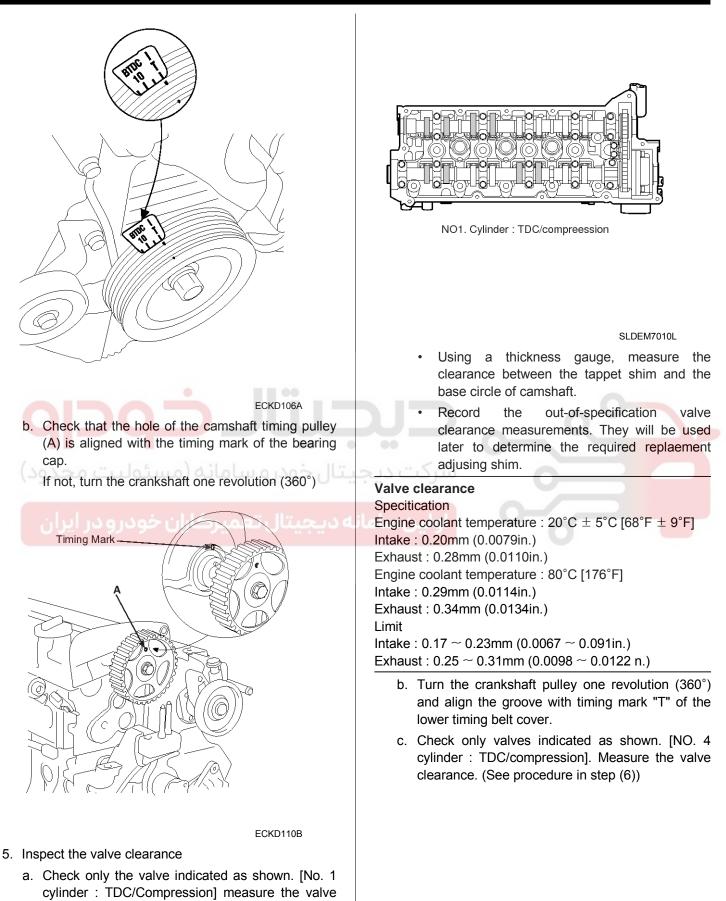
ECKD112A

c. Disconnect the accelerater cable (A) from the cylinder head cover.

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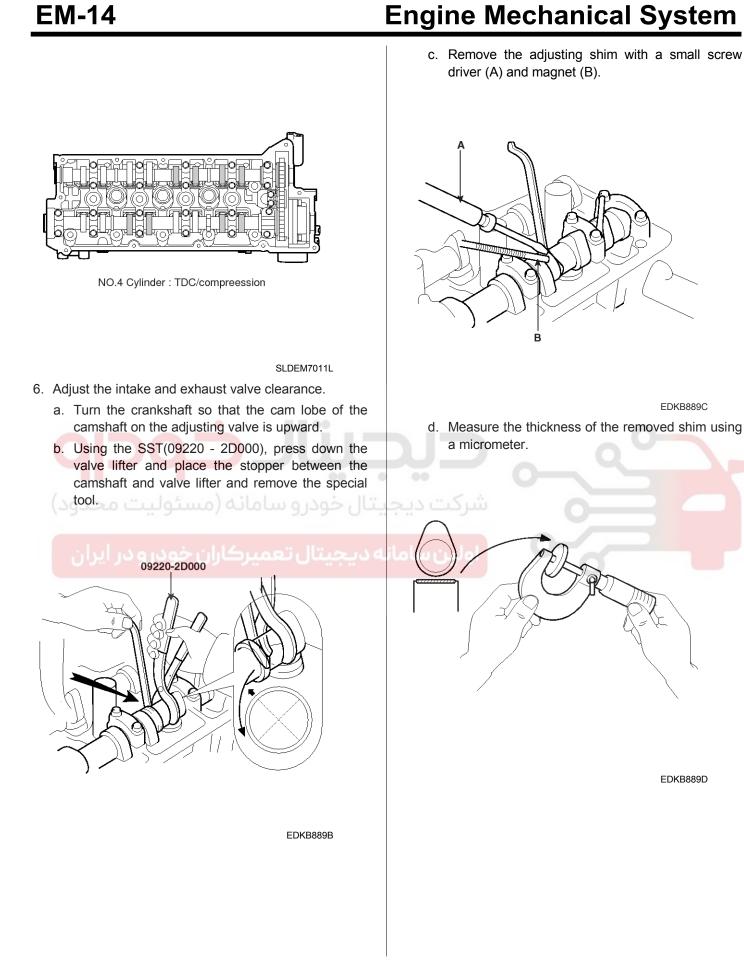
General Information

EM-13



clearance.

EM-14



General Information

e. Calculate the thickness of a new shim so that the valve clearance comes within the specificified value.

Valve clearance (Engine coolant temperature : 20°C \pm 5°C (68°F \pm 9°F))

T : Thickness of removed shim A : Measured valve clearance N : Thickness of new shim Intake : N = T + [A - 0.20mm(0.0079in.)] Exhaust : N = T + [A-0.28mm (0.0110in.)]

f. Select a new shim with a thickness as close as possible to the caculated value. [Refer to the Adjusting shim selection chart]

MOTICE

Shims are available in 20size increments of 0.04mm (0.0016in.) from 2.00mm (0.079in.) to 2.76mm (0.1087in.)

- g. Place a new adjusting shim on the valve lifter.
- h. Using the SST(09220 2D000), press down the valve lifter and remove the stopper.
- i. Recheck the valve clearance.

Valve clearance (Engine coolant temperature : $20^{\circ}C$ $\pm 5^{\circ}C$ ($68^{\circ}F \pm 9^{\circ}F$)) [Specification] Intake : 0.20mm (0.0079in.) Exhaust : 0.28mm (0.0110in.) [Limit] (After adjusting valve clearance) Intake : 0.17 ~ 0.23mm (0.0067 ~ 0.0091in.) Exhaust : 0.25 ~ 0.31mm (0.0098 ~ 0.0122in.)



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Adjusting Shim Selection Chart (Intake)

(6301.0) 07.5

2201.0) 89.S

(9501.0) 49.S

(1501.0) 28.5 (4201.0) 8.5

(0101.0) 88.5

(8001.0) 88.5 (0001.0) 42.5

9660.0) 88.9

(Seeo.o) SS.

(8860.0) 16.5

(+860.0) 02.5

(0860.0) 64.5 (9760.0) 84.5 (ST60.0) 74.S (6960.0) 84.S (2960.0) 24.5

(1960.0) 44.5 (7800.0) E4.S (560.0) 24.2 (0.0949) (0.0949)

(3460.0) 04.5 (140.0) 95.5

(7560.0) 85.5

(EE60.0) 7E.S

(6260.0) 86.5

(9260.0) 35.35 (FS00.0) 42.S (T100.0) EE.S

(E160.0) SE.S (9090.0) rs.S (9060.0) 0£.S (S000.0) 05.S

(8680.0) 85.5 (1680.0) <u>75.5</u> (0680.0) 95.5

(9880.0) 25.5

(\$880.0) \$5.5 (8780.0) ES.S (4780.0) SS.S (0780.0) ts.s 2.20 (0.0866) (2980.0) 61.2 (8280.0) 81.5 (#680.0) \r.S (0280.0) 31.5 (9480.0) 21.5 (2480.0) 41.5 (9580.0) 51.5 (200.0) 21.2 (1580.0) 11.5 (1280.0) 0F.S (0180.0) 80.5 (1180.0) 30.5 (£080.0) 40.5 (2670.0) \$0.5 (7870.0) 00.5

Install shim thickness mm (in.)

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EM-16



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Engine Mechanical System

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(0.0898)

19 20

(0.0913)

(0.0929)

10

(0.0945)

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F

(0.0787)

2.00

-

Thickness

Shim No.

Thickness

Shim No.

New shim thickness mm(in.)

(0.0961)

2.44 2.48 2.52 2.56 2.60 2.64 2.68 2.72 2.76

42 13 14 15 16 1

(0.0803)

2.04 2.08

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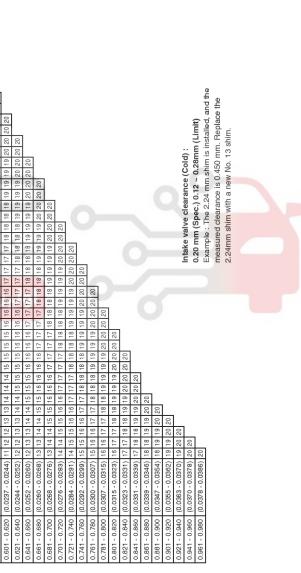
(0.0819) (0.0835) (0.0850) (0.0866) (0.0882)

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2.20 2.24 2.28 2.32 2.36

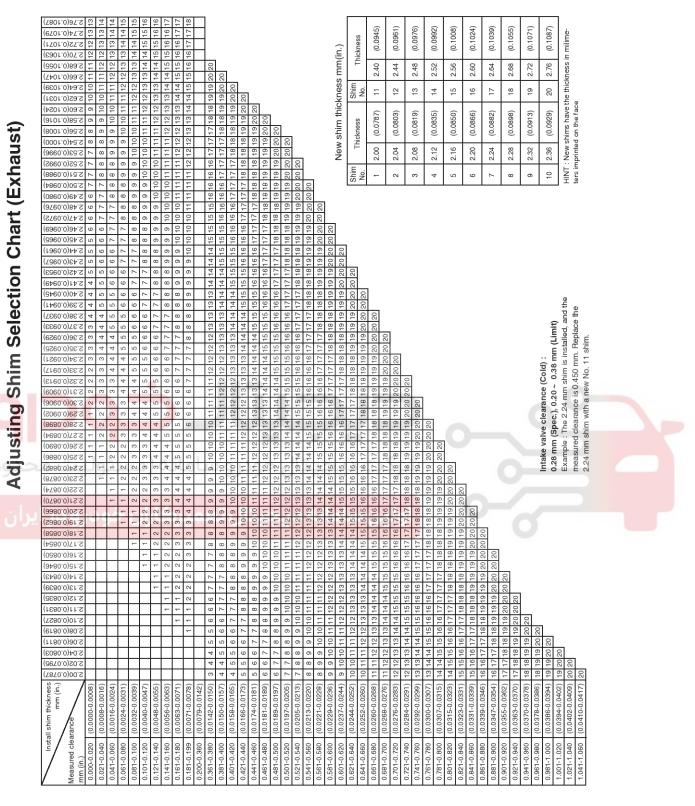


EDKB888D

HINT : New shims have the thickness in milime-ters imprinted on the face

General Information





EDKB888E

021 62 99 92 92

EM-17

EM-18

Engine Mechanical System

TROUBLESHOOTING

Symption	Suspect area	Remedy (See page)
Engine misfire with abnormal inter- nal lower engine noises.	Loose or improperly installed engine fly- wheel.	Repair or replace the flywheel as requir- ed.
	Worn piston rings (Oil consumption may or may not cause the engine to misfire.)	Inspect the cylinder for a loss of compre- ssion. Repair or replace as required.
	Worn crankshaft thrust bearings	Replace the crankshaft and bearings as required
Engine misfire with abnormal valve train noise.	Stuck valves. (Carbon buidup on the valve stem)	Repair or replace as required
	Excessive worn or mis-aligned timing ch- ain	Replace the timing chain and sprocket a- s required.
	Worn camshaft lobes.	Replace the camshaft and valve lifters.
Engine misfire with coolant consu- mption	 Faulty cylinder head gasket and/or c-ranking or other damage to the cylinder head and engine block cooling system. Coolant consumption may or may not cause the engine to overheat. 	 Inspect the cylinder head and engine block for damage to the coolant pass- ages and/or a faulty head gasket. Repair or replace as required.
Engine misfire with excessive oil c- onsumption	Worn valves, guides and/or valve stem oil seals.	Repair or replace as required.
نه (مسئولیت محدود) کابانیخودیودی ایران	Worn piston rings. (Oil consumption may or may not cause the engine to misfire)	 Inspect the cylinder for a loss of compression. Repair or replace as required.
En <mark>gine noise on start-up, but only</mark> lasting a few seconds.	Incorrect oil viscosity	Drain the oil.Install the correct viscosity oil.
	Worn crankshaft thrust bearing.	Inspect the thrust bearing and crank- shaft.Repair or replace as required.

General Information

EM-19

Symption	Suspect area	Remedy (See page)
Upper engine noise, regardless of	Low oil pressure	Repair or repalce as required.
engine speed.	Broken valve spring.	Replace the valve spring.
	Worn or dirty valve lifters.	Replace the valve lifters.
	Stetched or broken timing chain and/or damaged sprocket teeth.	Replace the timing chain and sprockets.
	Worn timing chain tensioner, if applicabl- e.	Replace the timing chain tensioner as re- quired.
	Worn camshaft lobes.	 Inspect the camshaft lobes. Replace the timing camshaft and valve lifters as required.
	Worn valve guides or valve stems.	Inspect the valves and valve guides, the- n repair as required.
	Stuck valves. (Carbon on the valve stem or valve seat may cause the valve to sta- y open.	Inspect the valves and valve guides, the- n repair as required.
Lower engine noise, regardless of	Low oil pressure.	Repair or required.
engine speed	Loose or damaged flywheel.	Repair or replace the flywheel.
	Damaged oil pan, contacting the oil pum- p screen.	Inspect the oil pan.Inspect the oil pump screen.Repair or replace as required.
نه (مسئولیت محدود)	Oil pump screen loose, damaged or rest- ircted.	 Inspect the oil pump screen. Repair or replace as required.
کاران خودرو در ایران	Excessive piston-to-cylinder bore cleara- nce.	 Inspect the piston, piston pin and cyl- inder bore. Repair as required.
	Excessive piston pin-to-clearance	Inspect the piston, piston pin and the connecting rod.Repair or replace as required.
	Excessive connecting rod bearing rod cl- earance	 Inspect the following components and repair as required. The connecting rod bearings. The connecting rods. The crankshaft. The crankshaft journal.
	Excessive crankshaft bearing clearance	 Inspect the following components, and r-epair as required. The crankshaft bearing. The crankshaft journals.
	Incorrect piston, piston pin and connecti- ng rod installation	Verify the piston pins and connecting rods are installed correctly.Repair as required.

EM-20

Engine Mechanical System

Symption	Suspect area	Remedy (See page)
Engine noise under load	Low oil pressure	Repair or replace as required.
	Excessive connecting rod bearing clear- ance	 Inspect the following components and repair as required : The connecting rod bearings. The connecting rods. The crankshaft
	Excessive crankshaft bearing clearance	 Inspect the following components, and r-epair as required. The crankshaft bearings. The crankshaft journals. The cylinder block crankshaft
Engine will not crank-crankshaft w- ill not rotate (مسئوليت محدود) کاران خودرو در ايران	Hydro-locked cylinder • Coolant/antifreeze in cylinder. • Oil in cylinder. • Fuel in cylinder	 Remove spark plugs and check for fluid. Inspect for broken head gasket. Inspect for cracked engine black or cylinder head. Inspect for a sticking fuel injector and /or leaking fuel regulator.
	Broken timing chain and/or timing chain and/or timing chain gears.	 Inspect timing chain and gears. Repair as required.
	Material cylinder • Broken valve • Piston material • Foreign material	 Inspect cylinder for damaged compo- nents and/or foreign materials. Repair or replace as required.
	Seized crankshaft or connecting rod bea- rings.	 Inspect crankshaft and connecting ro- d bearing. Repair as required.
	Bent or broken connecting rod.	 Inspect connecing rods. Repair as required.
	Broken crankshaft	 Inspect crankshaft. Repair as required.

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SPECIAL

General Information		EM-2		
SPECIAL SERVICE TOOLS				
Tool (Number and name)	Illustration	Use		
Crankshaft front oil seal inst- aller (09214-32000)	$\bigcirc \bigcirc \bigcirc \bigcirc$	Installation of the front oil seal		
Crankshaft front oil seal gui- de (09214-32100)		Installation of the front oil seal		
Valve clearance adjust tool set (09220-2D000)	Plier	Removeal and installation of the tappet shim		

Camshaft oil seal installer (09221-21000)	ين سامانه جيتال تعمير کارا	Installation of the camshaft oil seal
Valve guide installer (09221-22000 A/B)		Remove and installation of the valve guide
Valve stem oil seal installer (09222-22001)	0	Installation of the valve stem oil seal

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Stopper

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EM-22

Engine Mechanical System

Tool (Number and name)	Illustration	Use
Valve spring compressor & adaptor (09222-28000, 09222-28100)		Removal and installation of the intake or exha- ust valve
Crankshaft rear oil seal inst- aller (09231-21000)		 Installation of the engine rear oil seal Installation of the crankshaft rear oil seal

حیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

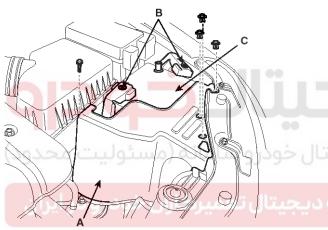
Engine And Transaxle Assembly

Engine And Transaxle Assembly

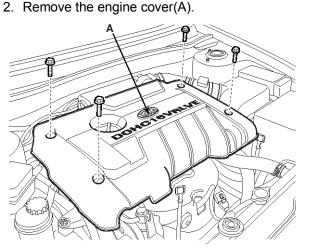
REMOVAL

- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

- Mark all wiring and hoses to avoid misconnection.
- Inspection the timing belt before removing the cylinder head.
- Turn the crankshaft pulley so that the No. 1 piston is at top dead center.
- 1. Remove the heat shield (A) first, and remove the battery terminal (B) and the battery (C).



 $r_{\rm A}$

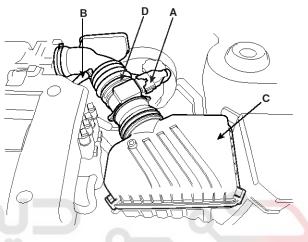


SLDM16001D

SLDM16100D

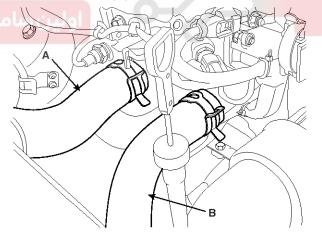
- 3. Remove the radiator cap to speed draining.
- 4. Remove the under cover.

- 5. Loosen the radiator drain plug and drain engine coolant.
- 6. Remove the intake air hose and air cleaner assembly.
 - 1) Disconnect the MAF connector (A).
 - 2) Disconnect the breather hose (B) from air cleaner hose (D).
 - 3) Remove the intake air hose and air cleaner (C).



SLDM16101D

7. Remove the upper radiator hose (A) and lower radiator hose (B).



SHDM16006L

8. Remove the ATF(Automatic Transaxle Fluid) oil cooler hose (A).

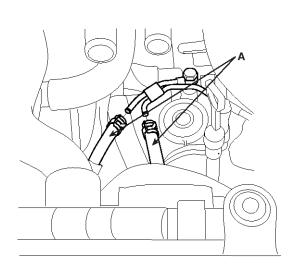
EM-23

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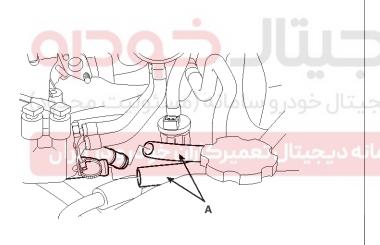
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EM-24



ECKD501C

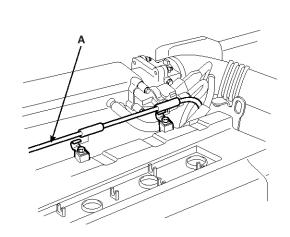
9. Remove the heater hoses (A).



ECKD202A

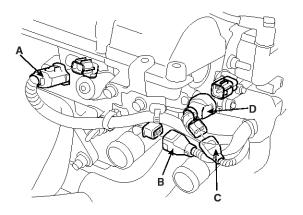
10. Remove the accelerator cable(A).

Engine Mechanical System



ECKD111A

- 11. Remove the engine wire harness connectors and wire harness clamps from the cyilnder head and the manifold.
 - Disconnect the OCV(Oil Control Valve) connector (A).
 - 2) Disconnect the oil temperature sensor connector (B).
 - 3) Disconnect the ECT(Electroic Coolant Temperature) sensor connector (C).
 - 4) Disconnect the ignition coil connector (D).



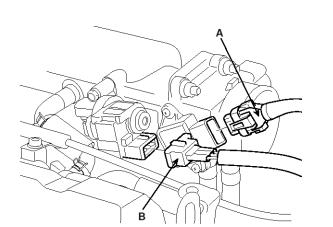
ECKD203A

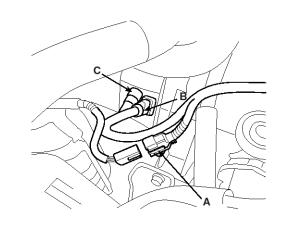
5) Disconnect the TPS(Throttle Position sensor) connector (A).

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Engine And Transaxle Assembly

6) Disconnect the ISA(Idle Speed Actuator) connector (B).

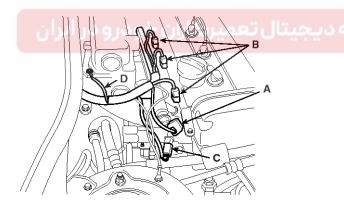




- ACGE056A
- 13) Disconnect the PCSV(Purge Control Solenoid Valve) connector (A).

ECKD204A

- 7) Disconnect the CMP(Camshaft Position sensor) connector (A).
- 8) Disconnect the fuel injector connector (B).
- 9) Disconnect the knock sensor connector (C) and
- the ground cable (D).



SLDM16102D

- 10) Disconnect the front heated oxygen sensor connector (A).
- 11) Disconnect the CKP(Crankshaft angle position sensor) connector (B).
- 12) Disconnect the oil pressure switch connector (C).

ECKD207A

- 12.Remove the transaxle wire harness connectors and control cable from transaxle (A/T).
 - Disconnect the transaxle range switch connector (A).
 - 2) Disconnect the solenoid valve connector (B).
 - 3) Disconnect the input shaft speed sensor connector (C).
 - 4) Disconnect the output shaft speed sensor connector (D).

EM-25

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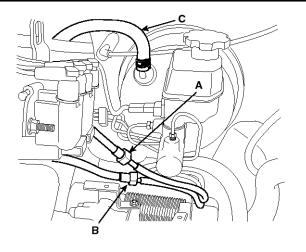
EM-26

Engine Mechanical System n. Ē 8 ACGE011A 5) Disconnect the vehicle speed sensor connector (A). ECKD604A 8) Remove the control cable. EKKD156A 6) Remove the transaxle ground cable (A). ACGE012A 13. Disconnect the fuel inlet hose (A) of the delivery pipe side. y 14. Disconnect the hose (B) of the PCSV(Purge Control Solenoid Valve) side. Ć 15. Remove the brake booster vacuum hose (C). ACGE058A 7) Remove the control cable nut (A) from transaxle range switch.

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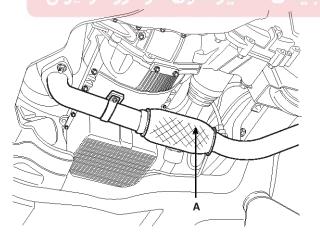
Engine And Transaxle Assembly

EM-27



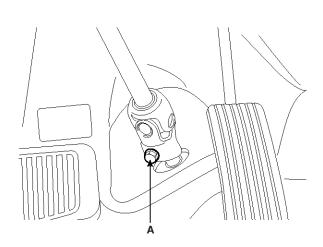
SLDM16103D

- 16. Remove the front wheel (RH, LH).
- 17. Remove the power steering pump and use a wire to secure the pump to the vehicle so that it is out of the way.
- 18. Remove the air conditioner compressor and fix the compressor to vehicle with a wire. (See HA group air conditioner compressor).
- 19. Install the engine jack to the engine and transaxle assembly.
- 20. Remove the lower arm ball joint mounting bolts.
- 21. Disconnect the tie-rod from the knuckle.
- 22. Disconnect the stabilizer bar link from the strut.
- 23. Remove the front muffler (A).



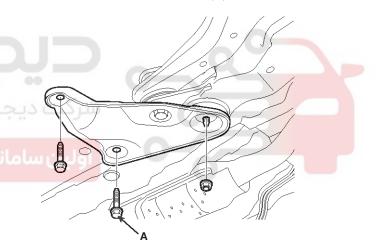
SLDM16003D

24. Remove the steering u-joint mounting bolt (A).

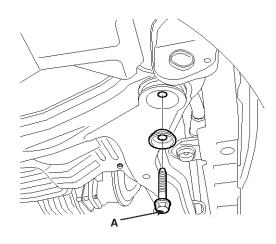


ECKD616A

25. Remove the sub frame bolts (A).



ECKD617A



ECKD618A

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EM-28

Engine Mechanical System

INSTALLATION

Perform the following :

- Adjust shift cable.
- Adjust throttle cable.
- Refill engine with engine oil.
- Refill transaxle with fluid.
- Refill radiator with engine coolant.
- Bleed air from the cooling system with the heater valve open.
- Clean battery posts and cable terminals with sandpaper assemble them, then apply grease to prevent corrosion.
- Inspect for fuel leakage.

After assembling the fuel line, turn on the ignition switch (do not operate the starter) so that the fuel pump runs for approximately two seconds and fuel line pressureizes.

Repeat this operation two or three times, then check for fuel leakage at any point in the fuel line.



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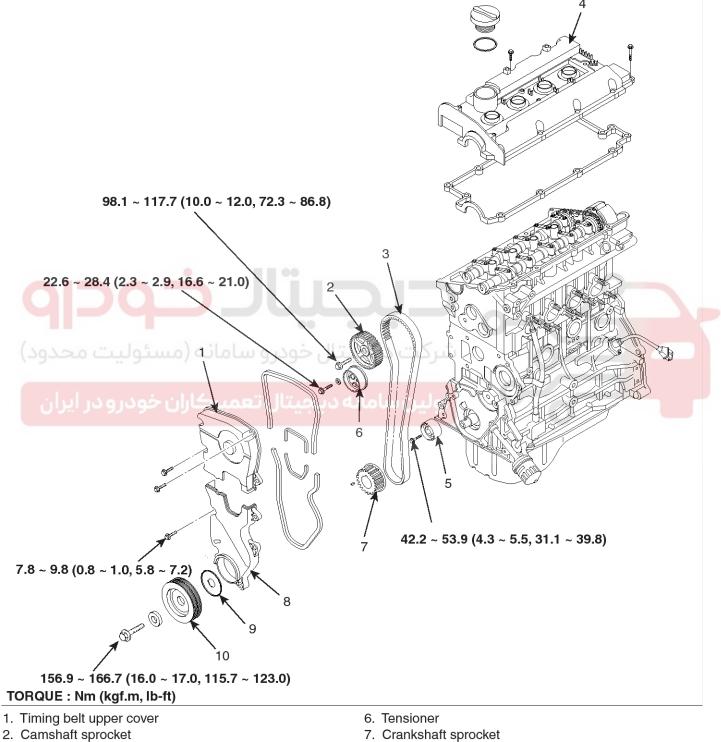


Timing System

Timing System

Timing Belt

COMPONENTS



- 3. Timing belt
- 4. Cylinder head cover
- 5. Idler

- 7. Crankshaft sprocket
- 8. Timing belt lower cover
- 9. Flange
- 10. Crankshaft pulley

021 62 99 92 92

EM-29

EM-30

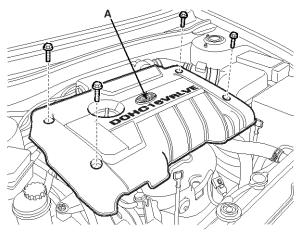
Engine Mechanical System

SHDM16300L

REMOVAL

Engine removal is not required for this procedure.

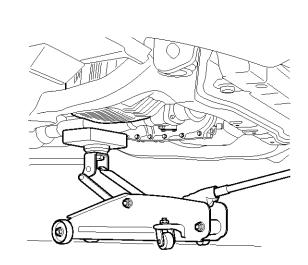
1. Remove the engine cover (A).



SLDM16001D

KXDSE16A

- ____
- 2. Remove RH front wheel.
- 3. Remove 2bolts (B) and RH side cover (A).

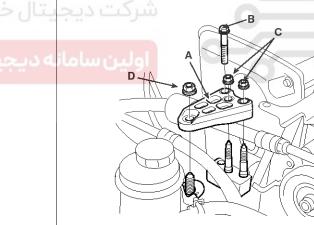


ECKD102A

WNOTICE

Place wooden block between the jack and engine oil pan.

2) Remove the bolt(B), three nuts(C, D) and engine mount bracket (A).



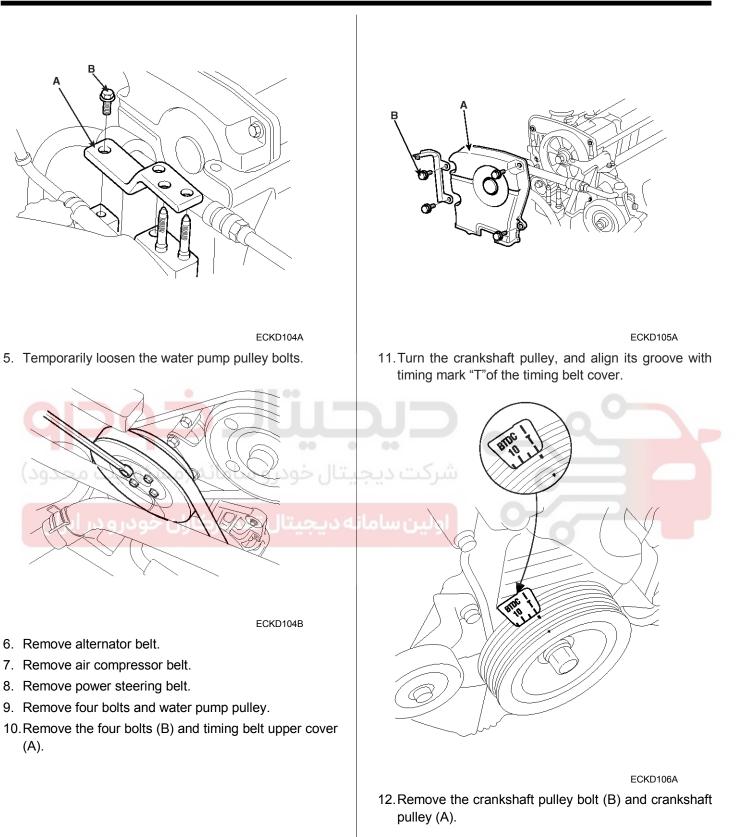
ACGE051A

3) Remove the bolt (B) and stay plate (A).

- 4. Remove the engine mount bracket.
 - 1) Set the jack to the engine oil pan.

Timing System

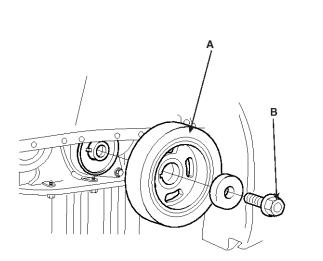
EM-31



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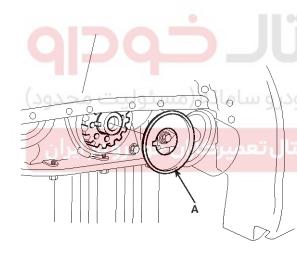
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EM-32

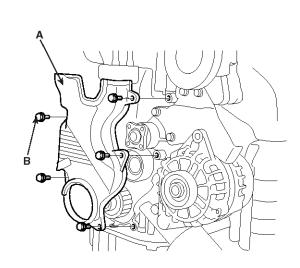


ECKD107A

13. Remove the crankshaft flange (A).

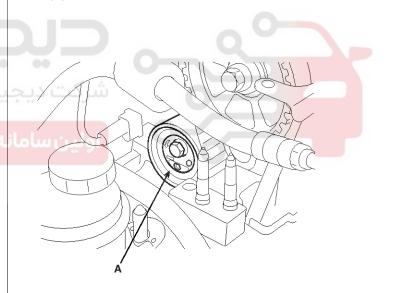


Engine Mechanical System



ECKD108B

15. Remove the timing belt tensioner (A) and timing belt (B).



ECKD108A

14.Remove the 5bolts (B) and timing belt lower cover (A).

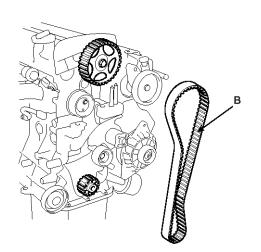
SHDM16316L

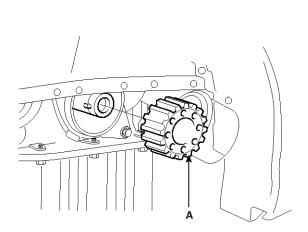
021 62 99 92 92

Timing System

EM-33

ECKD110A





18. Remove the cylinder head cover.

1) Remove the spark plug cable.

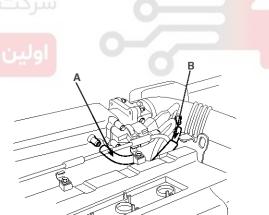
cable from the cylinder head cover.

hose (A) and breather hose (B).

ECKD109B

If the timing belt is reused, make an arrow indicating the turning direction to make sure that the belt is reinstalled in the same direction as before.

16. Remove the bolt (B) and timing belt idler (A).



2) Remove the accelerator cable and the auto-cruise

3) Remove the PCV(Positive Crankcase ventilation)

ECKD109C

17. Remove the crankshaft sprocket (A).

ECKD112A

4) Remove the bolts and cylinder head cover.

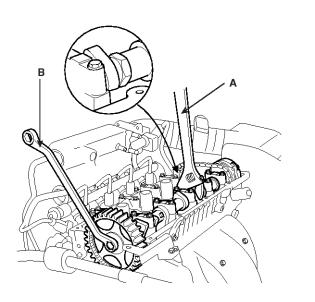
19. Remove camshaft sprocket.

 Hold the hexagonal head wrench (A) portion of the camshaft with a wrench (B), and remove the bolt and camshaft sprocket (C).

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021 62 99 92 92

EM-34



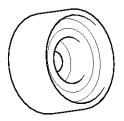
ECKD114A

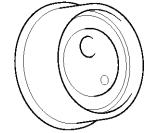
ACAUTION Be careful not to damage the cylinder head and valve lifter with the wrench.

INSPECTION

SPOCKETS, TENSIONER, IDLER

- 1. Check the camshaft sproket, crankshaft sprocket, tensioner pulley, and idler pulley for abnormal wear, cracks, or damage. Replace as necessary.
- Inspect the tensioner pulley and the idler pulley for easy and smooth rotation and check for play or noise. Replace as necessary.





ECKD115A

Engine Mechanical System

3. Replace the pulley if there is a grease leak from its bearing.

TIMING BELT

1. Check the belt for oil or dust deposits.

Replace, if necessary.

Small deposits should be wiped away with a dry cloth or paper. Do not clean with solvent.

2. When the engine is overhauled or belt tension adjusted, check the belt carefully. If any of the following flaws are evident, replace the belt.

MOTICE

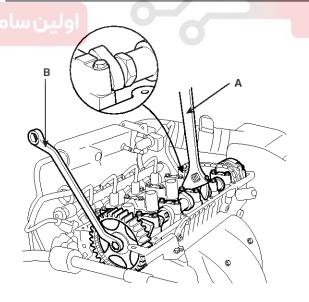
- Do not bend, twist or turn the timing belt inside out.
- Do not allow the timing belt to come into contact with oil, water and stem.

INSTALLATION

- 1. Install the camshaft sprocket and tighten the bolt to the specified torque.
 - 1) Temporarily install the camshaft sprocket bolt.
 - Hold the hexagonal head wrench (A) portion of the camshaft with a wrench (B), and tighten the camshaft sprocket (C) bolt.

Tightening torque

Camshaft sprocket bolt : 98.1 ~ 117.7Nm (10.0 ~ 12.0kgf.m, 72.3 ~ 86.8lb-ft)



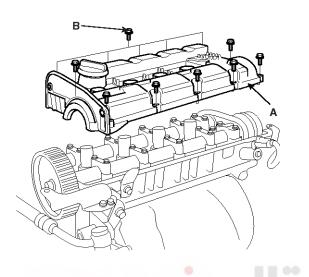
ECKD114A

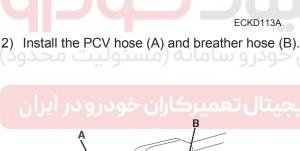
Timing System

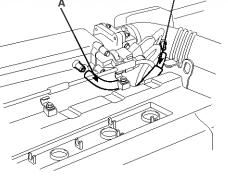
- 2. Install cylinder head cover.
 - 1) Install cylinder head cover (A) and the twelve bolts (B).

Tightening torque :

 $7.8 \sim 9.8 \text{Nm}$ (0.8 \sim 1.0kgf.m, 5.8 \sim 7.2lb-ft)

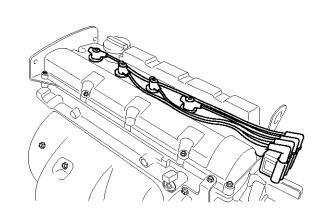






ECKD112A

3) Install the accelerator cable and the auto-cruise cable from the cylinder head cover.



SHDM16300D

- 4) Install the spark plug cable.
- 3. Install the crankshaft sprocket (A).

ECKD110A

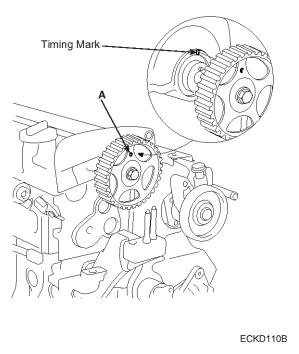
4. Align the timing marks of the camshaft sprocket (A) and crankshaft sprocket (B) with the No. 1 piston placed at top dead center and its compression stroke.

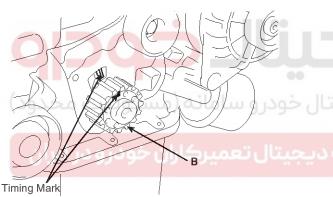
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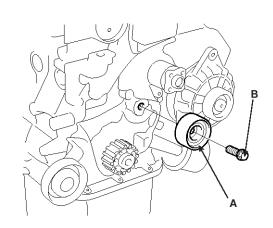
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EM-36





Engine Mechanical System

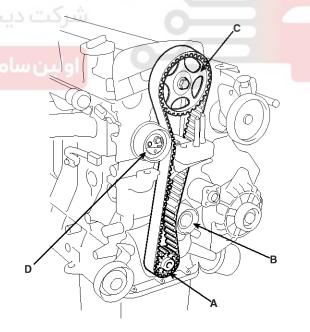


ECKD109C

- 6. Install the timing belt tensioner loosely enough for the adjuster to rotate. Make sure that the stopper of base is leaning against the lowering sealing cap on the cylinder head.
- 7. Belt so as not give slack at each center of shaft. Do as following procedures when installing timing belt.

Crankshaft sprocket (A) \rightarrow Idler pulley (B) \rightarrow Camshaft sprocket (C) \rightarrow timing belt tensioner (D).

(The tensioner can be installed after the timing belt.)



SHDM16302D

ECKD110C

5. Install the idler pulley (A) and tighten the bolt (B) to the specified torque.

Tightening torque

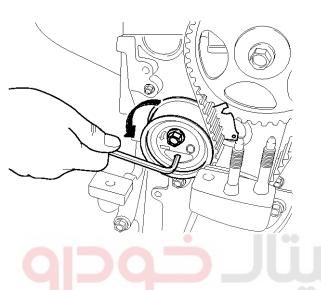
Idler pulley bolt : 42.2 \sim 53.9Nm (4.3 \sim 5.5kgf.m, 31.1 \sim 39.8lb-ft)

EM-37

021 62 99 92 92

Timing System

- 8. Check the alignment of the timing marks on each sprocket.
- 9. Remove the pin fixing the tensioner arm.
- 10. Using a hex wrench, turn the adjuster counterclockwise to make the indicator of the arm (A) located at the center of the base notch.



SHDEM7002N

خودرو سامانه (مسئوليتCAUTION

Do not rotate the adjuster clockwise.

- It will result in auto tensioner's functional problem.
- 11. Tightening tensioner bolt with fixing the indicator not to move.

Tightening torque

Tensioner bolt :

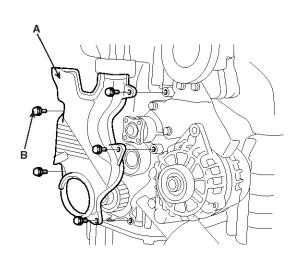
22.6 \sim 28.4Nm (2.3 \sim 2.9kgf.m, 16.6 \sim 21.0lb-ft)

- 12. Turn the crankshaft two revolutions in the operating direction (clockwise) and check that the indicator is in the center of base.
- 13.If the indicator is not located at the center of base, slacken the bolt and repeat the abore procedure.
- 14. Install the timing belt lower cover (A) with 5 bolts (B).

Tightening torque

Timing belt cover bolt :

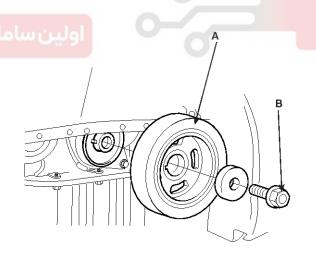
7.8 ~ 9.8Nm (0.8 ~1.0kgf.m, 5.8 ~ 7.2lb-ft)



ECKD108B

15. Install the flange and crankshaft pulley (A).Make sure that crankshaft sprocket pin fits the small hole in the pulley.

Tightening torque Crankshaft pulley bolt : 156.9 ~ 166.7N.m (16.0 ~ 17.0kgf.m, 115.7 ~ 123.0lb-ft)



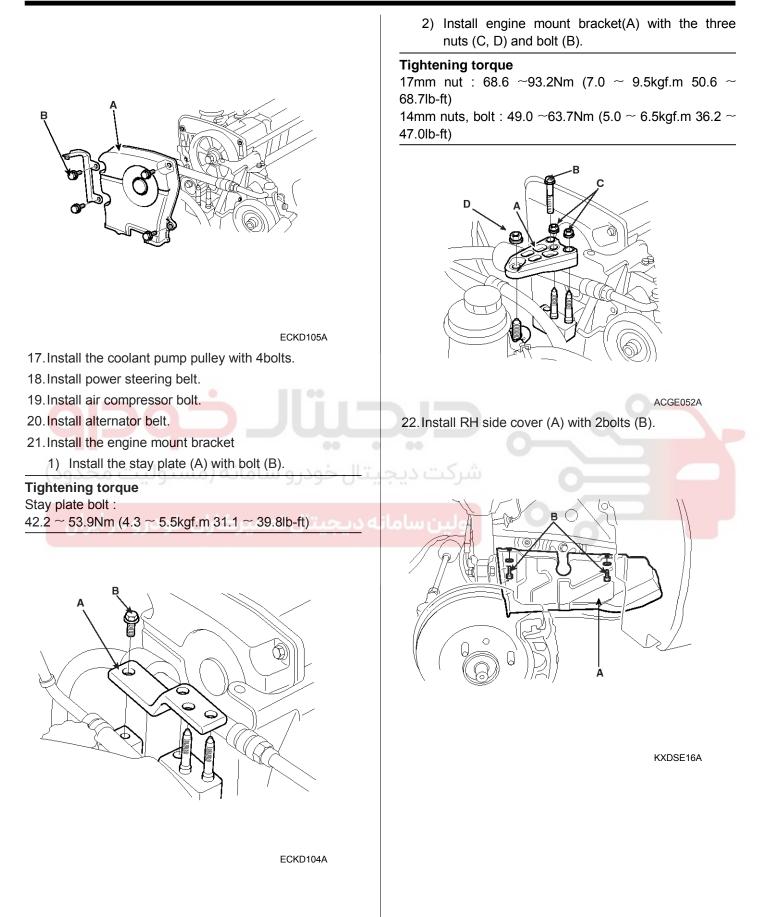
ECKD107A

16. Install the timing belt upper cover (A) with 4bolts (B).

Tightening torque : 7.8 \sim 9.8N.m (0.8 \sim 1.0kgf.m, 5.8 \sim 7.2lb-ft)

Engine Mechanical System

EM-38



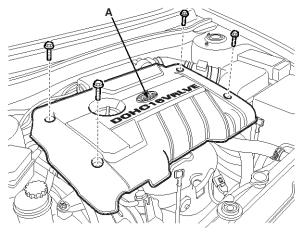
Timing System

23. Install RH front wheel.

Tightening torque

88.3 ~ 98.1Nm (9.0 ~ 10.0kgf.m, 65.1 ~ 72.3lb-ft)

24. Install engine cover (A) with the four bolts.



SLDM16001D



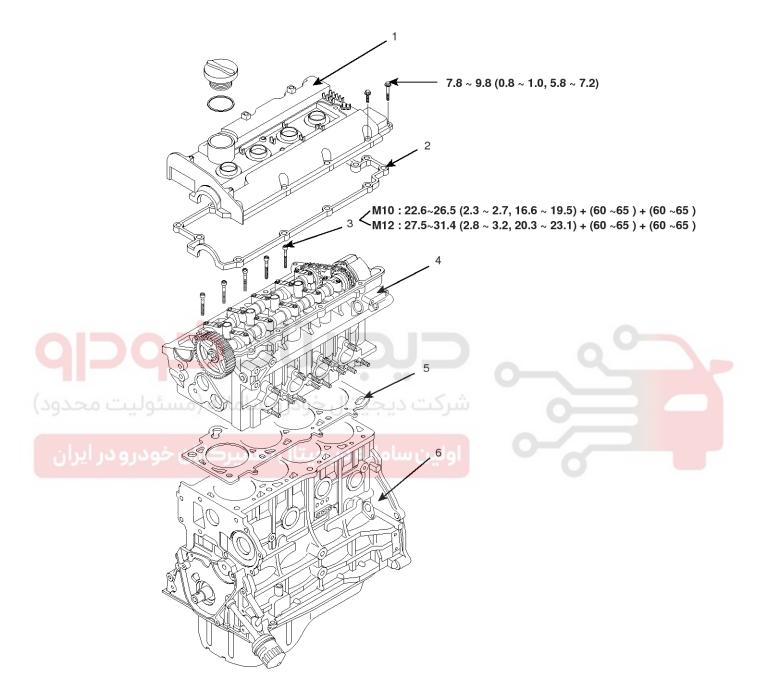
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EM-40

Engine Mechanical System

Cylinder Head Assembly COMPONENTS



TORQUE : Nm (kgf.m, lb-ft)

- 1. Cylinder head cover
- 2. Gasket
- 3. Cvlinder head bolt

4. Cylinder head

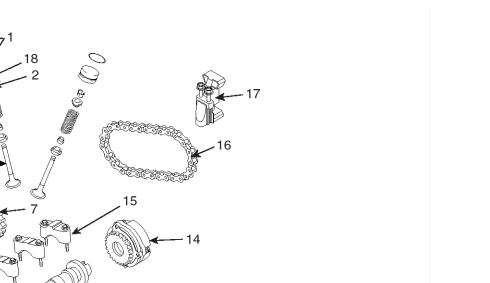
- 5. Cylinder head gasket
- 6. Cvlinder block

SLDEM7001L

Cylinder Head Assembly

5

6



-12

11

10

40.2 ~ 50.0

(4.1 ~ 5.1, 29.7~ 36.9)

TORQUE : Nm (kgf.m, lb-ft)

(10.0 ~ 12.0, 72.3 ~ 86.8)

13.7~14.7

(1.4 ~ 1.5, 10.1 ~ 10.8)

9

- 1. Mechanical lash adjuster(MLA)
- 2. Retainer

98.1 ~ 117.7

- 3. Valve spring
- 4. Stem seal
- 5. Spring seat
- 6. Valve
- 7. Chain sprocket
- 8. Intake camshaft
- 9. Camshaft sprocket

- 10. Oil control valve(OCV)
- 11. Washer

13

- 12. OCV filter
- 13. Exhaust camshaft
- 14. CVVT assembly
- 15. Camshaft bearing cap
- 16. Timing chain
- 17. Auto Tensioner
- 18. Retainer lock

SHDM16302L

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EM-41

EM-42

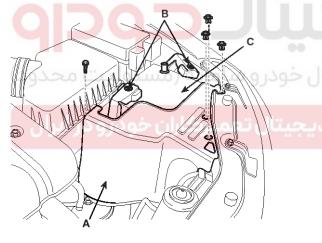
Engine Mechanical System

REMOVAL

- Use fender covers to avoid damaging painted surfaces.
- To avoid damaging the cylinder head, wait until the engine coolant temperature drops below normal temperature before removing it.
- When handling a metal gasket, take care not to fold the gasket or damage the contact surface of the gasket.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

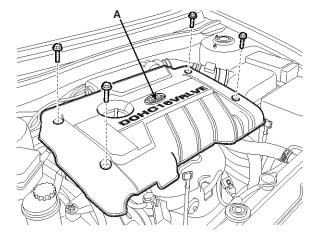
WNOTICE

- Mark all wiring and hoses to avoid misconnection.
- Inspect the timing belt before removing the cylinder head.
- Turn the crankshaft pulley so that the No. 1 piston is at top dead center.
- 1. Disconnect the battery teminal (B) and remove the heat shield (A), the battery (C).



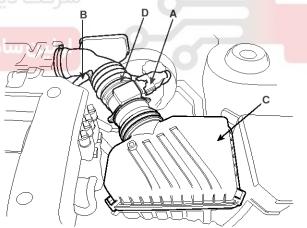
SLDM16100D

2. Remove the engine cover (A).



SLDM16001D

- 3. Remove the radiator cap to speed draining.
- 4. Loosen the radiator drain plug. and drain engine coolant.
- 5. Remove the intake air hose and air cleaner assembly.
 - 1) Disconnect the MAF connector (A).
 - 2) Disconnect the breather hose (B) from air cleaner hose (D).
 - 3) Remove the intake air hose and air cleaner assembly (C).

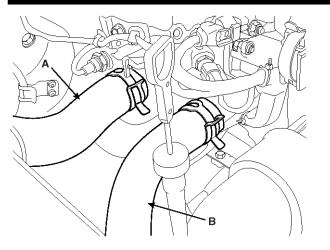


SLDM16101D

6. Remove the upper radiator hose(A) and lower radiator hose(B).

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Cylinder Head Assembly



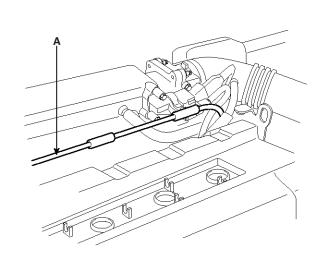
SHDM16006L

ECKD202A

7. Remove the heater hoses (A).

8. Remove the accelerator cable (A).





SHDM16301D

- 9. Remove the engine wire harness connectors and wire harness clamps from the cylinder head and the intake manifold.
 - 1) OCV(Oil control Valve) connector (A).
 - 2) Oil temperature sensor (OTS) connector (B).
 - 3) Engine coolant temperature (ECT) sensor connector (C).
 - 4) Ignition coil connector (D).

ECKD203A

- 5) TPS(Throttle Position Sensor) connector (A).
- 6) ISA(Idle Speed Actuator) connector (B).

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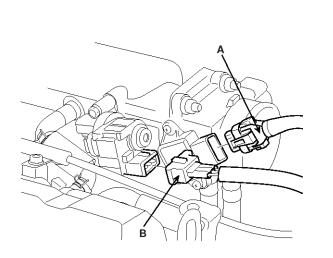
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EM-43

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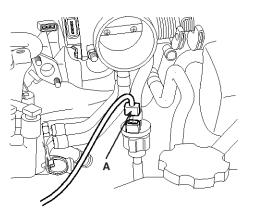
EM-44

(D).



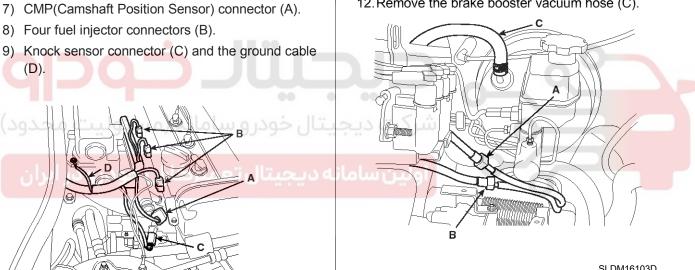
ECKD204A

Engine Mechanical System



ECKD207A

- 11) Front heated oxygen sensor connector.
- 10. Remove the fuel inlet hose (A) from delivery pipe.
- 11. Remove the PCSV hose (B).
- 12. Remove the brake booster vacuum hose (C).



SLDM16103D

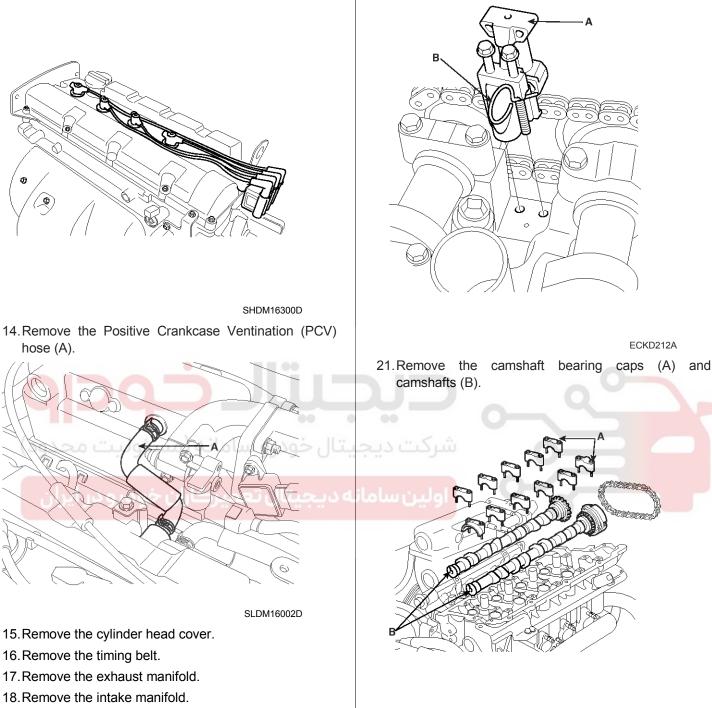
13. Remove the spark plug cable.

SLDM16102D 10) PCSV(Purge Control Solenoid Valve) connector (E).

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Cylinder Head Assembly

EM-45

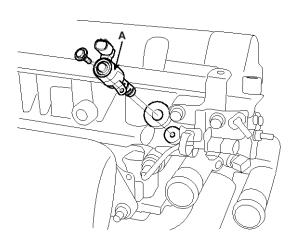


- 19. Remove the camshaft sprocket.
- 20. Remove the timing chain auto tensioner (A).

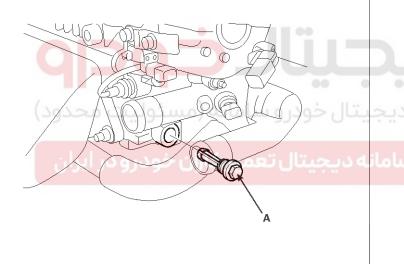
ECKD213A

22. Remove the OCV(oil control valve) (A).

EM-46



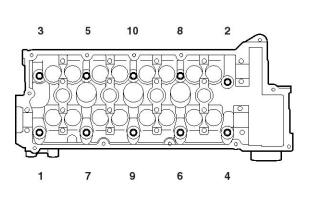
ECKD214A 23.Remove the OCV(oil control valve) filter (A).



ECKD215A

- 24. Remove the cylinder head bolts, then remove the cylinder head.
 - Using 8mm and 10mm hexagon wrench, uniformly loosen and remove the 10 cylinder head bolts, in several passes, in the sequence shown. Remove the 10 cylinder head bolts and plate washers.

Engine Mechanical System



ECKD216A

Head warpage or cracking could result from removing bolts in an incorrect order.

2) Lift the cylinder head from the dowels on the cylinder block and replace the cylinder head on wooden blocks on a bench.

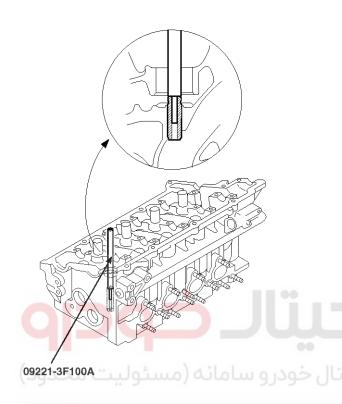
CAUTION

Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

Cylinder Head Assembly

REPLACEMENT VALVE GUIDE

1. Using the SST(09221-3F100A), withdraw the old valve guide toward the bottom of cylinder head.



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- 2. Recondition the valve guide hole so that it can match the newly press-fitted oversize valve guide.
- Using the SST(09221-3F100A/B), press-fit the valve guide. The valve guide must be press-fitted from the upper side of the cylinder head. Keep in mind that the intake and exhaust valve guides are different in length.

Over size mm(in.)	Size mar - k	Oversize valve guide hol - e size mm(in.)
0.05 (0.002)	5	11.05 ~ 11.068 (0.4350 ~ 0.4357)
0.25 (0.010)	25	11.25 ~ 11.268 (0.4429 ~ 0.4436)
0.50 (0.020)	50	11.50 ~ 11.518 (0.4528 ~ 0.4535)

Valve guide length

Intake : 46mm (1.8in.) Exhaust : 54.5mm (2.15in.) After the valve guide is press-fitted, insert a new valve and check for proper stem -to-guide clearance.
 After the valve guide is replaced, check that the valve

09221-3F100B

09221-3F100A

is seated properly. Recondition the valve seats as necessary.

EM-47

ECKD900B

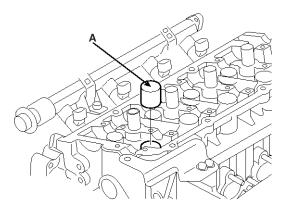
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EM-48

DISASSEMBLY

Identify MLA(Mechanical Lash Adjuster), valves, valve springs as they are removed so that each item can be reinstalled in its original position.

1. Remove MLAs (A).



ECKD217A

2. Remove valves.

09222-28100

1) Using SST(09222-28000, 09222-28100), compress the valve spring and remove retainer lock. **Engine Mechanical System**

6) Using a magnetic finger, remove the spring seat.

INSPECTION

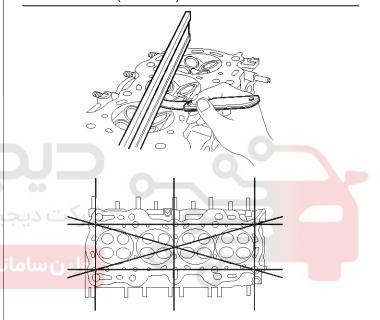
CYLINDER HEAD

 Inspect for flatness.
 Using a precision straight edge and feeler gauge, measure the surface the contacting the cylinder block and the manifolds for warpage.

Flatness of cylinder head gasket surface

Standard : Less than 0.03 mm (0.0012 in) Limit : 0.06 mm (0.0024 in) Flatness of manifold surface Standard : Less than 0.15 mm (0.0059 in)

Limit : 0.03 mm (0.0118 in)



SLDEM7002L

2. Inspect for cracks.

Check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks. If cracked, replace the cylinder head.

VALVE AND VALVE SPRING

- 1. Inspect valve stems and valve guides.
 - 1) Using a caliper gauge, measure the inside diameter or the valve guide.

Valve guide inside.

Valve gnide inside :

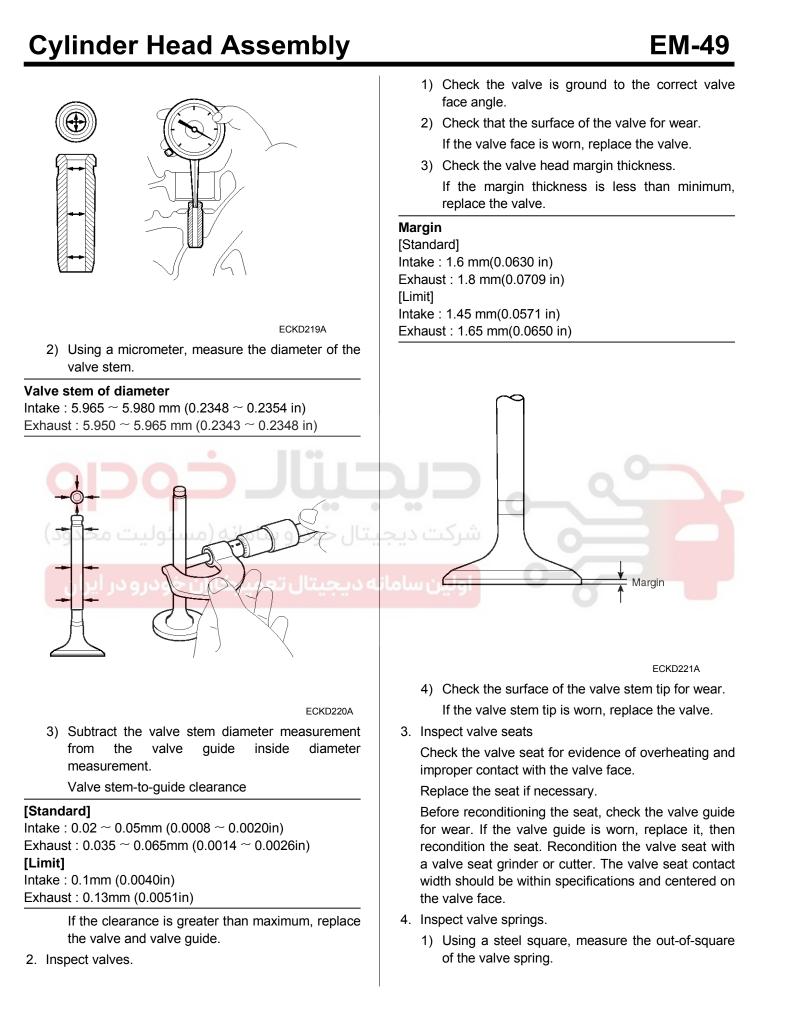
6.000 ~ 6.015 mm (0.2362 ~ 0.2368 in)

- 2) Remove the spring retainer.
- Remove the valve spring.
- 4) Remove the valve.
- 5) Remove the using needle-nose pliers, remove the oil seal.

09222-28000

ECKD218A

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EM-50

2) Using a vernier calipers, measure the free length of the valve spring.

Valve spring

[Standard] Free height : 48.86mm (1.9236 in) Load : 18.8±0.9kg/39.0mm (41.4±2.0lb/1.5354in) 41.0±1.5kg/30.5mm (90.4±3.3lb/1.2008in) Out-of-square : 1.5° less [Limit] Out-of-square : 3°

Out-of-square : 3°



If the free length is not as specified, replace the valve spring.

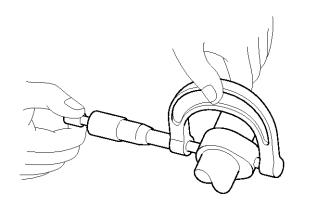
CAMSHAFT

1. Inspect cam lobes.

Using a micrometer, measure the cam lobe height.

Cam height

[Standard value] Intake : 44.518~44.718mm (1.7527~1.7605in) Exhaust : 44.418~44.618mm (1.7487~1.7566in)



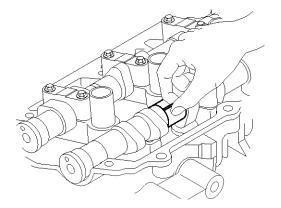
Engine Mechanical System

ECKD223A

ECKD224A

If the cam lobe height is less than minimum, replace the camshaft.

- 2. Inspect camshaft journal clearance.
 - 1) Clean the bearing caps and camshaft journals.
 - 2) Place the camshafts on the cylinder head.
 - 3) Lay a strip of plastigage across each of the camshaft journal.

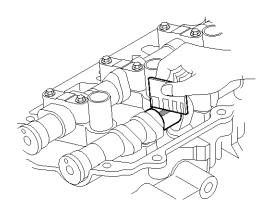


- 4) Install the bearing caps.

 - Do not turn the camshaft.
- 5) Remove the bearing caps.
- 6) Measure the plastigage at its widest point.

Bearing oil clearance :

[Standard value] : $0.02 \sim 0.061$ mm($0.0008 \sim 0.0024$ in) [Limit] : 0.1mm(0.0039in)



ECKD225A

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

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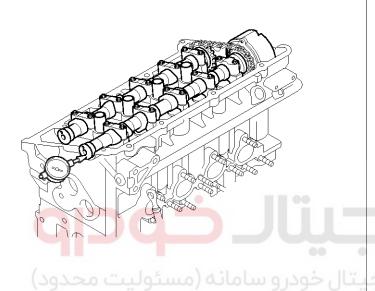
EM-51

Cylinder Head Assembly

- 7) Completely remove the plastigage.
- 8) Remove the camshafts.
- 3. Inspect camshaft end play.
 - 1) Install the camshafts.
 - 2) Using a dial indicator, measure the end play while moving the camshaft back and forth.

Camshaft end play

[Standard value] : 0.1 ~ 0.15mm(0.0039 ~ 0.0059in)



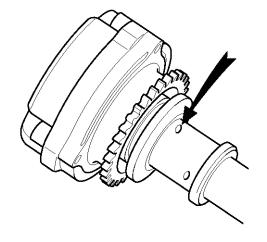
ECKD226A

If the end play is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

3) Remove the camshafts.

CVVT ASSEMBLY

- 1. Inspect CVVT assembly.
 - 1) Check that the CVVT assembly will not turn.
 - 2) Apply vinyl tape to all the parts except the one indicated by the arrow in the illustration.



EDKD270B

 Wind tape around the tip of the air gun and apply air of approx. 100kpa(1kgf/cm², 14psi) to the port of the camshaft.

(Perform this order to release the lock pin for the maximum delay angle locking.)

WNOTICE

When the oil splashes, wipe it off with a shop rag and the likes.

4) Under the condition of (3), turn the CVVT assembly to the advance angle side (the arrow marked direction in the illustration) with your hand.

Depending on the air pressure, the CVVT assembly will turn to the advance side without applying force by hand. Also, under the condition that the pressure can be hardly applied because of the air leakage from the port, there may be the case that the lock pin could be hardly released.

5) Except the position where the lock pin meets at the maximum delay angle, let the CVVT assembly turn back and forth and check the movable range and that there is no disturbance.

Standard: Movable smoothly in the range about 20°

6) Turn the CVVT assembly with your hand and lock it at the maximum delay angle position.

REASSEMBLY

WNOTICE

Thoroughly clean all parts to be assembled.

Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.

Replace oil seals with new ones.

- 1. Install valves.
 - 1) Install the spring seats.

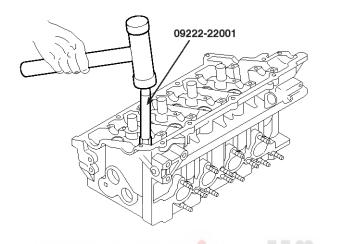
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EM-52

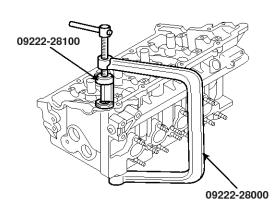
2) Using SST(09222-22001), push in a new oil seal.

WNOTICE

Do not reuse old valve stem seals. Incorrect installation of the seal could result in oil leakage past the valve guides.



Engine Mechanical System



ECKD218A

ECKD229A

3) Install the valve, valve spring and spring retainer. بودرو ساماته (مسئ

UNOTICE

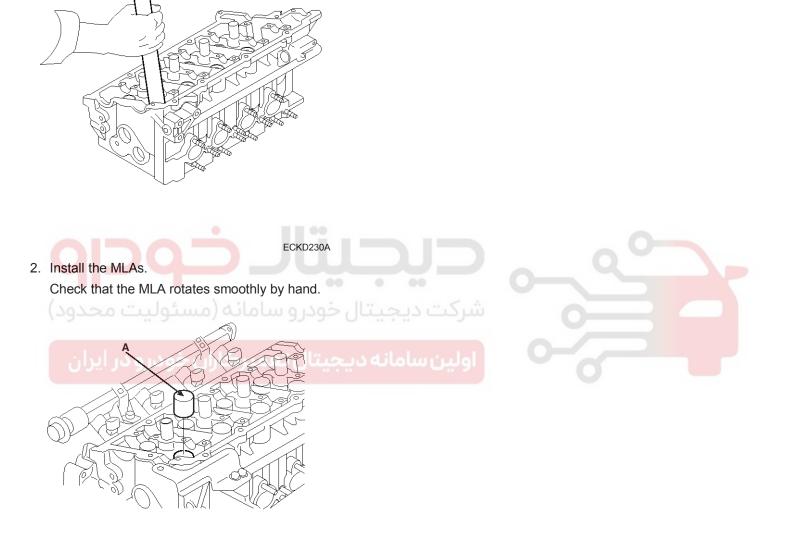
Place valve springs so that the side coated with enamel faces toward the valve spring retainer and then installs the retainer.

4) Using the SST(09222-28000,09222-28100), compress the spring and install the retainer locks. After installing the valves, ensure that the retainer locks are correctly in place before releasing the valve spring compressor.

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Cylinder Head Assembly

5) Lightly tap the end of each valve stem two or three times with the wooden handle of a hammer to ensure proper seating of the valve and retainer lock.



ECKD217A

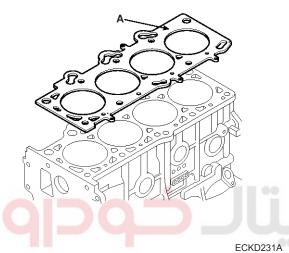
EM-53

EM-54

Engine Mechanical System

INSTALLATION

- Thoroughly clean all parts to be assembled.
- Always use a new head and manifold gasket.
- The cylinder head gasket is a metal gasket. Take care not to bend it.
- Rotate the crankshaft, set the No. 1 piston at TDC.
- 1. Install the cylinder head gasket (A) on the cylinder block.



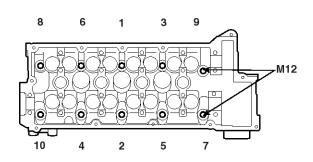


خودرو سامانه (مسئولیت мотісе Be careful of the installation direction.

- 2. Place the cylinder head quietly in order not to damage the gasket with the bottom part of the end.
- 3. Install the cylinder head bolts.
 - 1) Apply a light coat if engine oil on the threads and under the heads of the cylinder head bolts.
 - 2) Using 8mm and 10mm hexagon wrench, install and tighten the 10 cylinder head bolts and plate washers, in several passes, in the sequence shown.

Tightening torque

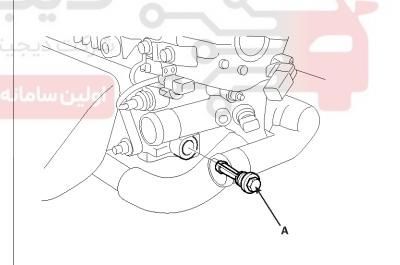
M10: 22.6~26.5 (2.3~2.7, 16.6~19.5) + (60° ~ 65°) + (60° ~ 65°) M12: 27.5~31.4 (2.8~3.2, 20.3~23.1) + (60° ~ 65°) + (60° ~ 65°)



ECKD232A

4. Install the Oil Control Valveco (OCV) filter (A).

Tightening torque 40.2 ~ 50.0Nm (4.1 ~ 5.1kgf.m, 29.7 ~ 36.9lb-ft)



ECKD215A

WNOTICE

Always use a new OCV filter gasket. Keep clean the OCV filter.

5. Install the Oil Control Valve (OCV) (A).

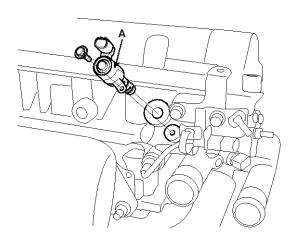
Tightening torque

9.8 ~ 11.8Nm(1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

021 62 99 92 92

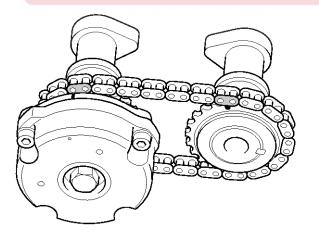
Cylinder Head Assembly

EM-55



ECKD214A

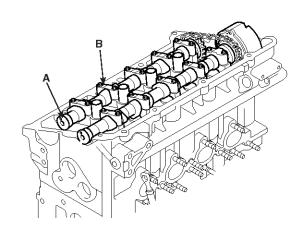
- Do not reuse the OCV when dropped.
- Keep clean the OCV.
- Do not hold the OCV sleeve during servicing.
- When the OCV is installed on the engine, do not move the engine with holding the OCV yoke.
- 6. Install the camshafts.
 - 1) Align the camshaft timing chain with the intake timing chain sprocket and exhaust timing chain sprocket as shown.



ECKD233A

2) Install the camshafts (A) and bearing caps (B).

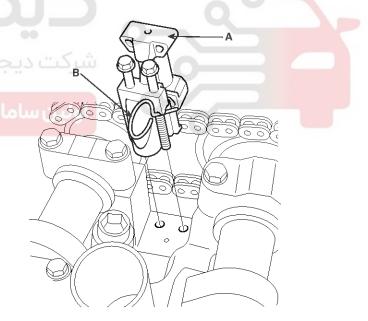
Tightening torque 13.7 \sim 14.7Nm (1.4 \sim 1.5kgf.m, 10.1 \sim 10.8lb-ft)



ECKD234A

3) Install the timing chain auto tensioner (A).

Tightening torque 7.8 \sim 9.8Nm (0.8 \sim 1.0kgf.m, 5.8 \sim 7.2lb-ft)



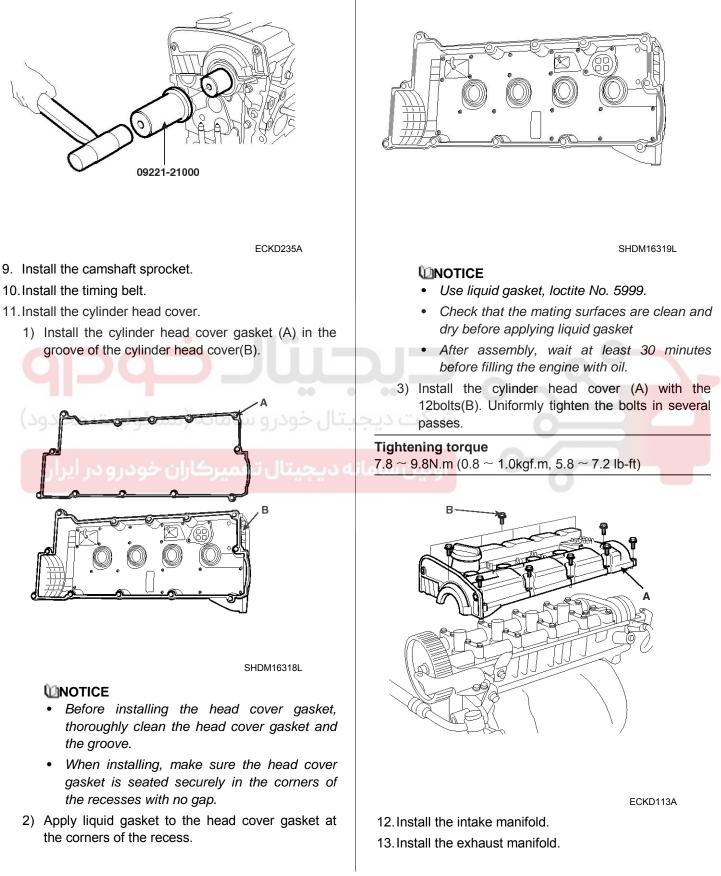
ECKD212A

- 4) Remove the auto tensioner stopper pin (B).
- 7. Check and adjust valve clearance.
- 8. Using the SST (09221-21000), install the camshaft bearing oil seal.

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EM-56

Engine Mechanical System



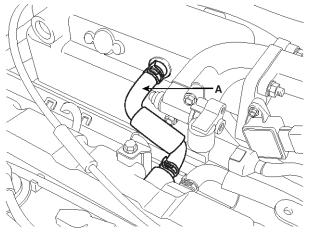
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021 62 99 92 92

EM-57

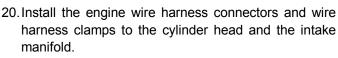
Cylinder Head Assembly

14. Install the Positive Crankcase Ventilation (PCV) (A).

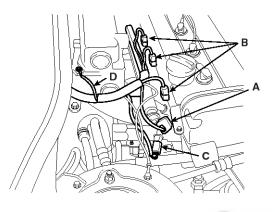


SLDM16002D

- 15.Install the spark plug cable. (Refer to Ignition in EE Group).
- 16.Install the accelerator cable and the auto-cruse cables.
- 17. Install the bake booster hose (C).
- 18. Install the Purge Control Solenoid Valve (PCSV) hose (B).
- 19. Install the fuel inlet hose (A).

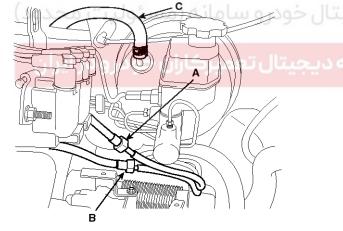


- 1) Front heated oxygen sensor connector.
- Knock sensor connector (C) and the ground cable (D).
- 3) Four fuel injector connectors (B).
- 4) CMP connector (A).



SLDM16102D

5) Purge Control Solenoid Valve (PCSV) connector (E).



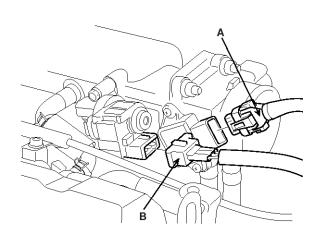
SLDM16103D

ECKD207A

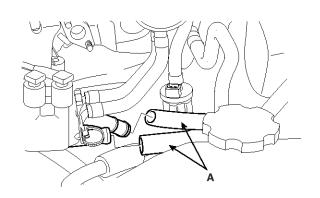
021 62 99 92 92

EM-58

- 6) Idle Speed Control Actuator (ISCA) connector (B).
- 7) Throttle Position Sensor (TPS) connector (A).



- **Engine Mechanical System**
 - 21. Install the heater hoses (A).



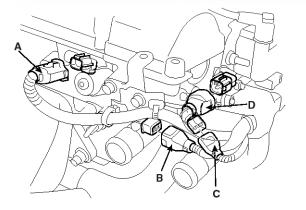
ECKD202A

22.Install the upper radiator hose (A) and lower radiator hose (B).

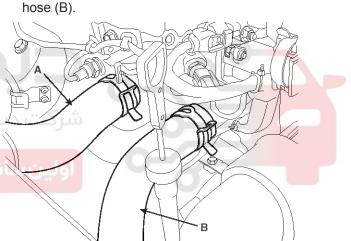
ECKD204A

- 8) Ignition coil connector (D).
- 9) Engine Coolant Temperature Sensor (ECTS) sensor connector (C).
- 10) Oil temperature sensor connector (B).
- 11) Oil Control Valve (OCV) connector (A).

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ECKD203A

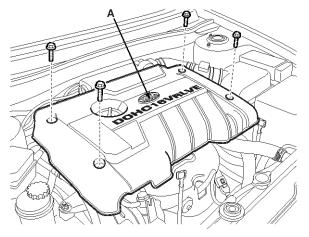


SHDM16006L

Cylinder Head Assembly

23. Install the intake air hose and air cleaner assembly.

24. Install the engine cover (A).



SLDM16001D

- 25. Connect the negative terminal to the battery.
- 26. Filll with engine coolant.
- 27. Start the engine and check for leaks.
- 28. Recheck engine coolant level and oil level.



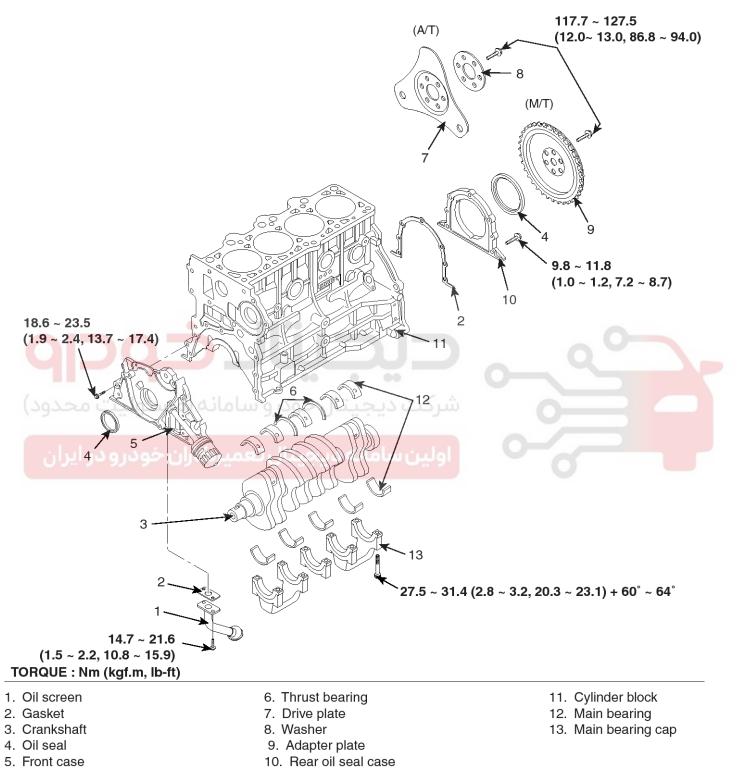
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

EM-59

EM-60

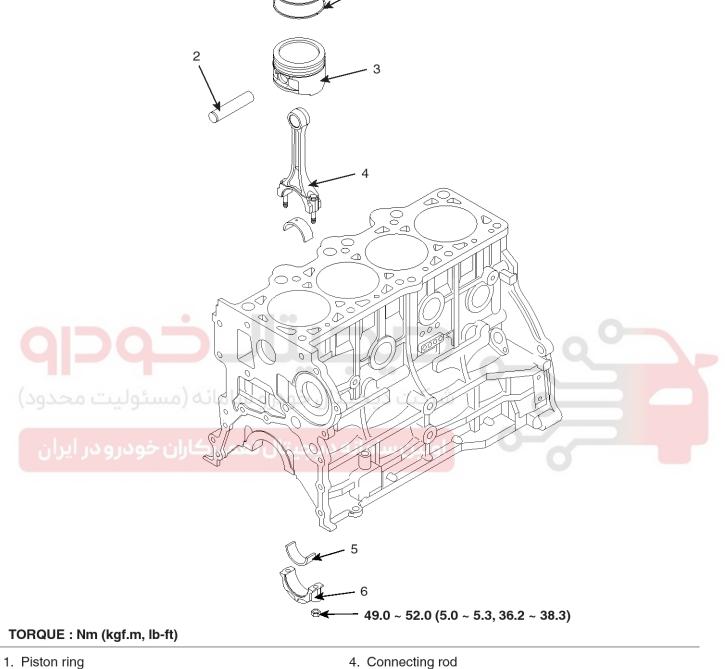
Engine Mechanical System

Cylinder Block COMPONENTS



SHDM16303L

Cylinder Block



- 2. Piston pin
- 3. Piston

- 4. Connecting rod
- 5. Connecting rod bearing
- 6. Connecting rod bearing cap

SHDM16304L

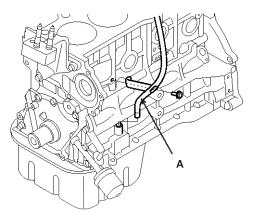
021 62 99 92 92

EM-61

EM-62

DISASSEMBLY

- 1. M/T : remove flywheel.
- 2. A/T : remove drive plate.
- 3. Install engine to engine stand for disassembly.
- 4. Remove timing belt.
- 5. Remove cylinder head.
- 6. Remove oil level gauge assembly (A).

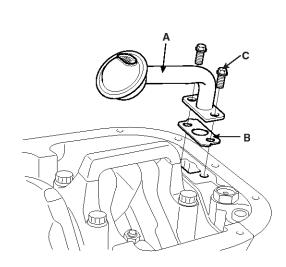


ECKD301A

ECKD303A

- 7. Remove knock sensor.
- 8. Remove oil pressure sensor (A).

Engine Mechanical System



ECKD305A

- 12. Check the connecting rod end play.
- 13.Remove the connecting rod caps and check oil clearance.
- 14. Remove piston and connecting rod assemblies.
 - 1) Using a ridge reamer, remove all the carbon from the top of the cylinder.
 - 2) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

WNOTICE

- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in the correct order.

15. Remove front case.

16. Remove rear oil seal case.

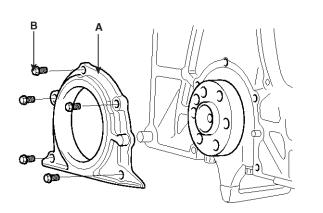
Remove the 5 bolts(B) and rear oil seal case (A).

- 9. Remove water pump.
- 10. Remove oil pan.
- 11. Remove oil screen.
 - Remove the 2bolts(C), oil screen (A) and gasket (B).

021 62 99 92 92

Cylinder Block

EM-63



ECKD306A

- 17.Remove crankshaft bearing cap and check oil clearance.
- 18. Check the crankshaft end play.
- 19. Lift the crankshaft (A) out of the engine, being careful not to damage journals.

WNOTICE

Arrange the main bearings and trust washers in the correct order.



Arrange the piston rings in the correct order only. 22. Disconnect connecting rod from piston.

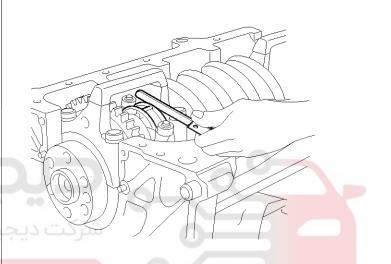
INSPECTION

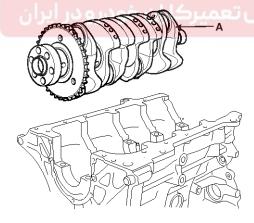
CONNECTING ROD AND CRANKSHAFT

1. Check the connecting rod end play.

Using a feeler gauge, measure the end play while moving the connecting rod back and forth.

Standard end play : $0.1 \sim 0.25$ mm($0.004 \sim 0.010$ in) Maximum end play : 0.4mm(0.016in)





ECKD307A

20. Check fit between piston and piston pin.

Try to move the piston back and forth on the piston pin. If any movement is felt, replace the piston and pin as a set.

- 21. Remove piston rings.
 - 1) Using a piston ring expender, remove the 2 compression rings.
 - 2) Remove the 2side rails and oil ring by hand.

ECKD308A

- If out-of-tolerance, install a new connecting rod.
- If still out-of-tolerance, replace the crankshaft.
- 2. Check the connecting road bearing oil clearance.
 - 1) Check the matchmarks on the connecting rod and cap are aligned to ensure correct reassembly.
 - 2) Remove the 2 connecting rod cap nuts.
 - 3) Remove the connecting rod cap and bearing half.
 - 4) Clean the crank pin and bearing.
 - 5) Place plastigage across the crank pin.
 - 6) Reinstall the bearing half and cap, and torque the nuts.

Tightening torque

49.0 ~ 52.0 Nm (5.0 ~ 5.3kgf.m, 36.2 ~ 38.3lb-ft)

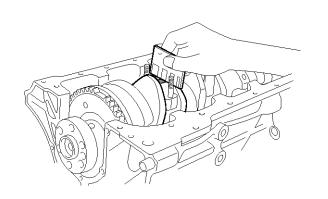
Do not turn the crankshaft.

- 7) Remove the 2 nuts, connecting rod cap and bearing half.
- 8) Measure the plastigage at its widest point.

EM-64

Standard oil clearance

 $0.024 \sim 0.042$ mm $(0.0009 \sim 0.0017$ in)



ECKD309A

9) If the plastigage measures too wide or too narrow, remove the upper half of the bearing, install a new, complete bearing with the same color mark (select the color as shown in the next column), and recheck the clearance.

Do not file, shim, or scrape the bearings or the caps to adjust clearance.

10) If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check clearance again.

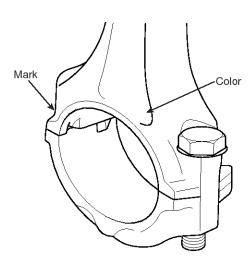
MOTICE

If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

If the marks are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

Connecting rod mark location

Engine Mechanical System

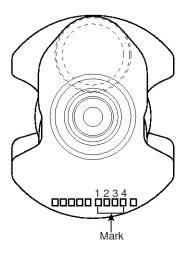


SLDEM7003L

Discrimination of connecting rod

CLASS	MARK	INSIDE DIAMETER
A	WHITE	48.00 ~ 48.006mm (1.8896 ~ 1.889 <mark>9</mark> in.)
В	NONE	48.006 ~ 48.012mm (1.8899 ~ 1.8902in.)
С	YELLOW	48.012 ~ 48.018mm (1.8902 ~ 1.8904in.)

Crankshaft pin mark location



SLDEM17005L

021 62 99 92 92

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Cylinder Block

EM-65

Discrimination of connecting rod bearing		
CLASS	MARK	THICKNESS OF BE- ARING
AA	BLUE	1.514 ~ 1.517mm (0.0596 ~ 0.0597in.)
А	BLACK	1.511 ~ 1.514mm (0.0595 ~ 0.0596in.)
В	NONE	1.508 ~ 1.511mm (0.0594 ~ 0.0595in.)
С	GREEN	1.505 ~ 1.508mm (0.0593 ~ 0.0594in.)
D	YELLOW	1.502 ~ 1.505mm (0.0591 ~ 0.0593in)

11) Selection

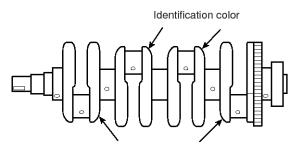
	CRANKSHAFT IND- ENTIFICATION MA- RK	CONNECTING ROD IDENTIFI- CATION MARK	ASSEMBING CLASSIFICATI- ON OF BEARI- NG
		A (WHITE)	D (YELLOW)
1	I (YELLOW)	B (NONE)	C (GREEN)
		C (YELLOW)	B (NONE)
2	سرخت دی	A (WHITE)	C (GREEN)
	II (NONE)	B (NONE)	B (NONE)
-	اولین سا	C (YELLOW)	A (BL <mark>ACK)</mark>
		A (WHITE)	B (NONE)
	III (WHITE)	B (NONE)	A (BLACK)
		C (YELLOW)	AA (BLUE)

- 3. Check the crankshaft bearing oil clearance.
 - 1) To check main bearing-to-journal oil clearance, remove the main caps and bearing halves.
 - 2) Clean each main journal and bearing half with a clean shop tower.
 - 3) Place one strip of plastigage across each main journal.
 - 4) Reinstall the bearings and caps, then torque the bolts.

Tightening torque :

27.5~31.4Nm (2.8~3.2kgf.m, 20.3~23.11lb-ft) + 60° \sim 64°

Do not turn the crankshaft.

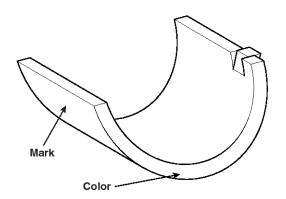


SLDEM17004L

Discrimination of crankshaft

CLSASS	MARK	OUTSIDE DIAMETE - R OF PAN	
5	YELLOW	44.960 ~ 44.966mm (1.7700 ~ 1.7703in.)	
ت محمود)		44.954 ~ 44.960mm (1.7698 ~ 1.7700in.)	
در ایرال	WHITE	44.948 ~ 44.954mm (1.7696 ~ 1.7698in.)	٩

Place of identification mark (Connecting rod bearing)



ECKD313A

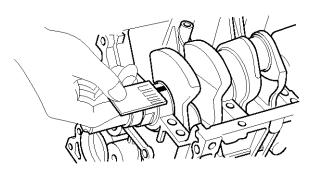
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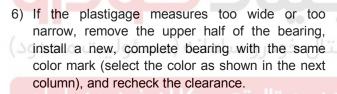
EM-66

5) Remove the cap and bearing again, and measure the widest part of the plastigage.

Standard oil clearance :

 $0.028 \sim 0.046 \text{mm}$ (0.0011 $\sim 0.0018 \text{in}$)





ECKD001

CAUTION

Do not file, shim, or scrape the bearings or the caps to adjust clearance.

7) If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check clearance again.

If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

If the marks are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

Engine Mechanical System

Connecting rods

- 1. When reinstalling, make sure that cylinder numbers put on the connecting rod and cap at disassembly match. When a new connecting rod is installed, make sure that the notches for holding the bearing in place are on the same side.
- 2. Replace the connecting rod if it is damaged on the thrust faces at either end. Also if step wear or a severely rough surface of the inside diameter of the small end is apparent, the rod must be replaced as well.
- 3. Using a connecting rod aligning tool, check the rod for bend and twist. If the measured value is close to the repair limit, correct the rod by a press. Any connecting rod that has been severely bent or distorted should be replaced.

Allowable bend of connecting rod : 0.05mm / 100mm (0.0020 in./3.94 in) or less Allowable twist of connecting rod : 0.1mm / 100mm (0.0039 in./3.94 in) or less

Letters have been stamped on the end of the block as a mark for the size of each of the 5 main journal bores.

Mark

SLDEM7006L

Discrimination of cylinder block

CALSS	MARK	INSIDE DIAMETER
а	А	59.000 ~ 59.006mm (2.3228 ~ 2.3230in.)
b	В	59.006 ~ 59.012mm (2.3230 ~ 2.3233in.)
с	С	59.012 ~ 59.018mm (2.3233 ~ 2.3235in.)

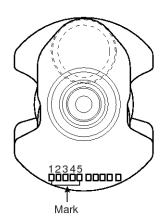
EM-67

021 62 99 92 92

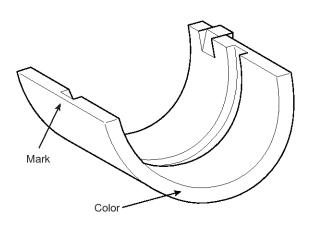
Cylinder Block

Crankshaft journal mark location

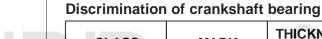








ECKD316A



CLASS	MARK	THICKNESS OF BE- ARING
AA	BLUE	2.014 ~ <mark>2.017mm</mark> (0.0793 ~ 0.0794in.)
А	BLACK	2.011 ~ 2.014mm (0.0791 ~ 0.0793in.)
اولین سان B	NONE	2.008 ~ 2.0 <mark>11mm</mark> (0.0790 ~ 0.0791in.)
С	GREEN	2.005 ~ 2.008mm (0.0789 ~ 0.790in.)
D	YELLOW	2.002 ~ 2.005mm (0.0788 ~ 0.0789in.)

Identification color المعالم معالم المعالم الم معالم المعالم ا

SHDM16326L

Discrimination of crankshaft

CLASS	MARK	OUTSIDE DIAMETE- R OF JOURNAL
I	YELLOW	$\begin{array}{l} 54.956 \sim 54.962 \text{mm} \\ (2.1636 \sim 2.1638 \text{in.}) \end{array}$
II	NONE	54.950 ~ 54.956mm (2.1633 ~ 2.1636in.)
111	WHITE	54.944 ~ 54.950mm (2.1631 ~ 2.1633in.)

EM-68

Selection

CRANKSHAFT IDENTIFICATI- ON MARK	CRANKSHAFT BORE IDENTI FICATION MA- RK	ASSEMBLING CLA- SSIFICATION OF B- EARING
	a (A)	D (YELLOW)
I (YELLOW)	b (B)	C (GREEN)
	c (C)	B (NONE)
	a (A)	C (GREEN)
II (NONE)	b (B)	B (NONE)
	c (C)	A (BLACK)
	a (A)	B (NONE)
III (WHITE)	b (B)	A (BLACK)
	c (C)	AA (BLUE)

4. Check crankshaft end play.

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard end play:

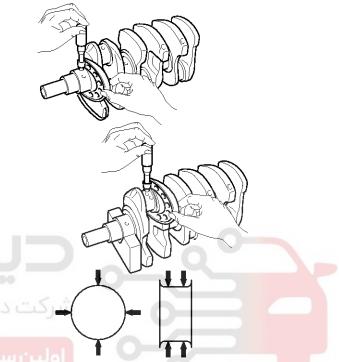
Standard 0.06 ~ 0.26mm (0.0023 ~ 0.010in) Limit : 0.30mm (0.0118in)

Engine Mechanical System

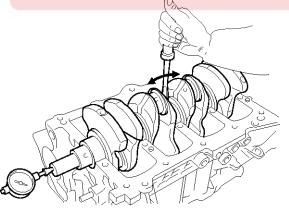
- 5. Inspect main journals and crank pins
- Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter :

56.942 ~ 56.962mm (2.2418~2.2426in) Crank pin diameter : 44.946 ~ 44.966mm (1.7695 ~ 1.7703in)



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ECKD001B

If the end play is greater than maximum, replace the thrust bearings as a set.

Thrust bearing thickness : 2.44 \sim 2.47mm(0.096 \sim 0.097in)

ECKD001E

CYLINDER BLOCK

1. Remove gasket material.

Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

2. Clean cylinder block

Using a soft brush and solvent, thoroughly clean the cylinder block.

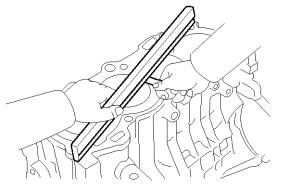
3. Inspect top surface of cylinder block for flatness.

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head gasket for warpage.

Flatness of cylinder block gasket surface Standard : 0.05 mm (0.0020 in)

Cylinder Block





ECKD001L

4. Inspect cylinder bore diameter

Visually check the cylinder for vertical scratchs.

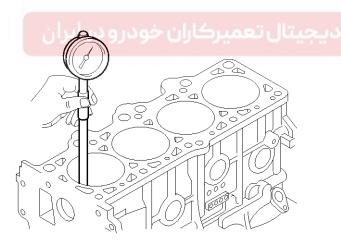
If deep scratches are present, replace the cylinder block.

5. Inspect cylinder bore diameter

Using a cylinder bore gauge, measure the cylinder bore diameter at position in the thrust and axial directions.

Standard diameter :

82.00 ~ 82.03mm (3.2283 ~ 3.2295in)

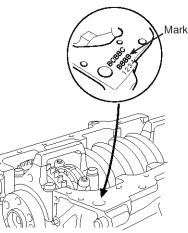


ECKD318A

EM-69

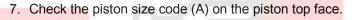
021 62 99 92 92

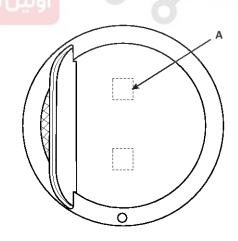
6. Check the cylinder bore size code on the cylinder block bottom face.



SLDEM7008L

Class	Cylinder bore inner diameter	Size code
A	82.00 ~ 82.01mm (3.228~ 3.2287in)	А
в	82.01 ~ 82.02mm (3.2287~ 3.2291in)	В
C	82.02 ~ 82.03mm (3.2291~ 3.2295in.)	С





SHDM16321L

EM-70

Stamp the grade mark of basic diameter with rubber stamp.

Class	Piston outer diameter	Size code
A	81.97 ~ 81.98mm (3.2271 ~ 3.2275in)	А
-	81.98 ~ 81.99mm (3.2275 ~ 3.2279in)	-
С	81.99 ~ 82.00mm (3.2279 ~ 3.2283in)	С

8. Select the piston related to cylinder borre class.

Clearance

0.02 ~ 0.04mm (0.00078 ~ 0.00157in.)

Boring cylinder

1. Oversize pistons should be selected according to the largest bore cylinder.

Identification Mark	Size
0.25	0.25mm (0.010in)
0.50	0.50mm (0.020in)

ONOTICE

The size of piston is stamped on top of the piston.

- 2. Measure the outside diameter of the piston to be used.
- 3. According to the measured O.D., calculate the new bore size.

New bore size = Piston O.D + 0.02 to 0.04 mm (0.0008 to 0.0016 in.) (clearance between piston and cylinder) - 0.01 mm (0.0004 in.) (honing margin.)

4. Bore each of the cylinders to the calculated size.

To prevent distortion that may result from temperature rise during honing, bore the cylinder holes in the firing order.

- 5. Hone the cylinders, finishing them to the proper dimension (piston outside diameter + gap with cylinder).
- 6. Check the clearance between the piston and cylinder.

Standard : 0.02 ~ 0.04 mm (0.0008 ~ 0.0016 in.)

When boring the cylinders, finish all of the cylinders to the same oversize. Do not bore only one cylinder to the oversize.

Engine Mechanical System

PISTON AND RINGS

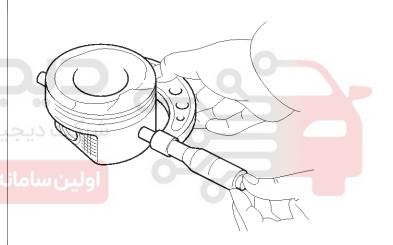
- 1. Clean piston
 - 1) Using a gasket scraper, remove the carbon from the piston top.
 - 2) Using a groove cleaning tool or broken ring, clean the piston ring grooves.
 - 3) Using solvent and a brush, thoroughly clean the piston.

Do not use a wire brush.

2. The standard measurement of the piston outside diameter is taken 47 mm (1.85 in.) from the top land of the piston.

Standard diameter

81.97 ~ 82.00mm (3.2272 ~ 3.2283in)



ECKD001D

3. Calculate the difference between the cylinder bore diameter and the piston diameter.

Piston-to-cylinder clearance $0.02 \sim 0.04$ mm $(0.0008 \sim 0.0016$ in)

Cylinder Block

4. Inspect the piston ring side clearance.

Using a feeler gauge, measure the clearance between new piston ring and the wall of the ring groove.

Piston ring side clearance

No. 1 : $0.04 \sim 0.08 \text{ mm} (0.0016 \sim 0.0031 \text{ in})$ No. 2 : $0.03 \sim 0.07 \text{ mm} (0.0012 \sim 0.0028 \text{ in})$ Oil ring : $0.06 \sim 0.15 \text{ mm} (0.0024 \sim 0.0059 \text{ in})$ Limit No. 1 : 0.1mm (0.004in)No. 2 : 0.1mm (0.004in)Oil ring : 0.2 mm (0.0079 in)



ECKD001G

If the clearance is greater than maximum, replace the piston.

5. Inspect piston ring end gap.

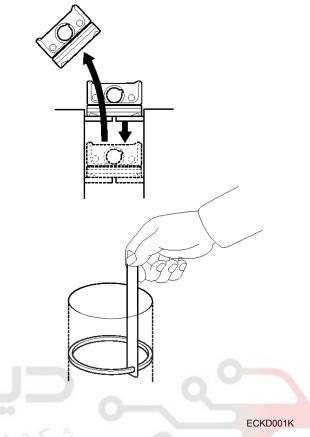
To measure the piston ring end gap, insert a piston ring into the cylinder bore. Position the ring at right angles to the cylinder wall by gently pressing it down with a piston. Measure the gap with a feeler gauge. If the gap exceeds the service limit, replace the piston ring. If the gap is too large, recheck the cylinder bore diameter against the wear limits. If the bore is over the service limit, the cylinder block must be rebored.

Piston ring end gap

 $\begin{array}{l} \mbox{Standard} \\ \mbox{No. 1: } 0.20 \sim 0.35 \mbox{mm} (0.0079 \sim 0.0138 \mbox{ in}) \\ \mbox{No. 2: } 0.37 \sim 0.52 \mbox{mm} (0.0146 \sim 0.0205 \mbox{ in}) \\ \mbox{Oil ring: } 0.20 \sim 0.60 \mbox{ mm} (0.0079 \sim 0.0236 \mbox{ in}) \\ \mbox{Limit} \\ \mbox{No. 1, 2, oil ring: } 1.0 \mbox{mm} (0.039 \mbox{in}) \end{array}$



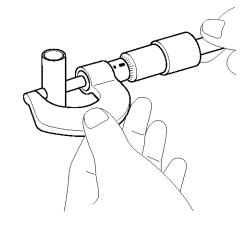
021 62 99 92 92



PISTON PINS

1. Measure the diameter of the piston pin.

Piston pin diameter 20.001 ~ 20.006mm (0.7874 ~ 0.7876in)



ECKD001Z

2. Measure the piston pin-to-piston clearance.

Piston pin-to-piston clearance $0.01 \sim 0.02$ mm ($0.0004 \sim 0.0008$ in)

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EM-72

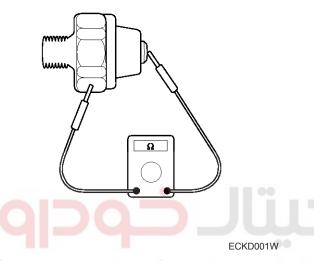
3. Check the difference between the piston pin diameter and the connecting rod small end diameter.

Piston pin-to-connecting rod interference $-0.032 \sim -0.016$ mm (-0.0013 ~ -0.00006 in)

OIP PRESSURE SWITCH

1. Check the continuity between the terminal and the body with an ohmmeter.

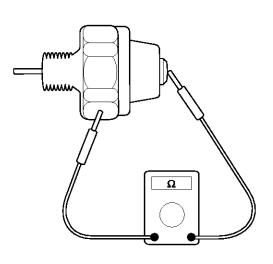
If there is no continuity, replace the oil pressure switch.



- 2. Check the continuity between the terminal and the body when the fine wire is pushed. If there is continuity even when the fine wire is pushed, replace the switch.
- 3. If there is no continuity when a 50kpa (7psi) vacuum is applied through the oil hole, the switch is operaing properly.

Check for air leakage. If air leaks, the diahragm is broken. Replace it.

Engine Mechanical System

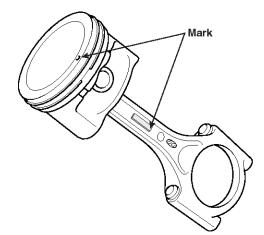


ECKD001Y

REASSEMBLY

MOTICE

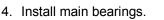
- Thoroughly clean all parts to assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O-rings and oil seals with new parts.
- 1. Assemble piston and connecting rod.
 - 1) Use a hydraulic press for installation.
 - The piston front mark and the connecting rod front mark must face the timing belt side of the engine.



ECKD320A

Cylinder Block

- 2. Install piston rings.
 - 1) Install the oil ring expander and 2 side rails by hand.
 - Using a piston ring expander, install the 2 compression rings with the code mark facing upward.
 - Position the piston rings so that the ring ends are as shown.



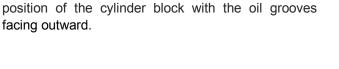
bearings.

5. Install thrust bearings.

Upper 1,2,4,5 bearings have an oil groove of oil holes; Lower bearings do not.

1) Align the bearing claw with the claw groove of the cylinder block, push in the 5 upper bearings(A).





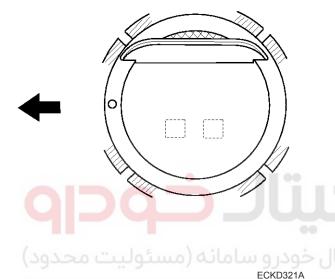
2) Align the bearing claw with the claw groove of the

Install the 2 thrust bearings under the No.3 journal

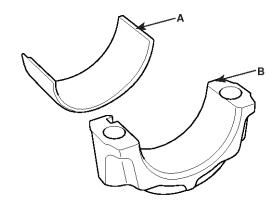
main bearing cap, and push in the 5 lower

ECKD323A



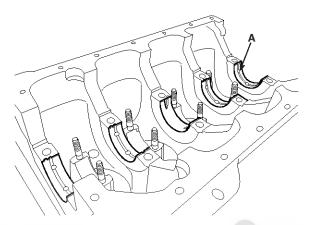


- 3. Install connecting rod bearings.
 - 1) Align the bearing claw with the groove of the connecting rod or connecting rod cap.
 - Install the bearings (A) in the connecting rod and connecting rod cap(B).





ECKD322A





EM-74

- ECKD324A
- 6. Place crankshaft on the cylinder block.
- 7. Place main bearing caps on cylinder block.
- 8. Install main bearing cap bolts.

- The main bearing cap bolts are tightened in 2 progressive steps.
- If any of the bearing cap bolts in broken or deformed, replace it.
- 1) Apply a light coat of engine oil on the threads and under the bearing cap bolts.
- Install and uniformly tighten the 10 bearing cap bolts(A), in several passes, in the sequence shown.

Tightening torque

27.5 \sim 31.4Nm (2.8 \sim 3.2kgf.m, 20.3 \sim 23.1lb-ft) + 60 \sim 64°

Always use new main bearing cap bolts.

Engine Mechanical System

10. Install piston and connecting rod assemblies.

Before installing the pistons, apply a coat of engine oil to the ring grooves and cylinder bores.

- Remove the connecting rod caps, and slip short sections of rubber hose over the threaded ends of the connecting rod bolts.
- 2) Install the ring compressor, check that the bearing is securely in place, then position the piston in the cylinder, and tap it in using the wooden handle of a hammer.
- Stop after the ring compressor pops free, and check the connecting rod-to-check journal alignment before pushing the piston into place.
- Apply engine oil to the bolt threads. Install the rod caps with bearings, and torque the nuts : 50 ~ 53Nm (5.0 ~ 5.3kgf.m, 36.9 ~ 39lb-ft)

MOTICE

Maintain downward force on the ring compressor to prevent the rings from expanding before entering the cylinder bore.



ECKD001F

ECHE200A

- 3) Check that the crankshaft turns smoothly.
- 9. Check crankshaft end play.

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EM-75

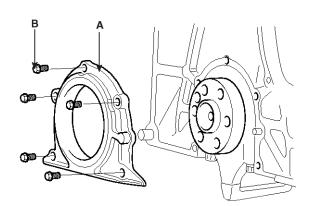
ECKD305A

Cylinder Block

11. Install a new gasket and rear oil seal case (A) with 5 bolts (B).

Tightening torque

 $9.8 \sim 11.8$ Nm ($1.0 \sim 1.2$ kgf.m, $7.2 \sim 8.7$ lb-ft)

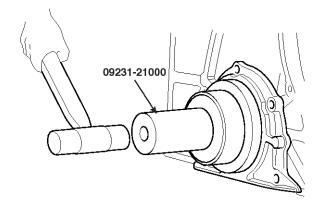


ECKD306A

UNOTICE

Check that the mating surfaces are clean and dry. 12. Install rear oil seal.

- 1) Apply engine oil to a new oil seal lip.
- 2) Using SST(09231-21000) and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.



ECKD326A

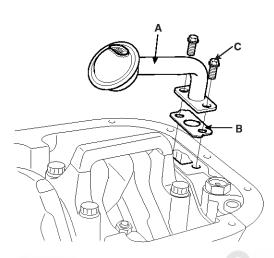
13. Install front case.

14. Install oil screen.

Install a new gasket (A) and oil screen (B) with 2 bolts(C).

Tightening torque

 $14.7 \sim 21.6$ Nm ($1.5 \sim 2.2$ kgf.m, $10.8 \sim 15.9$ lb-ft)



15. Install oil pan.

1) Using a razor blade and gasket scraper, remove all the old packing material from the gasket surfaces.

WNOTICE

Check that the mating surfaces are clean and dry before applying liqued gasket.

2) Apply liquid gasket as an even bead, centered between the edges of the mating surface.

Use liquid gasket 'TB 1217H' or equivalent.

- To prevent leakage of oil, apply liquid gasket to the inner threads of the bolt holes.
- Do not install the parts if five minutes or more have elapsed since applying the liquid gasket. Instead, reapply liquid gasket after removing the residue.
- After assembly, wait at least 30 minutes before filling the engine with oil.
- 3) Install the oil pan with the 19 bolts.

Uniformly tighten the bolts in several passes.

Tightening torque

9.8 ~ 11.8Nm (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

16. Install water pump.

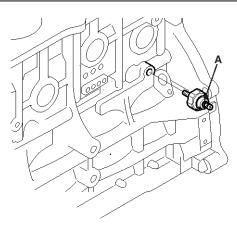
EM-76

17. Install oil pressure sensor.

- Apply adhesive to 2 or 3 threads.
 Adhesive : Three bond 2310/2350 or equivalent.
- 2) Install the oil pressure sensor (A).

Tightening torque

14.7 ~ 21.6Nm (1.5 ~ 2.2kgf.m, 10.8 ~ 15.9lb-ft)



- **Engine Mechanical System**
 - 22. Remove engine stand.
 - 23.A/T : Install drive plate.

Tightening torque

117.7 \sim 127.5Nm (12.0 \sim 13.0kgf.m, 86.8 \sim 94.0lb-ft)

24.M/T : Install flywheel.

Tightening torque

117.7 \sim 127.5Nm (12.0 \sim 13.0kgf.m, 86.8 \sim 94.0lb-ft)

 13. Install knock sensor.

 Toppengg

 14. Install knock sensor.

 19. Install clevel gauge assembly.

 19. Install clevel gauge assembly (A) with the bot.

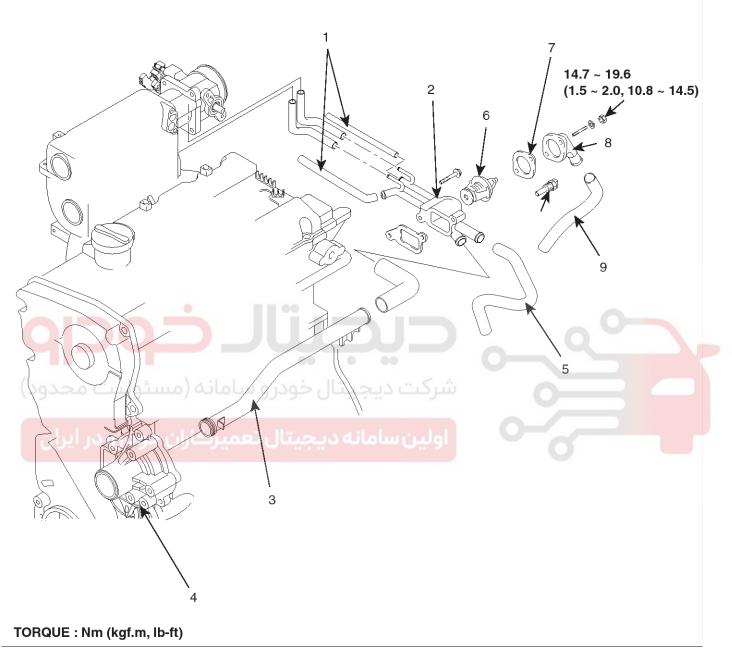
 10. Shall the oil level gauge assembly (A) with the bot.

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Cooling System

Cooling System



- 1. Heater hoses
- 2. Thermostat housing
- 3. Coolant inlet pipe
- 4. Water pump
- 5. Radiator upper hose

- 6. Thermostat
- 7. Gasket
- 8. Coolant inlet fitting
- 9. Radiator lower hose

SHDM16305L

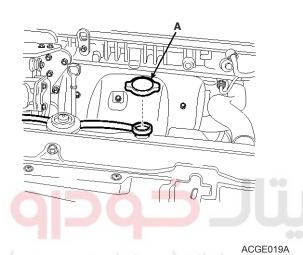
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EM-78

Engine Coolant Refilling and Bleeding

When pouring engine coolant, be sure to shut the relay box lid and not to let coolant spill on the electrical parts or the paint. If any coolant spills, rinse it off immediately.

- 1. Slide the heater temperature control lever to maximum heat. Make sure the engine and radiator are cool to the touch.
- 2. Remove radiator cap (A).



3. Loosen the drain plug, and drain the coolant.

- 4. Tighten the radiator drain plug securely.
- 5. Remove, drain and reinstall the reservoir. Fill the tank halfway to the MAX mark with water, then up to the MAX mark with antifreeze.
- 6. Mix the recommended antifreeze with water at the ratio of four to six in a clean container.

WNOTICE

- Use only genuine antifreeze coolant.
- For best corrosion protection, the coolant concentration must be maintained year-round at 50% minimum. Coolant concentrations less than 50% may not provide sufficient protection against corrosion or freezing.
- Coolant concentrations greater then 60% will impair cooling efficiency and are not recommended.

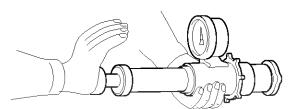
- Do not mix different brands of antifreeze coolants.
- Do not use additional rust inhibitors or anti-rust products; they may not be compatible with the coolant.

Engine Mechanical System

- 7. Pour coolant into the radiator up to base of the filler neck, and install the radiator cap loosely.
- 8. Start the engine and let it run until it warms up (the radiator fan comes on at least twice).
- 9. Turn off the engine. Check the level in the radiator, add coolant if needed.
- 10.Put the radiatir cap on tightly, then run the engine again and check for leaks.

Cap Testing

1. Remove the radiator cap, wet its seal with engine coolant, then install it no pressure tester.



- ECKD501X
- Apply a pressure of 93 ~ 123kPa (0.95 1.25kgf/cm², 14 ~ 19psi).
- 3. Check for a drop in pressure.
- 4. If the pressure drops, replace the cap.

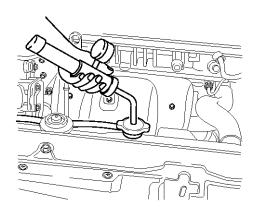
Testing

- 1. Wait until engine is cool, then carefully remove the radiator cap and fill the radiator with engine coolant, then install it on the pressure tester.
- 2. Apply a pressure tester to the radiator and apply a pressure of 93 \sim 123kPa (0.95 \sim 1.25kgf/cm² 14 \sim 18psi).

021 62 99 92 92

Cooling System

EM-79



ACGE020A

- 3. Inspect for engine coolant leaks and a drop in pressure.
- 4. Remove the tester and reinstall the radiator cap.

WNOTICE

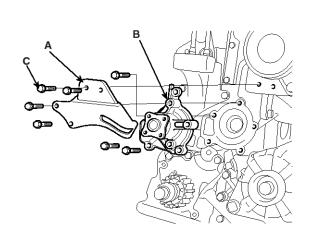
Check for engine oil in the coolant and/or coolant in the engine oil.

REMOVAL WATER PUMP

1. Drain the engine coolant.

WARNING System is under high pressure when the engine is hot. To avoid danger of releasing scalding engine coolant, remove the cap only when the engine is cool.

- 2. Remove drive belts.
- 3. Remove the timing belt.
- 4. Remove the timing belt idler.
- Remove the power steering pump and the power steering pump bracket (Refer to power steering pump in ST).
- 6. Remove the water pump.
 - 1) Remove the 4 bolts and pump pulley.
 - Remove the 2 bolts(C), then remove the alternator brace (A).
 - 3) Remove the water pump (B) and gasket.



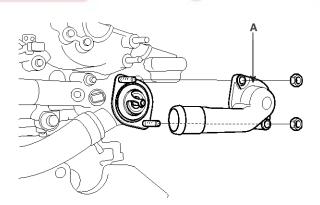
ECKD501A

THERMOSTAT

MOTICE

Removal of the thermostat would have an adverse effect, causing a lowering of cooling efficiency. Do not remove the thermostat, even if the engine tends to overheat.

- 1. Drain engine coolant so its level is below thermostat.
- 2. Remove water inlet (A), gasket and thermostat.



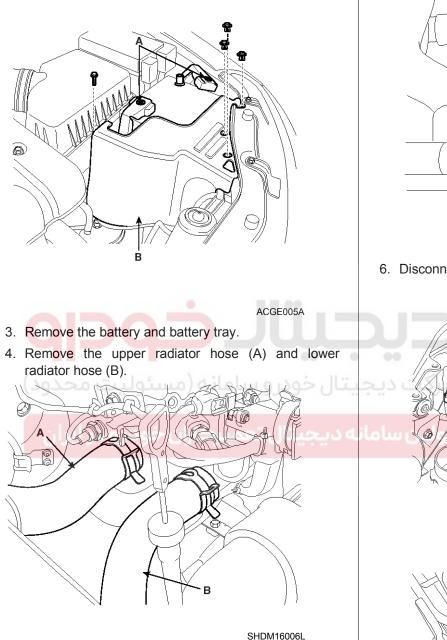
ECKD501B

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EM-80

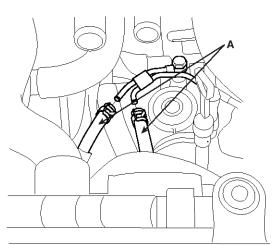
RADIATOR

- 1. Drain the engine coolant.
- 2. Remove the battery terminals (A) and heat shield (B).



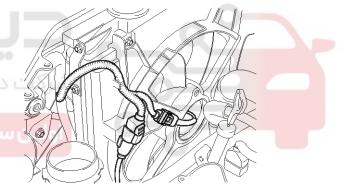
5. Remove the ATF(Automatic Transaxle Fluid) cooler hose (A).

Engine Mechanical System

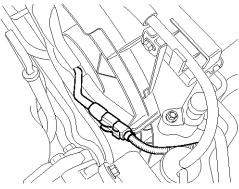


ECKD501C

6. Disconnect the fan motor connector.



ACGE022A

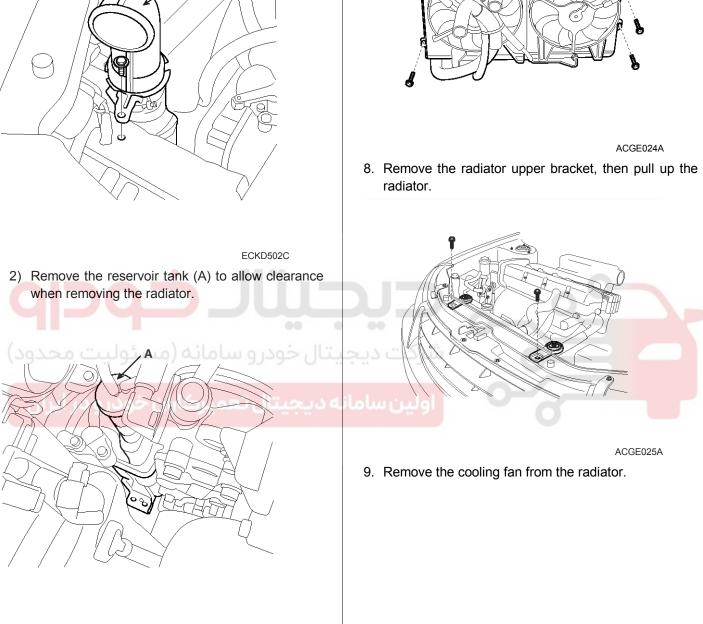


ACGE023A

7. Remove the radiator.

Cooling System

1) Remove the air duct (A) to allow for radiator removal.



ECKD502D

3) Rrmove the radiator mounting bolts and remove the radiator from condenser.

021 62 99 92 92

EM-82

INSPECTION WATER PUMP

- 1. Check each part for cracks, damage or wear, and replace the coolant pump assembly if necessary.
- 2. Check the bearing for damage, abnormal noise and sluggish rotation, and replace the coolant pump assembly if necessary.

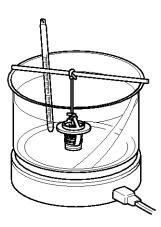


3. Check for coolant leakage. If coolant leaks from hole, the seal is defective. Replace the coolant pump assembly.

A small amount of "weeping" from the bleed hole is normal.

THERMOSTAT

1. Immerse the thermostat in water and gradually heat the water.



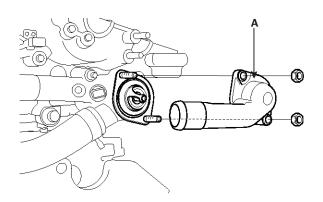
ECKD503B

Engine Mechanical System

2. Check the valve opening temperature.

Valve opening temperature : 82 °C(177 °F) Full opening temperature : 95 °C(205 °F)

If the valve opening temperature is not as specified, replace the thermostat.

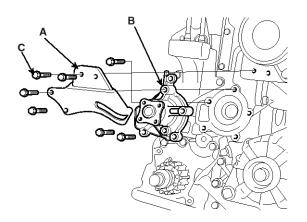


ECKD501B

INSTALLATION WATER PUMP

- 1. Install the water pump.
- Install the water pump (B) and a new gasket with the 3 bolts(C).

Tightening torque $11.8 \sim 14.7 \text{Nm} (1.2 \sim 1.5 \text{kgf.m}, 8.7 \sim 10.8 \text{lb-ft})$



EM-83

021 62 99 92 92

Cooling System

ECKD501A

ECKD510A

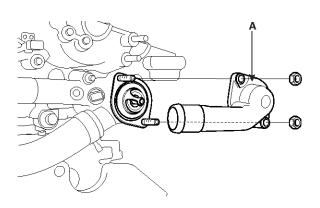
2) Install the alternator brace with the 2 bolts.

Tightening torque

- 19.6 ~ 26.5Nm (2.0 ~ 2.7kgf.m, 14.5 ~ 19.5lb-ft)
 - 3) Install the 4 bolts and pump pulley.
- 2. Install the power steering pump and the power steering bracket.
- 3. Install the timing belt idler.
- 4. Install the timing belt.
- 5. Install drive belts.
- 6. Fill with engine coolant.
- 7. Start engine and check for leaks.
- 8. Recheck engine coolant level.

THERMOSTAT

- 1. Place thermostat in thermostat housing.
 - 1) Install the thermostat with the jiggle valve upward.
 - 2) Install a new gasket (A) to the thermostat (B).

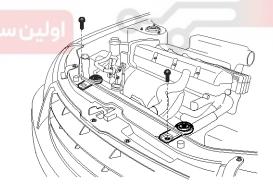


ECKD501B

- 3. Fill with engine coolant.
- 4. Start engine and check for leaks.

RADIATOR

- 1. Install the cooling fan assembly to the radiator and then fix the assembly to the condenser in engine.
- 2. Install the radiator upper dracket.



2. Install water inlet (A).

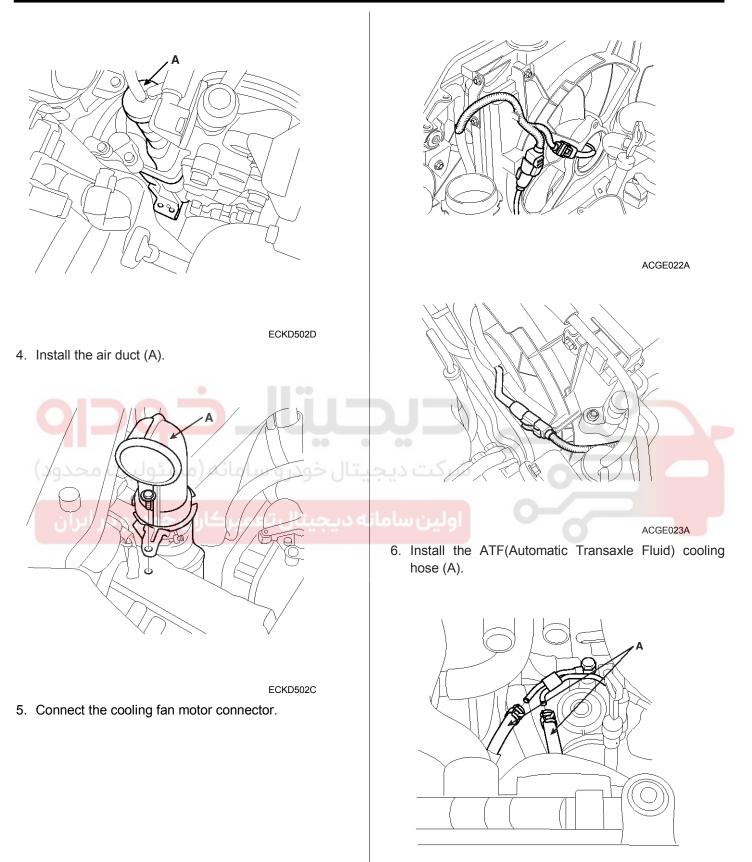
Tightening torque 14.7 ~ 19.6Nm (1.5 ~ 2.0kgf.m, 10.8 ~ 14.5lb-ft) ACGE025A

3. Install the reservoir tank (A).

021 62 99 92 92

EM-84

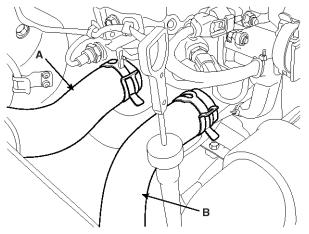
Engine Mechanical System



ECKD501C

Cooling System

7. Install the radiator upper (A) / lower hose (B).



SHDM16006L

- 8. Install the battery and battery tray.
- 9. Install the battery terminal and the heat sheild.

10. Fill with engine coolant.

Quantity :

 $6.5 \simeq 6.6 L~(6.87 \simeq 6.97 US~qt,~5.72 \simeq 5.81 lmp~qt)$

11. Start engine and check for leaks.

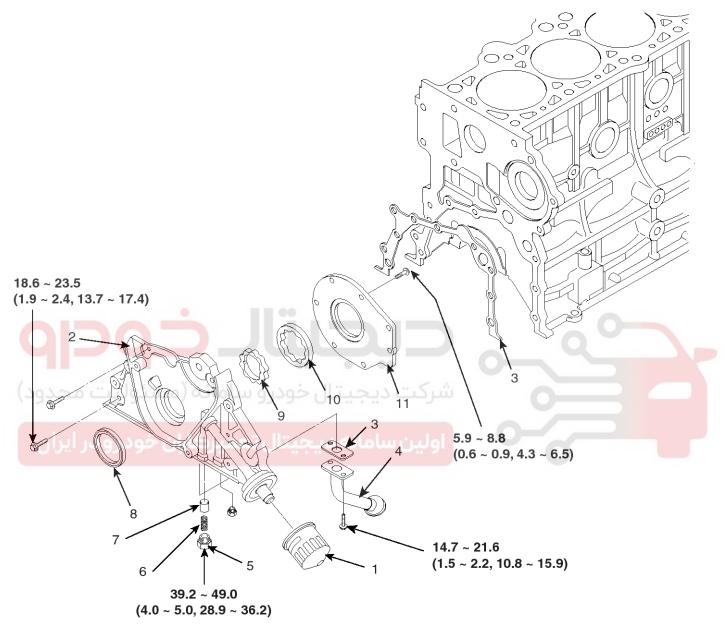
شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

EM-86

Engine Mechanical System

Lubrication System COMPONENTS



TORQUE : Nm (kgf.m, lb-ft)

- 1. Filter
- 2. Front case
- 3. Gasket
- 4. Oil screen
- 5. Plug
- 6. Relief spring

- 7. Relief plunger
- 8. Oil seal
- 9. Inner rotor
- 10. Outer rotor
- 11. Pump cover

SHDM16306L

Lubrication System

OIL AND FILTER

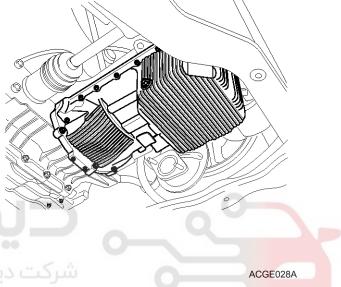
- Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.
- Exercise caution in order to minimize the length and frequency of contact of your skin to used oil. Wear protective clothing and gloves. Wash your skin thoroughly with soap and water, or use water-less hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.
- In order to preserve the environment, used oil and used oil filter must be disposed of only at designated disposal sites.
- 1. Drain engine oil.
 - a. Remove the oil filter cap.
 - b. Remove the oil drain plug, and drain the oil into a container.
- 2. Replace oil filter.
 - a. Remove the oil filter.
 - b. Check and clean the oil filter installation surface.
 - c. Check the part number of the new oil filter is as same as old one.
 - d. Apply clean engine oil to the gasket of a new oil filter.
 - e. Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
 - f. Tighten it an additional 3/4 turn.

a. Clean and install the oil drain plug with a new gasket.

Torque :

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

Steel : $34.3 \sim 44.1$ N.m ($3.5 \sim 4.5$ kgf.m, $25.3 \sim 32.5$ lb-ft)



b. Fill with fresh engine oil

Capacity

When replacing a short engine or a block assembly : 4.1L (4.33US qts, 3.60lmp qts)

When rdplacing an oil pan : 3.7L (3.91US qts, 3.26Imp qts)

Drain and refill including oil filter : 4.0L (4.23US qts, 3.25Imp qts)

- c. Install the oil filter cap.
- 4. Start engine and check for oil leaks.
- 5. Recheck engine oil level.

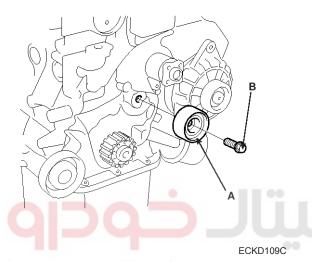
EM-88

Engine Mechanical System

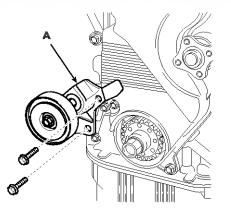
REMOVAL

OIL PUMP

- 1. Drain engine oil.
- 2. Remove the drive belts.
- 3. Turn the crankshaft and align the white groove on the crankshaft pulley with the pointer on the lower cover.
- 4. Remove the timing belt.
- 5. Remove the timing belt idle mounting bolt (B) and the idle (A).

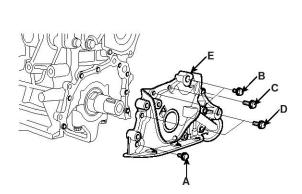


- 6. Remove the oil pan and oil screen.
- 7. Remove the alternator (Refer to Alternator in EE) group.
- 8. Remove the air compressor tension bracket (A).



ACGE029A

9. Remove the front case (E).



SLDEM7012L

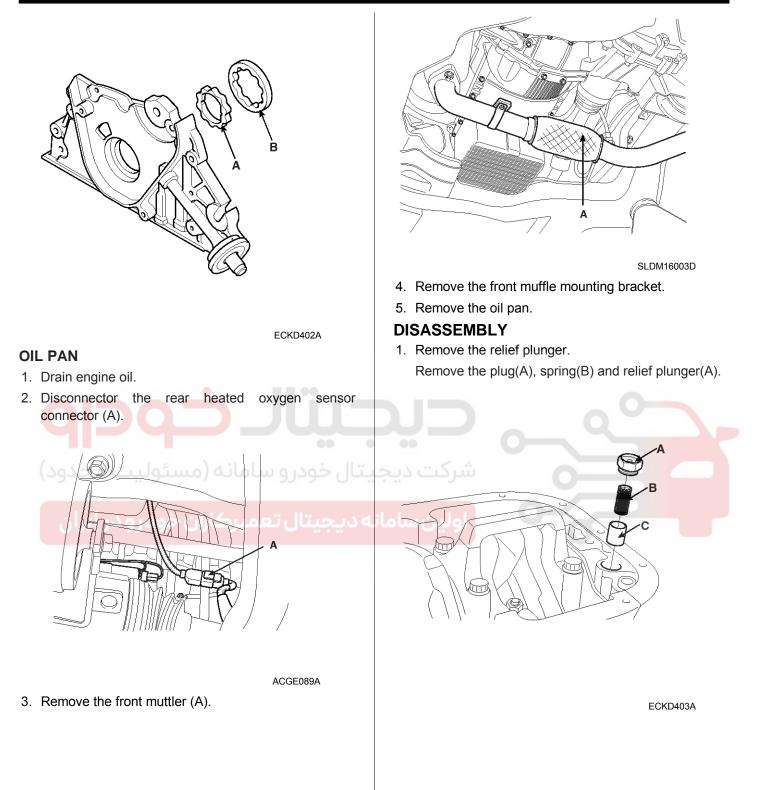
1) Remove the screws (B) from the pump housing, then separate the housing and cover (A).

ECKD401A

2) Remove the inner (A) and outer (B) rotors.

021 62 99 92 92

Lubrication System



EM-90

INSPECTION

1. Inspect relief plunger.

Coat the valve with engine oil and check that it falls smoothly into the plunger hole by its own weight.

If it does not, replace the relief plunger. If necessary, replace the front case.

2. Inspect relief valve spring.

Inspect for distorted or broken relief valve spring.

Standard value

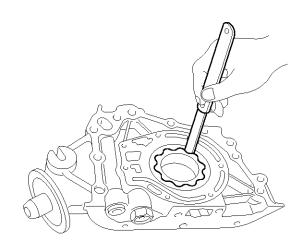
Free height : 43.8mm (1.724 in.) Load : 3.7kg/40.1mm (8.14 lb/1.579 in.)

3. Inspect rotor side clearance.

Using a feeler gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

Side clearance	Outer ge- ar	$0.04 \sim 0.09$ mm (0.0016 ~ 0.0035 in.)
	Inner ge- ar	0.04 ~ 0.085mm (0.0016 ~ 0.0033in.)
00		

Engine Mechanical System



ECKD405A

If the tip clearance is greater than maximum, replace the rotor as a set.

5. Inspect rotor body clearance.

Using a feeler gauge, measure the clearance between the outer rotor and body.

Body clearance 0.12 ~ 0.185 mm(0.0047 ~ 0.0073 in.)



ECKD404A

If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the front case.

4. Inspect rotor tip clearance.

Using a feeler gauge, measure the tip clearance between the inner and outer rotor tips.

Tip clearance

 $0.025 \sim 0.069 \text{ mm}(0.0010 \sim 0.0027 \text{ in.})$

ECKD406A

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the front case.

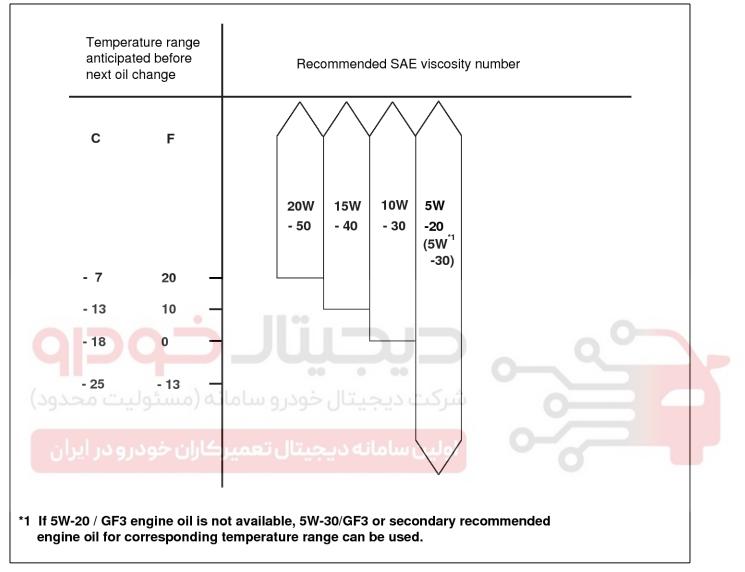
021 62 99 92 92

Lubrication System

SELECTION OF ENGINE OIL

Recommended API classification : Above SJ or SL

Recommended SAE viscosity grades :



MOTICE

For best performance and maximum protection of all types of operation, select only those lubricants whitch :

- Satisfy the requirement of the API classification.
- Have proper SAE grade number for expected ambient temperature range.

Lubricants that do not have both an SAE grade number and API service classification on the container should not be used.

ECKD403A

EM-92

ENEINE OIL

1. Check engine oil quality.

Check the oil for deterioration, entry of water, discoloring or thinning.

If the quality is visibly poor, replace the oil.

2. Check engine oil level.

After warming up the engine and then 5 minutes after the engine stop, oil level should be between the "L" and "F" marks on the dipstick.

If low, check for leakage and add oil up to the "F" mark.

Engine Mechanical System

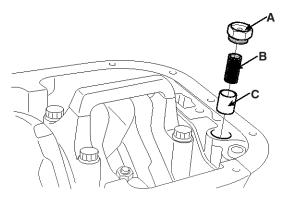
REASSEMBLY

1. Install relief plunger.

Install relief plunger(A) and spring(B) into the front case hole, and install the plug(A).

Tightening torque

 $39.2 \sim 49.0$ N.m ($4.0 \sim 5.0$ kgf.m, $28.9 \sim 36.2$ lb-ft)



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SLDEM7013L

WNOTICE Do not fill with engine oil above the "F" mark.

Lubrication System

INSTALLATION OIL PUMP

- 1. Install oil pump.
 - 1) Place the inner and outer rotors into front case with the marks facing the oil pump cover side.
 - Install the oil pump cover (A) to front case with the 7 screws(B).

Tightenig torque

 $5.9 \sim 8.8 \text{ N.m} (0.6 \sim 0.9 \text{ kgf.m}, 4.3 \sim 6.5 \text{ lb-ft})$

EM-93

SLDEM7012L

- Body length (A) : 25mm (0.98 in)
- (B) : 20mm (0.787 in)
- (C) : 38mm (1.496 in)
- (D) : 45mm (1.771 in)

Tightening torque

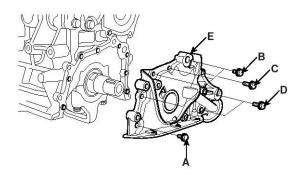
- 19.6 ~ 26.5 N.m (2.0 ~ 2.7 kgf.m, 14.5 ~ 19.5 lb-ft)
- 4. Apply a light coat of oil to the seal lip.
- 5. Using the SST(09214-33000), install the oil seal.



ECKD401A

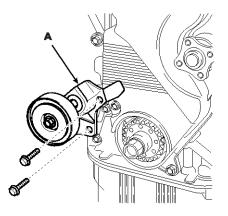
- 2. Check that the oil pump turns freely.
- 3. Install the oil pump on the cylinder block.

Place a new front case gasket on the cylinder block. Apply engine oil to the lip of the oil pump seal. Then, install the oil pump onto the crankshaft. When the pump is in place, clean any excess grease off the crankshaft and check that the oil seal lip is not distorted.



ECHE200B

6. Install the ail compressor tension bracket (A).



ACGE029A

7. Install the alternator (Refer to Alternator in EE Group).

EM-94

8. Install the oil screen.

Tightening torque

 $14.7 \sim 21.6 \text{ N.m} (1.5 \sim 2.2 \text{ kgf.m}, 0.8 \sim 15.9 \text{ lb-ft})$

9. Install the oil pan.

Tightening torque

<u>9.8 ~ 11.8 N.m (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.2 lb-ft)</u>

Clean the oil pan gasket mating surfaces.

10.Install the timing belt idle.

Tightening torque

42.2 ~ 53.9 N.m (4.3 ~ 5.5 kgf.m, 31.1 ~ 39.8 lb-ft)

- 11. Install the timing belt.
- 12. Install the drive belt.
- 13. Fill the engine oil.

OIL PAN

- 1. Install the oil pan.
 - 1) Using a razor blade and gasket scraper, remove all the old packing material from the gasket surfaces.

WNOTICE

Check that the mating surfaces are clean and dry before applying liquid gasket.

2) Apply liquid gasket as an even bead, centered between the edges do the mating surface.

Liquid gasket : loctite NO.5900 or equivalent

MOTICE

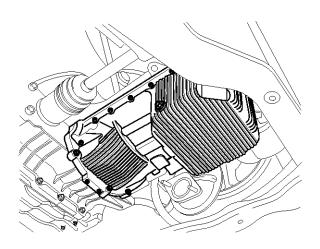
- To prevent leakage of oil, apply liquid gasket to the inner threads of the bolt holes.
- Do not install the parts if five minutes or more have dlapsed since applying the liquid gasket.
- After assembly, wait at least 30 minutes befere filling the engine with oil.

Engine Mechanical System

Install the oil pan with the bolts.
 Uniformly tighten the bolts in several passes.

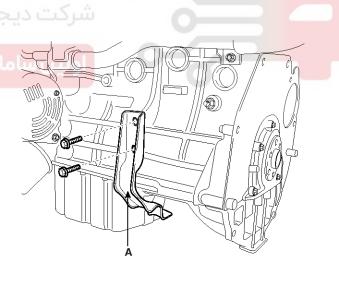
Tightening torque :

 $9.8 \simeq 11.8$ N-m (1.0 $\simeq 1.2$ kg-m, 7.2 $\simeq 8.7$ lb-ft)



ACGE028A

2. Install the front muffler bracket (A).

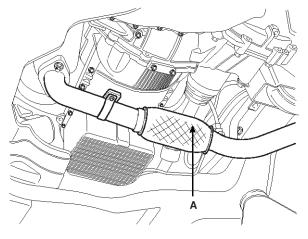


ACGE027A

3. Install the exhaust manifold.

Lubrication System

4. Install the front muffler (A).



SLDM16003D

5. Connect the rear oxygen sensor connector (A).



ACGE089A

6. Fill with engine oil.

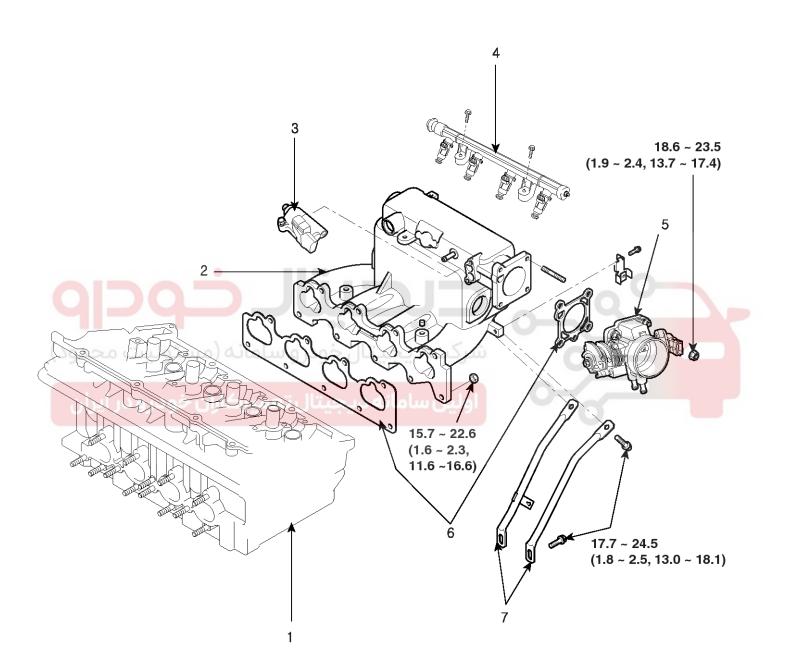
EM-96

Engine Mechanical System

Intake And Exhaust System

Intake Manifold

COMPONENTS



TORQUE : Nm (kgf.m, lb-ft)

- 1. Cylinder head
- 2. Intake manifold
- 3. Idle speed actuator(ISA)
- 4. Delivery pipe assembly

- 5. Throttle body assembly
- 6. Gasket
- 7. Intake manifold stay

Intake And Exhaust System

REMOVAL

2. Disconnect

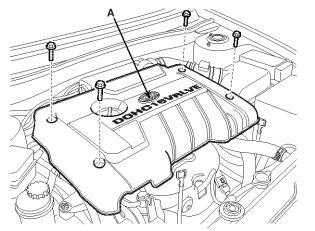
connector

connector(B).

the

and

1. Removal the engine cover(A).



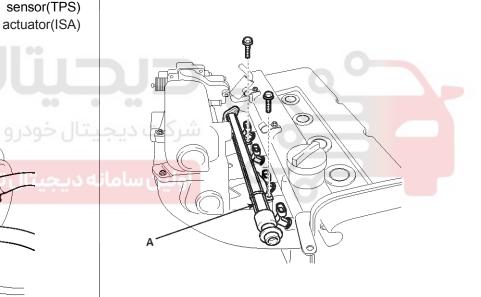
throttle

idle

the

SLDM16002D

- 4. Disconnect the accelerator cable.
- 5. Remove the delivery pipe(A).



ACGE030A

6. Disconnect the heater hose(A), pulge control solenoid valve(PCSV) hose(B) and the brake booster hose from the intake manifold and throttle body assembly(C).

ECKD204A

SLDM16001D

position

speed

 Disconnect the positive crankcase ventilation(PCV) hose(A) and the breather hose.

в

021 62 99 92 92

EM-97

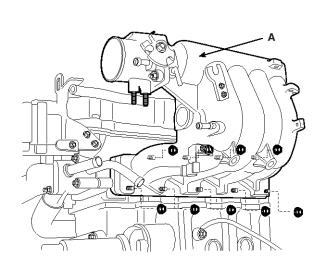
SHDM16327L

021 62 99 92 92

EM-98

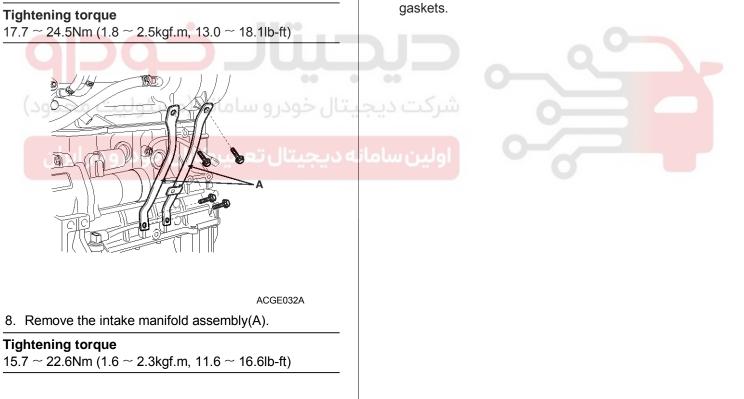
7. Remove the intake manifold stay(A).

Engine Mechanical System



SHDM16215D

9. To install, reverse the removal procedure with new gaskets.

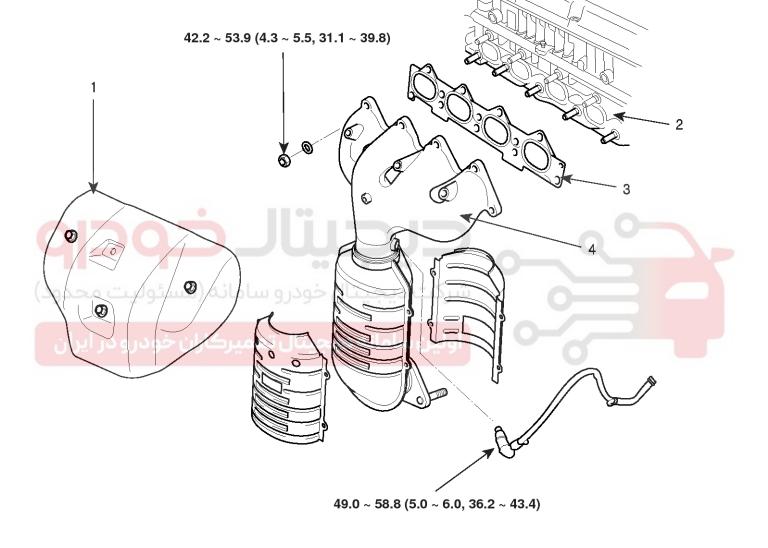


SLDM16105D

Intake And Exhaust System

Exhaust Manifold

COMPONENTS



TORQE : Nm (kgf.m, lb-ft)

- 1. Heat protector
- 2. Cylinder Head
- 3. Gasket

- 4. Exhaust manifold
- 5. Front oxygen sensor

SLDEM7009L

EM-99

021 62 99 92 92

021 62 99 92 92

EM-100

Engine Mechanical System

REMOVAL

- 1. Remove the engine cover.
- 2. Disconnect the front oxygen sensor connector.
- 3. Remove the front muffler(A).

Tigtening torque

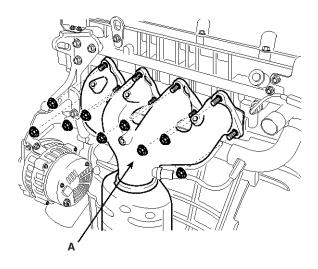
39.2 ~ 58.8 N.m(4.0 ~ 6.0 kgf.m, 28.9 ~ 43.4 lb-ft)



4. Remove the heat protector.

5. Remove the exhaust manifold and catalytic converter assembly(A).





SHDM16216D

6. To install, reverse the removal procedure with new gaskets.

Intake And Exhaust System

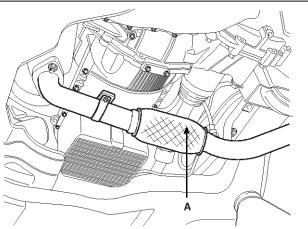
Front Exhaust Pipe

RENOVAL

1. Remove the front muffle (A).

Tighening torque

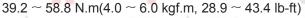
 $39.2 \sim 58.8$ N.m($4.0 \sim 6.0$ kgf.m, $28.9 \sim 43.4$ lb-ft)

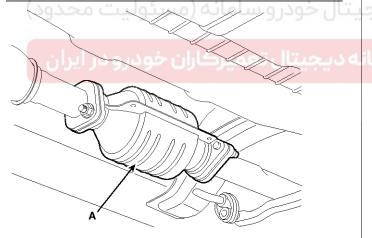


SLDM16003D

2. Remove the catalytic converter(A).

Tighening torque



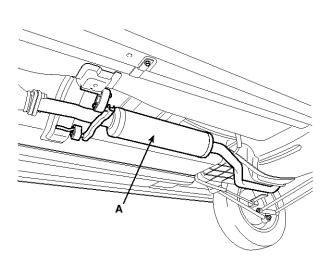


SLDEM7027D

3. Remove the center muffle(A).

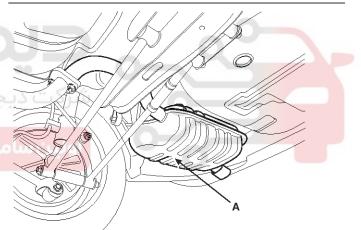
Tightening torque

 $39.2 \sim 58.8 \text{ N.m}(4.0 \sim 6.0 \text{ kgf.m}, 28.9 \sim 43.4 \text{ lb-ft})$



SLDEM7028D

- 4. Remove the main muffle(A).
- Tightening torque $39.2 \sim 58.8 \text{ N.m}(4.0 \sim 6.0 \text{ kgf.m}, 28.9 \sim 43.4 \text{ lb-ft})$



SLDEM7029D