Engine Mechanical System [DOHC 1.6L]

GENERAL

SPECIFICATION EDNC0010

Description	Specification	Limit
General		
Type	In-line, Double Over Head Camshaft	
Number of cylinders	4	
Bore	76.5mm (3.0118 in)	
Stroke	87mm (3.4252 in)	
Total displacement	1599 cc (97.54 cu.in)	
Compression ratio	10	
Firing order	1-3-4-2	
Valve timing		
Intake valve		
Opens (BTDC)	5°	
Closes (ABDC)	35°	
Exhaust valve		
Opens (BBDC)	43°	
Closes (ATDC)	5°	
Valve overlap	10°	
Cylinder head		
Flatness of cylinder head surface	Max. 0.03mm (0.0012 in.)	0.1 mm (0.0039in.)
Flatness of mainfold mounting surface	0.15mm (0.0059 in.)	0.2mm (0.008in.)
Oversize rework dimension of valve seat hole		
Intake		
0.3mm (0.012 in.) O.S.	30.7-30.721 mm (1.2087- 1.2095 in.)	
0.6mm (0.024 in.) O.S.	40.0-40.021 mm (1.5748- 1.5756 in.)	
Exhaust		
0.3mm (0.012 in.) O.S.	27.3-27.321mm (1.0748- 1.0756 in.)	
0.6mm (0.024 in.) O.S	27.6-27.621mm (1.0866- 1.0874 in.)	
Oversize rework dimensions of valve		
Guide hole		
0.05mm (0.002 in.) O.S.	11.05-11.068mm (0.435-0.4357 in.)	
0.25mm (0.010 in.) O.S.	11.25-11.268mm (0.443-0.4436 in.)	
0.50mm (0.020 in.) O.S.	11.50-11.518mm (0.453-0.4535 in.)	
Camshaft		
Camlobe height		
Intake	43.4484mm (1.7106 in.)	42.9484mm (1.6909in.)
Exhaust	43.8489mm (1.7263 in.)	43.3489mm (1.7.66in.)
Joumal O.D	ø27mm (1.0630 in.)	
Bearing oil clearance	0.035- 0.072mm (0.0014- 0.0028 in.)	
End play	0.1- 0.2mm (0.004- 0.008 in.)	

Description	Specification	Limit
Valve		
Valve length		
Intake	91.7mm (3.6102 in.)	
Exhaust	92.3mm (3.6339 in.)	
Stem O.D.		
Intake	5.955- 5.97mm (0.2344- 0.2350 in.)	
Exhaust	5.935- 5.95mm (0.2337- 0.2343 in.)	
Face angle thickness of valve head (Margin)		
Intake	1.1mm (0.0433 in.)	0.8mm (0.031in.)
Exhaust	1.3mm (0.0512 in.)	1.0mm (0.039in.)
Valve stem to valve guide clearance		
Intake	0.03- 0.06mm (0.0012- 0.0024 in.)	0.10mm (0.0039in.)
Exhaust	0.05-0.08mm (0.0020- 0.0031 in.)	0.15mm (0.0059in.)
Valve guide		
Installed dimension O.D.		
Intake	12.8mm (0.504 in.)	
Exhaust	12.8mm (0.504 in.)	
Service size	0.05, 0.25, 0.50mm (0.002, 0.010, 0.020 in.) oversize	
Valve seat		
Width of seat contact		
Intake	0.8-1.2mm (0.031-0.047 in.)	
Exhaust	1.3-1.7mm (0.051-0.066 in.)	
Seat angle	45°	
Oversize	0.3, 0.6mm (0.012, 0.024 in.) oversize	
Valve spring		
Free length	44.00mm (1.7323 in.)	
Load	21.6kg/ 35mm (47.6lb/1.3780 in.) 45.1kg/ 27.2mm (99.4lb/1.709 in.)	
Squareness	1.5° or less	
Cylinder block		
Cylinder bore	76.50-76.53mm (3.0118-3.0130 in.)	
Out- of- round and taper of cylinder bore	Less than 0.01mm (0.0004 in.)	
Clearance with piston	0.025-0.045mm (0.0009-0.0017 in.)	
Piston		
O.D.	76.465 - 76.495mm (3.0104 - 3.0116 in.)	
Service size	0.25, 0.50, 0.75, 1.00mm (0.010, 0.020, 0.030, 0.039 in.) oversize	
Piston ring		
Side clearance		
No. 1	0.04-0.085mm (0.0015-0.0033 in.)	0.1mm (0.004in.)
No. 2	0.04-0.085mm (0.0015-0.0033 in.)	0.1mm (0.004in.)
Endgap		
No. 1	0.20-0.35mm (0.0079- 0.0138 in.)	1.0mm (0.039in.)
No. 2	0.30-0.45mm (0.0118-0.0177 in.)	1.0mm (0.039in.)
Oil ring side rail	0.2-0.7mm (0.0078- 0.0275 in.)	1.0mm (0.039in.)
Service size	0.25, 0.50, 0.75, 1.00mm (0.010, 0.020, 0,030, 0.039 in.) noversize	

Description	Specification	Limit
Connecting rod Bend Twist Connecting rod big end to crankshaft side clearance Connecting rod bearing oil clearance Undersize	 0.05mm (0.0020 in.) or less 0.1mm (0.0039 in.) or less 0.100-0.250mm (0.0039-0.0098 in.) 0.018-0.036mm (0.0007-0.0014 in.) 0.25, 0.50, 0.75mm (0.010, 0.020, 0.030 in.)	 0.4mm (0.0157in.)
Crankshaft Pin O.D. Journal O.D. Bend Out- of- round, taper of journal and pin End play	 45 mm (1.77 in.) 50 mm (1.97 in.) 0.03 mm (0.0012 in.) or less 0.005 mm (0.0002 in.) or less 0.05- 0.175 mm (0.0019- 0.0068 in.)	
Undersize rework dimension of pin 0.25mm (0.010 in.) 0.50mm (0.20 in.) 0.75mm (0.030 in.)	 44.725- 44.74mm (1.7608- 1.7614 in.) 44.475-44.49mm (1.7509- 1.7516 in.) 44.225-44.24mm (1.7411- 1.7417 in.)	
Undersize rework dimension of journal 0.25mm (0.010 in.) 0.50mm (0.20 in.) 0.75mm (0.030 in.)	 49.727- 49.742mm (1.9577-1.9583 in.) 49.477- 49.492mm (1.9479-1.9485 in.) 49.227- 49.242mm (1.9380-1.9386 in.)	
Flywheel Runout	 0.1mm (0.0039 in.)	 0.13mm (0.0051in.)
Oil pump Clearance between outer circumference and front case (body clearance) Front case tip clearance Side clearance Inner gear Outer gear	 0.12- 0.18mm (0.0047-0.0070 in.) 0.025-0.069mm (0.001-0.0027 in.) 0.04-0.085mm (0.0016-0.0033 in.) 0.06- 0.11mm (0.0024-0.0043 in.)	
Engine oil pressure Engine at idle [Oil temperature is 90 to 100°C (194 to 215°F)]	 147KPa (1.5 kg/ cm², 21.33psi)	
Relief spring Free height Load	 46.6mm (1.8346 in.) 6.1kg at 40.1mm (13.42lb/ 1.578 in.)	
Cooling method	Water-cooled, pressurized, forced circulation with electrical fan	
Coolant Quantity Radiator Type	 6 liter Pressurized corrugated fin type	
Radiator cap Main valve opening pressure Vacuum valve opening pressure	 81.4-108 kpa (11.8-15.6 psi.,0.83-1.1kg/cm²) -6.86 kpa (-1.00 psi, -0.07 kg/cm² or less	
Coolant pump	Centrifugal type impeller	

Description	Specification	Limit
Thermostat Type Valve opening temperature Full-opening temperature	 Wax pellet type with jiggle valve 82°C (180°F) 95°C (203°F)	
Engine coolant temperature sensor Type Resistance	 Heat-sensitive thermistor type 2.31-2.59k Ω at 20°C(68°F) 146.9-147.3 Ω at 110°C(230°F)	
Air cleaner Type Element	 Dry type Un woven cloth type	
Exhaust pipe Muffler Suspension system	 Expansion resonance type Rubber hangers	

NOTE

O.D. = Outer Diameter
I.D. = Inner Diameter
O.S. = Oversize Diameter
U.S. = Undersize Diameter

TIGHTENING TORQUE EDNC0020

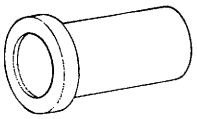
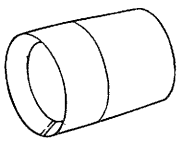
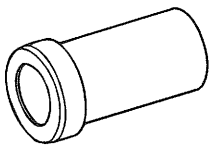
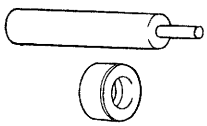
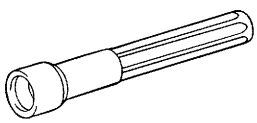
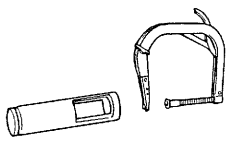
Item	Nm	Kg.cm	lb.ft
Cylinder Block			
Front engine support bracket bolt and nut	45 - 55	450 - 550	33 - 41
Engine suppot bracket stay bolt	45 - 55	450 - 550	33 - 41
Oil pressure switch	13 - 15	130 - 150	10 - 11
Cylinder head			
Cylinder head bolt	30+(90°)+Release all bolts+30+(90°)	300+(90°)+Release all bolts+300+(90°)	22+(90°)+Release all bolts+22+(90°)
Intake manifold bolts or nuts	15 - 20	150 - 200	11 - 15
Exhaust manifold nut	25 - 30	250 - 300	18 - 22
Cylinder head cover bolt	8 - 10	80 - 100	6 - 7
Camshaft bearing cap bolt	12 - 14	120 - 140	9 - 10
Rear plate bolt	32 - 35	320 - 350	24 - 26
Main Moving system			
Connecting rod cap nut	32 - 35	320 - 350	24 - 26
Crankshaft bearing cap bolt	55 - 60	550 - 600	41 - 44
Fly wheel M/T bolt	120 - 130	1200 - 1300	89 - 96
Drive plate A/T bolt	120 - 130	1200 - 1300	89 - 96
Timing system			
Crankshaft pulley bolt	140 - 150	1400 - 1500	103 - 111
Camshaft sprocket bolt	80 - 100	800 - 1000	59 - 74
Timing belt tensioner bolt	20 - 27	200 - 270	15 - 20
Timing belt idle bolt	43 - 55	430 - 550	32 - 41
Timing belt cover bolt	8 - 10	80 - 100	6 - 7
Front case bolt	20 - 27	200 - 270	15 - 20
Engine Mounting			
Right mounting insulator (large) nut	90 - 110	900 - 1100	66 - 81
Right mounting insulator (small) nut	45 - 64	450 - 640	33 - 47
Right mounting bracket to engine nuts and bolts	50 - 65	500 - 650	37 - 48
Transmission mount insulator nut	50 - 65	500 - 650	37 - 48
Transmission insulator bracket to side member bolts	45 - 64	450 - 640	33 - 47
Rear roll stopper insulator nut	45 - 64	450 - 640	33 - 47
Rear roll stopper bracket sub frame bolts	45 - 64	450 - 640	33 - 47
Front roll stopper insulator nut	45 - 64	450 - 640	33 - 47
Front roll stopper bracket to sub frame bolts	45 - 64	450 - 640	33 - 47
Oil filter	12 - 16	120 - 160	9 - 12
Oil pan bolts	10 - 12	100 - 120	7 - 9
Oil pan drain plug	35 - 45	350 - 450	25 - 33
Oil screen bolts	15 - 22	150 - 220	11 - 16

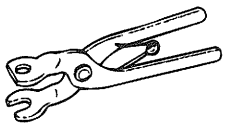
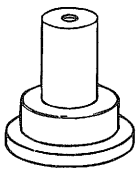
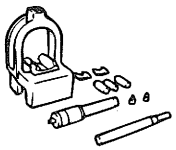
Item	Nm	Kg.cm	lb.ft
Alternator support bolt and nut	20 - 25	200 - 250	15 - 18
Alternator lock bolt	12 - 15	120 - 150	9 - 11
Alternator brace mounting bolt	20 - 27	200 - 270	15 - 20
Coolant pump pulley	8 - 10	80 - 100	6 - 7
Coolant pump bolt	12 - 15	120 - 150	9 - 11
Collant temperature sensor	25 - 30	250 - 300	18 - 22
Coolant inlet fitting bolt	17 - 20	170 - 200	13 - 14
Thermostat housing bolt	15 - 20	150 - 200	11 - 14
Intake and Exhaust system			
Air cleaner body mounting bolts	8 - 10	80 - 100	6 - 7
Resonator mounting bolts	4 - 6	40 - 60	3 - 4
Intake manifold to cylinder head nuts and bolts	15 - 20	150 - 200	11 - 14
Surge tank stay to cylinder block bolts	18 - 25	180 - 250	13 - 18
Throttle body to surge tank bolts	15 - 20	150 - 200	11 - 14
Exhaust manifold to cylinder head nuts	25 - 30	250 - 300	18 - 22
Exhaust manifold cover to exhaust manifold bolts	15 - 20	150 - 200	11 - 14
Oxygen sensor to exhaust manifold	50 - 60	500 - 600	37 - 44
Front exhaust pipe to exhaust manifold nuts	30 - 40	300 - 400	22 - 30
Front exhaust pipe bracket bolts	30 - 40	300 - 400	22 - 30
Front exhaust pipe to catalytic converter bolts	40 - 60	400 - 600	30 - 44

SERVICE STANDARD EDDA0030

Standard value	
Antifreeze	Mixture ratio of anti-freeze in coolant
ETHYLENE GLYCOL BASE FOR ALUMINUM	50 %

SPECIAL TOOLS EDKB0040

Tool (Number and name)	Illustration	Use
Crankshaft front oil seal installer (09214-21000)	 ECKA010C	Installation of the front oil seal
Crankshaft front oil seal guide (09214-21100)	 ECKA010D	Guide of oil seal
Camshaft oil seal installer (09221-21000)	 EDDA005B	Installation of the camshaft oil seal
Valve guide installer (09221-22000)	 ECKA010B	Removal and installation of valve guides
Valve stem oil seal installer (09222-22001)	 ECKA010A	Installation of valve stem oil seals
Valve spring compressor (09222-28000) Valve spring compressor holder (09222-28000)	 J20-008F	Removal and installation of intake and exhaust valves

Tool (Number and name)	Illustration	Use
Valve stem seal remover 09222-29000	 EDDA005J	Removal of valve stem seal
Crankshaft rear oil seal installer (09231-21000)	 EDDA005F	Installation of engine real oil seal and crankshaft rear oil seal
Piston pin remover and installer kit (09234-33001)	 EDDA005G	Removal and installation of piston pin (Use with 09234-33003)
Piston pin setting tool insert (09234-33002)	 EDDA005H	Removal and installation of piston pin (Use with 09234-33001)

TROUBLESHOOTING EDKB0050

Symptom	Probable cause	Remedy
Low compression	Blown cylinder head gasket Worn or damaged piston rings Worn piston or cylinder Worn or damaged valve seat	Replace gasket Replace rings Repair or replace piston and/or cylinder block Repair or replace valve and/or seat ring
Low oil pressure	Low engine oil level Faulty oil pressure switch Clogged oil filter Worn oil pump gears or cover Thin or diluted engine oil Oil relief valve stuck (open) Excessive bearing clearance	Check engine oil level Replace Replace Replace Change and determine cause Repair Replace
High oil pressure	Oil relief valve stuck (closed)	Repair
Excessive engine vibration	Loose engine roll stopper (front, rear) Loose transaxle mount bracket Loose engine mount bracket Loose center member Broken transaxle mount insulator Broken engine mount insulator Broken engine roll stopper insulator	Re-tighten Re-tighten Re-tighten Re-tighten Replace Replace Replace
Noisy valves	Thin or diluted engine oil (low oil pressure) Worn or damaged valve stem or valve guide HLA abnormal operation	Change Replace Speed the engine up (for venting) or Replace the HLA
Connecting rod and/or main bearing noise	Insufficient oil supply Thin or diluted engine oil Excessive bearing clearance	Check engine oil level Change and determine cause Replace
Timing belt noise	Incorrect belt tension	Adjust belt tension
Low coolant level	Leakage of coolant 1. Heater or radiator hose 2. Faulty radiator cap 3. Thermostat housing 4. Radiator 5. Engine coolant pump	 Repair or replace parts Tighten or replace clamps Replace gasket or housing Repair or replace Replace parts
Clogged radiator	Foreign material in coolant	Replace coolant
Abnormally high coolant temperature	Faulty thermostat Faulty radiator cap Restricted flow in cooling system Loose or missing drive belt Faulty water pump Faulty electric fan Insufficient coolant	Replace parts Replace parts Clear restriction or replace parts Adjust or replace Replace Repair or replace Refill coolant
Abnormally low coolant temperature	Faulty thermostat Faulty temperature sensor wiring	Replace Repair or replace
Inoperative electrical cooling fan	Damaged thermo sensor, electrical motor, radiator fan relay and wiring, fuse	Replace or repair

Symptom	Probable cause	Remedy
Exhaust gas leakage	Loose connections Broken pipe or muffler	Retighten Repair or replace
Abnormal noise	Detached baffle plate in muffler Broken rubber hanger Pipe or muffler contacting vehicle body Broken pipe or muffler	Replace Replace Correct Repair or replace

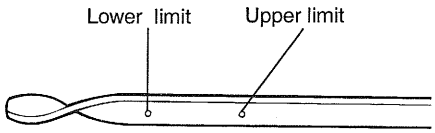
MAINTENCE EDKB0060

CHECKING ENGINE OIL

1. Position the vehicle on a level surface.
2. Warm up the engine.

> **NOTE**
> *If a vehicle has been out of service for a prolonged period of time, warm up the engine for approximately 20 minutes.*

3. Turn off the engine, and wait 2 or 3 minutes, then check the oil level.
4. Check that the engine oil level is within the level range indicated on the oil dipstick If the oil level is found to have fallen to the lower limit (the L mark), refill to the "F" mark.



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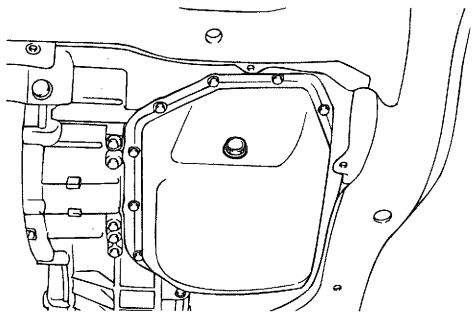
> **NOTE**
> *When refilling, use the same type of engine oil.*

5. Check that the oil is not dirty or contaminated with coolant or gasoline, and that it has the proper viscosity.

CHANGING ENGINE OIL

> **CAUTION**
> ***Be careful not to burn yourself, as the engine oil is hot.***

1. Run the engine until it reaches normal operating temperature.
2. Turn off the engine
3. Remove the oil filler cap and the drain plug (on the oil pan). Drain the engine oil.



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4. Install and tighten the drain plug to the specified torque.

Tightening torque

Drain plug : 35-45Nm (350-450kg.cm, 24-33lb.ft)

5. Fill the crankcase with fresh engine oil through the oil filler cap opening.

Drain and Refill Without oil filter :

3.0liter (3.17U.S.qts, 2.64 Imp.qts.)

Drain and Refill With oil filter :

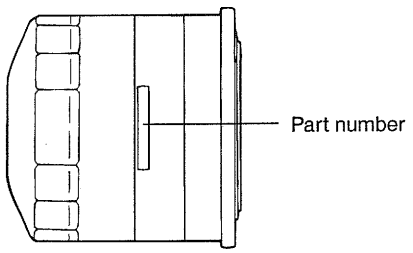
3.3liter (3.48U.S.qts., 2.90 Imp.qts.)

6. Install the oil filler cap.
7. Start and run the engine.
8. Turn off the engine and then check the oil level. Add oil if necessary.

EDKB0070

FILTER SELECTION

All Hyundai engines are equipped with a high quality, disposable oil filter. This filter is recommended as a replacement filter on all vehicles. The quality of replacement filters varies considerably. Only high quality filters should be used to assure the most efficient service. Make sure that the rubber gasket from the old oil filter is completely removed from the contact surface on the engine block before installing the new filter.



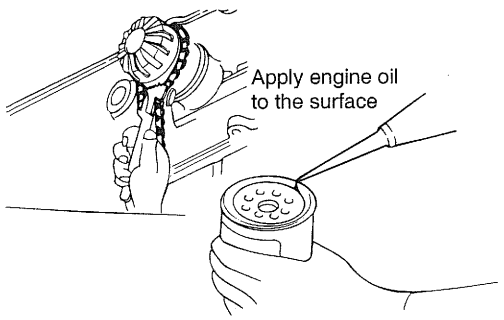
EDDA063A

PROCEDURE FOR REPLACING THE OIL FILTER

⚠ ***CAUTION***

Be careful not to burn yourself, as the engine and engine oil are hot.

1. Use a filter wrench to remove the oil filter.
2. Before installing the new oil filter on the engine, apply clean engine oil to the surface of the rubber gasket.



EDDA063B

3. Tighten the oil filter to the specified torque.

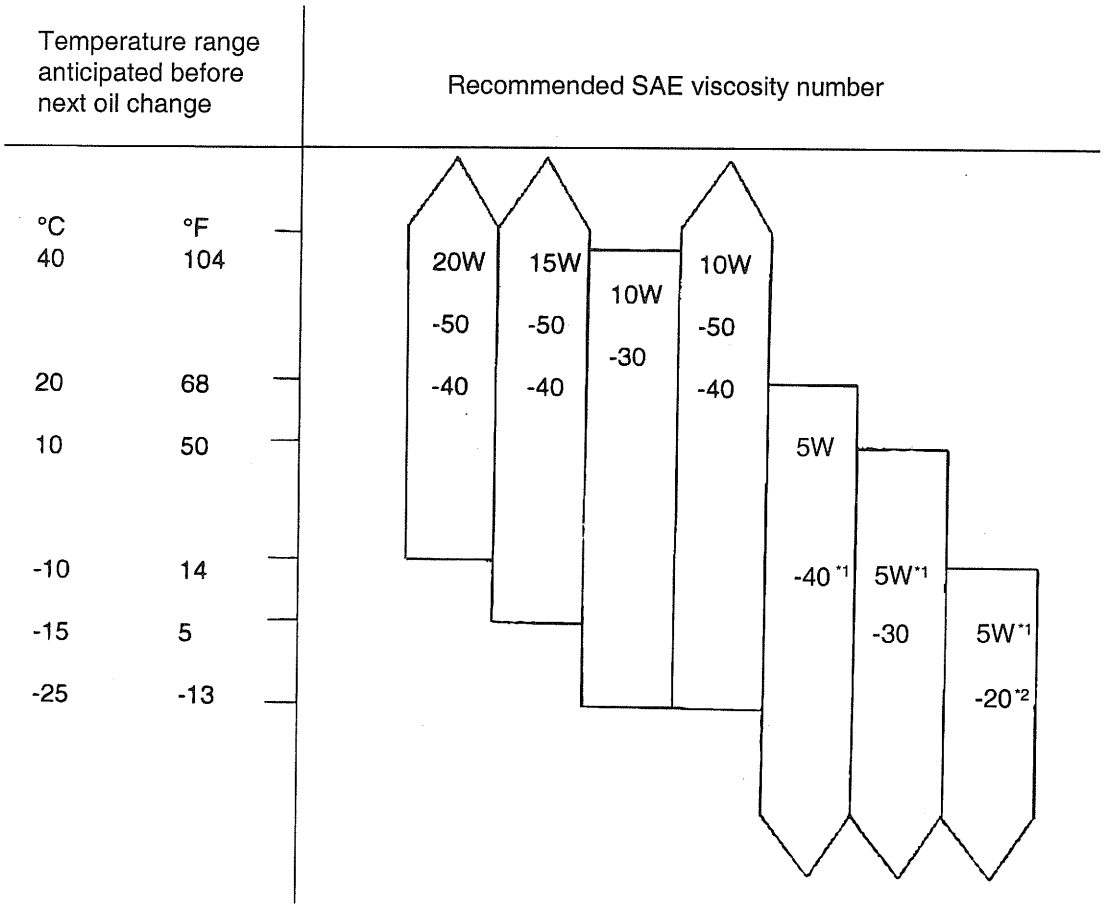
Tightening torgue
Oil filter : 12 - 16 Nm (120 - 160 kg.cm, 9 - 12 lb.ft)

4. Run the engine to check for engine oil leaks.
5. After turning off the engine, check the oil level and add oil as necessary.

SELECTION OF ENGINE OIL ECHA0600

Recommended API classification: SD OR ABOVE SE OR ABOVE [For EC.]

Recommended SAE viscosity grades:



***1 Restricted by driving condition and environment.**
***2 Not recommended for sustained high speed vehicle operation**

EDA9990B

NOTE

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

1. *Satisfy the requirements of the API classification.*
2. *Have proper SAE grade number for expected ambient temperature range.*

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

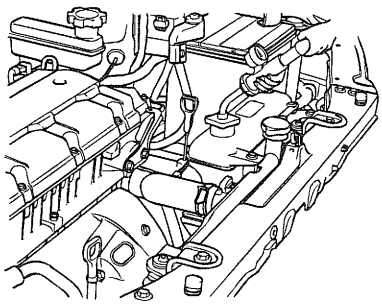
CHECKING COOLANT LEAK ECNC0110

1. Loosen the radiator cap.
2. Confirm that the coolant level is up to the filler neck.
3. Install a radiator cap tester to the radiator filler neck and apply 140 KPa (1.4 kg/cm², 20psi) pressure. Hold it for two minutes in that condition, while checking for leakage from the radiator, hoses or connections.

NOTE

1. Radiator coolant may be extremely hot. Do not open the system because hot, or scalding water could gush out causing personal injury. Allow the vehicle to cool before servicing this system.
2. Be sure to clean away any moisture from the places checked completely.
3. When the tester is removed, be careful not to spill any coolant from it.
4. Be careful, when installing and removing the tester and when testing, not to deform the filler neck of the radiator.

4. If there is leakage, repair or replace with the apropriate part.



KDNB001D

RADIATOR CAP PRESSURE TEST

1. Use an adapter to attach the cap to the tester.
2. Increase the pressure until the gauge stops moving.

Main valve opening pressure :

83-110 kPa (0.83-1.1 kg/cm², 12-16 psi)

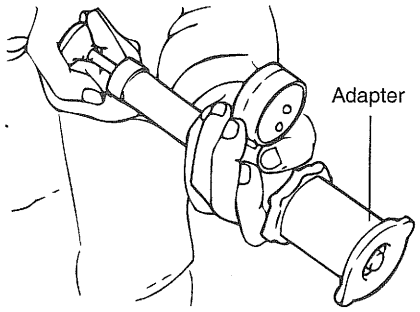
Vacuum valve opening pressure :

-7 kPa (-0.07 kg/cm², -1.0 psi)

3. Check that the pressure level is maintained at or above the limit.
4. Replace the radiator cap if the reading does not remain at or above the limit.

NOTE

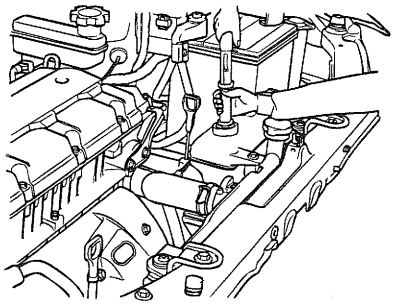
Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an incorrect reading.



ECA9090A

SPECIFIC GRAVITY TEST ECNC0120

1. Measure the specific gravity of the coolant with a hydrometer.
2. Measure the coolant temperature and calculate the concentration from the relation between the specific gravity and temperature, using the following table for reference.



KDNB001E

RELATION BETWEEN COOLANT CONCENTRATION AND SPECIFIC GRAVITY

Coolant temperature °C (°F) and specific gravity					Freezing temperature °C (°F)	Safe operating temperature °C (°F)	Coolant concentration (Specific volume)
10 (50)	20 (68)	30 (86)	40 (104)	50 (122)			
1.054	1.050	1.046	1.042	1.036	-16 (3.2)	-11 (12.2)	30%
1.063	1.058	1.054	1.049	1.044	-20 (-4)	-15 (5)	35%
1.071	1.067	1.062	1.057	1.052	-25 (-13)	-20 (-4)	40%
1.079	1.074	1.069	1.064	1.058	-30 (-22)	-25 (-13)	45%
1.087	1.082	1.076	1.070	1.064	-36 (-32.8)	-31 (-23.8)	50%
1.095	1.090	1.084	1.077	1.070	-42 (-44)	-37 (-35)	55%
1.103	1.098	1.092	1.084	1.076	-50 (-58)	-45 (-49)	60%

Example

The safe operating temperature is -15°C (5°F) when the measured specific gravity is 1.058 at coolant temperature of 20°C (68°F)

⚠ ***CAUTION***

• If the concentration of the coolant is below 30%, its anti-corrosion properties will be adversely affected. • if the concentration is above 60%, both the anti-freeze and engine cooling property will decrease, affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.
• Do not use together with another brand's product.

RECOMMENDED COOLANT

Antifreeze	Mixture ratio of anti freeze in coolant
ETHYLENE GLYCOL BASE FOR ALUMINUM	50% [Except tropical areas] 40% [Tropical areas]

CHECKING COMPRESSION PRESSURE ECKB0130

1. Before checking engine compression, check the engine oil level. Also check that the starter motor and battery are all in normal operating condition.
2. Start the engine and wait until engine coolant temperature reaches 80-95°C (176-205°F).
3. Turn off engine and disconnect the spark plug cables.
4. Remove the spark plugs.
5. Crank the engine to remove any foreign material in the cylinders.
6. Insert the compression gauge into the spark plug hole.
7. Depress the accelerator pedal to open the throttle fully.
8. Crank the engine and read the gauge.

Standard value : 1500kpa (15Kg/cm², 218 psi)
Limit : 1400kpa (14Kg/cm², 203 psi)

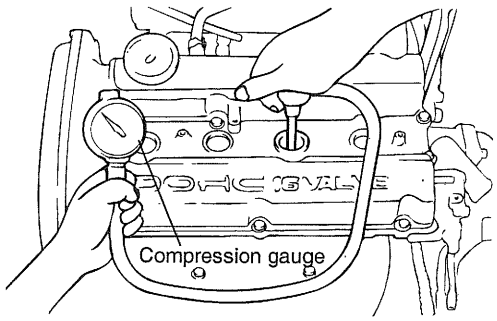
9. Repeat steps 6 to 8 over all cylinders, ensuring that the pressure differential for each of the cylinders is within the specified limit.

Limit :	Max. 100 kpa (1.0 kg/cm² ,14 psi) between cylinders

10. If a cylinder's compression or pressure differential is outside the specification, add a small amount of oil through the spark plug hole, and repeat steps 6 to 9.
    1) If the addition of oil makes the compression to rise, it is likely that there may be wear between the piston ring and cylinder wall
    2) If compression remains the same, valve seizure, poor valve seating or a compression leak from the cylinder head gasket are all possible causes.

Tightening torque

Spark plug : 20-30 Nm (200-300 kg.cm, 14-22 lb.ft)



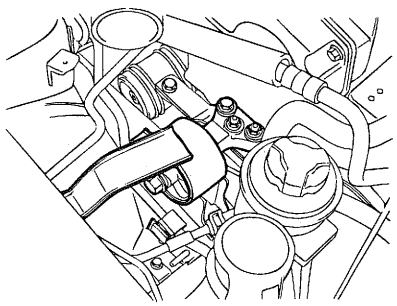
ECA9001A

ADJUSTING TIMING BELT TENSION EDNC0140

1. Lift the vehicle by using of jack.
2. Rotate the steering wheel counter-clockwise throughly.

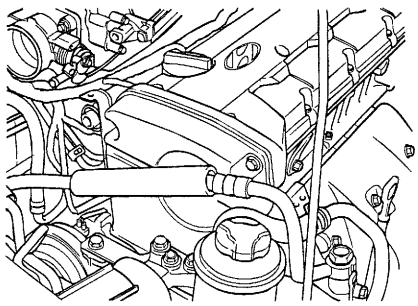
   NOTE
   Do watch not to over load.

3. Remove the engine support bracket.



KDNB001B

4. Remove the water pump pulley.
5. Remove the timing belt upper cover.



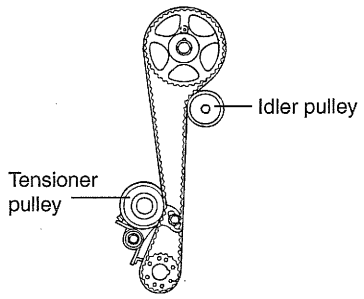
KDNB001C

6. Remove the spark plug.

7. Place the pistion of No. 1 cylinder to TDC of the compression stroke by rotating the crankshaft clockwise.

NOTE

Crankshaft is to be rotated clockwise otherwise, the tension is inadequately adjusted.



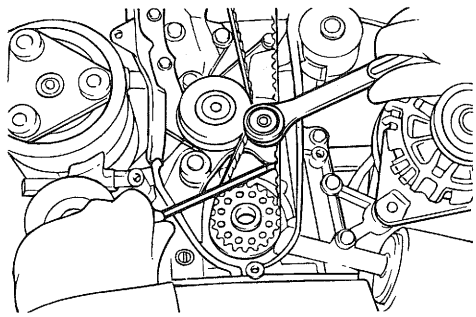
EDDB091A

8. Loosen the tensioner bolt of pivot side and slotside.

9. Rotate the crankshaft clockwise as many as 2 teeth of sprocket.

NOTE

Set the exhaust valve rocker arm to upper position of cam in order to be the specified tension.



EDDA092A

10. Check that the teeth of sprocket and belt coincide with each other.

11. Tighten the bolt of slot side of first and then tighten the bolt of pivot side.

12. Install the timing belt tension.

13. Install the spark plug.

14. Install the timing belt upper cover.

15. Install the water pump pulley and engine support bracket.

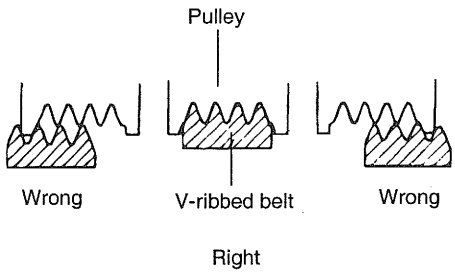
ADJUSTING DRIVE BELT TENSION EDKB0130

1. Check that the belts are not damaged and are properly fit for the pulley grooves.

2. Apply 100 N (22 lbs.) force to the back and midway portion of the belt between the pulleys as shown in the illustration, measure the amount of deflection with a tension gauge.

CAUTION

1. ***When installing the V-ribbed belt, check that the V-ribs are properly aligned.***
2. ***If noise or slippage is detected, check the belt for wear, damage, or breakage on the pulley contact surface, and check the pulley for scoring. Also check the amount that the belt is deflected.***



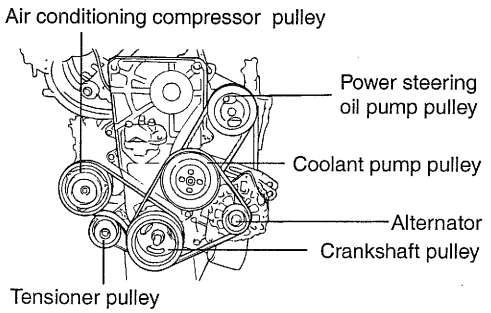
ECA9980A

STANDARD VALUE:

Items		Inspection	Adjustment	
			New	Used
For alternator	Deflection mm (in.)	5.1-6.0 (0.200-0.236)	4.0-4.4 (0.157-0.173)	5.1-5.7 (0.200-0.224)
	Tension N (lb)	350-500 (79-112)	650-750 (143-165)	400-500 (88-110)
For air conditioner	Deflection mm (in.)	8 (0.31)	5.0-5.5 (0.20-0.22)	6.0-7.0 (0.24-0.28)
	Tension N (lb)	250-500 (56-112)	470-570 (106-128)	320-400 (72-90)
For power steering	Deflection mm (in.)	6.0-9.0 (0.24-0.35)	-	-

NOTE

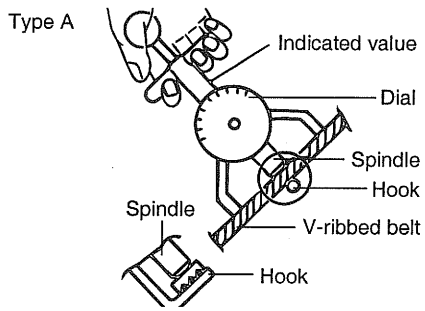
1. *The belt tension must be measured half - way between the specified pulleys.*
2. *When a new belt is installed, adjust the tension to the central value of the standard range indicated under "New" in the above table. Let the engine idle for 5 minutes or more, and check the standard value indicated under "Inspection."*
3. *When adjusting a belt which has been used,or newly installed, after 5 minutes or more of operation, refer to the standard value indicated under "Used" in the above table.*
4. *Refer to the standard value indicated under "Inspection" for periodic inspections.*



EAKA001B

TYPE A TENSION GAUGE

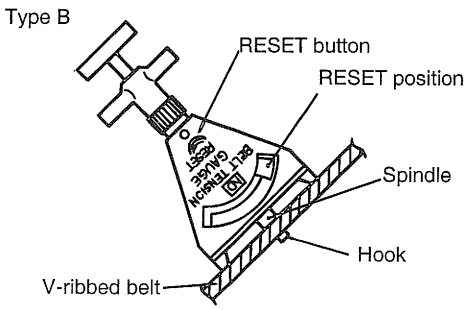
Do not let the dial section of the tension gauge contact other objects during measurement.



ECA9980C

TYPE B TENSION GAUGE

1. When measuring, turn the reset button in the direction of the arrow and set the gauge needle to the RESET position.
2. If the tension gauge is removed from the belt, the needle will still indicate the tension. Read the tension value after removing the gauge.



ECA9980D

ADJUSTING THE ALTERNATOR BELT

⚠ *CAUTION*

If the belt is too loose, it will cause noise or sudden wear.
If the belt is too tight, the engine coolant pump bearing or the alternator can get damaged.

1. Loosen the alternator nut "A" and the tension adjuster lock bolt "B".
2. Using the tension adjuster bolt, adjust the belt tension to the specification.
3. Tighten the adjuster lock bolt "B".
4. Tighten the alternator nut "A".
5. Check the tension or the deflection of belt, readjust if necessary.

Tightening torque

Alternator support bolt and nut :

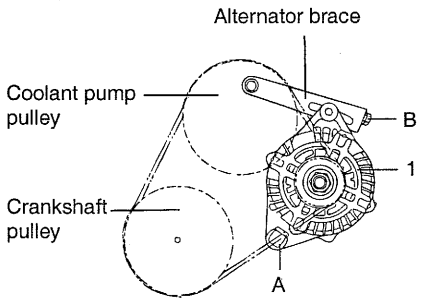
20-25 Nm (200-250 kg.cm, 14-18 lb.ft)

Alternator lock bolt B :

12-15 Nm (120-150 kg.cm, 9-11 lb.ft)

Alternator brace mounting bolt :

20-27 Nm (200-270 kg.cm, 15-20 lb.ft)

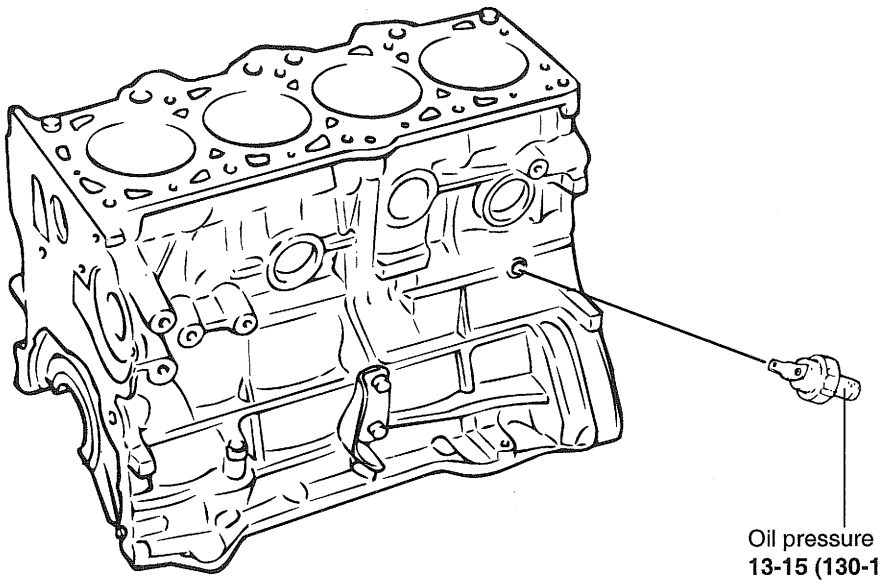


ECKA010H

CYLINDER BLOCK

CYLINDER BLOCK

COMPONENTS ECKB1000

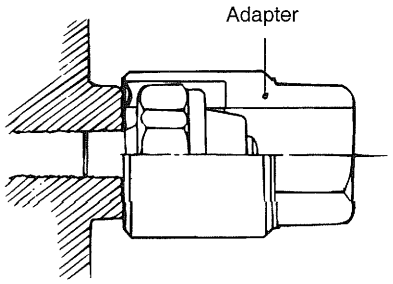


TORQUE : Nm (kg.cm, lb.ft)

V5EM104B

DISASSEMBLY ECKB1100

1. Remove the cylinder head, timing belt, front case, flywheel, pistons and crankshaft.
2. Remove the oil pressure switch.



EDDA008A

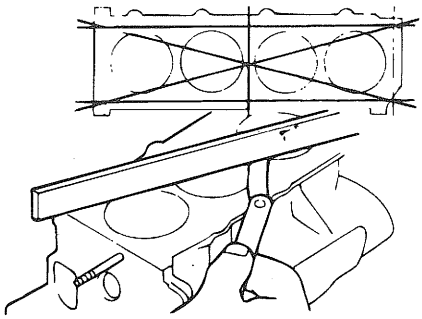
CYLINDER BLOCK EDKB1200

1. Check the engine block for scores, rust and corrosion. Also check for cracks or any other defects. Replace the block if defective.

2. Using a straight edge and feeler gauge, check the top surface of the block for warpage. Make sure that the surface is free from gasket chips or other foreign material.

Standard : 0.03 mm (0.0012 in.) or less

Limit : 0.15 mm (0.0059 in.) or less

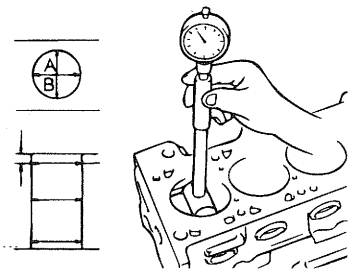


ECA9450B

3. Measure the cylinder bore with a cylinder gauge at three levels in the direction of A and B. If the cylinder bores show more than the specified out-of-round or taper or if the cylinder walls are badly scuffed or scored, the cylinder block should be rebored and honed. Oversize pistons and rings must be fitted.

Cylinder I.D : 76.5 - 76.53 mm (3.0118 - 3.0130 in.)

Cylinder I.D taper : 0.01 mm (0.0004 in.) or less



EDDA085B

4. If a cylinder ridge exists, cut away with a ridge reamer.

5. Oversize pistons are available in four sizes.

Piston service size and mark mm (in.)

0.25 (0.010) O.S. : 0.25

0.50 (0.020) O.S. : 0.50

0.75 (0.030) O.S. : 0.75

1.00 (0.039) O.S. : 1.00

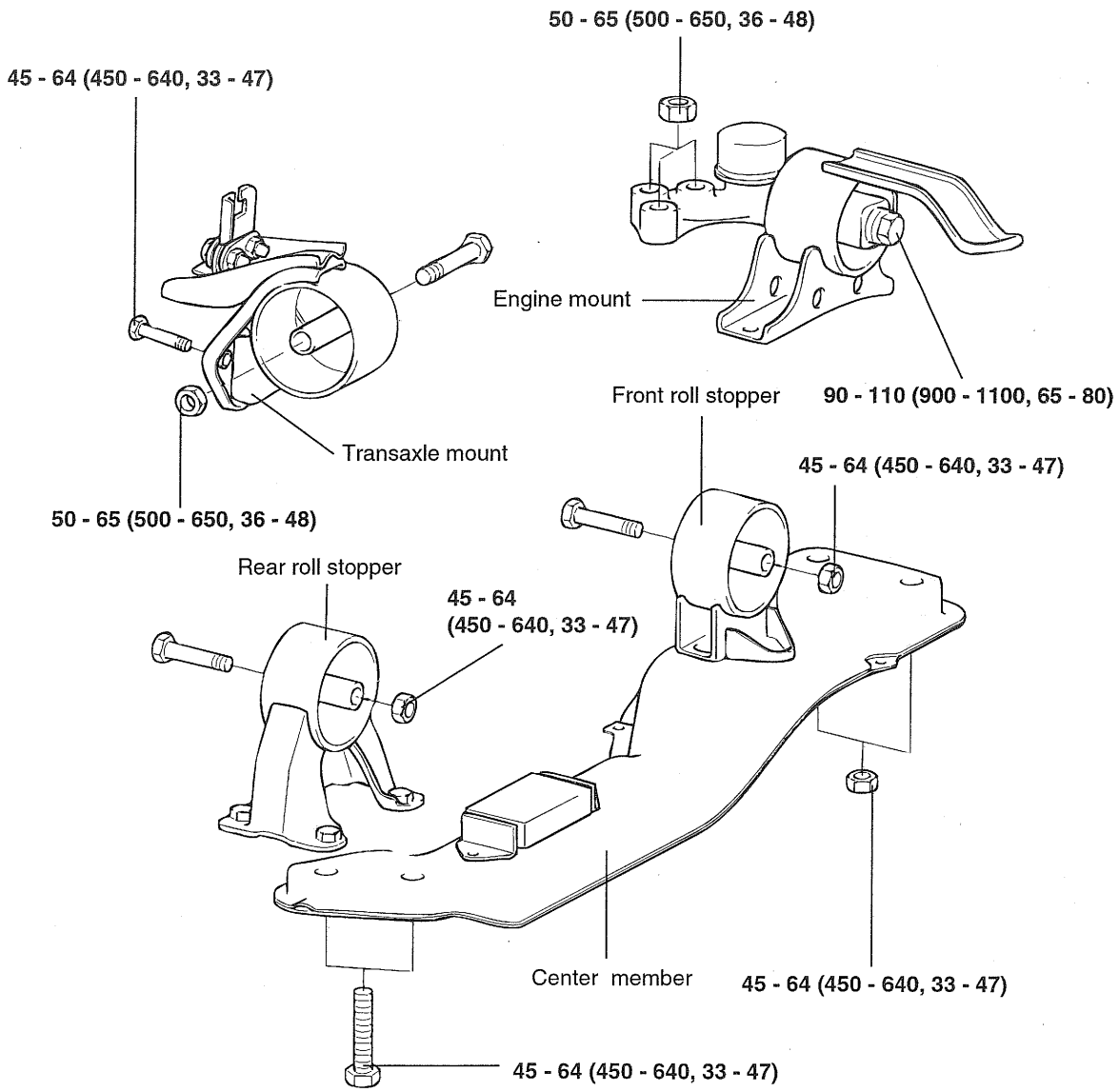
6. When boring the cylinder to the oversize, maintain the specified clearance between the oversize piston and the bore, and make sure that all pistons used are the same oversize.
The standard measurment of the piston's outside diameter is taken 47 mm (1.85 in.) from the top land of the piston.

Piston - to - cylinder clearance :

0.025 - 0.045 mm (0.0010 - 0.0018 in.)

ENGINE MOUNTS

COMPONENTS ECNC1300

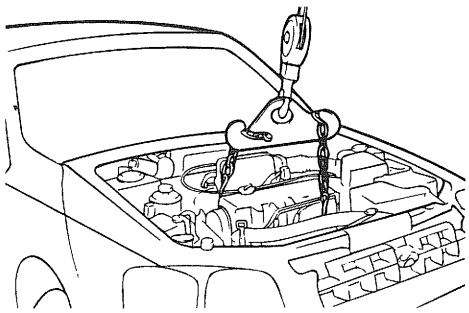


TORQUE : Nm (kg.cm, lb.ft)

EDNB002A

REMOVAL ECNC1400

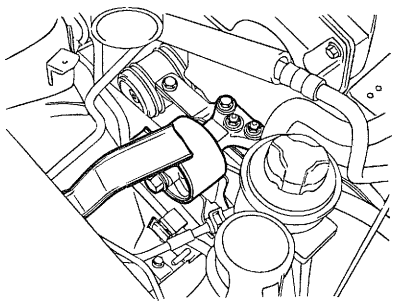
1. Attach an engine hoist to the engine hooks, and raise the engine just enough so that there is no pressure on the insulators.



ECDA012A

ENGINE MOUNTING

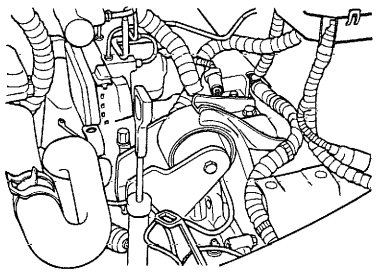
1. Remove the engine mounting insulator bolts.
2. Remove the engine mounting bracket from the engine.



KDNB001B

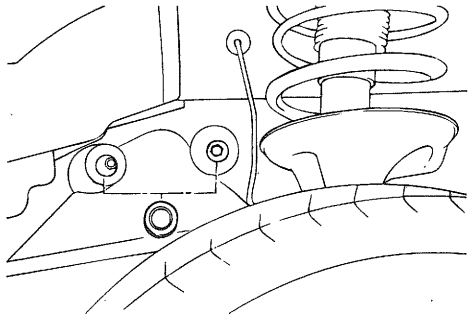
TRANSMISSION MOUNTING

1. For vehicles with a 5-speed manual transmission, remove the select control valve.
2. Remove the transmission mounting bolt.



KDNB002B

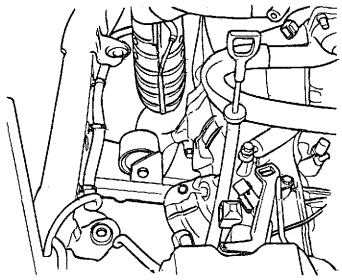
3. Detach the cap from inside the right fender shield. Remove the transmission mounting bolts.
4. Remove the transmission bracket.



ECKA020B

FRONT ROLL STOPPER

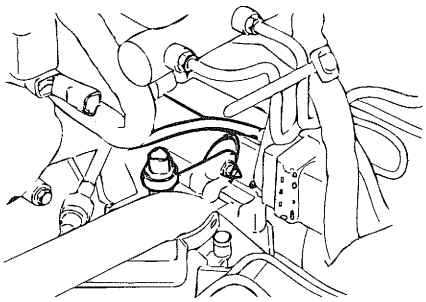
1. Remove the front roll stopper bracket from the center member.



KDNB002C

REAR ROLL STOPPER

1. Remove the rear roll stopper from the center member.

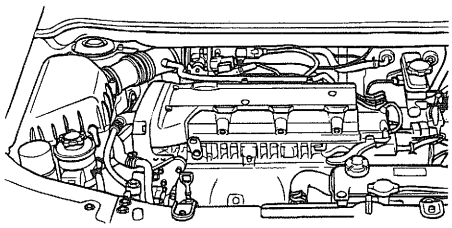


KDNB002D

ENGINE AND TRANSAXLE ASSEMBLY

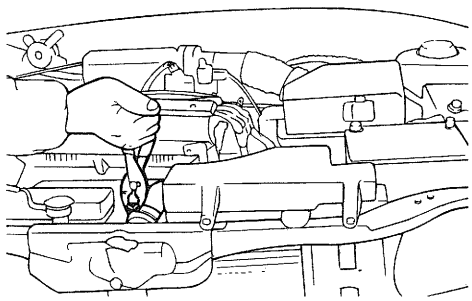
REMOVAL ECNC1600

1. Remove the battery.
2. Detach the air cleaner.



KDNB003C

3. Disconnect the connectors for the backup lamp switch and engine harness.
4. For vehicles with a 5-speed manual transmission, disconnect the select control valve connector.
5. Disconnect the connectors for the alternator harness and the oil pressure gauge wiring.
6. Drain the engine coolant.



EDDA016B

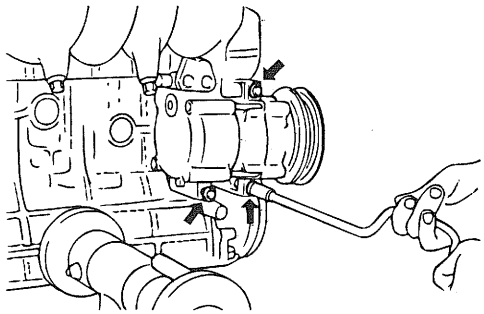
NOTE

When disconnecting hoses, make identification marks to ensule they are reconnected correctly.

CAUTION

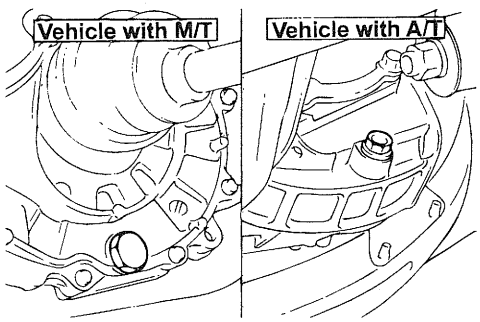
Be careful not to spill oil or fluid from hoses. Plug the openings to prevent foreign material from entering.

7. Disconnect the radiator upper and lower hoses on the engine side, then remove the radiator assembly.
8. Disconnect the engine ground.
9. Disconnect the brake booster vacum hose.
10. Remove the main fuel line, the return and vapor hoses from the engine side.
11. Disconnect the heater hoses (inlet and outlet) on the engine side.
12. Disconnect the accelerator cable at the engine side.
13. For vehicles with manual transmission, remove the control cable from the transmission.
14. For vehicles with automatic transmission, remove the control cable from the transmission.
15. Disconncet the speedometer cable from the transmission.
16. Disconncet the air conditioner compressor from the mounting bracket.



EDDA016C

17. Jack up the vehicle.
18. Drain the transmission oil (or fluid).



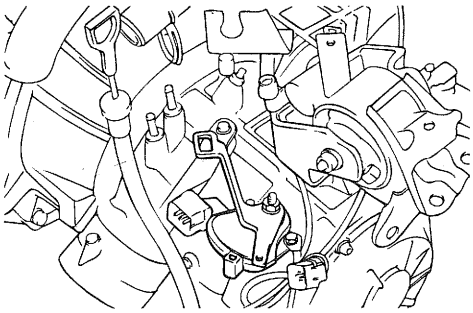
EDDA016D

19. Disconnect the front exhaust pipe from the manifold.

NOTE

Use wire to suspend the exhaust pipe from the bottom of the vehicle.

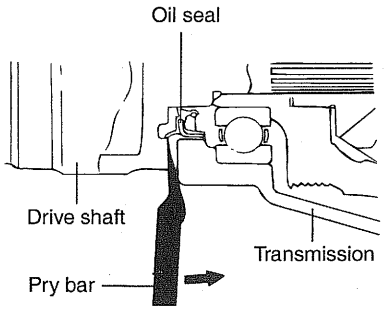
20. For vehicles with manual transmission, remove the shift control rod and extension rod.



ECKA020G

21. Remove the lower arm ball joint bolts and the stabilizer bar at the point where it is mounted to the lower arm.

22. Remove the drive shafts from the transmission case.



EDDA016E

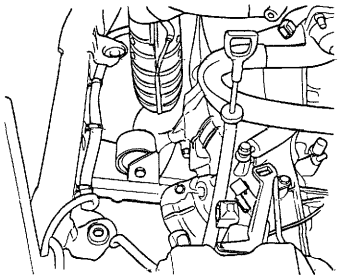
⚠ ***CAUTION***

- ***Plug the axle holes of the transmission case to prevent entry of foreign material.***
- ***Install new circlips on the drive shafts when reassembling.***

23. Hang the lower arm and drive shaft from the body with wire.

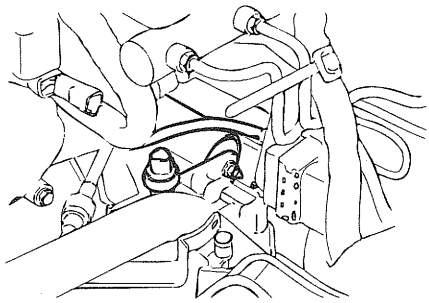
24. Attach a chains or cables to the engine. Use an engine hoist or a chain hoist to slightly raise the engine (enough to support the engine's weight while processing with the following steps).

25. Remove the front roll stopper.



KDNB002C

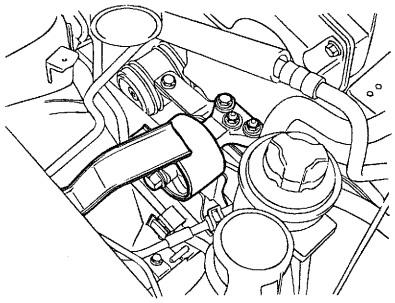
26. Separate the rear roll stopper.



KDNB002D

27. Remove the engine mounting insulator bolts.

28. Remove the engine mounting bracket from the engine.



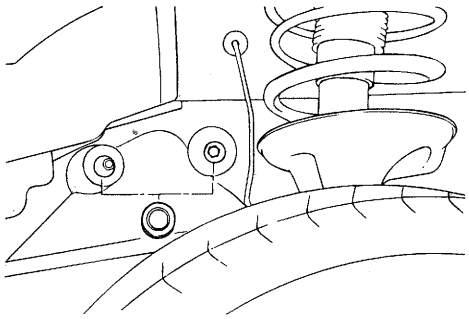
KDNB001B

29. Slowly raise the engine (to the extent that the weight of the engine and transmission assembly is not applied to the mounting portions) and temporarily hold it in the raised position.

⚠ ***CAUTION***

Check that all cables, hoses, harnesses, connectors etc. are disconnected from the engine.

30. Remove the caps from the inside of the right fender shield and remove the transaxle mount bracket bolts.



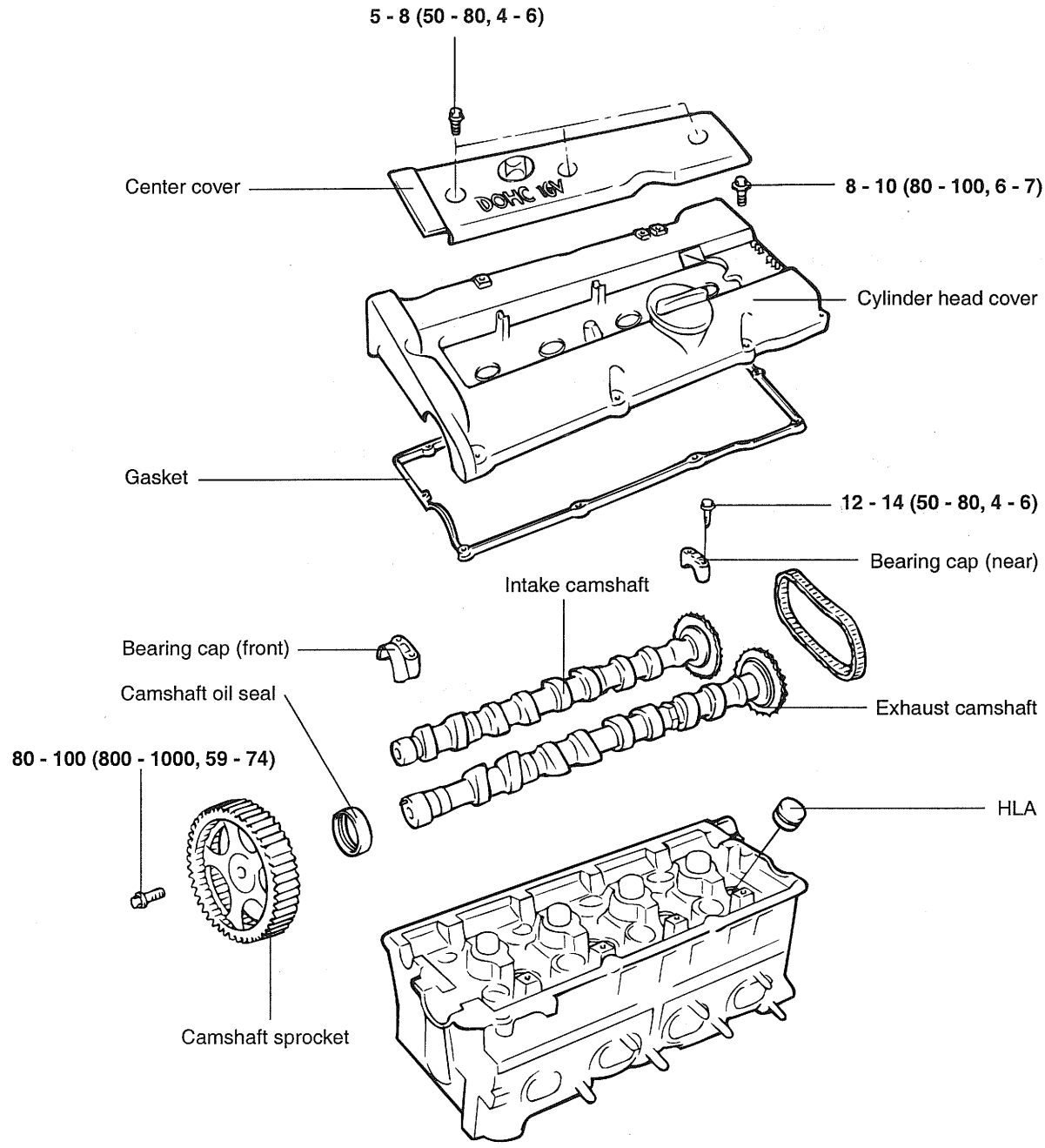
ECKA020B

31. While directing the transmission side downward, lift the engine and transmission assembly up and out of the vehicles.

MAIN MOVING SYSTEM

CAM SHAFT

COMPONENTS EDDA0180

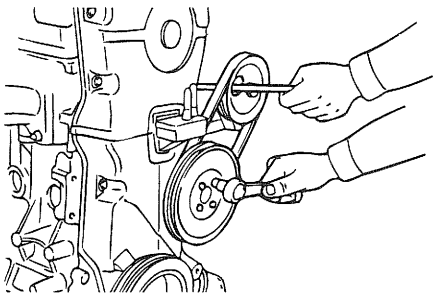


TORQUE : N.m (kg.cm, lb.ft)

EDDA018A

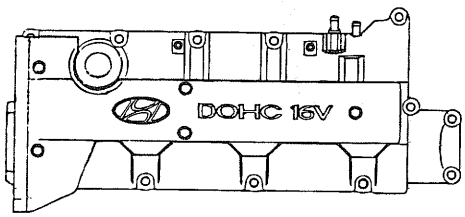
DISASSEMBLY ECKB1800

1. Disconnect the breather hose and the P.C.V. hose.
2. Remove the coolant pump pulley and crankshaft pulley.



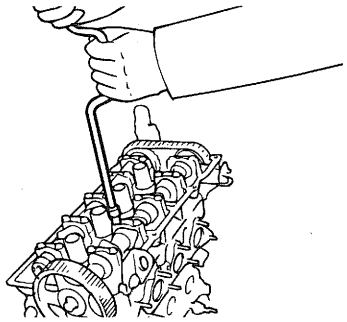
EDDA019A

3. Remove the timing belt cover.
4. Loosen the timing belt tensioner pulley and temporarily secure it.
5. Remove the timing belt from the camshaft sprocket.
6. Loosen the center cover bolts and then remove the center cover.
7. Remove the ignition coil assembly.
8. Loosen the cylinder head cover bolts and then remove the cylinder head cover.



EDKB444C

9. Remove the camshaft sprocket.
10. Remove the camshaft bearing caps and timing chain.



EDDA019C

11. Remove the camshaft.
12. Remove the mechanical tappets and shims.

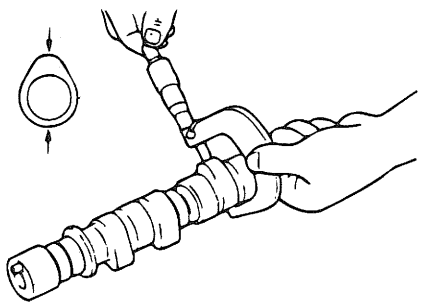
> **NOTE**
> *Arrange the mechanical tapets and shims in correct order.*

INSPECTION EDKB1900

CAMSHAFTS

1. Check the camshaft journals for wear. If the journals are badly worn, replace the camshaft.
2. Check the cam lobes for damage. If the lobe is damaged or worn excessively, replace the camshaft.

Standard value	
Intake	43.4484 mm (1.7106 in.)
Exhaust	43.8489 mm (1.7263 in.)
Limit	
Intake	42.9484 mm (1.6909 in.)
Exhaust	43.3489 mm (1.7066 in.)



KDDA001D

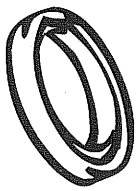
3. Check the cam surface for abnormal wear or damage, and replace if necessary.

4. Check each bearing for damage. If the bearing surface is excessively damaged, replace the cylinder head assembly or camshaft bearing cap, as necessary.

Camshaft end play : 0.1-0.15mm(0.0039-0.0059 in.)

OIL SEAL

1. Check the lips for wear. If the lip threads are worn, replace.
2. Check the oil seal lip contacting surface of the camshaft. If it is worn, replace the camshaft.

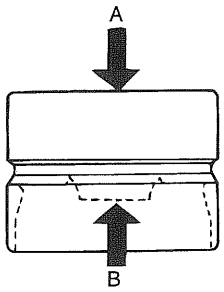


V5EM202A

HLA (HYDRAULIC LASH ADJUSTER)

With the HLA filled with engine oil, hold A and press B by hand. If B moves, replace the HLA.

For other specific trouleshooting regarding HLA, refer to the table below.



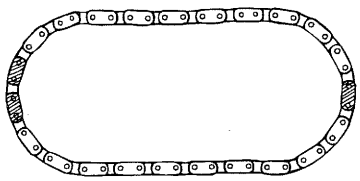
EDDA020B

Problem	Possible cause	Action
Temporary noise on starting a cold engine	Normal	This noise will disappear after the oil in the engine has reached normal pressure.
Continuous noise when engine is running after sitting more than 48 hours.	Oil leakage of the high pressure chamber on HLA,allowing air to get in.	Noise will disappear within 15 minutes when engine runs at 2000-3000 rpm If it doesn't disappear,refer to item 7 below
Continuous noise when engine is first started after rebuilding cylinder head.	Insufficient oil in cylinder head oil gallery.	
Continuous noise when engine is running after excessive cranking.	Oil drain out of the high-pressure chamber in HLA, allowing air to get in. Insufficient oil in HLA,	
Continuous noise when engine is running after changing HLA.		⚠ ***CAUTION*** ***Do not run engine at a speed higher than 3000 rpm as this may damage HLA.***
Continuous noise during idle after high speed running.	Engine oil level too high or too low.	Check oil level. Drain or add oil as necessary.
	Excessive amount of air in the oil at high engine speed.	Check oil supply system
	Deteriorated oil	Check oil quality. If deteriorated, replace with specified type and amount of oil.

Problem	Possible cause	Action
Noise continuous for more than 15 minutes.	Low oil pressure	Check oil pressure and oil supply system of each part of engine.
	Faulty HLA.	Remove the cylinder head cover and press down on the HLA by hand. If it moves, replace HLA. ⚠ ***CAUTION*** ***Be careful of hot HLA.***

TIMING CHAIN

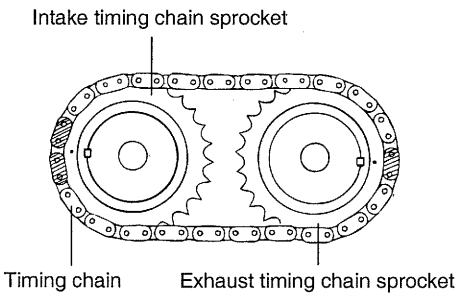
Check the bushing and plate of timing chain for wear. Replace if wear is severe.



EDDA020C

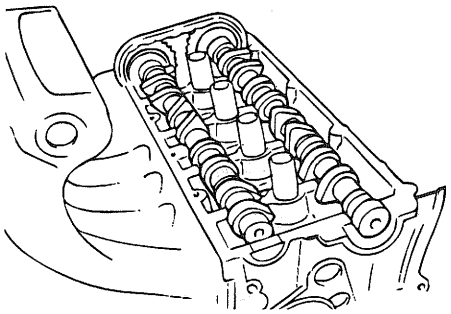
REASSEMBLY EDNC2200

1. Install the HLA.
2. Align the camshaft timing chain with intake timing chain sprocket and exhaust timing chain sprocket as shown.



EDDA021A

3. Install the camshaft after lubricating the camshaft journals with engine oil.

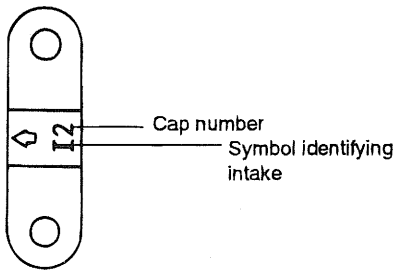


EDDA021B

4. Install the bearing caps. The markings on the caps are for intake/exhaust identification.

   I: Intake camshaft

   E: Exhaust camshaft



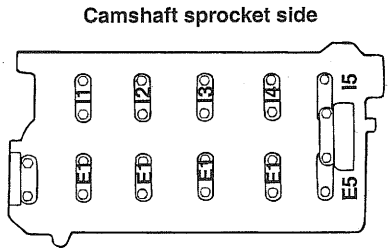
EDDA021C

5. Tighten the bearing caps to the specified torque in two or three steps as shown.

Tightening torque

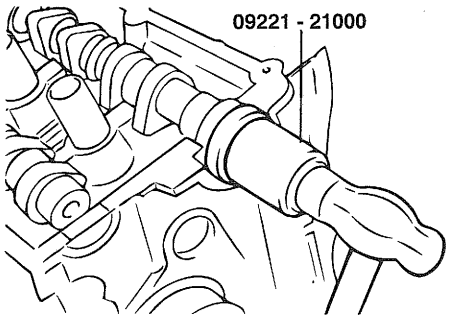
Bearing cap bolt. :

12 - 14Nm (120 - 140kg.cm, 9 - 10lb.ft)



EDDA021D

6. Using the special tool, camshaft oil seal installer (09221-21000), press fit the camshaft oil seal. Be sure to apply engine oil to the oil seal lip. Insert the oil seal along the camshaft front end and install by driving the installer with a hammer until the oil seal is fully seated.



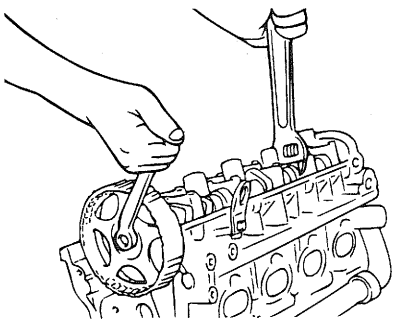
EDDA021E

7. Install the camshaft sprocket bolts to the specified torque.

Tightening torque

Camshaft sprocket bolt :

80 - 100Nm (800 - 1000kg.cm, 59 - 74lb.ft)



EDDA021F

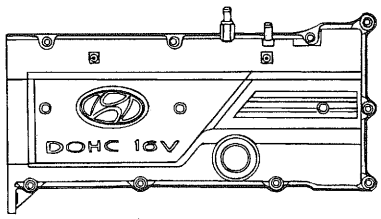
8. Align the camshaft sprocket and crankshaft sprocket timing marks. Place the piston in the No.1 cylinder to top dead center on the compression stroke.

9. Install the cylinder head cover.

Tightening torque

Cylinder head cover bolts :

8-10Nm (80-100kg.cm, 6-7lb.ft)



ECKA030A

10. Install the spark plug cables, ignition coil assembly and cylinder head center cover.

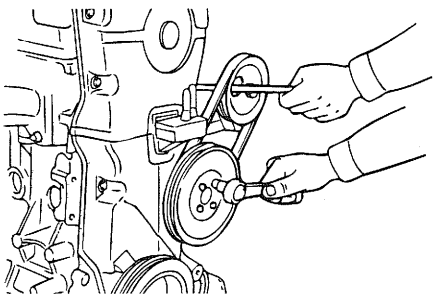
11. Install the timing belt and then tighten the timing belt tensioner pulley.

12. Install the timing belt cover.

Tightening torque

Timing belt cover : 8-10Nm (80-100kg.cm, 6-7lb.ft)

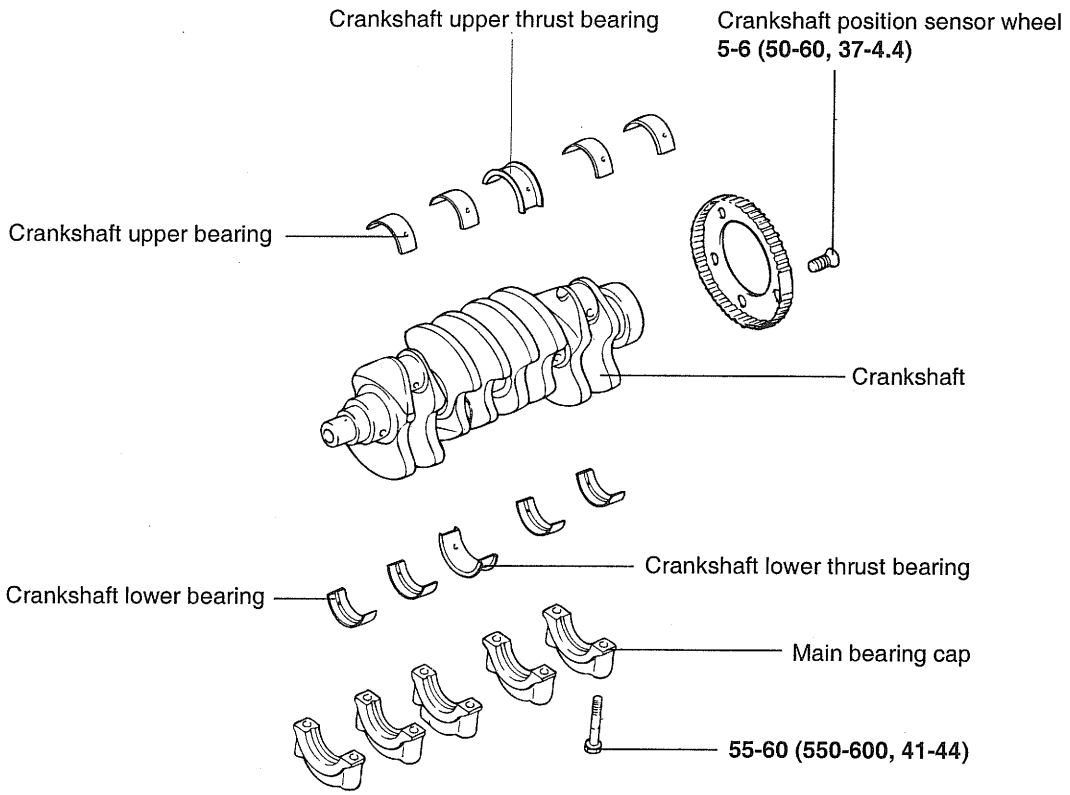
13. Install the coolant pump pulley and crankshaft pulley



EDDA019A

CRANK SHAFT

COMPONENTS EDDA0260



TORQUE : Nm (kg.cm, lb.ft)

ECDA031A

DISASSEMBLY EDKB2400

1. Remove the timing belt, front case, flywheel, cylinder head assembly and oil pan. For details, refer to the respective chapters.
2. Remove the rear plate and the rear oil seal.
3. Remove the connecting rod caps.
4. Remove the main bearing caps and remove the crankshaft.
5. Remove the crankshaft position sensor wheel.

⚠ ***CAUTION***

Mark the main bearing caps to permit reassembly in the original position and direction.

INSPECTION EDKB2500

CRANKSHAFT

1. Check the crankshaft journals and pins for damage, uneven wear, and cracks. Also check oil holes for clogging. Correct or replace any defective part.
2. Inspect the crankshaft journal for taper and out - of - round.

Standard value

Crankshaft journal O.D : 50mm (1.9685 in.)

Crankshaft pin O.D : 45mm (1.7717 in.)

Crankshaft journal, pin out-of-roundness and taper :

0.005 mm (0.0002 in.) or less

MAIN BEARINGS AND CONNECTING ROD BEARINGS

1. Visually inspect each bearing for peeling, melting, seizure, and improper contact. Replace the defective bearings.

OIL CLEARANCE MEASUREMENT

1. Measure the diameter of the crankshaft journal and pin.
2. Measure the diameter of the crankshaft bore and connecting rod bore.
3. Measure the thickness of the crankshaft bearing and connecting rod bearing.
4. Measure the clearance by the value that subtract the diameter of journal and pin and the thickness of bearing from the diameter of bore.

Connecting rod bearing oil clearance :

0.018 - 0.036 mm (0.0007 - 0.0014 in.)

Crankshaft main bearing oil clearance

NO.1, 2, 4, 5 : 0.022-0.040mm (0.0009-0.0018 in.)

NO.3 : 0.028-0.046 mm (0.0011-0.0018 in.)

OIL SEAL

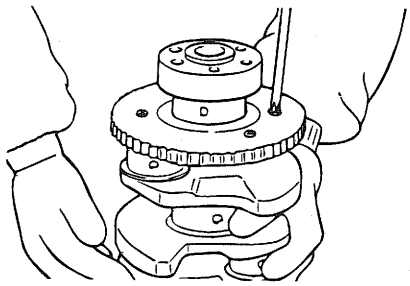
1. Check front and rear oil seals for damage or wear. Replace any seal that is defective.

CRANKSHAFT SENSOR WHEEL

1. Remove the sensor wheel
2. Check the sensor wheel for damage, cracks and wear, and replace if necessary.
3. Check the clearance between the sensor wheel and the crank position sensor with a depth gage.

Standard value

Clearance between sensor wheel and crank position sensor : 0.5 - 1.1 mm (0.020 - 0.043 in.)



EDDA028C

NOTE

1. *Measure the depth of the top of sensor wheel tooth and the cylinder block mounting block.*
2. *Measure the difference between sensor length and depth.*
3. *Sensor length is the distance between the end of the sensor and the inner point of the contacting face.*

REASSEMBLY EDKB2600

1. Install the upper main bearing inserts in the cylinder block.

   When reusing the main bearings, remember to install them by referring to the location marks made at the time of disassembly.

2. Install the crankshaft. Apply engine oil to the journals.

3. Install bearing caps and tighten cap bolts to the specified torque in the following sequence; center, No.2, No.4, front, and rear caps.
   Cap bolts should be tightened evenly in 2 to 3 stages before they are tightened to the specified torque.
   The caps should be installed with the arrow mark directed toward the crank pulley side of engine. Cap numbers must be correct.

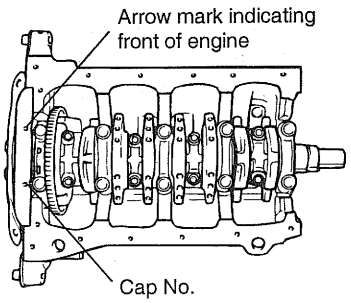
Tightening torque

Main bearing cap bolt. :

55-60Nm (550-600kg.cm, 41-44lb.ft)

Connecting rod cap bolt :

32-35Nm (320-350kg.cm, 24-26lb.ft)



ECDA034A

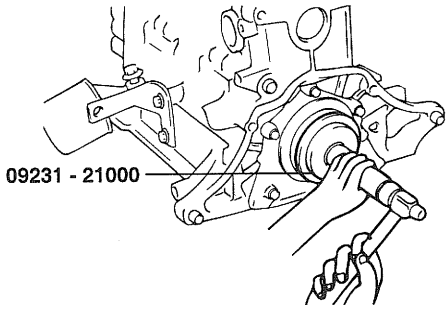
4. Make certain that the crankshaft turns freely and has the proper clearance between the center main bearing thrust flange and the connecting rod big end bearing.

Standard value:

Crankshaft end play :

0.05-0.175mm (0.0019-0.0068 in.)

5. Install the oil seal in the crankshaft rear oil seal case. Use the Special Tool, Crankshaft Rear Oil Seal Installer (09231 - 21000) as shown. Press fit the oil seal all the way in, being careful not to misalign it.



EDDA029B

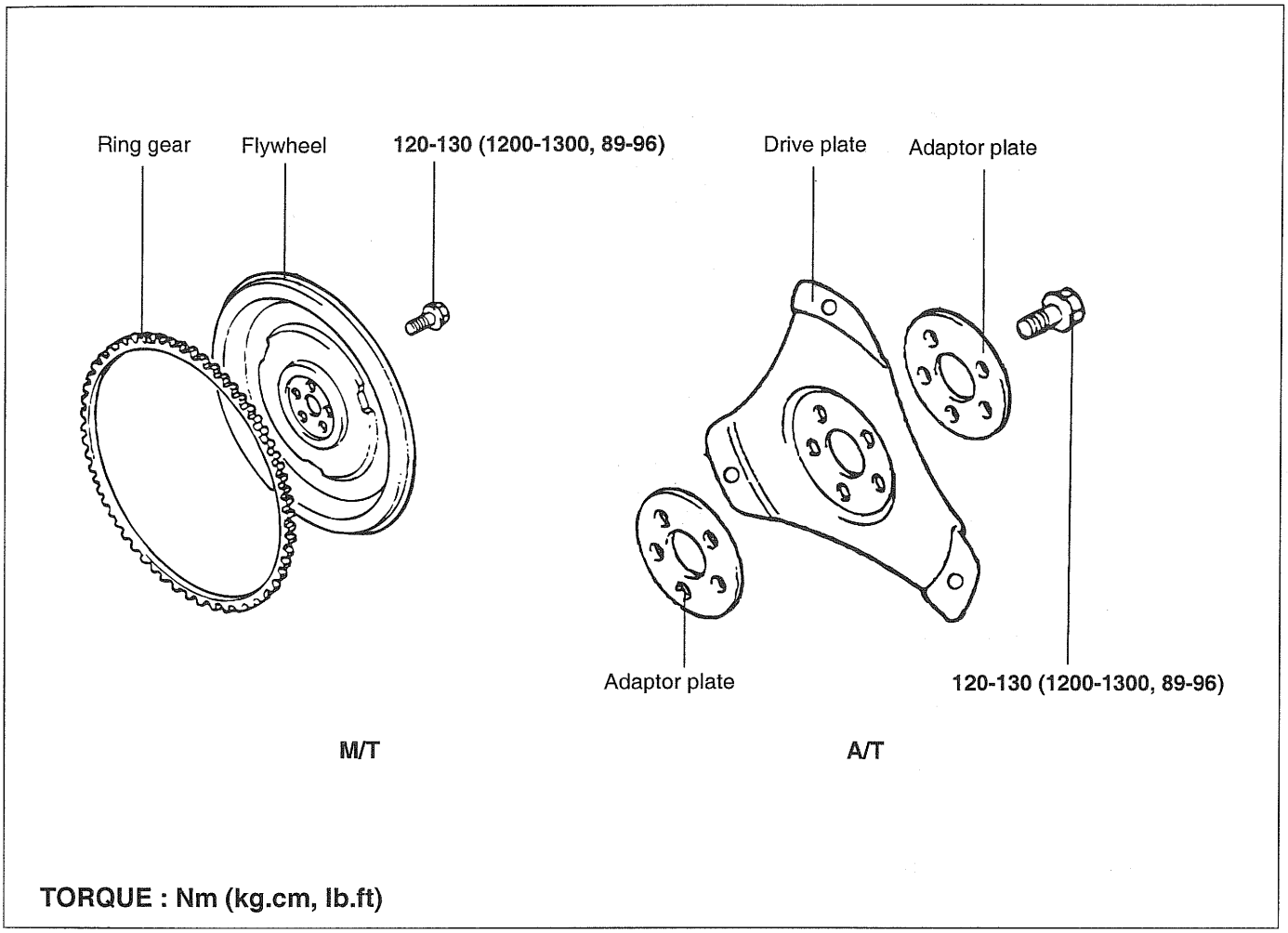
6. Install the rear plate and tighten the bolts.

7. Install the connecting rod caps.

8. Install the flywheel, front case, oil pan and timing belt. For further details, refer to the respective chapters.

FLY WHEEL

COMPONENTS EDNC2700



EDDA030A

M/T : Manual Transmission Vehicles

A/T : Automatic Transmission Vehicles

DISASSEMBLY EDKB2800

1. Remove the Transmission and clutch.
2. Remove the flywheel.

INSPECTION EDDA0320

1. Check the clutch disc contacting surface of the flywheel for damage and wear. Replace the flywheel if excessively damaged or worn.
2. Check the clutch disc contacting surface of the flywheel for runout.

Standard value
Flywheel run-out : 0.1mm (0.0039 in.)

3. Check the ring gear for damage, cracks, and wear, and replace if necessary.

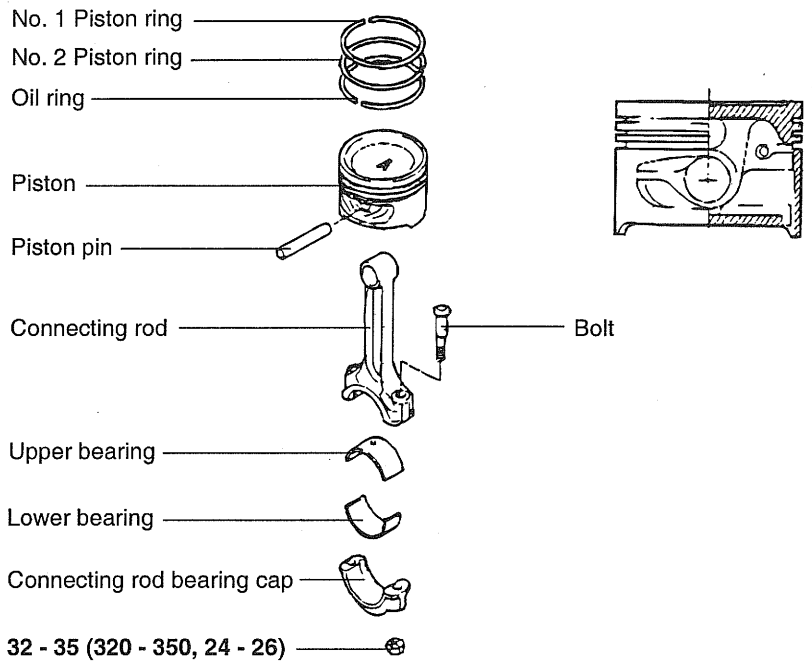
REASSEMBLY EDDA0330

1. Install the flywheel assembly and tighten the bolts to the specified torque.

Tightening torque
Flywheel bolt :
120-130Nm (1200-1300kg.cm, 89-96lb.ft)

PISTON

COMPONENTS EDKB3100



TORQUE : Nm (kg.cm, lb.ft)

EDDA034A

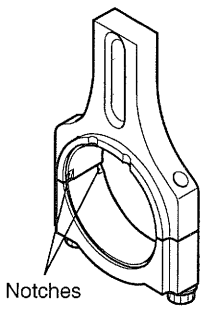
DISASSEMBLY EDKB3200

CONNECTING ROD CAP

⚠ ***CAUTION***

Keep the bearings in order with their corresponding connecting rods (according to cylinder numbers) for proper reassembly.

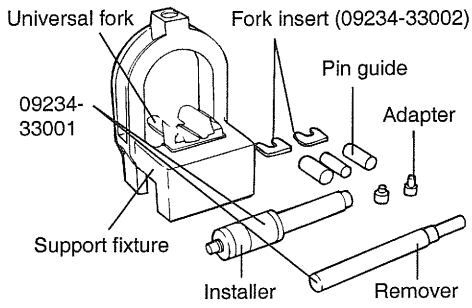
1. Remove the connecting rod cap bolts, then remove the caps and the big end lower bearing.
2. Push each piston connecting rod assembly toward the top of the cylinder.



KFW3049A

DISASSEMBLY AND REASSEMLY OF THE PISTON PIN

1. Using the special tools (09234-33001) and (09234-33002), disassemble and reassemble the piston and connecting rod.

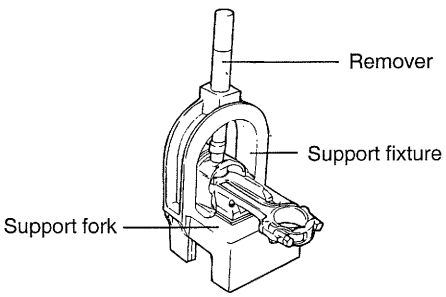


ECA9361A

2. The piston pin is press fit into the rod little end, and the piston floats on the pin.

3. The tool consists of a support fixture with fork inserts, guides, adapters, an installer and a remover. The piston is supported in the support fixture while the pin is being installed or removed. Guides help position the pin as it is installed or removed, while the rod is supported by fork inserts.

4. To remove the pin from the piston, place the piston in the support fixture with the rod resting on the fork inserts. Pass the remove tool through the top of the support fixture and use it to press out the pin.



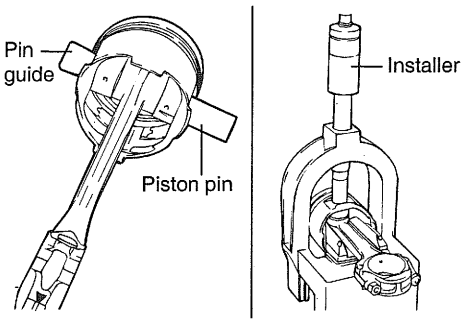
EDA9048A

5. To install a new pin, the proper fork inserts must be in place to support the rod.

6. Position the rod inside the piston. Insert the proper pin guide through one side of the piston and through the rod. Hand tap the pin guide so it is held by the piston. Insert the new pin into the piston from the other side and set the assembly into the support fixture with the pin guide facing down.

NOTE

The pin guide should be centered on the connecting rod through the piston. If assembled correctly, the pin guide will sit exactly under the center of the hole in the tool's arch, and rest evenly on the fork inserts. If the wrong size pin guide is used, the piston and pin will not line up with the support fixture.

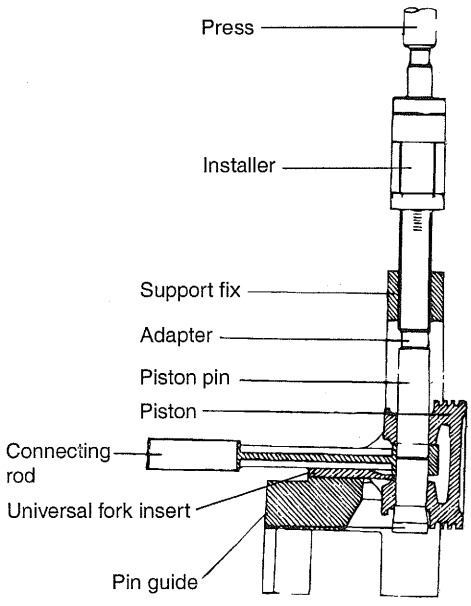


ECA9361C

7. Insert the installer tool through the hole in the arch of the support fixture and use an hydraulic press to force the piston pin through the rod little end. Continue pressing until the pin guide falls free and the installer tool seats against the top of the arch.

CAUTION

Do not exceed 1250 ± 500 kg (2765 ± 1102 lb) of force when the installing tool seats against the top of the arch.



HEW20A55

INSPECTION EDKB3300

PISTONS AND PISTON PINS

1. Check each piston for scuffing, scoring, wear and other defects. Replace any piston that is defective.
2. Check each piston ring for breakage, damage and abnormal wear. Replace the defective rings. When the piston requires replacement, its rings should also be replaced.
3. Check that the piston pin fits in the piston pin hole. Replace any piston and pin assembly that is defective. The piston pin must be smoothly pressed by hand into the pin hole (at room temperature).

PISTON RINGS

1. Measure the piston ring side clearance. If the measured value exceeds the service limit, insert a new ring in the ring groove to measure the side clearance. If the clearance still exceeds the service limit, replace the piston and rings together. If it is less than the service limit, replace the piston rings only.

Piston ring side clearance
No.1 : 0.04-0.085 mm (0.0016-0.0033 in.)
No.2 : 0.04-0.085 mm (0.0016-0.0033 in.)
[Limit]
No.1 : 0.1 mm (0.004 in.)
No.2 : 0.1 mm (0.004 in.)

2. To measure the piston ring end gap, insert a piston ring into the cylinder bore. Position the ring at right angles in 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.

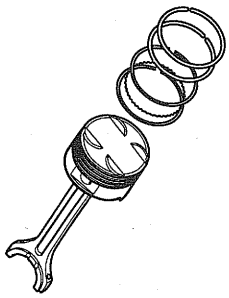
Piston ring end gap
[Standard dimensions]
No.1 : 0.20-0.35 mm (0.0079 - 0.0138 in.)
No.2 : 0.30-0.45 mm (0.0118 - 0.0177 in.)
Oil ring side rail : 0.2-0.7 mm (0.0079-0.0276)
[Limit]
No.1, No.2 : .1.0 mm (0.039 in.)
Oil ring side rail : 1.0 mm (0.039 in)

When replacing the ring without correcting the cylinder bore, check the gap with the ring situated at the low part of cylinder that is less worn out.

Piston ring service size and mark	
standard	None
0.25mm (0.010 in.) O.S	25
0.50mm (0.020 in.) O.S	50
0.75mm (0.030 in.) O.S	75
1.00mm (0.039 in.) O.S	100

NOTE

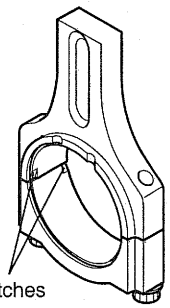
The mark can be found on the upper side of the ring next to the end.



KFW3037C

CONNECTING RODS

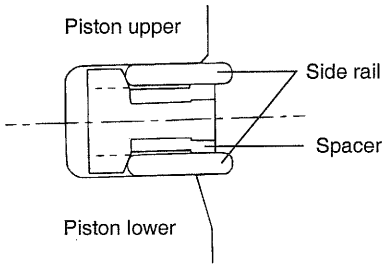
1. When the connecting rod cap is installed, make sure that the cylinder numbers, marked on rod end cap at disassembly, match. When a new connecting rod is installed, make sure that the notches holding the bearing in place are on the same side.
2. Replace the connecting rod if it is damaged at either end of the thrust faces. If it has a stratified wear in, or if the surface of the inside diameter of the small end is severely rough, replace the rod.



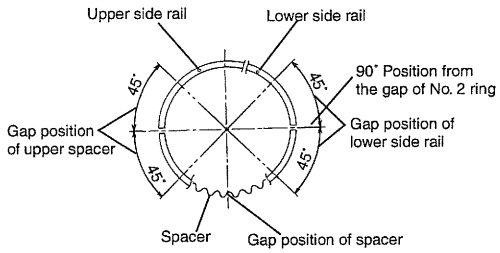
KFW3049A

REASSEMBLY EDKB3400

1. Install the spacer.



ECA9082A



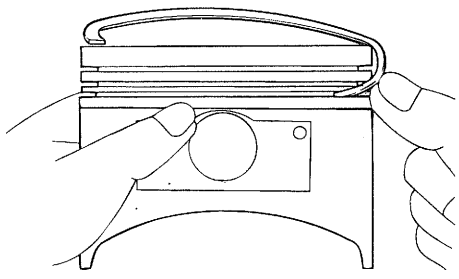
EDJA490A

2. Install the upper side rail. To install the side rail, first put one end of the side rail between the piston ring groove and spacer, hold it firmly, and press down with a finger on the portion to be inserted into the groove (as illustrated).

⚠ ***CAUTION***

Do not use a piston ring expander when installing side rail.

3. Install the lower side rail by the same procedure described in Step 2.

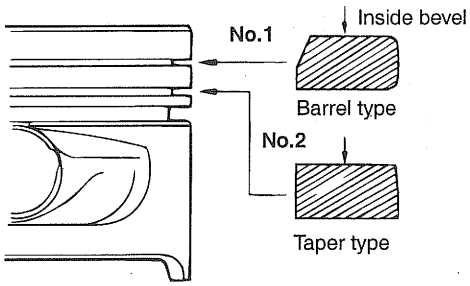


ECA9380B

4. Apply engine oil around the piston and piston grooves.

5. Using a piston ring expander, install the No.2 piston ring.

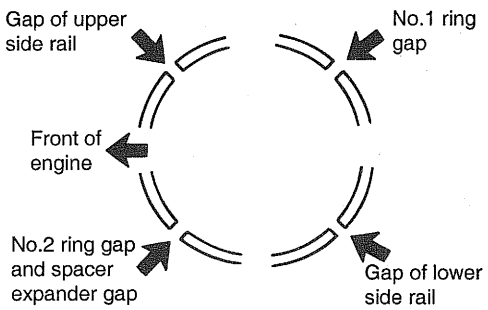
6. Install the No. 1 piston ring.



EDDA037B

7. Position each piston ring end gap as far away from its neighboring gaps as possible. Make sure that the gaps are not positioned in the thrust and pin directions.

8. Hold the piston rings firmly with a piston ring compressor as they are inserted into cylinder.



ECA9380D

9. Install the upper main bearings in the cylinder block.

10. Install the lower main bearings in the main bearing caps.

11. Make sure that the front mark of the piston and the front mark (identification mark) of the connecting rod are directed toward the front of the engine.

12. When a new connecting rod is installed, make sure that the notches for holding the bearing in place are on the same side.

13. When assembling, bolts should be fastened by the angle - torque controlled method as the following.

    1) Apply oil to the thread of nuts and spot areas.

    2) Tighten the connecting rod bolt.

Tightening torque

Connecting rod cap nut :

32-35 Nm (320-350 kg.cm, 24-26 lb.ft)

⚠ ***CAUTION***

After removing the connecting rod bolt, do not use if again.
When using a new bolt, do not tighten the bolt more than 3 times.

14. Check the connecting rod side clearance.

Connecting rod side clearance

Standard : 0.10-0.25 mm (0.0039-0.0098 in.)

Limit : 0.4 mm (0.0157 in.)

15. Install the oil screen.

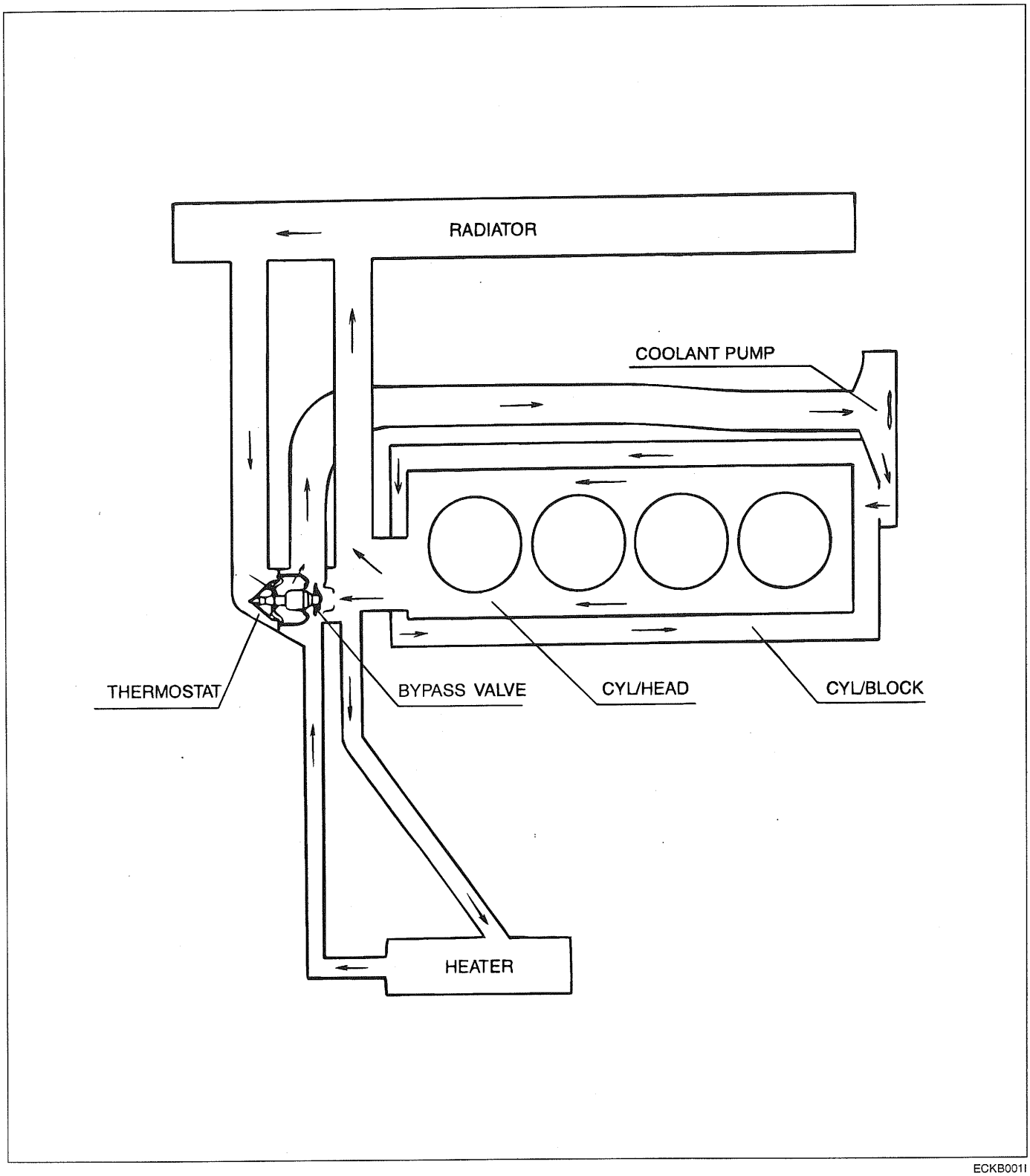
16. Install the oil pan

17. Install the cylinder head.

COOLING SYSTEM

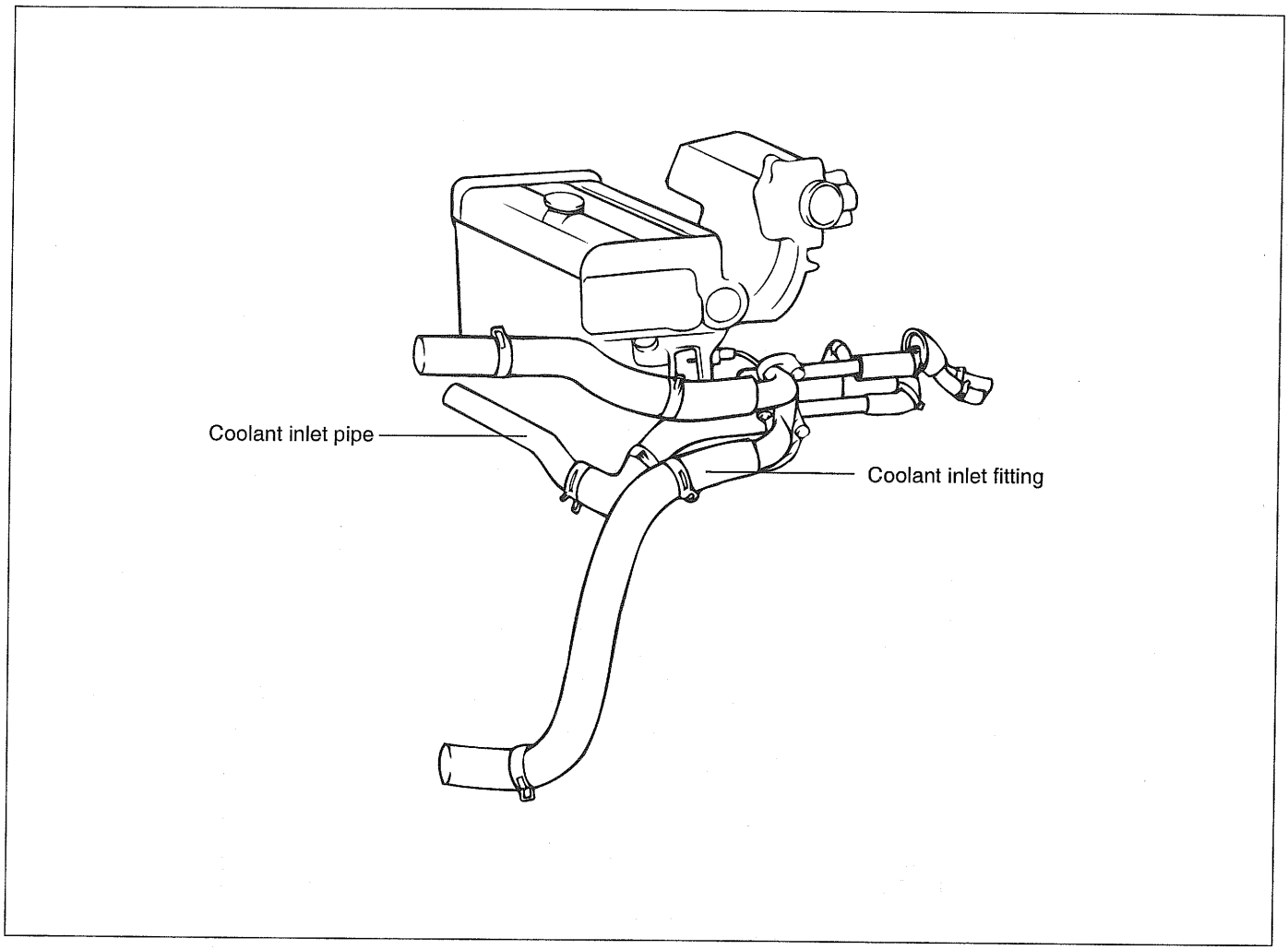
ENGINE COOLANT HOSE/PIPES

COOLING SYSTEM EDKB3500



ECKB0011

COMPONENTS EDDA0430



EDDA043A

INSPECTION EDDA0440

Check the coolant pipe and hoses for cracks, damage, or restrictions.

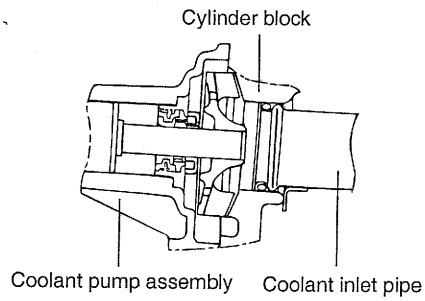
Replace if necessary.

REASSEMBLY EDKB3800

1. Fit on O-ring in the groove provided at the coolant inlet pipe end, wet the O-ring with coolant and insert the coolant inlet pipe.

NOTE

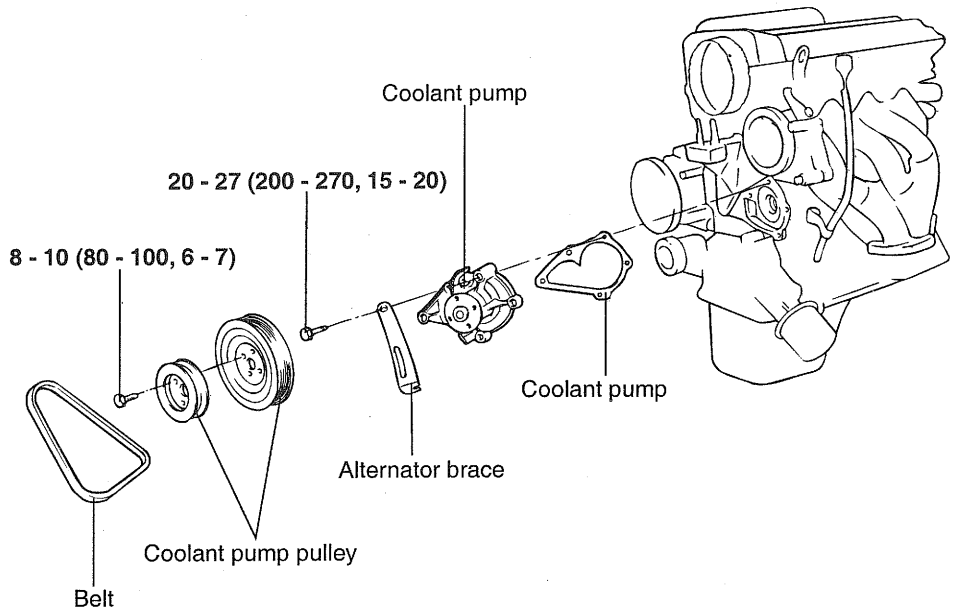
1. *Do not apply oil or grease to the coolant pipe O-ring.*
2. *Keep the coolant pipe connections free of sand, dust, etc.*
3. *Insert the coolant pipe fully into the cylinder block.*
4. *Do not reuse the O-ring. Replace it with a new part.*



ECKA040A

ENGINE COOLANT PUMP

COMPONENTS EDKB3900



TORQUE : Nm (kg.cm, lb.ft)

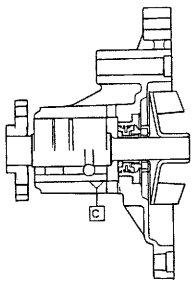
EDDA046A

DISASSEMBLY EDKB4000

1. Drain the coolant and disconnect the coolant inlet pipe connection hose from the coolant pump.
2. Remove the drive belt and engine coolant pump pulley.
3. Remove the timing belt covers and the timing belt idler.
4. Remove the coolant pump mounting bolts, then remove the alternator brace.
5. Remove the coolant pump assembly from the cylinder block.

INSPECTION EDKB4100

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 then the seal is defective. Replace the coolant pump assembly.



EDKB051A

REASSEMBLY EDKB4200

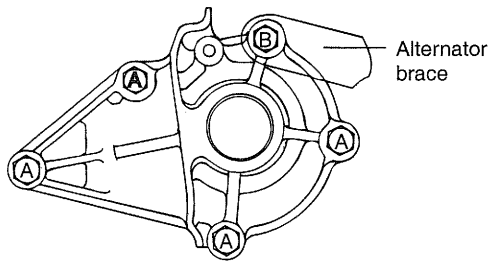
1. Clean the gasket surfaces of the coolant pump body and the cylinder block.
2. Install a new coolant pump gasket to the coolant pump and tighten the bolts to the specified torque.

Tightening torque

Coolant pump to cylinder block :

A : 12-15Nm (120-150kg.cm, 9-11lb.ft)

B : 20-27Nm (200-270kg.cm, 15-20 lb.ft)

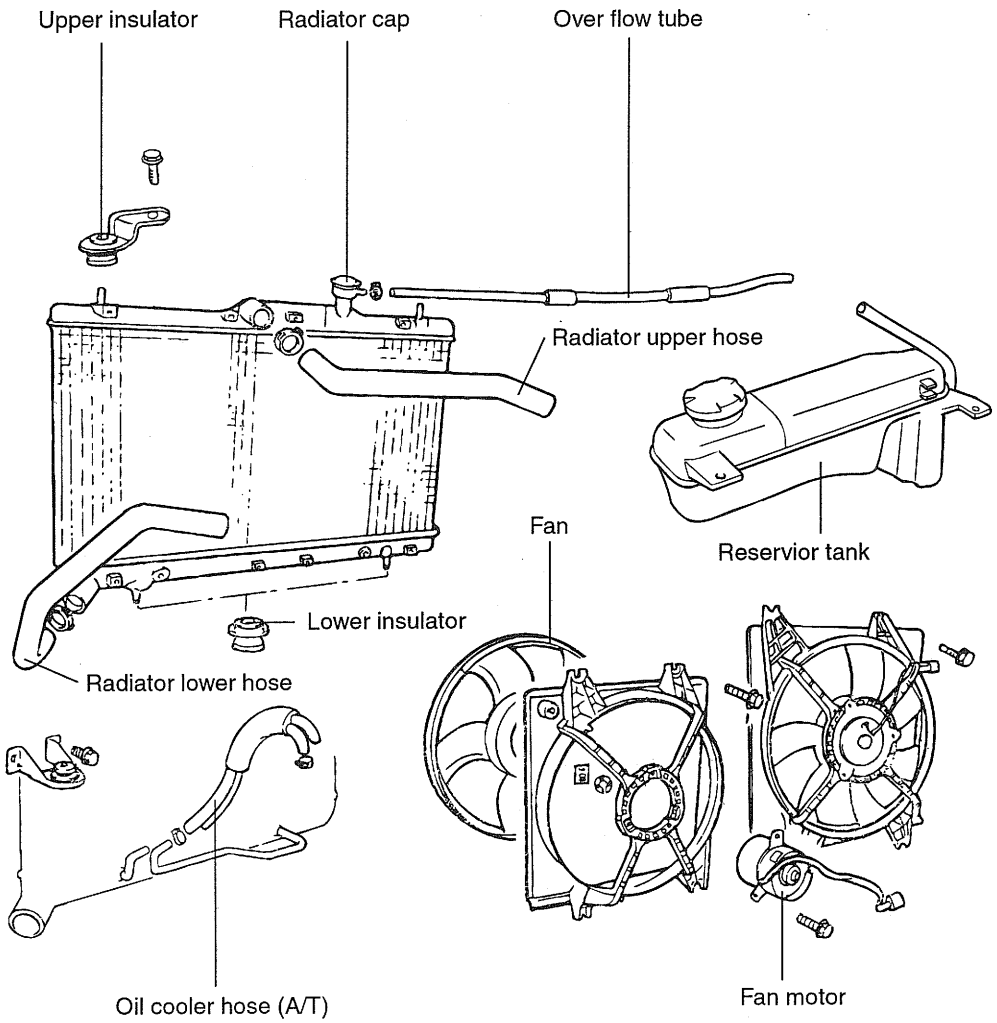


ECKA040B

3. Install the timing tensioner and timing belt. Adjust the timing belt tension.
4. Install the timing belt covers.
5. Install the coolant pump pulley and drive belt, and then adjust the belt tension.
6. Refill the system with clean coolant.
7. Run the engine and check for leaks.

RADIATOR

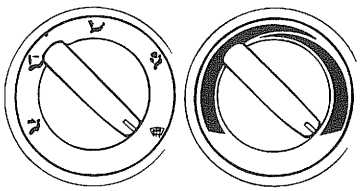
COMPONENTS ECNC4300



EDNB005A

DISASSEMBLY EDKB4400

1. Disconnect the radiator fan motor connector.
2. Set the temperature of the heater control to the hot position.



ECDA063A

3. Loosen the radiator drain plug to drain coolant.
4. Disconnect the upper and lower hose and overflow tube.
5. For vehicles with automatic transmission, disconnect the oil cooler hoses from the automatic transmission.

⚠ ***CAUTION***

Plug the ends of the oil cooler hoses and the automatic transmission fittings to prevent transmission fluid from spilling out and foreign material from entering.

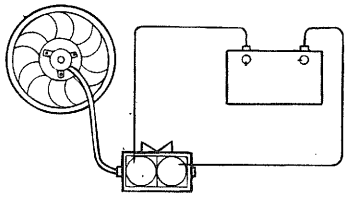
6. Remove the radiator mounting bolts.
7. Remove the radiator together with the fan motor.
8. Remove the fan motor from the radiator.

INSPECTION EDKB4500

1. Check the radiator for bent, broken or plugged fins.
2. Check the radiator for corrosion, damage, rust or scale.
3. Check the radiator hoses for cracks, damage or deterioration.
4. Check the reservoir tank for damage.
5. Check the radiator cap spring for damage.
6. Test the pressure of the cap using a cooling system checker
7. Check the radiator cap seal for cracks or damage.

RADIATOR FAN MOTOR

1. Check that the radiator fan rotates when the battery voltage is applied to the terminals.



ECDA064A

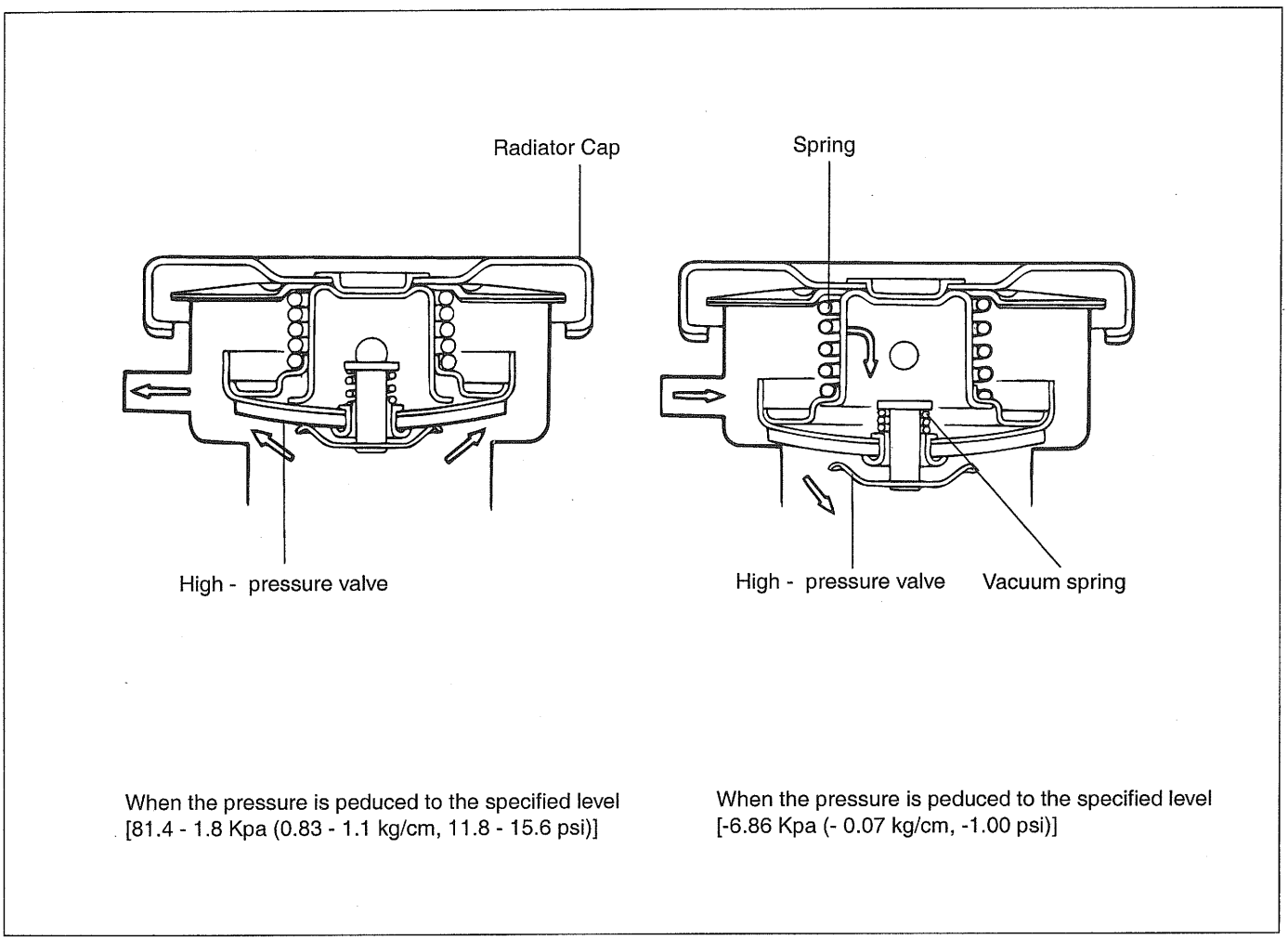
2. Check that abnormal noises are not produced while the motor is turning.

REASSEMBLY EDDA0530

1. Fill the radiator and reservoir tank with clean coolant mixture.
2. Run the engine until the thermostat opens, and then stop the engine.
3. Remove the radiator cap, and add coolant up to the filler neck of the radiator, and then fill the reservoir tank to the upper level. Replace the radiator cap.
4. Check that there are no leaks from the radiator, hoses or connections.

RADIATOR CAP

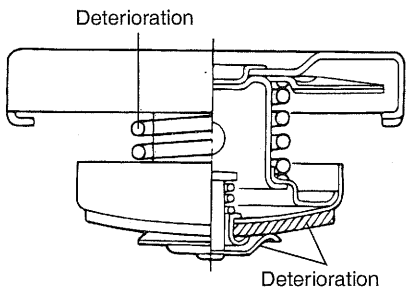
COMPONENTS ECKB4700



ECDA066A

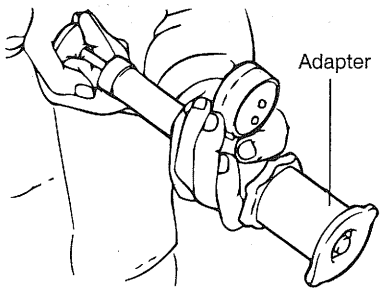
INSPECTION ECKB4800

1. Check the radiator cap for damage, cracks and deterioration.



ECDA068A

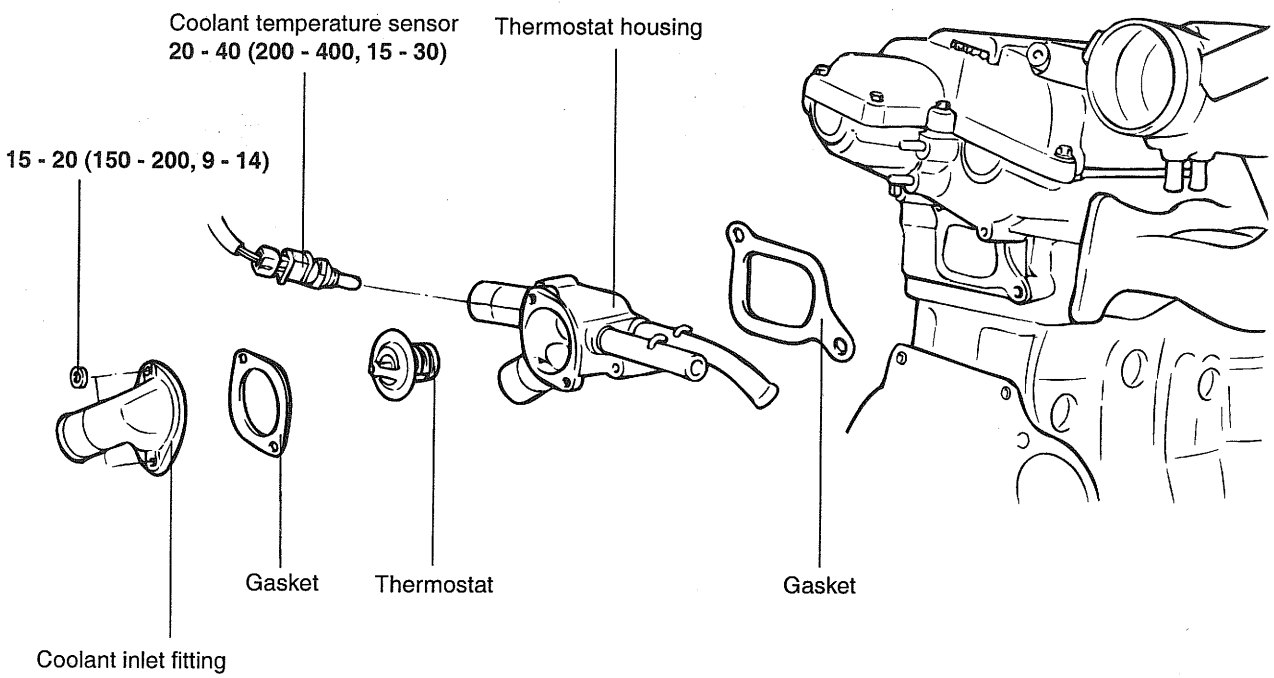
2. Attach a radiator cap tester to the radiator.
3. Pump the tester until the pointer stabilizes.
4. If the pointer stays constant for 10 sec. at a point exceeding the service limit, the radiator cap is good.



ECDA068B

THERMOSTAT

COMPONENTS ECKB4900



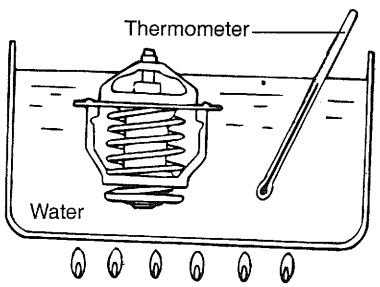
TORQUE : Nm (kg.cm, lb.ft)

ECKB040D

DISASSEMBLY AND INSPECTION ECNC5000

1. Drain the coolant so its level is below thermostat.
2. Remove the inlet fitting and gasket.
3. Remove the thermostat.
4. Immerse thermostat in hot coolant to check proper valve opening temperature. Replace if necessary.

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



ECDA070A

COOLANT TEMPERATURE SENSOR

1. Heat the sensor by submerging it in hot engine coolant.
2. Check that the resistance is within the specified range.

Resistance

At : 20 °C(68 °F) : 2.31 - 2.59 kΩ

REASSEMBLY ECKB5100

1. Check that the flange of the thermostat is correctly seated in the socket of the thermostat housing.
2. Install a new gasket and the coolant inlet fitting.
3. Refill the system with clean coolant.

Tightening torque

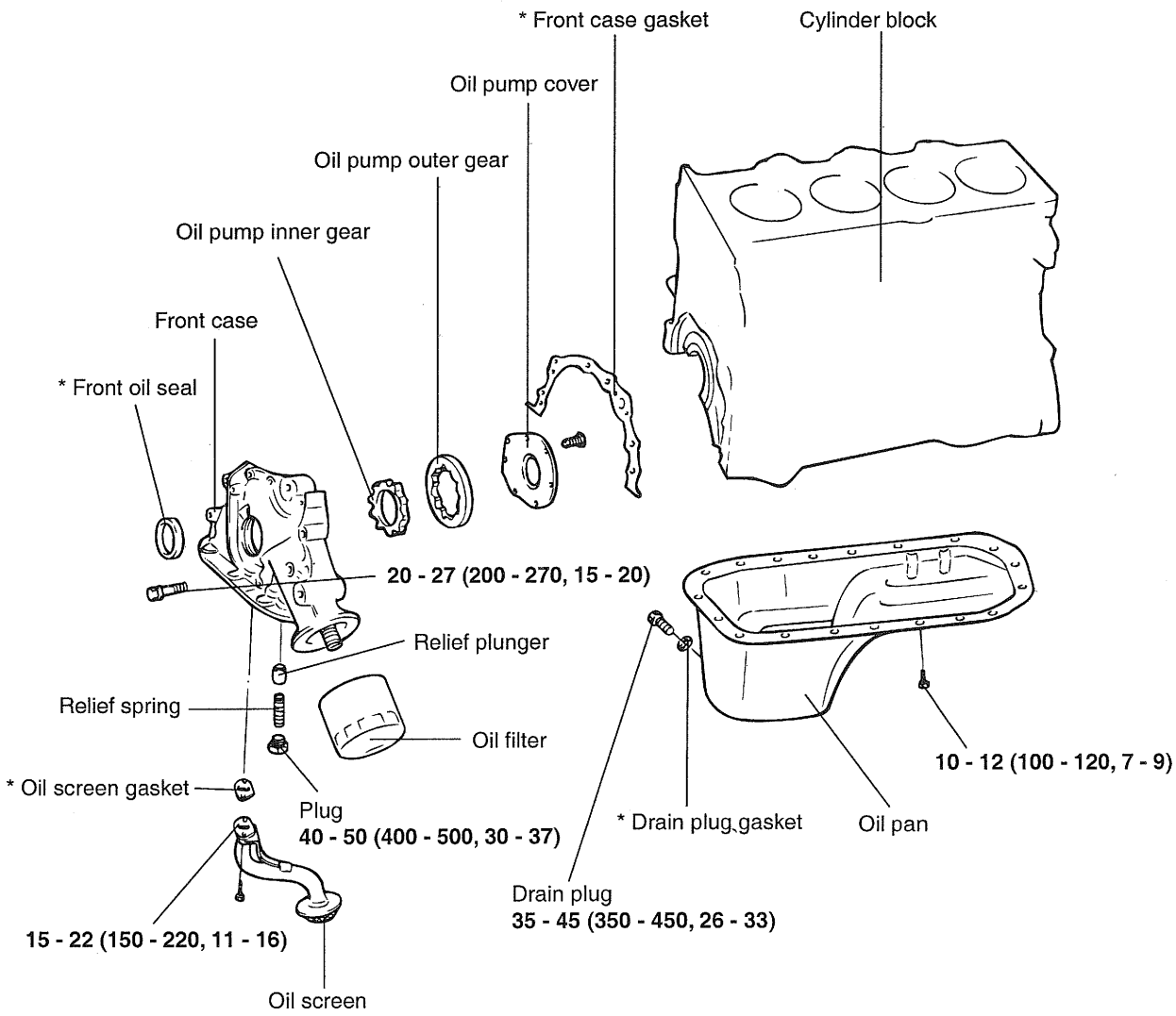
Coolant temperature sensor :

20 - 40 Nm (200 - 400 kg.cm, 15 - 30 lb.ft)

LUBRICATION SYSTEM

OIL PUMP

COMPONENTS ECKB5200



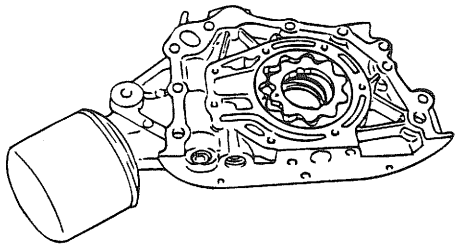
*** Replace the gasket and seal with new ones after removal.**

TORQUE : Nm (kg.cm, lb.ft)

EDDA012A

DISASSEMBLY ECKB5300

1. Remove the timing belt.
2. Remove all the oil pan bolts.
3. Remove the oil pan.
4. Remove the oil screen.
5. Remove the front case assembly.



ECDA020A

6. Remove the oil pump cover.
7. Remove the inner and outer gears from the front case. The matching marks on the inner and outer gears indicate the direction of installation.
8. Remove all the oil pan bolts.

INSPECTION EDKB5400

FRONT CASE

1. Check the front case for cracks or damage. Replace as necessary.
2. Check the front oil seal for worn or damaged lips. Replace if defective.

OIL PAN AND OIL SCREEN

1. Check the oil pan for failure, damage or cracks. Replace if defective.
2. Check the oil screen for failure, damage and cracks and replace if defective.

FRONT CASE AND OIL PUMP COVER

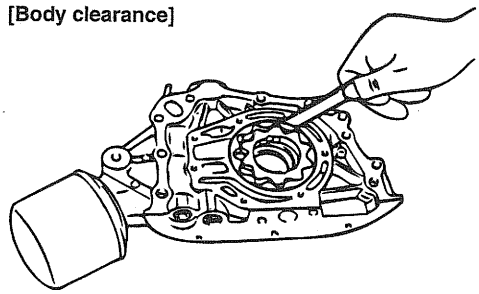
Check the surfaces contacting the gears for damage or wear.

OIL PUMP GEARS

1. Check the gear tooth surfaces for wear or damage.
2. Measure the clearance between outer gear and front case.

Body clearance : 0.12 - 0.185 mm (0.0047- 0.0073 in.)
Tip clearance : 0.025 - 0.069 mm (0.0010- 0.0027 in.)
Side clearance Outer gear : 0.04 - 0.09 mm (0.0016- 0.0035 in.) Inner gear : 0.04 - 0.085 mm (0.0016- 0.0033 in.)

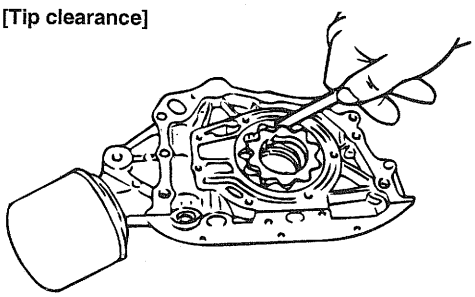
[Body clearance]



EDDA066A

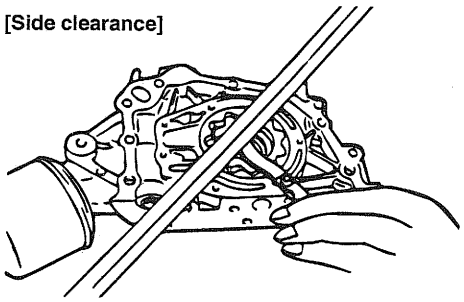
3. Check the tip clearance on the pump roter.

[Tip clearance]

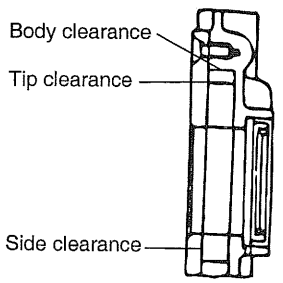


EDDA066B

[Side clearance]



A5EM048C



EDDA066D

RELIEF VALVE AND SPRING

1. Check sliding condition of the relief valve inserted in the front case.
2. Inspect for distorted or broken relief valve spring.

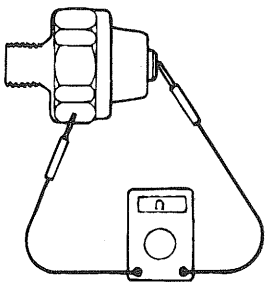
Standard value

Free height : 46.6 mm (1.8346 in.)

Load : 6.1 kg/40.1 mm (13.42 lb/1.578 in.)

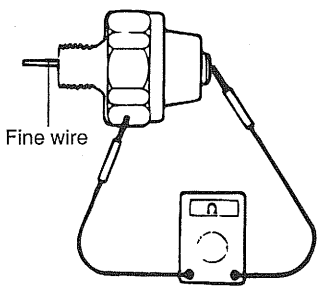
OIL PRESSURE SWITCH

1. Use an ohmmeter to check the continuity between the terminal and the body. If there is no continuity, replace the oil pressure switch.



EDDA061A

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 50 kPa (7 psi) vacuum is applied through the oil hole, the switch is operating properly.
   Check for air leaks. If air does leak, the diaphragm is broken. Replace the switch.



EDDA061B

REASSEMBLY EDKB5500

OIL PUMP

1. Install the outer and inner gears into the front case. Make sure that the inner and outer gears are installed in the same direction as shown.
2. Install the oil pump cover and tighten the bolts to the specified torque. After the bolts have been tightened, check to ensure that the gear turns smoothly.

Tightening torque

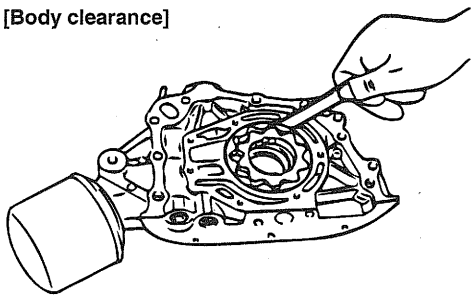
Oil pump cover bolt : 8-12 Nm (80-120 kg.cm, 6-9 lb.ft)

3. Install the relief valve and spring. Tighten the plug to the specified torque. Apply engine oil to the relief valve.

Relief valve plug :

40-50 Nm (400-500 kg.cm, 30-37 lb.ft)

[Body clearance]



EDDA066A

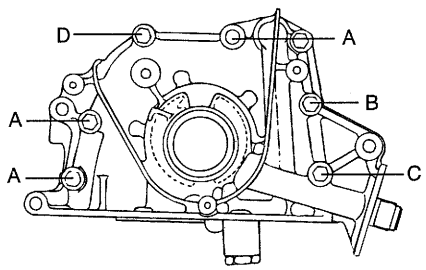
FRONT CASE

1. Install the front case assembly with a new gasket, and tighten the bolts to the specified torque.

Tightening torque :

20 - 27 N.m (200 - 270 kg.cm, 15 - 20 lb.ft)

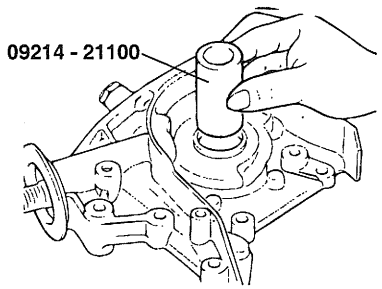
Length
A : 30 mm (1.18 in.)
B : 45 mm (1.77 in.)
C : 60 mm (2.36 in.)
D : 22 mm (0.89 in.)



ECKA020E

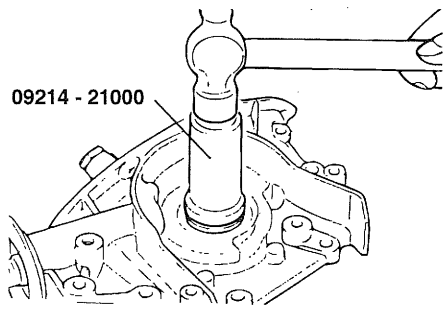
OIL SEAL

1. Using the special tool, Crankshaft oil seal guide(09214 - 21100), install the oil seal.



EDDA018B

2. Using the special tool, Crankshaft front oil seal installer (09214-21000), install the oil seal.

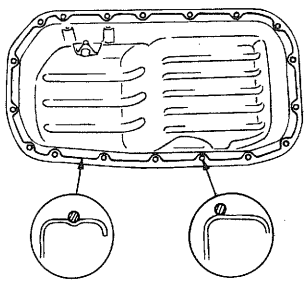


EDDA018C

3. Install the oil screen.
4. Clean both gasket surfaces of the oil pan and the cylinder block.
5. Apply sealant into the groove of the oil pan flange as shown.

⚠ ***CAUTION***

- ***Apply sealant approx. 4mm (0.16 in.) in thickness.***
- ***After application of sealant, do not exceed 15 minutes before installing the oil pan.***



ECDA018D

6. Install the oil pan and tighten the bolts to the specified torque.

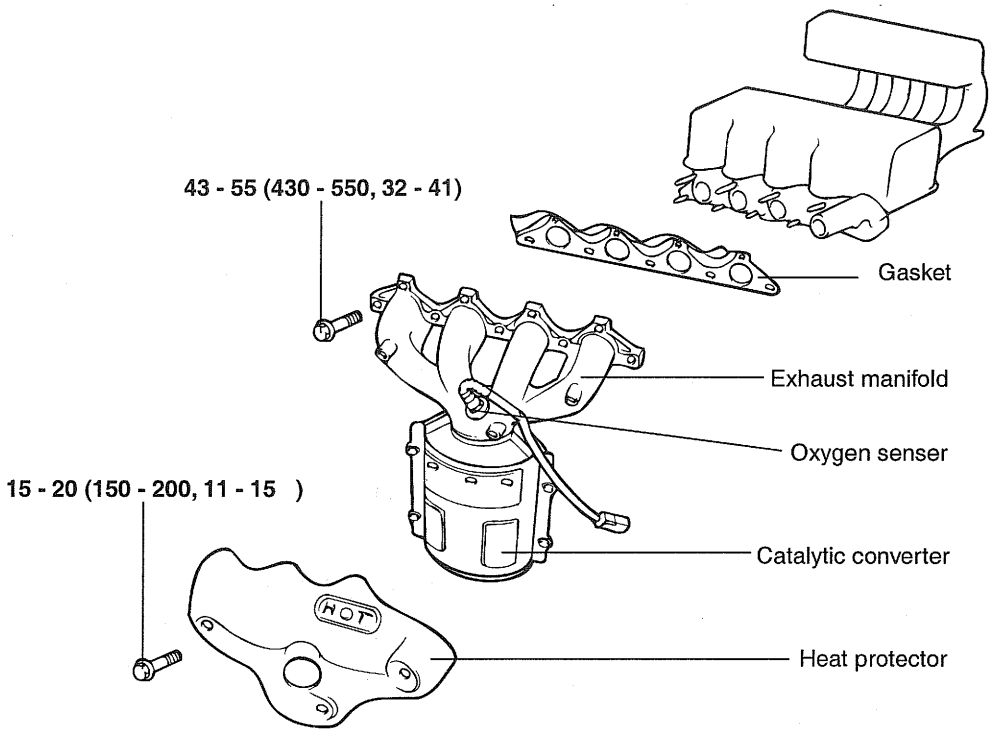
Tightening torque

Oil pan bolt : 10-12 Nm (100-120 kg.cm, 7-9 lb.ft)

INTAKE AND EXHAUST SYSTEM

EXHAUST MANIFOLD

COMPONENTS ECKB5600



*** Replace the lock nuts with new ones after removal.**

TORQUE : Nm (kg.cm, lb.ft)

ECKA050A

DISASSEMBLY ECKB5700

1. Remove the exhaust manifold heat protector.
2. Remove the exhaust manifold assembly from the cylinder head.
3. Remove the exhaust manifold gasket.

INSPECTION ECKB5800

EXHAUST MANIFOLD

1. Check for damage or cracking.
2. Check for damage or cracking of welding between exhaust manifold and converter.

REASSEMBLY ECKB5900

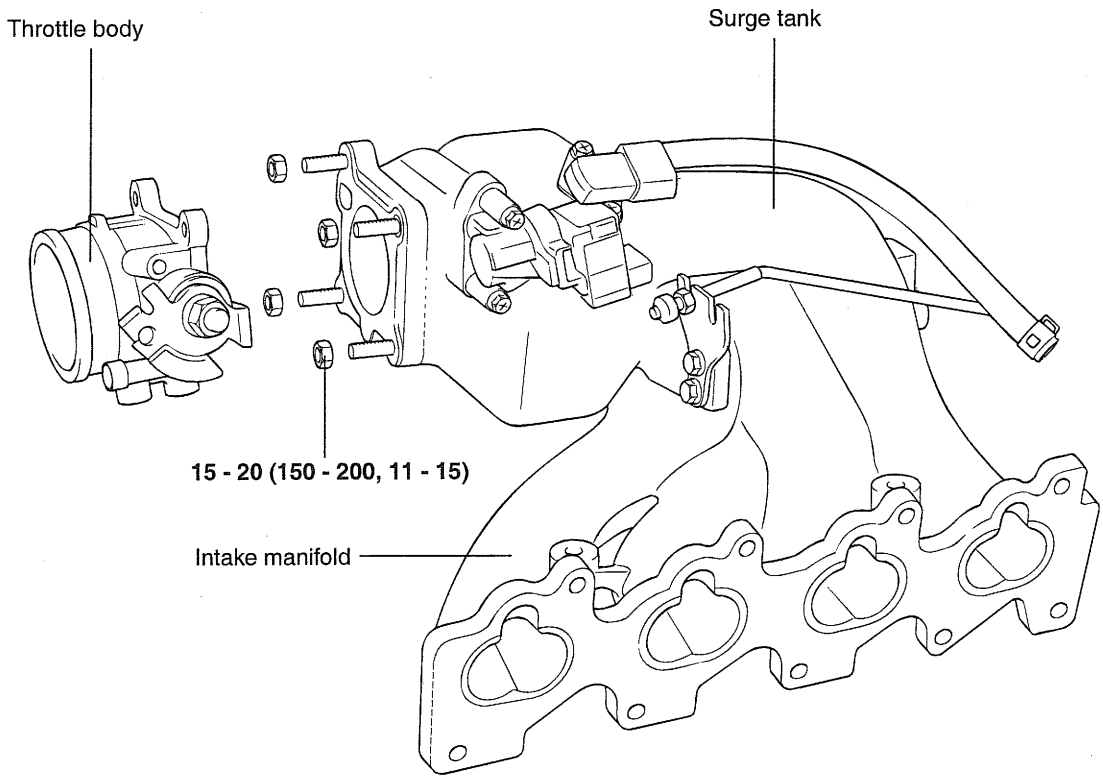
Install the exhaust manifold in the reverse order of removal.

⚠ *CAUTION*

Replace the exhaust manifold gasket and lock nut when reassembling.

INTAKE MANIFOLD

COMPONENTS ECNC6000

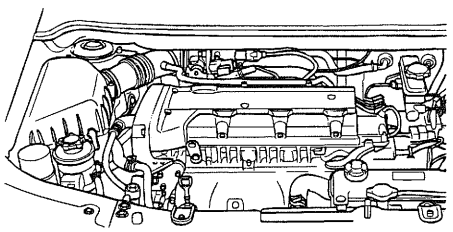


TORQUE : Nm (kg.cm, lb.ft)

EDNB006A

REMOVAL ECNC6100

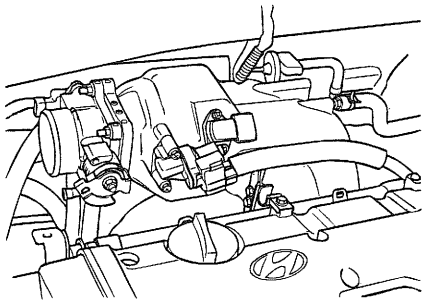
1. Remove the engine cover.



KDNB003C

2. Remove the intake air hose connected to the throttle body.

3. Remove the accelerator cable.
4. Remove the P.C.V. hose and brake booster vacuum hoses.
5. Disconnect the vacuum hose connections, ISA and TPS connector.

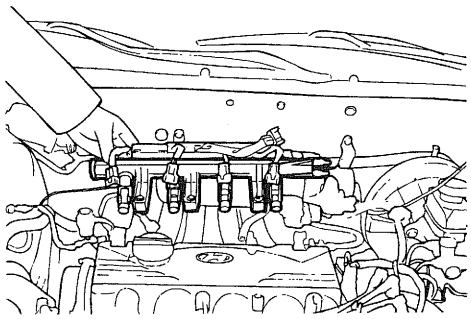


KDNB006B

6. Disconnect the high pressure fuel hose connection after relieving pressure in the fuel rail to prevent fuel from spilling.
7. Remove the intake manifold.
8. Remove the intake manifold assembly and gasket.
9. Disconnect the fuel injector harness connector.
10. Remove the delivery pipe with the fuel injectors.

⚠ ***CAUTION***

Be careful not to drop the injectors when removing the delivery pipe.



ECDA088B

INSPECTION ECKB6200

INTAKE MANIFOLD

Check the parts for damage or cracking.

AIR HOSE

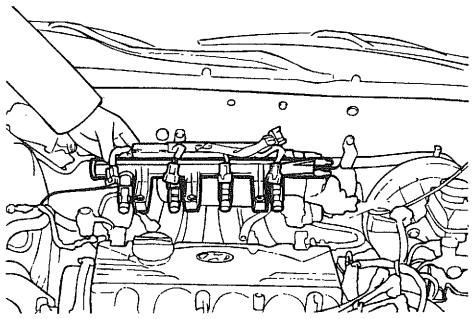
Check for damage or cracking of any part.

INSTALLATION ECKB6300

1. Replace the intake manifold gasket and install the intake manifold.

⚠ ***CAUTION***

Be careful not to drop the injectors when removing the delivery pipe.

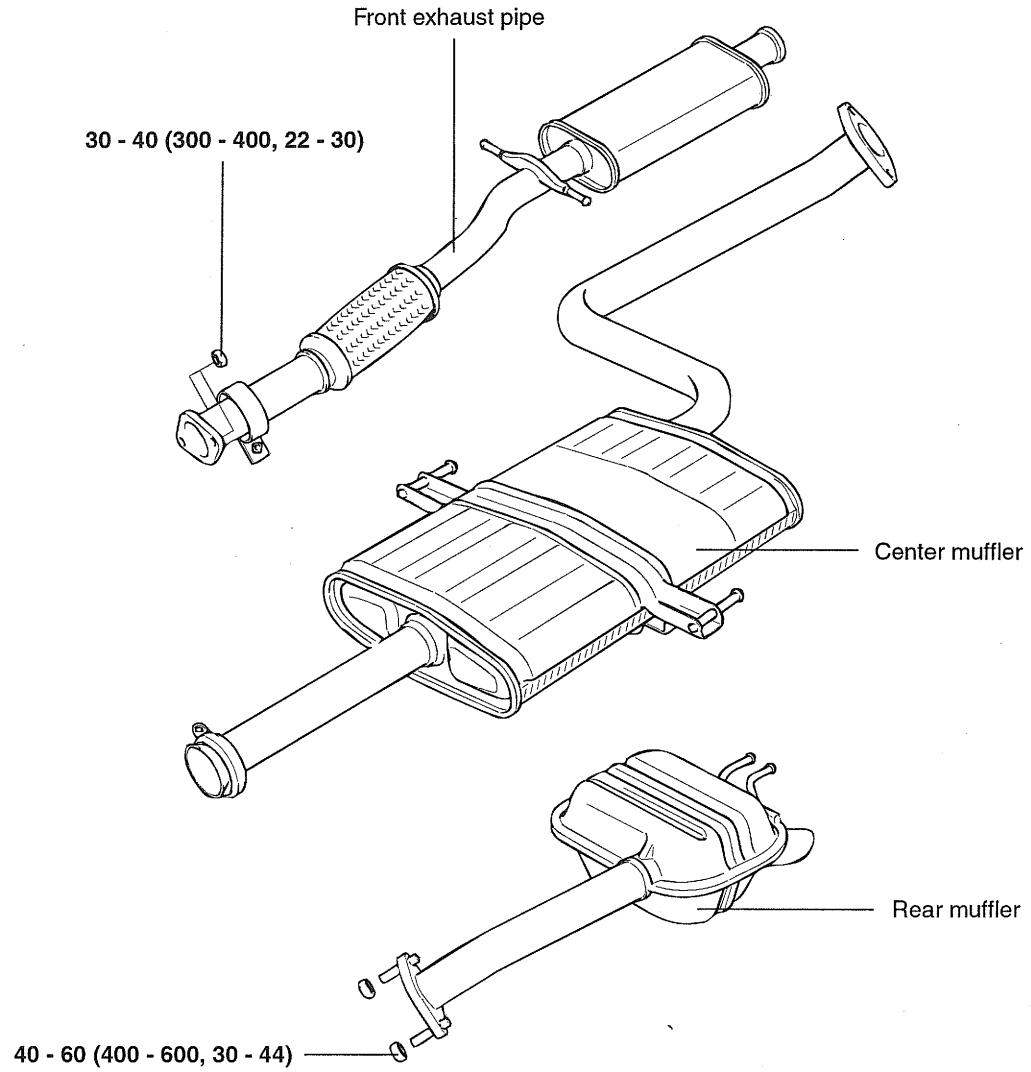


ECDA088B

2. Install the delivery pipe with the fuel injectors.
3. Connect the fuel injector harmess connector.
4. Install the intake manifold stay.
5. Connect the high pressure fuel hose connection.
6. Install the P.C.V hose and brake booster vacuum hose.
7. Install the intake air hose to the throttle body.
8. Install the accelorator cable.
9. Connect the ISA and TPS wire harness connector.

MUFFLER

COMPONENTS ECNC6400



TORQUE : Nm (kg.cm, lb.ft)

EDNB007A

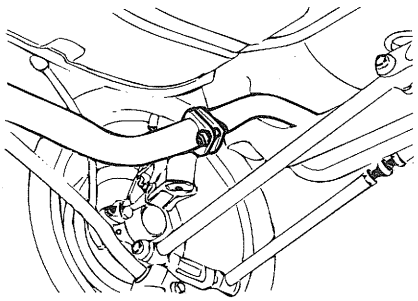
REMOVAL ECNC6500

REAR MUFFLER

CAUTION

Before removing or inspecting the exhaust system, ensure that the exhaust system is cool.

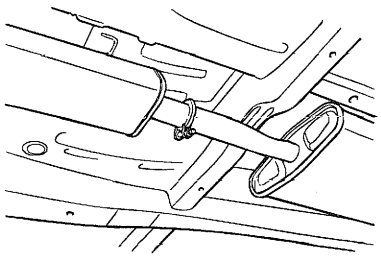
1. Disconnect the rear muffler from the center muffler.
2. Remove the rubber hangers and remove the rear muffler.



KDNB007C

CENTER MUFFLER

1. Remove the center muffler assembly from the rear muffler and front exhaust pipe.

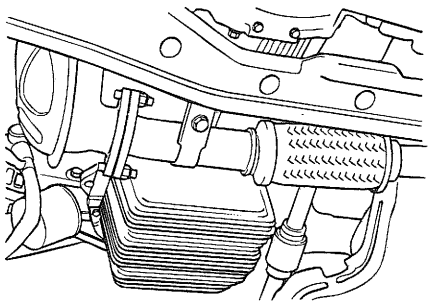


KDNB007B

2. Remove the rubber hanger, then remove the center muffler.

FRONT EXHAUST PIPE

1. Remove the front exhaust pipe clamp bolts. and remove the front exhaust pipe nuts from the catalytic converter.
2. Remove the front exhaust pipe and center muffler bolt.



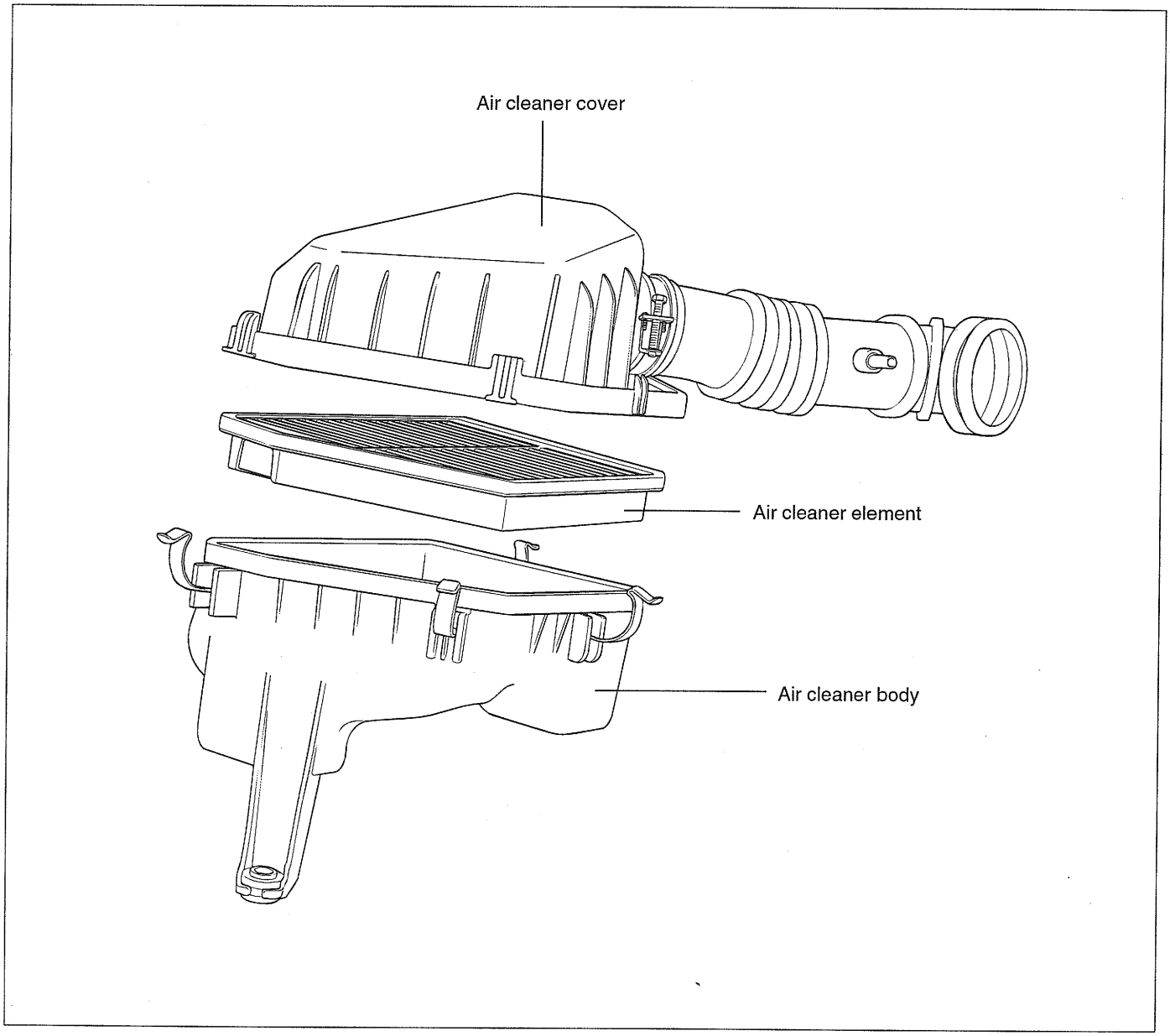
KDNB003B

INSTALLATION ECNC6600

1. Temporarily install the front exhaust pipe, the center exhaust pipe, and the rear muffler, in that order.
2. Tighten the parts securely. Make sure there is no interference with any body components.

AIR CLEANER (ACL)

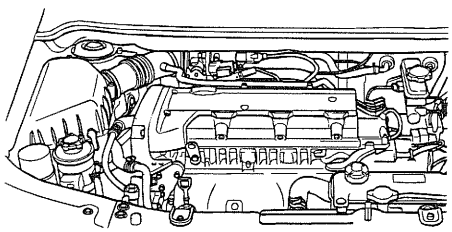
COMPONENTS ECNC6700



EDNB008A

REMOVAL ECNC6800

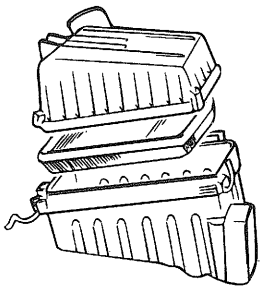
1. Remove the air duct connected to the air cleaner.
2. Remove the air intake hose at the air cleaner side.
3. Remove the air cleaner cover and filter.
4. Remove the air cleaner mounting bolts and remove the air cleaner.



KDNB003C

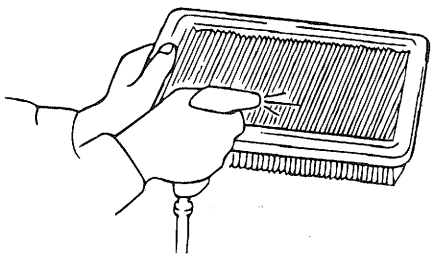
INSPECTION ECKB6900

1. Check the air cleaner body, cover, or filter for distortion, corrosion or damage.
2. Check the air duct for damage.
3. Check the resonator for distortion or damage.



ECKA060B

4. Check the air cleaner filter for restriction, contamination or damage. If the filter is slightly restricted, remove the dust and other contaminants by blowing compressed air from the upper side through the filter.



EDDA080B

5. Check the air cleaner housing for restrictions, contamination or damage.

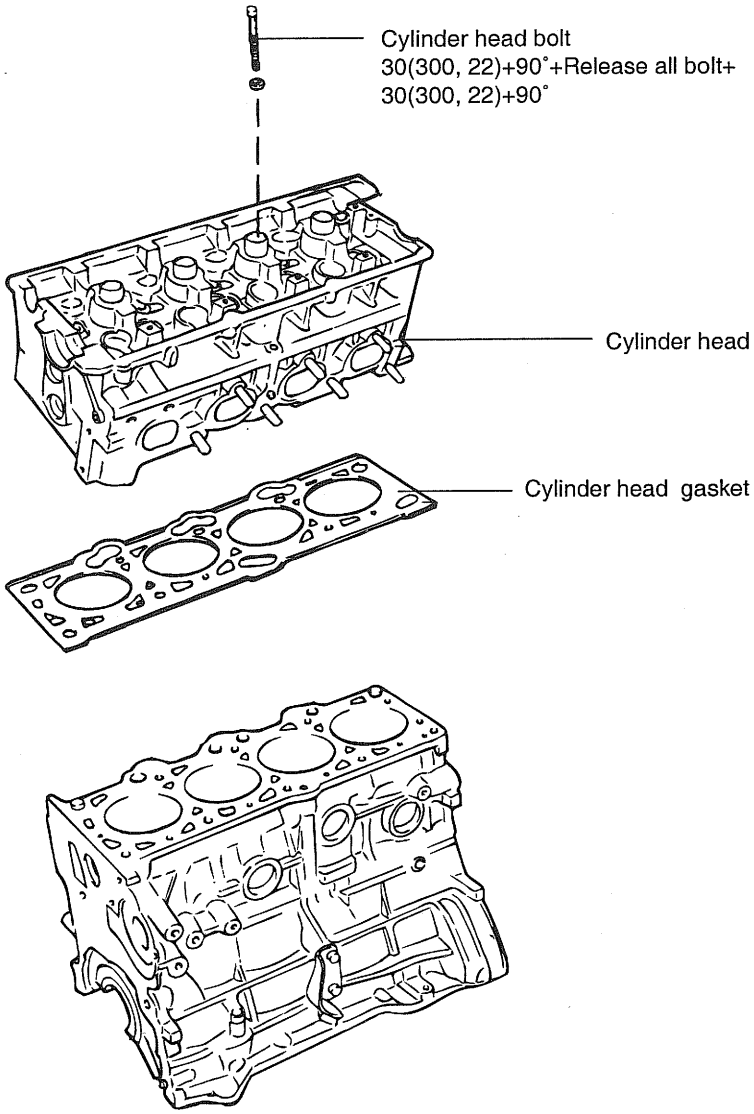
INSTALLATION ECKB7000

Install the air cleaner assembly following the reverse order of removal.

CYLINDER HEAD ASSEMBLY

CYLINDER HEAD

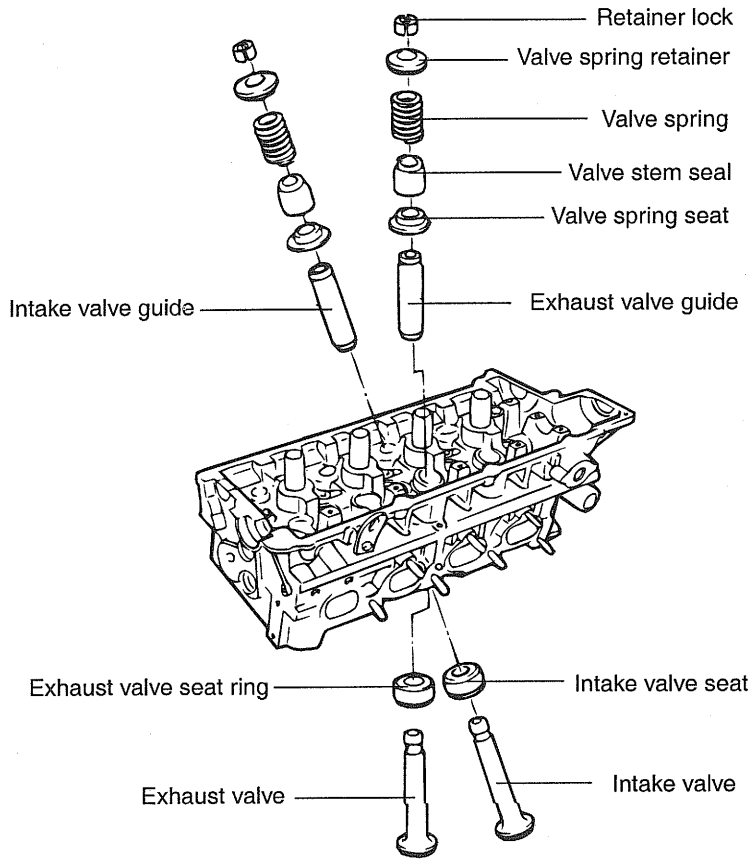
COMPONENTS EDNC7100



TORQUE : Nm (kg.cm, lb.ft)

EDNC777A

COMPONENTS ECKB7200



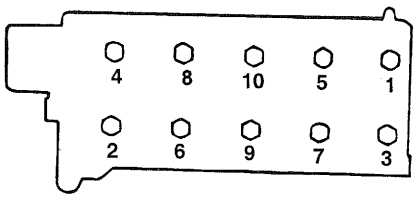
TORQUE : Nm (kg.cm, lb.ft)

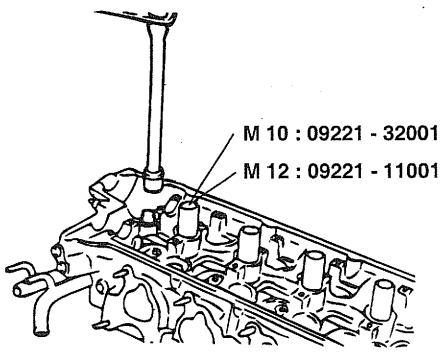
***Replace the seal with new one after removal**

EDKB050D

DISASSEMBLY EDNC7300

1. Using a special tool (09221-32001), remove the cylinder head bolts in the order shown in the illustration.



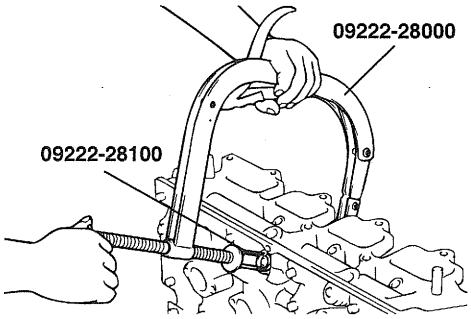


KDDB001L

2. Using the special tool (09222-28000, 09222-28100), remove the valve retainer lock. Next remove the spring retainer, valve spring, spring seat and valve.

NOTE

Arrange these parts so that they can be reinstalled in their original positions.

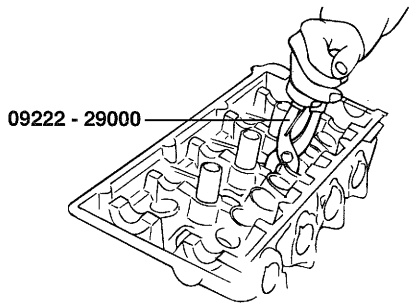


ECHA910B

3. Remove the valve stem seals with pliers.

NOTE

Do not reuse the valve stem seals.



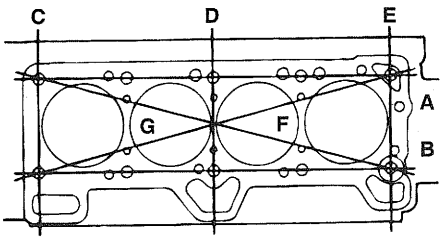
EDDA088B

INSPECTION EDKB7400

CYLINDER HEAD

1. Check the cylinder head for cracks, damage and coolant leakage. If cracked, replace the cylinder head.

2. Remove scale, sealing compound and carbon deposits completely. After cleaning the oil passages, apply compressed air to verify that the passages are not clogged.



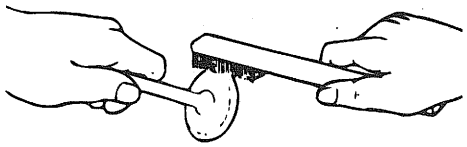
EDDA084A

3. Check the cylinder head surface for flatness in the direction as shown in the illustration. If flatness exceeds the service limit in any direction, either replace the cylinder head or machine the cylinder head matching surface lightly.

Flatness of cylinder head gasket surface
Standard : Less than 0.03mm(0.0012 in.)
Limit : 0.2 mm (0.008 in.)

VALVES

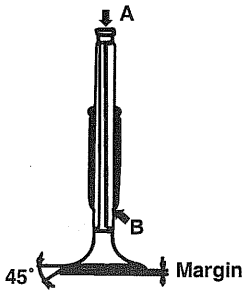
1. Using a wire brush, clean the valve thoroughly.



ECA9281A

2. Check each valve for wear, damage and distortion of the head and the stem at B Position. Replace, if necessary. If stem end, A, is hollowed out or worn, resurface as necessary. This correction must be limited to a minimum. Also resurface the valve face.
Replace the valve if the margin has decreased to less than the service limit.

Margin
[Standard]
Intake : 1.1 mm (0.043 in.)
Exhaust : 1.3 mm (0.051 in.)
[Limit]
Intake : 0.8 mm (0.028 in.)
Exhaust : 1.0 mm (0.040 in.)



ECA9281B

VALVE SPRINGS

1. Check the free height of each valve spring. If they exceed the service limit, replace the springs.
2. Using a square, test the squareness of each spring. If a spring is excessively out-of-square, replace it.

Valve spring

[Standard]

Free height : 44 mm (1.7323 in.)

Load :

21.6kg/35 mm (47.6 lb/1.0709 in.)

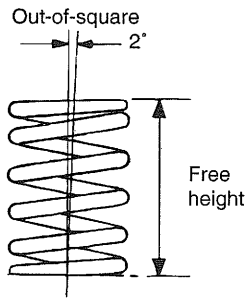
45.1 kg/27.2 mm (16 lb/1.0709 in.)

Out of square : 1.5° or less 100

[Limit]

Free height : - 1.0 mm (- 0.039 in.)

Out of square : 4°



ECA9281C

VALVE GUIDES

Check the valve stem-to-guide clearance. If the clearance exceeds the service limit, replace the valve guide with the next oversize part.

Valve stem-to-guide clearance

[Standard]

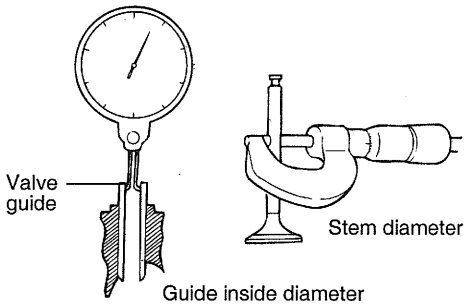
Intake : 0.03-0.06 mm (0.0012 -0.0024 in.)

Exhaust : 0.05-0.08 mm (0.0020-0.0031 in.)

[Limit]

Intake : 0.1mm(0.0040 in)

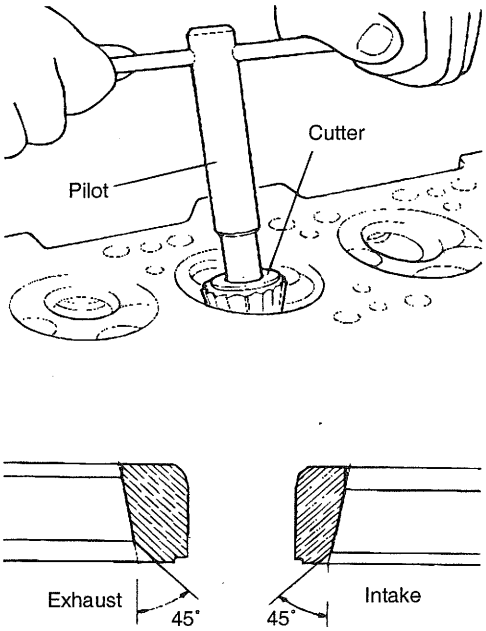
Exhaust : 0.15mm(0.0059 in.)



ECA9281D

RECONDITIONING VALVE SEAT

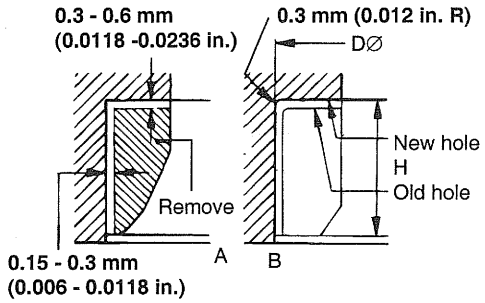
Check the valve seat for overheating and unequal contact with the valve face. Recondition or replace the seat if necessary. Before reconditioning the seat, check the valve guide for wear. If the valve guide is worn, replace it and then recondition the seat. Recondition the valve seat with a valve seat grinder or cutter. The valve seat contact width should be within specificatons and centered on the valve face. After reconditioning, the valve and valve seat should be lapped lightly with a lapping compound.



ECHA920B

REPLACING THE VALVE SEAT RING

1. Cut away the inner face of the valve seat to reduce the wall thickness.



ECA9281F

2. Enlarge the diameter of the valve seat so that it matches the specified oversize hole diameter of the new valve seat ring.
3. Heat the cylinder head to about 250°C (480°F) and press - fit an oversize seat ring for the bore in the cylinder head.
4. Using lapping compound, lap the valve to the new seat.

Valve seat contact width

Intake : 0.8 - 1.2 mm (0.0315 - 0.0472 in.)

Exhaust : 1.3 - 1.7 mm (0.0512 - 0.0670 in.)

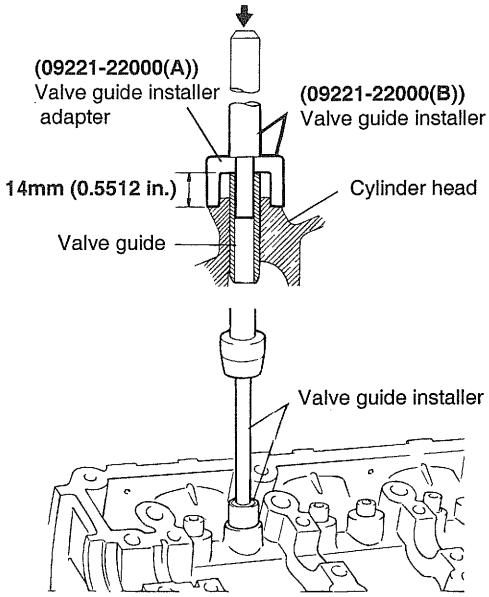
VALVE SEAT INSERT OVERSIZES

Description	Size mm (in.)	Size mark	Seat ring height H mm(in.)	Oversize hole diameter I.D. mm(in.)
Intake valve	0.3 (0.012) O.S.	30	5.1-5.3 (0.2008-0.2087)	30.7-30.721 (1.2087-1.2095)
Seat ring	0.6 (0.024) O.S.	60	5.4-5.6 (0.2126-0.2205)	31.0-31.021 (1.2205-1.2213)
Exhaust valve	0.3 (0.012) O.S.	30	6.2-6.4 (0.2441-0.2520)	27.3-27.321 (1.0748-1.0756)
Seat ring	0.6 (0.024) O.S	60	6.5-6.7 (0.2560-0.2638)	27.6-27.621 (1.0866-1.0874)

REPLACING VALVE GUIDE

1. Using the special tool (09221-22000 A/B), withdraw the old valve guide toward the bottom of cylinder head.

2. Recondition the valve guide hole so that it can match the newly press-fitted oversize valve guide.



ECDA109C

3. Using the special tool (09221-22000 A/B), press-fit the valve guide. The valve guide must be press-fitted from the upper side of the cylinder head.

4. After the valve guide is press-fitted, insert a new valve and check for proper the clearance.

5. After the valve guide is replaced, check that the valve is seated properly. Recondition the valve seats as necessary.

VALVE GUIDE OVERSIZES

Over size mm (in.)	Size mark	Oversize valve guide hole 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)

VALVES

REASSEMBLY EDNC7500

NOTE

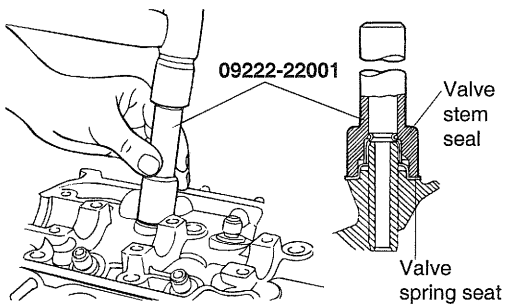
1. *Clean each part before assembly.*
2. *Apply engine oil to the sliding and rotating parts.*

1. Install the spring seats.
   Using a special tool (09222-22001), tap the seal in position lightly.

NOTE

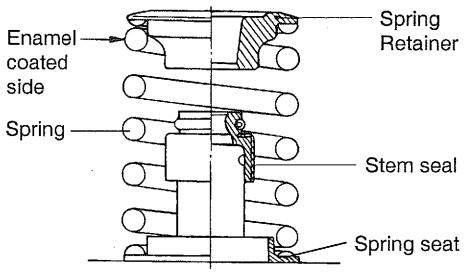
- *Do not reuse old valve stem seals.*
- *Incorrect installation of the seal could result in oil leakage past the valve guides.*

2. Apply engine oil to each valve. Insert the valve into the valve guide. Avoid pushing the valve into the seal by force. After inserting the valve, check that it moves smoothly.



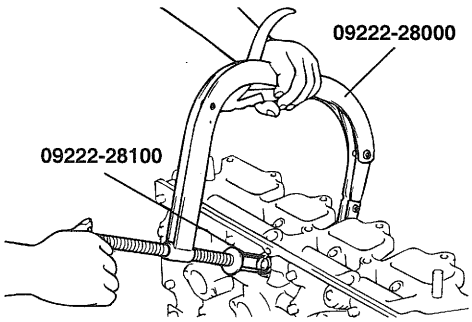
ECHB930A

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



ECA9290B

4. Using the special tool (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.



ECHA910B

NOTE

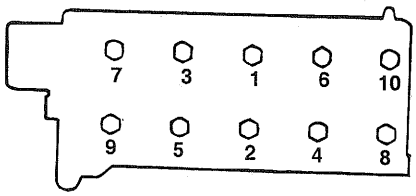
When the spring is compressed, Check that the valve stem seal is not pressed against the bottom of the retainer.

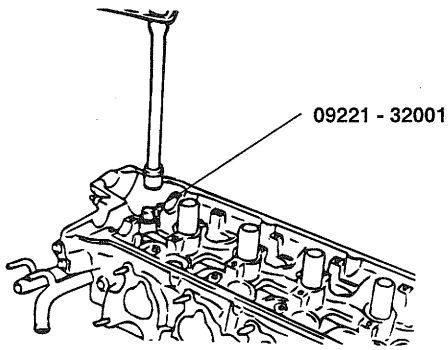
5. Clean both gasket surfaces of the cylinder block and cylinder head.

6. Verify the identification marks on the cylinder head gasket.

7. Install the gasket so that the surface with the identification mark faces toward the cylinder head.

8. Tighten the bolts to the specified torque in the sequenec shown.





KDDA001L

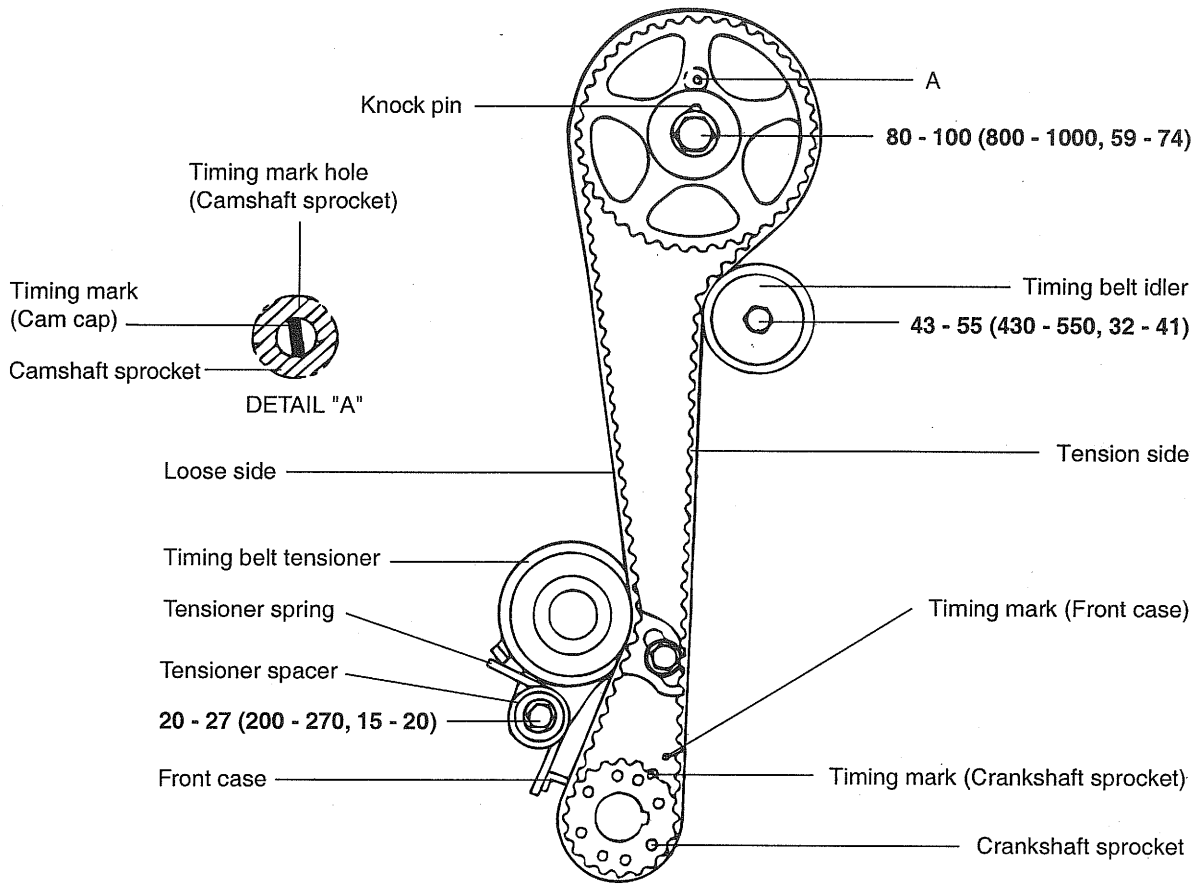
Cylinder head bolt :

30 Nm (300 kg.cm, 22 lb.ft)+90°+Release all bolt
+ 30 Nm (300kg.cm, 22 lb.ft) + 75°

TIMING SYSTEM

TIMING SYSTEM

COMPONENTS EDDA0910

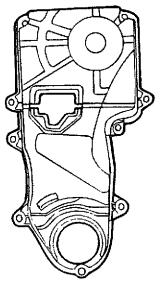


TORQUE : Nm (kg.cm, lb.ft)

EDDA091A

DISASSEMBLY EDKB7700

1. Loosen the coolant pump pulley bolt.
2. Loosen the alternator bolt.
3. Remove the coolant pump pulley and belt.
4. Remove the crankshaft pulley.
5. Remove the timing belt cover.

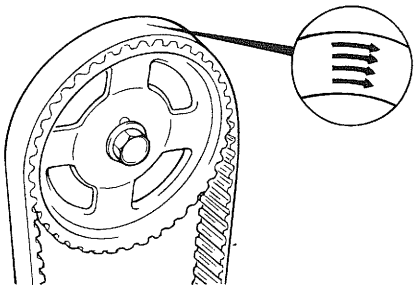


EDDA094F

6. Move the timing belt tensioner pulley toward the coolant pump and temporarily secure it.
7. Remove the camshaft from the camshaft sprocket.
8. Remove the camshaft sprocket.
9. Remove the timing belt.

NOTE

If the timing belt is reused, mark with an arrow to indicate direction of rotation (on the front of the engine) to make sure that the belt is reinstalled in the same direction as before.



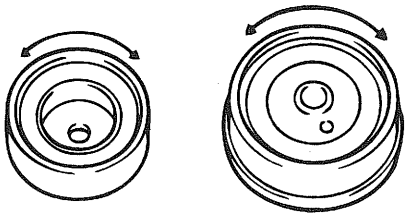
ECDA121B

10. Remove the crankshaft sprocket bolts. Remove the crankshaft sprocket and flange.
11. Remove the timing belt tensioner.

INSPECTION EDKB7800

SPROCKETS TENSIONER PULLEY, AND IDLER PULLEY

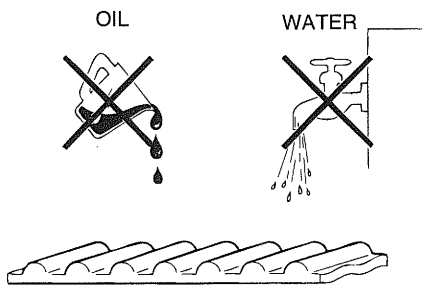
1. Check the camshaft sporcket, crankshaft sprocket, tensioner pulley, and idler pulley for abnormal wear, cracks, or damage.
   Replace as necessary.
2. Inspect the tensioner pulley and the idler pulley for easy and smooth rotation and check for play or noise.
   Replace as necessary.
3. Replace the pulley if there is a grease leak from its bearing.



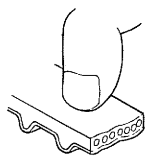
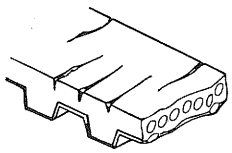
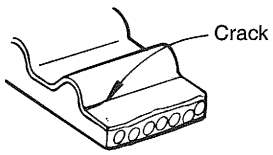
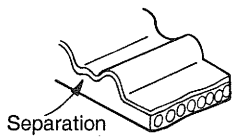
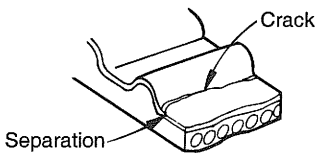
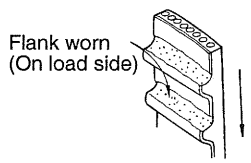
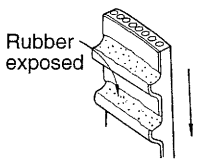
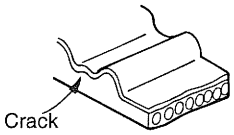
ECKA070A

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 with a new one.



EDDA093B

Description	Flaw conditions
1. Hardened back surface • Back surface is glossy, non-elastic and so hard that when your fingernail is pressed into it, no mark is produced.	 EDDA093C
2. Cracked back surface rubber	 EDDA093D
3. Cracked or separating canvas	 EDDA093E  EDDA093F  EDDA093G
4. Badly worn teeth (initial stages) • Canvas on load side of tooth flank worn (Fluffy canvas fibers, rubber gone and color changed to white, and unclear canvas texture)	 EDDA093H
5. Badly worn teeth (last stage) • Canvas on load side of tooth flank worn down and rubber exposed (tooth width reduced)	 EDDA093I
6. Cracked tooth bottom	 EDDA093J

Description	Flaw conditions
7. Missing tooth	Tooth missing and canvas fiber exposed  EDDA093K
8. Side of belt badly worn **NOTE** *Normal belt should have precisely cut sides as if cut by a sharp knife.*	
9. Side of belt cracked	

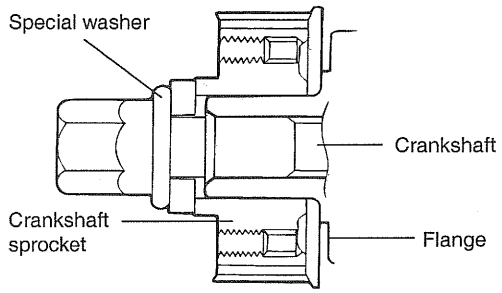
REASSEMBLY EDNC7900

1. Install the flange and crankshaft sprocket as shown. Pay close attention to their mounting directions.

Tightening torque

Crankshaft sprocket bolt :

140-150Nm (1400-1500kg.cm, 103-111lb.ft)



ECNC094B

2. Install the camshaft sprocket and tighten the bolt to the specified torque.

Tightening torque

Camshaft sprocket bolt :

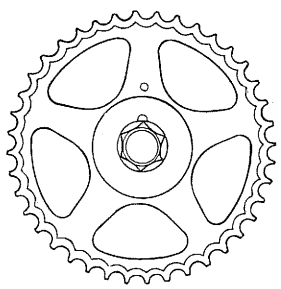
80-100Nm (800-1000kg.cm, 59-74lb.ft)

3. Install the idler and tighten the idler bolt to the specified torque.

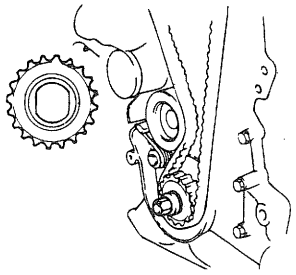
Tightening torque

Idler bolt : 43-55Nm (430-550kg.cm, 32-41lb.ft)

4. Align the timing marks of the camshaft sprocket and crankshaft sprocket, with the No.1 piston placed at top dead center on its compression stroke.

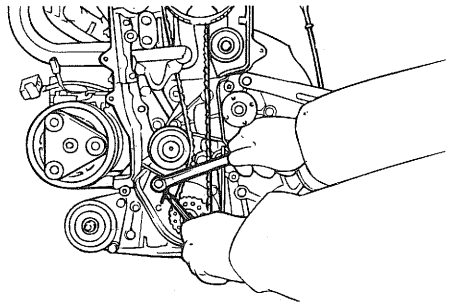


ECDA125B



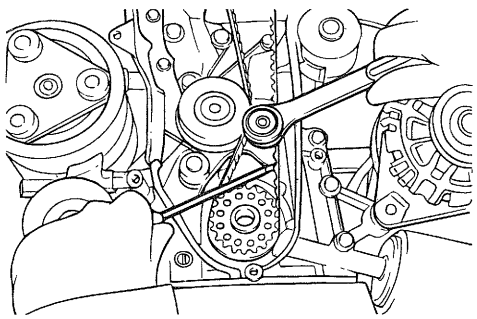
EDDA094B

5. To install the timing belt tensioner, first mount the tensioner, spring, and spacer. Temporarily tighten the bolts. Next, temporarily tighten the tensioner long hole side washer and bolts. Install the bottom end of the spring against the front case as shown in the illustration.



EDDA094C

6. Secure the tensioner, positioned towards the water pump.
7. Install the timing belt on the crankshaft sprocket.
8. Install the timing belt on the camshaft sprocket. When the timing belt is installed on the camshaft sprocket, make sure that the tension side is tight. Then, check to ensure that when the tension side is tightened by turning the camshaft sprocket in a reverse direction and all timing marks are in line.



EDDA092A

9. Tighten the tensioner bolts.

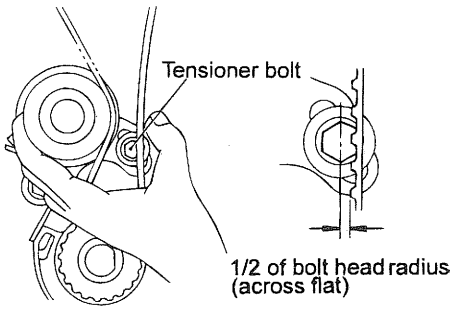
10. Turn the crankshaft two turns in its operating direction (clock-wise) and realign the camshaft sprocket timing mark with the top dead center position.

Tightening torque

Tensioner attaching bolt :

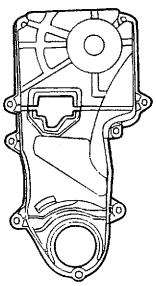
20-27Nm (200-270kg.cm, 15-20lb.ft)

11. Then recheck the belt tension. Verify that when the tensioner and the tension side of the timing belt are pushed in horizontally with a moderate force [approx. 49N (11lb)], the timing belt cog end is aprox. $\frac{1}{2}$ of the tensioner monting bolt head radius (across flats) away from the bolt head center.



EDDA094E

12. Install the timing belt cover.



EDDA094F

Tightening torque

Timing belt cover bolt :

8-10Nm (80-100kg.cm, 6-7 lb.ft)

13. Install the crankshaft pulley. Make sure that the crankshaft sprocket pin fits the small hole in the pulley.

Tightening torque

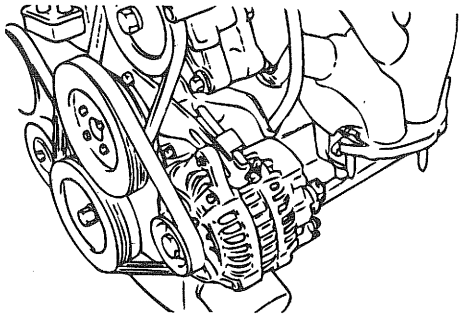
Crankshaft pulley bolt :

140-150 Nm (1400-1500kg.cm, 103-111lb.ft)

14. Install the fan belt and adjust the belt tension.

15. Install the water pump pulley

16. Install V-belt and adjust the belt tension.



EDDA094G