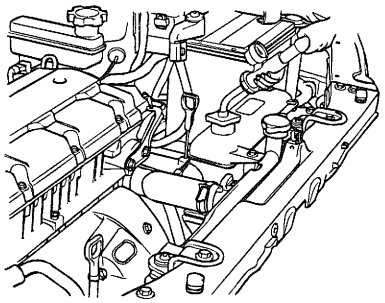
CHECKING COOLANT LEAK ECNC0110

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

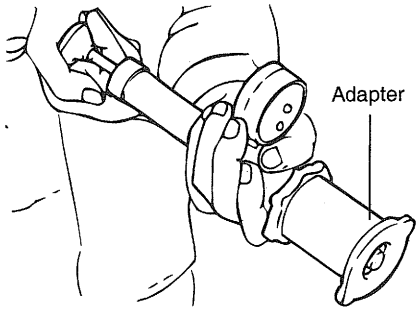
1. Use an adapter to attach the cap to the tester.
2. Increase the pressure until the gauge stops moving.

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

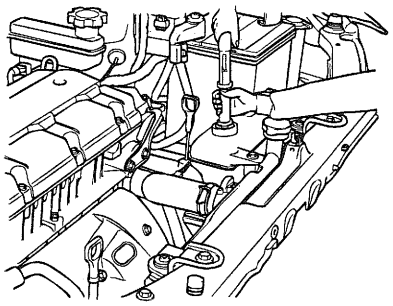
Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an incorrect reading.



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)

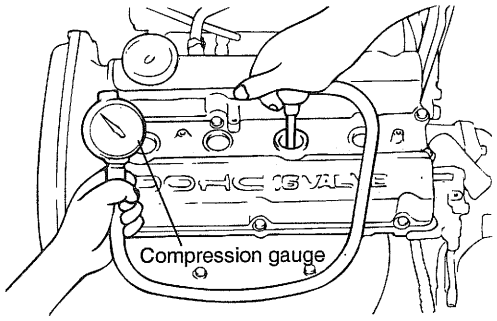
9. Repeat steps 6 to 8 over all cylinders, ensuring that the pressure differential for each of the cylinders is within the specified limit.

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

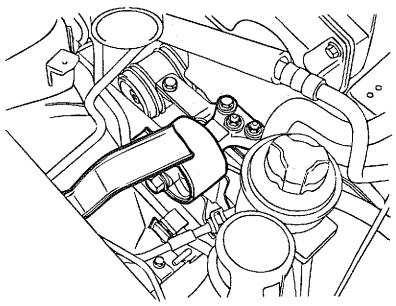
ADJUSTING TIMING BELT TENSION ECNC0140

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

   NOTE

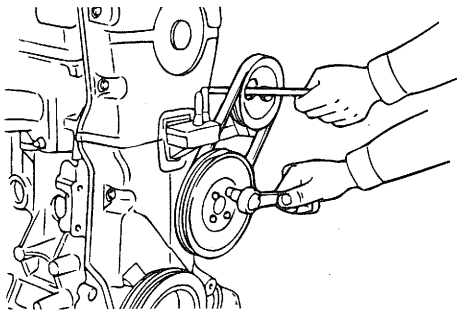
   Do watch not to over load.

3. Remove the engine support bracket.



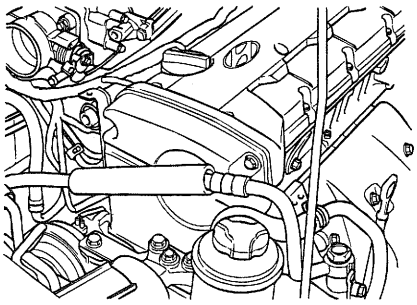
KDNB001B

4. Remove the water pump pulley.



EDDA083A

5. Remove the timing belt upper cover.



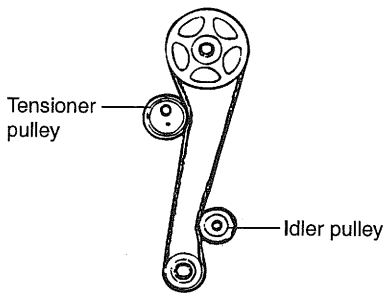
KDNB001C

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.



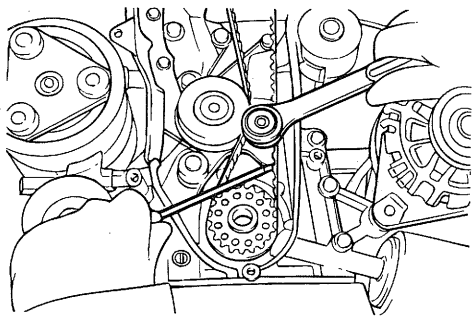
KDDA001B

8. Loose the tensioner bolt of pivot side and slot side.

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 at first and then tighten the bolt of pivot side.

12. Install the timing belt tension.

13. Install the spark plug.

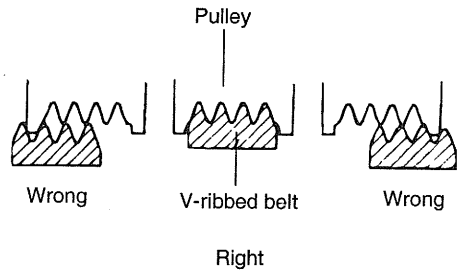
14. Install the timing belt upper cover.

15. Install the water pump pulley and engine mount.

ADJUSTING DRIVE BELT TENSION ECKB0150

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.



ECA9980A

CAUTION

1. When installing the V-ribbed belt, check that the V-ribs are properly aligned.

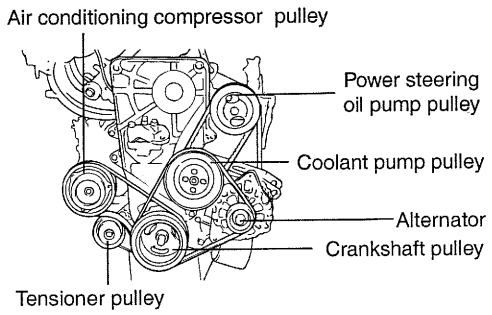
2. If noise or slippage is detected, check the belt for wear, damage, or breakage on the pulley contact surface, and check the pulley for scoring. Also check the degree that the belt is deflected.

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

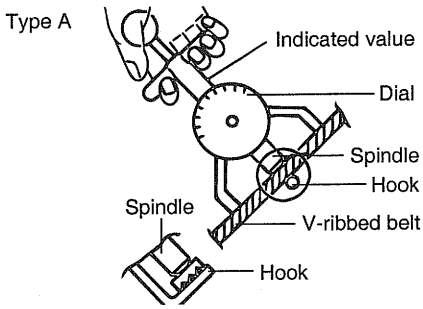
1. *The belt tension must be measured half - way between the specified pulleys.*
2. *When a new belt is installed, adjust the tension to the central value of the standard range indicated under "New" in the above table. Let the engine idle for 5 minutes or more, and check the standard value indicated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

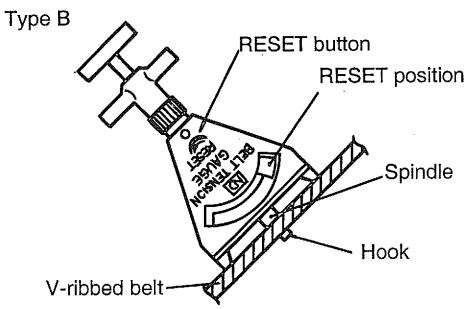
Do not let the dial section of the tension gauge contact other objects during measurement.



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, and readjust if necessary.

Tightening torque

Alternator support bolt and nut :

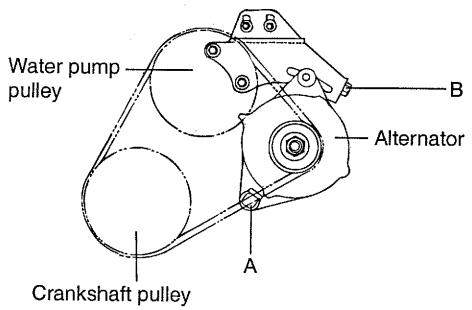
20-25 Nm (200-250 kg.cm, 14-18 lb.ft)

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)

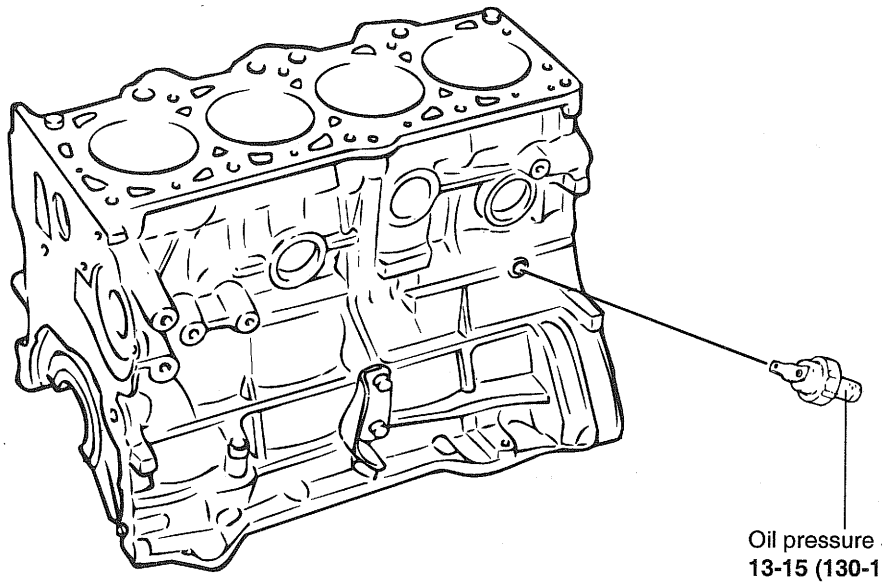


EDKA010C

CYLINDER BLOCK

CYLINDER BLOCK

COMPONENTS ECKB1000

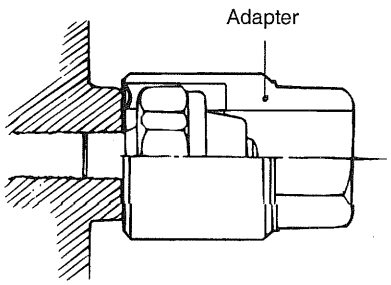


TORQUE : Nm (kg.cm, lb.ft)

V5EM104B

DISASSEMBLY ECKB1100

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



EDDA008A

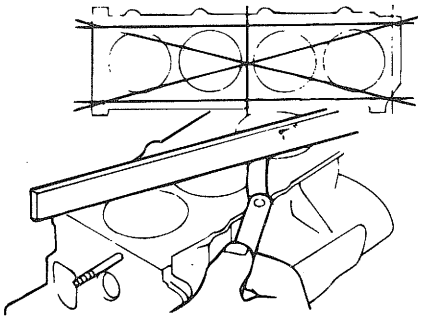
INSPECTION ECKB1200

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 : 0.1 mm (0.0039 in.) or less

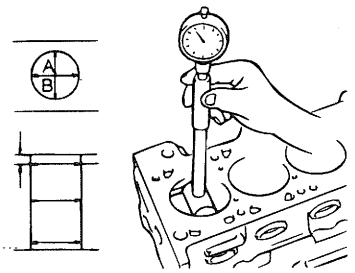


ECA9450B

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. Now oversize pistons and rings must be fitted. The value of measuring points are as shown.

Cylinder I.D : 82 mm (3.228 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 bore 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.

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

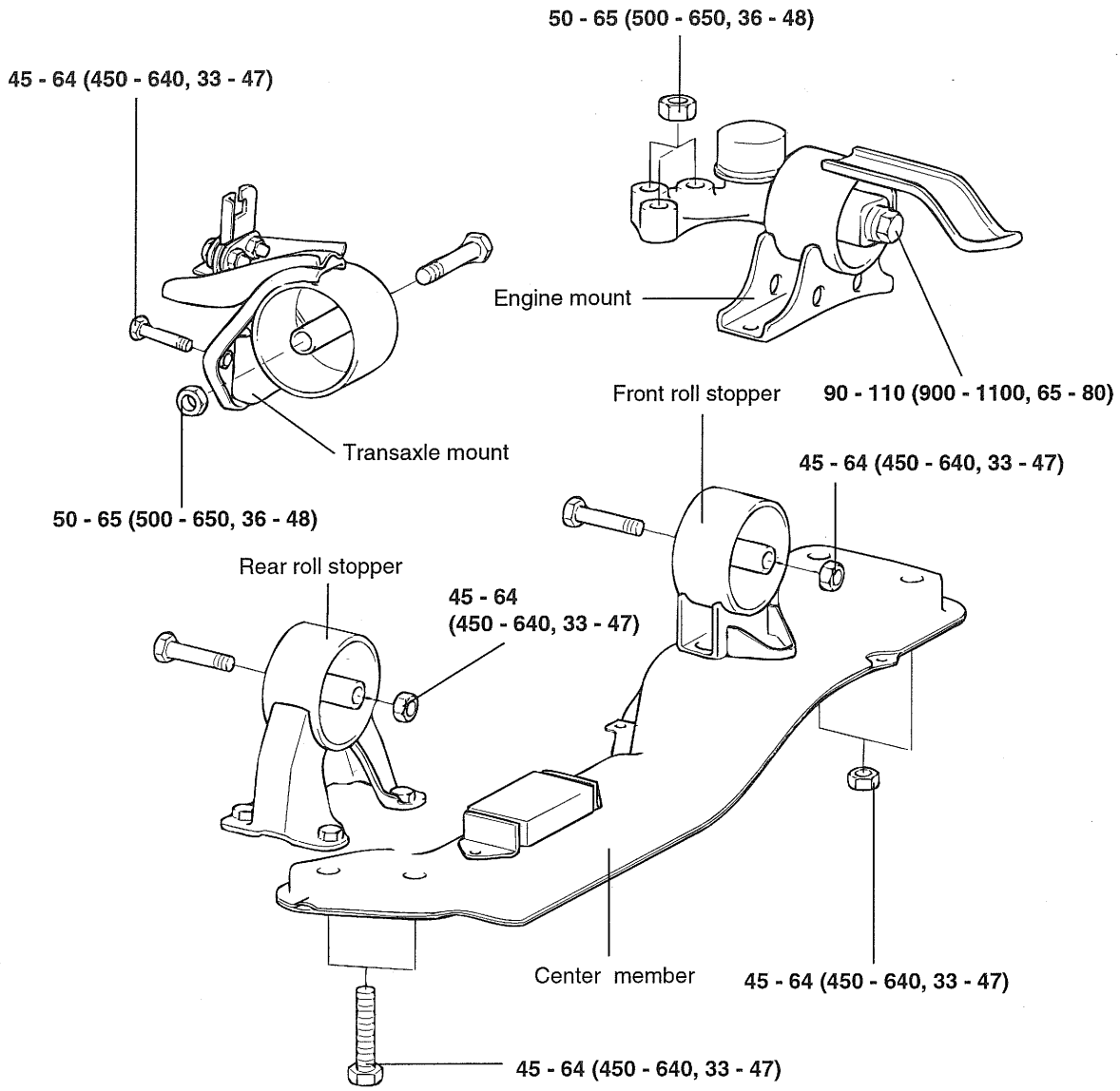
Piston - to - cylinder clearance (To set limits to new parts) :

0.02 - 0.04 mm (0.0008 - 0.0016 in.)

8. For used parts, it is acceptable if the maximum clearance is 85μm or less.

ENGINE MOUNTS

COMPONENTS ECNC1300

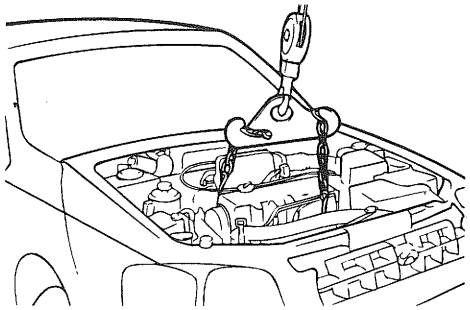


TORQUE : Nm (kg.cm, lb.ft)

EDNB002A

REMOVAL ECNC1400

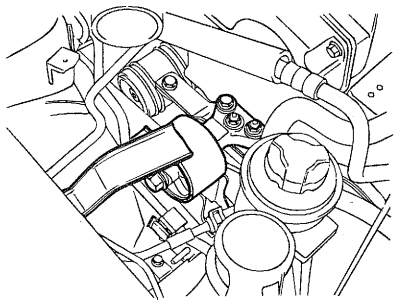
1. Attach an engine hoist to the engine hooks, and raise the engine just enough so that there is no pressure on the insulators.



ECDA012A

ENGINE MOUNTING

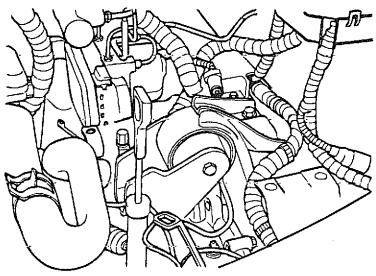
1. Remove the engine mounting insulator bolts.
2. Remove the engine mounting bracket from the engine.



KDNB001B

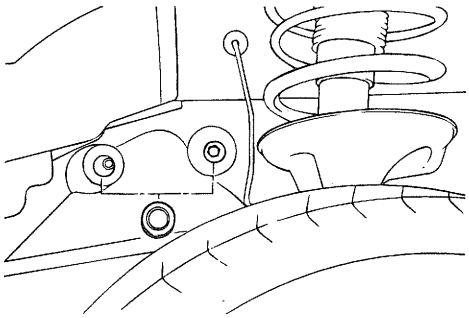
TRANSMISSION MOUNTING

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



KDNB002B

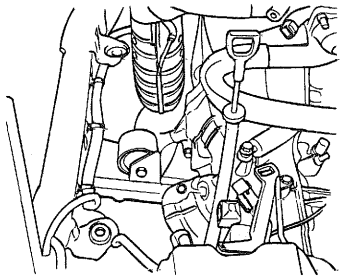
3. Detach the cap from inside the right fender shield. Remove the transmission mounting bolts.
4. Remove the transmission bracket.



ECKA020B

FRONT ROLL STOPPER

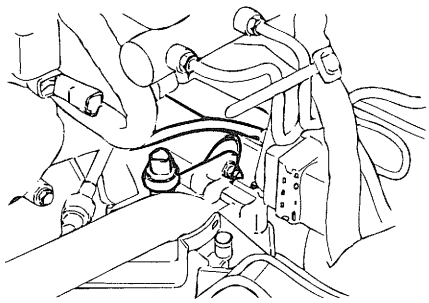
1. Remove the front roll stopper bracket from the center member.



KDNB002C

REAR ROLL STOPPER

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

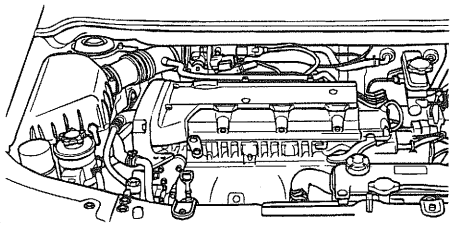


KDNB002D

ENGIN E AND TRANSAXLE ASSEMBLY

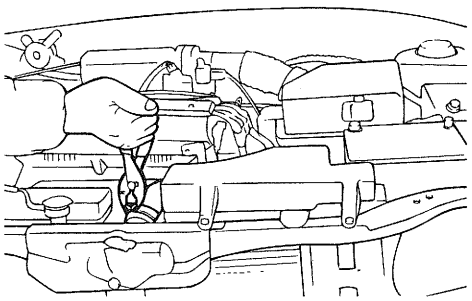
REMOVAL ECNC1600

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

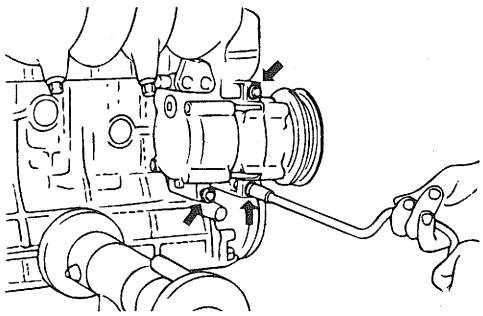
NOTE

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

CAUTION

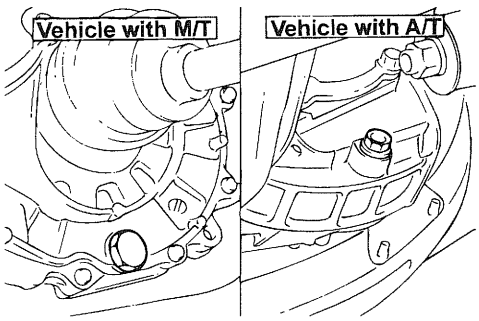
Be careful not to spill oil or fluid from hoses. Plug the openings to prevent foreign material from entering.

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).



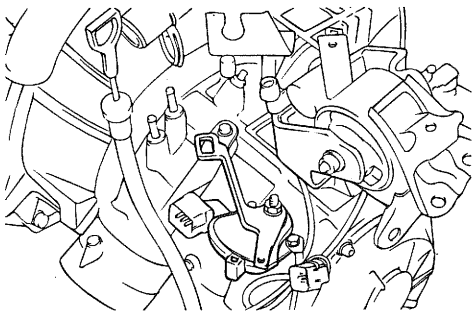
EDDA016D

19. Disconnect the front exhaust pipe from the manifold.

NOTE

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

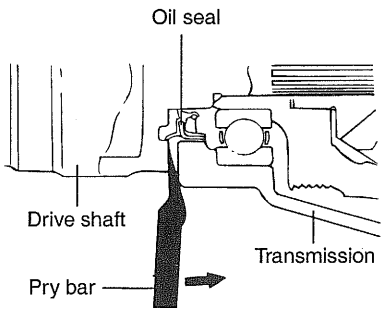
20. For vehicles with manual transmission, remove the shift control rod and extension rod.



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

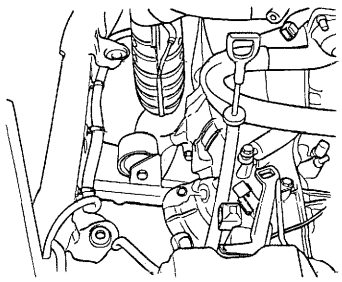
⚠ ***CAUTION***

- ***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.

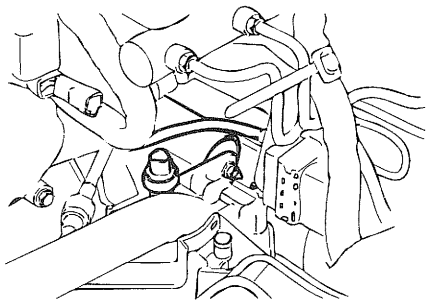
24. Attach a chains or cables to the engine. Use an engine hoist or a chain hoist to slightly raise the engine (enough to support the engine's weight while processing with the following steps).

25. Remove the front roll stopper.



KDNB002C

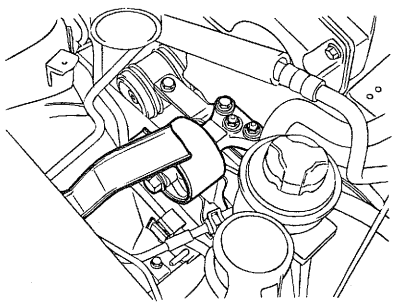
26. Separate the rear roll stopper.



KDNB002D

27. Remove the engine mounting insulator bolts.

28. Remove the engine mounting bracket from the engine.



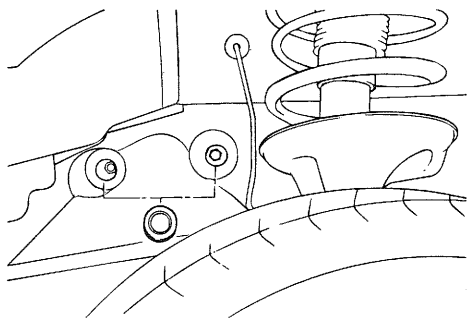
KDNB001B

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.



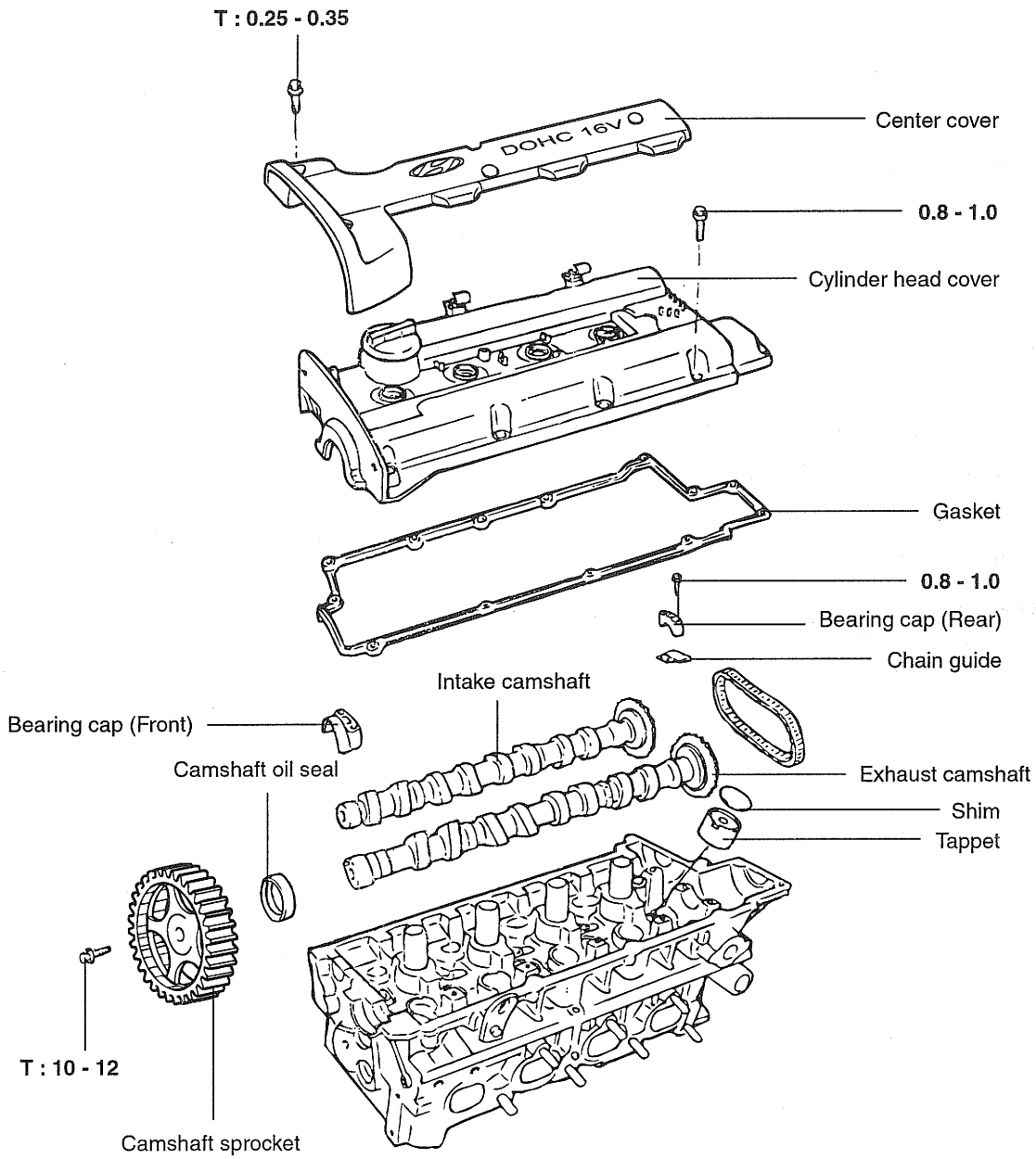
ECKA020B

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 ECNC1700

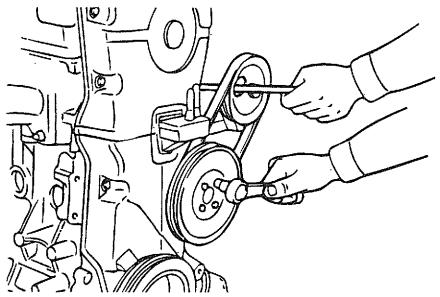


TORQUE : Nm (kg.cm,lb.ft)

EDNB004A

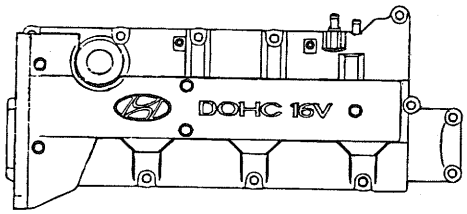
DISASSEMBLY ECKB1800

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



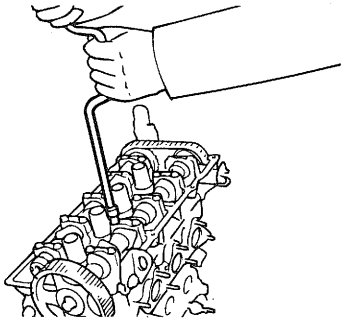
EDDA019A

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 ECKB1900

CAMSHAFT

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.

Cam height

[Standard value]

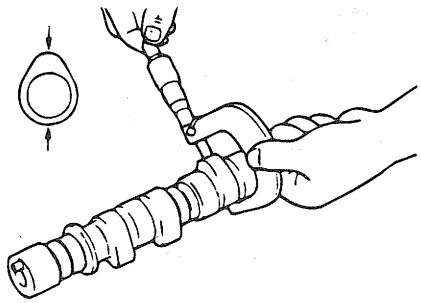
Intake : 44.820 mm (1.7646 in.)

Exhaust : 44.720 mm (1.7606 in.)

[Limit]

Intake : 44.720 mm (1.7606 in.)

Exhaust : 44.620 mm (1.7567 in.)



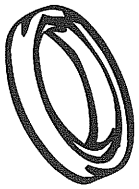
KDDA001D

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 - 0.2 mm (0.004 - 0.008 in.)

CAMSHAFT OIL SEAL

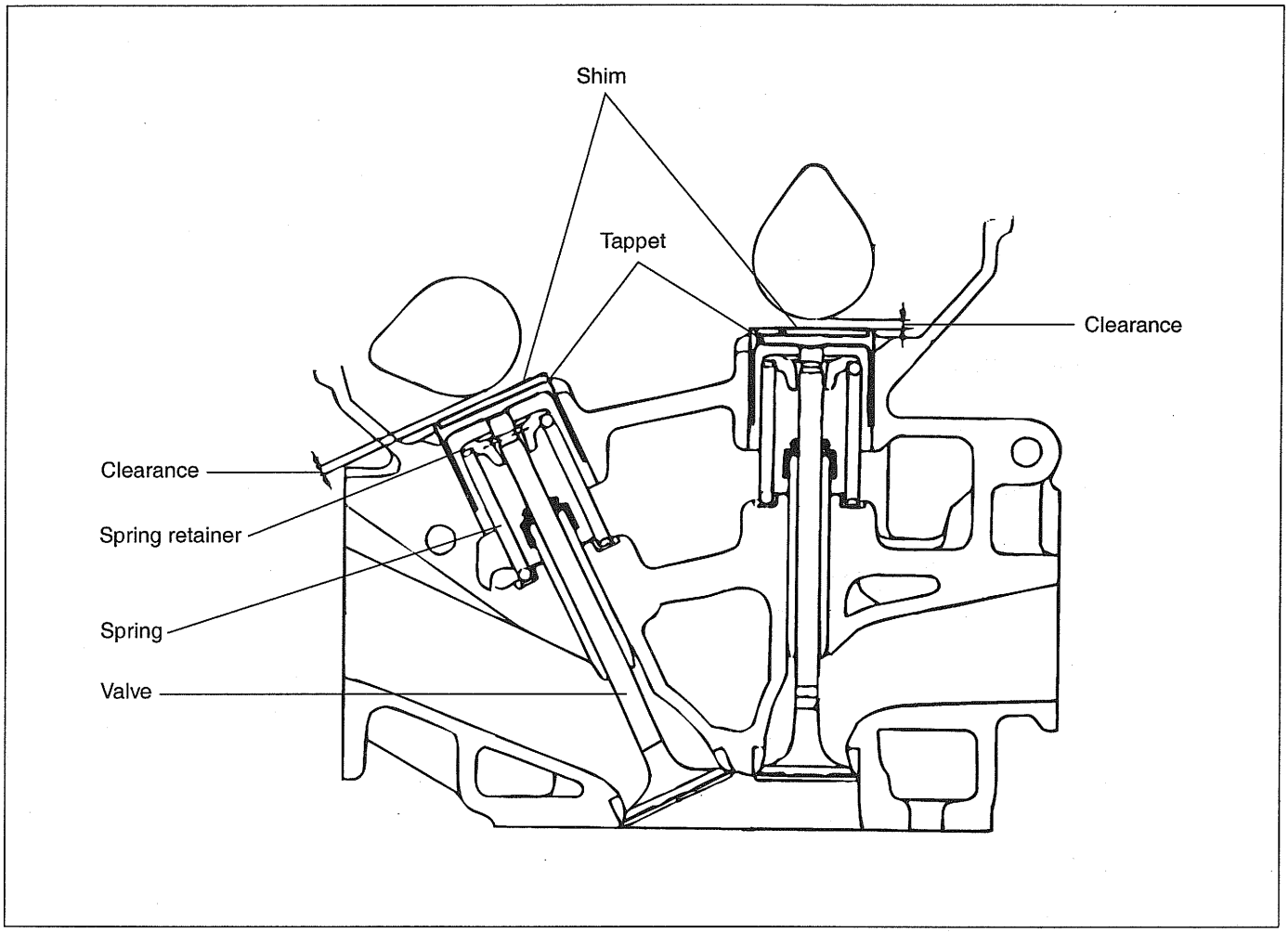
1. Check the lips for wear. If the lip threads are worn, replace.
2. Check the oil seal lip contacting surface of the camshaft. If it is worn, replace the camshaft.



V5EM202A

MLA (MECHANICAL LASH ADJUSTER) ECNC2000

VALVE CLEARANCE INSPECTION AND ADJUSTMENT



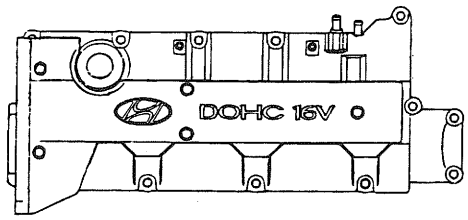
EDKB888A

NOTE

Inspect and adjust the valve clearance when the engine is cold (Engine coolant temperature : 20°C) and cylinder head is installed on the cylinder block.

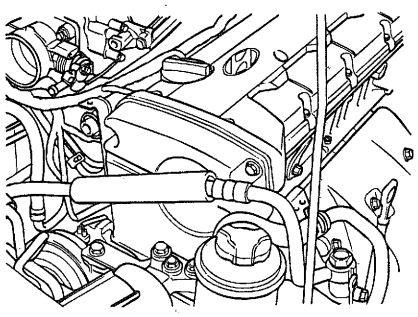
1. Remove the engine cover.
2. Remove oil filler cap.

3. Remove the center cover bolts and then remove the center cover.



EDKB444C

4. Remove the upper timing belt cover



KDNB001C

a. Loosen the upper timing belt cover bolts and then remove the cover.

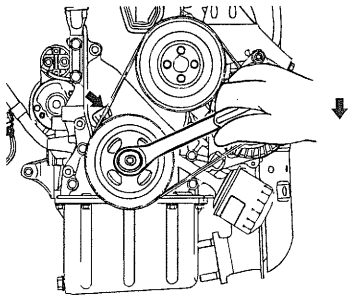
5. Remove the cylinder head cover.
   a. Disconnect the spark plug cables and do not pull on the spark plug cables by force.

NOTE

Pulling on or bending the cables may damage the conductor inside.

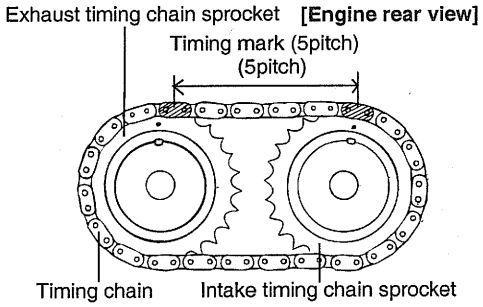
   b. Disconnect the P.C.V. hose and the breather hose from the cylinder head cover.
   c. Disconnect the accelerater cable from the cylinder head cover.
   d. Loosen the cylinder head cover bolts and then remove the cover and gasket.

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



EDKB222A

   b. Check that the hole of the camshaft timing pulley is aligned with the timing mark of the bearing cap. If not, turn the crankshaft one revolution (360°)



EDKA030B

7. Inspect the valve clearance.
   a. Check only the valves indicated as shown. [No.1 cylinder : TDC/Compression] measure the valve clearance
      - Using a thickness gauge, mesure the clearance between the tappet shim and the base circle of camshaft.
      - Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Engine coolant temperature : 20°C)

[Specification]

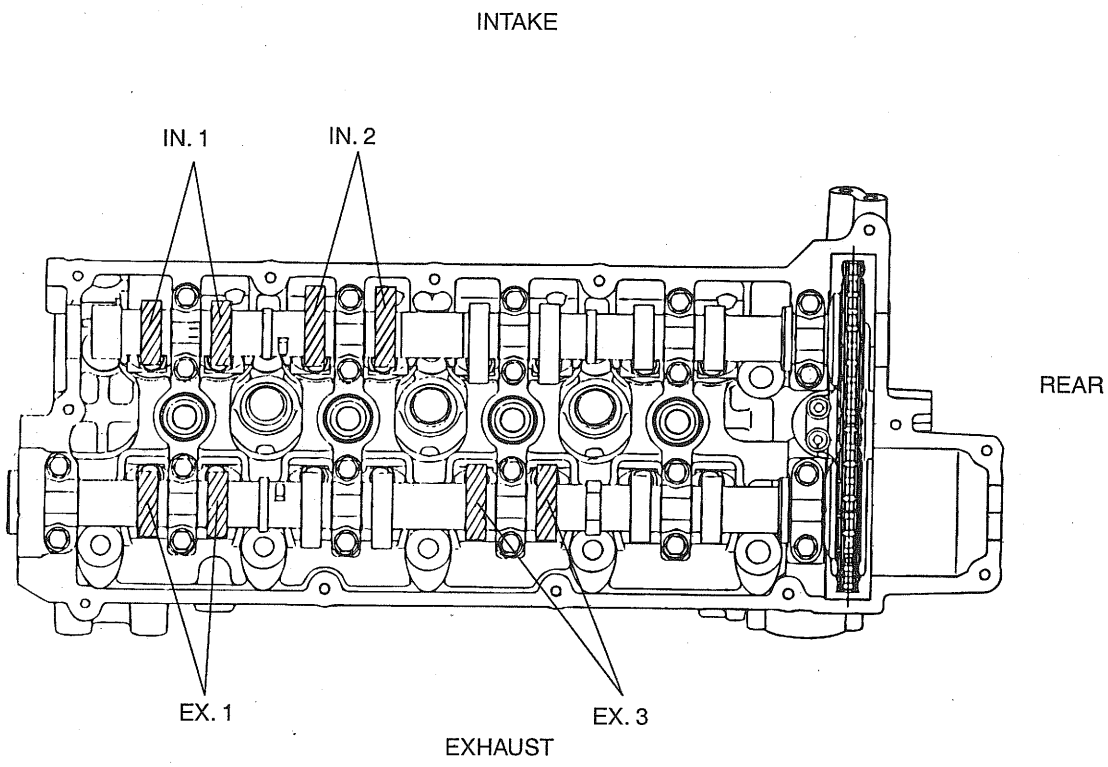
Intake : 0.20mm (0.0079 in.)

Exhaust : 0.28mm (0.0110 in.)

[Limit]

Intake : 0.12 - 0.28 mm (0.0047 - 0.0110 in.)

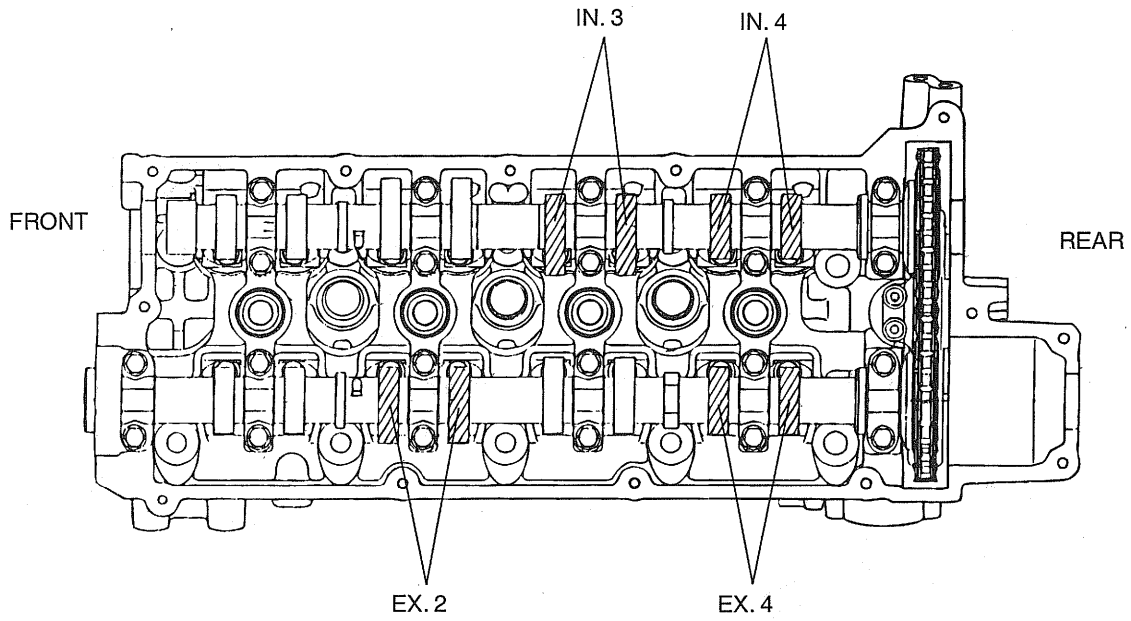
Exhaust : 0.20 - 0.36 mm (0.0079 - 0.0142 in.)



ADJUSTING VALVE AT NO. 1 TOP DEAD CENTER

EDKB888B

b. Turn the crankshaft pulley one revolution (360°) and align the groove with timing mark "T" of the lower timing belt cover.
c. Check only the valves indicated as shown. [NO.4 cylinder : TDC/compression]. Measure the valve clearance. (See procedure in step (1))

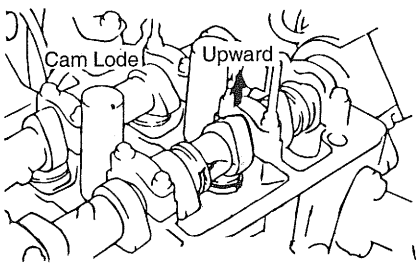


EXHAUST

ADJUSTING VALVE AT NO. 4 TOP DEAD CENTER

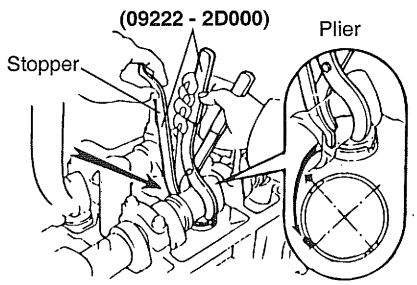
EDKB888C

8. Adjust the intake and exhaust valve clearance.
   a. Turn the crankshaft so that the cam lobe of the camshaft on the adjusting valve is upward.



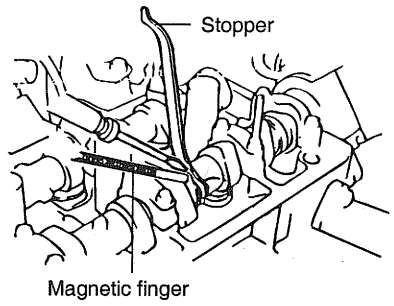
EDKB889A

   b. Using the special tool (09220 - 2D000), press down the valve lifter and place the stopper between the camshaft and valve lifter and remove the special tool.



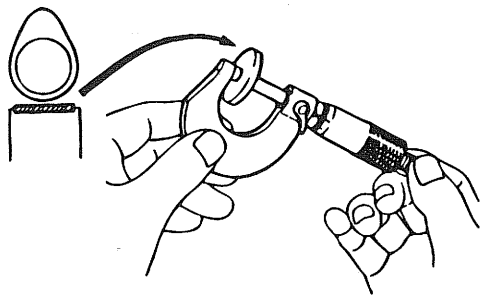
EDKB889B

c. Remove the adjusting shim with a small screw driver and magnet.



EDKB889C

d. Measure the thickness of the removed shim using a micrometer.



EDKB889D

e. Caculate the thickness of a new shim so that the valve clearance comes within the specified value.

Valve clearance (Engine coolant temperature : 20°C)

T : Thickness of removed shim

A : Measured valve clearance

N : Thickness of new shim

Intake : N = T + [A - 0.20 mm (0.0079 in.)]

Exhaust : N = T + [A - 0.28 mm (0.0110 in.)]

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

NOTE

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

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

Valve clearance (Engine coolant temperature : 20°C)

[Specification]

Intake : 0.20 mm (0.0079 in.)

Exhaust : 0.28 mm (0.0110 in.)

[Limit] (After adjusting valve clearance)

Intake : 0.17 - 0.23 mm (0.0067 - 0.0091 in.)

Exhaust : 0.25 - 0.31 mm (0.0098 - 0.0122 in.)

Adjusting Shim Selection Chart (Intake)

Installed shim thickness mm (in.)

Measured clearance mm	(in.)	2.00 (0.0787)	2.02 (0.0795)	2.04 (0.0803)	2.06 (0.0811)	2.08 (0.0819)	2.10 (0.0827)	2.11 (0.0831)	2.12 (0.0835)	2.13 (0.0839)	2.14 (0.0843)	2.15 (0.0846)	2.16 (0.0850)	2.17 (0.0854)	2.18 (0.0858)	2.19 (0.0862)	2.20 (0.0866)	2.21 (0.0870)	2.22 (0.0874)	2.23 (0.0878)	2.24 (0.0882)
0.000 – 0.020	(0.0000 – 0.0008)													1	1	1	1	1	2	2	2
0.021 – 0.040	(0.0008 – 0.0016)											1	1	1	1	2	2	2	2	3	3
0.041 – 0.060	(0.0016 – 0.0024)									1	1	1	1	2	2	2	2	3	3	3	3
0.061 – 0.080	(0.0024 – 0.0031)							1	1	1	1	2	2	2	2	3	3	3	3	4	4
0.081 – 0.100	(0.0032 – 0.0039)						1	1	1	2	2	2	2	3	3	3	3	4	4	4	4
0.101 – 0.119	(0.0040 – 0.0047)					1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5
0.120 – 0.280	(0.0047 – 0.0110)																				
0.281 – 0.300	(0.0111 – 0.0118)	3	4	4	5	5	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9
0.301 – 0.320	(0.0119 – 0.0126)	4	4	5	5	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10
0.321 – 0.340	(0.0126 – 0.0134)	4	5	5	6	6	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
0.341 – 0.360	(0.0134 – 0.0142)	5	5	6	6	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11
0.361 – 0.380	(0.0142 – 0.0150)	5	6	6	7	7	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11
0.381 – 0.400	(0.0150 – 0.0157)	6	6	7	7	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12
0.401 – 0.420	(0.0158 – 0.0165)	6	7	7	8	8	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12
0.421 – 0.440	(0.0166 – 0.0173)	7	7	8	8	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13
0.441 – 0.460	(0.0174 – 0.0181)	7	8	8	9	9	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13
0.461 – 0.480	(0.0181 – 0.0189)	8	8	9	9	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14
0.481 – 0.500	(0.0189 – 0.0197)	8	9	9	10	10	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14
0.501 – 0.520	(0.0197 – 0.0205)	9	9	10	10	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15
0.521 – 0.540	(0.0205 – 0.0213)	9	10	10	11	11	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15
0.541 – 0.560	(0.0213 – 0.0220)	10	10	11	11	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16
0.561 – 0.580	(0.0221 – 0.0228)	10	11	11	12	12	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16
0.581 – 0.600	(0.0229 – 0.0236)	11	11	12	12	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17
0.601 – 0.620	(0.0237 – 0.0244)	11	12	12	13	13	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17
0.621 – 0.640	(0.0244 – 0.0252)	12	12	13	13	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18
0.641 – 0.660	(0.0252 – 0.0260)	12	13	13	14	14	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18
0.661 – 0.680	(0.0260 – 0.0268)	13	13	14	14	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19
0.681 – 0.700	(0.0268 – 0.0276)	13	14	14	15	15	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19
0.701 – 0.720	(0.0276 – 0.0283)	14	14	15	15	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20
0.721 – 0.740	(0.0284 – 0.0291)	14	15	15	16	16	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
0.741 – 0.760	(0.0292 – 0.0299)	15	15	16	16	17	17	18	18	18	18	19	19	19	19	20	20	20	20		
0.761 – 0.780	(0.0300 – 0.0307)	15	16	16	17	17	18	18	18	19	19	19	19	20	20	20	20				
0.781 – 0.800	(0.0307 – 0.0315)	16	16	17	17	18	18	19	19	19	19	20	20	20	20						
0.801 – 0.820	(0.0315 – 0.0323)	16	17	17	18	18	19	19	19	20	20	20	20								
0.821 – 0.840	(0.0323 – 0.0331)	17	17	18	18	19	19	20	20	20	20										
0.841 – 0.860	(0.0331 – 0.0339)	17	18	18	19	19	20	20	20												
0.861 – 0.880	(0.0339 – 0.0346)	18	18	19	19	20	20														
0.881 – 0.900	(0.0347 – 0.0354)	18	19	19	20	20															
0.901 – 0.920	(0.0355 – 0.0362)	19	19	20	20																
0.921 – 0.940	(0.0363 – 0.0370)	19	20	20																	
0.941 – 0.960	(0.0370 – 0.0378)	20	20																		
0.961 – 0.980	(0.0378 – 0.0386)	20																			

Measured clearance mm	(in.)	2.25 (0.0886)	2.26 (0.0890)	2.27 (0.0894)	2.28 (0.0898)	2.29 (0.0902)	2.30 (0.0906)	2.31 (0.0909)	2.32 (0.0913)	2.33 (0.0917)	2.34 (0.0921)	2.35 (0.0925)	2.36 (0.0929)	2.37 (0.0933)	2.38 (0.0937)	2.39 (0.0941)	2.40 (0.0945)	2.41 (0.0949)	2.42 (0.0953)	2.43 (0.0957)	2.44 (0.0961)
0.000 – 0.020	(0.0000 – 0.0008)	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7
0.021 – 0.040	(0.0008 – 0.0016)	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8
0.041 – 0.060	(0.0016 – 0.0024)	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8
0.061 – 0.080	(0.0024 – 0.0031)	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9
0.081 – 0.100	(0.0032 – 0.0039)	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9
0.101 – 0.119	(0.0040 – 0.0047)	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10
0.120 – 0.280	(0.0047 – 0.0110)																				
0.281 – 0.300	(0.0111 – 0.0118)	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14
0.301 – 0.320	(0.0119 – 0.0126)	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15
0.321 – 0.340	(0.0126 – 0.0134)	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15
0.341 – 0.360	(0.0134 – 0.0142)	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16
0.361 – 0.380	(0.0142 – 0.0150)	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16
0.381 – 0.400	(0.0150 – 0.0157)	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17
0.401 – 0.420	(0.0158 – 0.0165)	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17
0.421 – 0.440	(0.0166 – 0.0173)	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18
0.441 – 0.460	(0.0174 – 0.0181)	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18
0.461 – 0.480	(0.0181 – 0.0189)	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19
0.481 – 0.500	(0.0189 – 0.0197)	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19
0.501 – 0.520	(0.0197 – 0.0205)	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20
0.521 – 0.540	(0.0205 – 0.0213)	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
0.541 – 0.560	(0.0213 – 0.0220)	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20		
0.561 – 0.580	(0.0221 – 0.0228)	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20				
0.581 – 0.600	(0.0229 – 0.0236)	17	17	18	18	18	18	19	19	19	19	20	20	20	20						
0.601 – 0.620	(0.0237 – 0.0244)	18	18	18	18	19	19	19	19	20	20	20	20								
0.621 – 0.640	(0.0244 – 0.0252)	18	18	19	19	19	19	20	20	20	20										
0.641 – 0.660	(0.0252 – 0.0260)	19	19	19	19	20	20	20	20												
0.661 – 0.680	(0.0260 – 0.0268)	19	19	20	20	20	20														
0.681 – 0.700	(0.0268 – 0.0276)	20	20	20	20																
0.701 – 0.720	(0.0276 – 0.0283)	20	20																		
0.721 – 0.740	(0.0284 – 0.0291)																				
0.741 – 0.760	(0.0292 – 0.0299)																				
0.761 – 0.780	(0.0300 – 0.0307)																				
0.781 – 0.800	(0.0307 – 0.0315)																				
0.801 – 0.820	(0.0315 – 0.0323)																				
0.821 – 0.840	(0.0323 – 0.0331)																				
0.841 – 0.860	(0.0331 – 0.0339)																				
0.861 – 0.880	(0.0339 – 0.0346)																				
0.881 – 0.900	(0.0347 – 0.0354)																				
0.901 – 0.920	(0.0355 – 0.0362)																				
0.921 – 0.940	(0.0363 – 0.0370)																				
0.941 – 0.960	(0.0370 – 0.0378)																				
0.961 – 0.980	(0.0378 – 0.0386)																				

Measured clearance mm	(in.)	2.45 (0.0965)	2.46 (0.0969)	2.47 (0.0972)	2.48 (0.0976)	2.49 (0.0980)	2.50 (0.0984)	2.51 (0.0988)	2.52 (0.0992)	2.53 (0.0996)	2.54 (0.1000)	2.56 (0.1008)	2.58 (0.1016)	2.6 (0.1024)	2.62 (0.1031)	2.64 (0.1039)	2.66 (0.1047)	2.68 (0.1055)	2.70 (0.1063)	2.72 (0.1071)	2.74 (0.1079)	2.76 (0.1087)
0.000 – 0.020	(0.0000 – 0.0008)	7	8	8	8	8	9	9	9	9	10	10	11	11	12	12	13	13	14	14	15	15
0.021 – 0.040	(0.0008 – 0.0016)	8	8	9	9	9	9	10	10	10	10	11	11	12	12	13	13	14	14	15	15	16
0.041 – 0.060	(0.0016 – 0.0024)	9	9	9	9	10	10	10	10	11	11	11	12	12	13	13	14	14	15	15	16	16
0.061 – 0.080	(0.0024 – 0.0031)	9	9	10	10	10	10	11	11	11	11	12	12	13	13	14	14	15	15	16	16	17
0.081 – 0.100	(0.0032 – 0.0039)	10	10	10	10	11	11	11	11	12	12	12	13	13	14	14	15	15	16	16	17	17
0.101 – 0.119	(0.0040 – 0.0047)	10	10	10	11	11	11	11	12	12	12	13	13	14	14	15	15	16	16	17	17	18
0.120 – 0.280	(0.0047 – 0.0110)																					
0.281 – 0.300	(0.0111 – 0.0118)	15	15	15	15	16	16	16	16	17	17	17	18	18	19	19	20	20				
0.301 – 0.320	(0.0119 – 0.0126)	15	15	16	16	16	16	17	17	17	17	18	18	19	19	20	20					
0.321 – 0.340	(0.0126 – 0.0134)	16	16	16	16	17	17	17	17	18	18	18	19	19	20	20						
0.341 – 0.360	(0.0134 – 0.0142)	16	16	17	17	17	17	18	18	18	18	19	19	20	20							
0.361 – 0.380	(0.0142 – 0.0150)	17	17	17	17	18	18	18	18	19	19	19	20	20								
0.381 – 0.400	(0.0150 – 0.0157)	17	17	18	18	18	18	19	19	19	19	20	20									
0.401 – 0.420	(0.0158 – 0.0165)	18	18	18	18	19	19	19	19	20	20	20										
0.421 – 0.440	(0.0166 – 0.0173)	18	18	19	19	19	19	20	20	20	20											
0.441 – 0.460	(0.0174 – 0.0181)	19	19	19	19	20	20	20	20													
0.461 – 0.480	(0.0181 – 0.0189)	19	19	20	20	20	20															
0.481 – 0.500	(0.0189 – 0.0197)	20	20	20	20																	
0.501 – 0.520	(0.0197 – 0.0205)	20	20																			
0.521 – 0.540	(0.0205 – 0.0213)																					
0.541 – 0.560	(0.0213 – 0.0220)																					
0.561 – 0.580	(0.0221 – 0.0228)																					
0.581 – 0.600	(0.0229 – 0.0236)																					
0.601 – 0.620	(0.0237 – 0.0244)																					
0.621 – 0.640	(0.0244 – 0.0252)																					
0.641 – 0.660	(0.0252 – 0.0260)																					
0.661 – 0.680	(0.0260 – 0.0268)																					
0.681 – 0.700	(0.0268 – 0.0276)																					
0.701 – 0.720	(0.0276 – 0.0283)																					
0.721 – 0.740	(0.0284 – 0.0291)																					
0.741 – 0.760	(0.0292 – 0.0299)																					
0.761 – 0.780	(0.0300 – 0.0307)																					
0.781 – 0.800	(0.0307 – 0.0315)																					
0.801 – 0.820	(0.0315 – 0.0323)																					
0.821 – 0.840	(0.0323 – 0.0331)																					
0.841 – 0.860	(0.0331 – 0.0339)																					
0.861 – 0.880	(0.0339 – 0.0346)																					
0.881 – 0.900	(0.0347 – 0.0354)																					
0.901 – 0.920	(0.0355 – 0.0362)																					
0.921 – 0.940	(0.0363 – 0.0370)																					
0.941 – 0.960	(0.0370 – 0.0378)																					
0.961 – 0.980	(0.0378 – 0.0386)																					

New shim thickness mm (in.)

Shim No.	Thickness		Shim No.	Thickness	
1	2.00	0.0787	11	2.40	0.0945
2	2.04	0.0803	12	2.44	0.0961
3	2.08	0.0819	13	2.48	0.0976
4	2.12	0.0835	14	2.52	0.0992
5	2.16	0.0850	15	2.56	0.1008
6	2.20	0.0866	16	2.60	0.1024
7	2.24	0.0882	17	2.64	0.1039
8	2.28	0.0898	18	2.68	0.1055
9	2.32	0.0913	19	2.72	0.1071
10	2.36	0.0929	20	2.76	0.1087

Intake valve clearance (Cold) :

0.20 mm (Spec.), 0.12 – 0.28 mm (Limit)

Example : The 2.24 mm shim is installed, and the measured clearance is 0.450 mm. Replace the 2.24 mm shin with a new No. 13 shim.

HINT : New shims have the thickness in millimeters imprinted on the face.

EDKB888D

Adjusting Shim Selection Chart (Exhaust)

Measured clearance mm (in.) \ Installed shim thickness mm (in.)		2.00 (0.0787)	2.02 (0.0795)	2.04 (0.0803)	2.06 (0.0811)	2.08 (0.0819)	2.10 (0.0827)	2.11 (0.0831)	2.12 (0.0835)	2.13 (0.0839)	2.14 (0.0843)	2.15 (0.0846)	2.16 (0.0850)	2.17 (0.0854)	2.18 (0.0858)	2.19 (0.0862)	2.20 (0.0866)	2.21 (0.0870)	2.22 (0.0874)	2.23 (0.0878)	2.24 (0.0882)	2.25 (0.0886)	2.26 (0.0890)	2.27 (0.0894)	2.28 (0.0898)	2.29 (0.0902)	2.30 (0.0906)	2.31 (0.0909)	2.32 (0.0913)	2.33 (0.0917)	2.34 (0.0921)	2.35 (0.0925)	2.36 (0.0928)	2.37 (0.0933)	2.38 (0.0937)	2.39 (0.0941)	2.40 (0.0945)	2.41 (0.0949)	2.42 (0.0953)	2.43 (0.0957)	2.44 (0.0961)	2.45 (0.0965)	2.46 (0.0969)	2.47 (0.0972)	2.48 (0.0976)	2.49 (0.0980)	2.50 (0.0984)	2.51 (0.0988)	2.52 (0.0992)	2.53 (0.0996)	2.54 (0.1000)	2.56 (0.1008)	2.58 (0.1016)	2.6 (0.1024)	2.62 (0.1031)	2.64 (0.1039)	2.66 (0.1047)	2.68 (0.1055)	2.70 (0.1063)	2.72 (0.1071)	2.74 (0.1079)	2.76 (0.1087)
0.000 - 0.020	(0.0000 0.0008)																					1	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	9	9	10	10	11	11	12	12	13	13
0.021 - 0.040	(0.0008 0.0016)																			1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	10	10	11	11	12	12	13	13	14
0.041 - 0.060	(0.0016 0.0024)																	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	10	10	11	11	12	12	13	13	14	14
0.061 - 0.080	(0.0024 0.0031)															1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	11	11	12	12	13	13	14	14	15
0.081 - 0.100	(0.0032 0.0039)													1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	11	11	12	12	13	13	14	14	15	15
0.101 - 0.120	(0.0040 0.0047)											1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	12	12	13	13	14	14	15	15	16
0.121 - 0.140	(0.0048 0.0055)									1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	12	12	13	13	14	14	15	15	16	16
0.141 - 0.160	(0.0056 0.0063)							1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	13	13	14	14	15	15	16	16	17
0.161 - 0.180	(0.0063 0.0071)						1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	13	13	14	14	15	15	16	16	17	17
0.181 - 0.199	(0.0071 0.0078)					1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	13	13	14	14	15	15	16	16	17	17	18
0.200 - 0.360	(0.0079 0.0142)																																																														
0.361 - 0.380	(0.0142 0.0150)	3	4	4	5	5	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	18	18	19	19	20	20				
0.381 - 0.400	(0.0150 0.0157)	4	4	5	5	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	16	17	17	18	18	19	19	20	20					
0.401 - 0.420	(0.0158 0.0165)	4	5	5	6	6	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	19	19	20	20						
0.421 - 0.440	(0.0166 0.0173)	5	5	6	6	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	20	20							
0.441 - 0.460	(0.0174 0.0181)	5	6	6	7	7	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	20	20								
0.461 - 0.480	(0.0181 0.0189)	6	6	7	7	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20									
0.481 - 0.500	(0.0189 0.0197)	6	7	7	8	8	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20										
0.501 - 0.520	(0.0197 0.0205)	7	7	8	8	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20											
0.521 - 0.540	(0.0205 0.0213)	7	8	8	9	9	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20													
0.541 - 0.560	(0.0213 0.0220)	8	8	9	9	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20															
0.561 - 0.580	(0.0221 0.0228)	8	9	9	10	10	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20																	
0.581 - 0.600	(0.0229 0.0236)	9	9	10	10	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20																			
0.601 - 0.620	(0.0237 0.0244)	9	10	10	11	11	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20																					
0.621 - 0.640	(0.0244 0.0252)	10	10	11	11	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20																							
0.641 - 0.660	(0.0252 0.0260)	10	11	11	12	12	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20																									
0.661 - 0.680	(0.0260 0.0268)	11	11	12	12	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20																											
0.681 - 0.700	(0.0268 0.0276)	11	12	12	13	13	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20																													
0.701 - 0.720	(0.0276 0.0283)	12	12	13	13	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20																															
0.721 - 0.740	(0.0284 0.0291)	12	13	13	14	14	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20																																	
0.741 - 0.760	(0.0292 0.0299)	13	13	14	14	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20																																			
0.761 - 0.780	(0.0300 0.0307)	13	14	14	15	15	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20																																					
0.781 - 0.800	(0.0307 0.0315)	14	14	15	15	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20																																							
0.801 - 0.820	(0.0315 0.0323)	14	15	15	16	16	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20																																									
0.821 - 0.840	(0.0323 0.0331)	15	15	16	16	17	17	18	18	18	18	19	19	19	19	20	20	20	20																																											
0.841 - 0.860	(0.0331 0.0339)	15	16	16	17	17	18	18	18	19	19	19	19	20	20	20	20																																													
0.861 - 0.880	(0.0339 0.0346)	16	16	17	17	18	18	19	19	19	19	20	20	20	20																																															
0.881 - 0.900	(0.0347 0.0354)	16	17	17	18	18	19	19	19	20	20	20	20																																																	
0.901 - 0.920	(0.0355 0.0362)	17	17	18	18	19	19	20	20	20	20																																																				
0.921 - 0.940	(0.0363 0.0370)	17	18	18	19	19	20	20	20																																																						
0.941 - 0.960	(0.0370 0.0378)	18	18	19	19	20	20																																																								
0.961 - 0.980	(0.0378 0.0386)	18	19	19	20	20																																																									
0.981 - 1.000	(0.0386 0.0394)	19	19	20	20																																																										
1.001 - 1.020	(0.0394 0.0402)	19	20	20																																																											
1.021 - 1.040	(0.0402 0.0409)	20	20																																																												
1,041 - 1.060	(0.0410 0.0417)	20																																																													

New shim thickness mm (in.)

Shim No.	Thickness		Shim No.	Thickness	
1	2.00	0.0787	11	2.40	0.0945
2	2.04	0.0803	12	2.44	0.0961
3	2.08	0.0819	13	2.48	0.0976
4	2.12	0.0835	14	2.52	0.0992
5	2.16	0.0850	15	2.56	0.1008
6	2.20	0.0866	16	2.60	0.1024
7	2.24	0.0882	17	2.64	0.1039
8	2.28	0.0898	18	2.68	0.1055
9	2.32	0.0913	19	2.72	0.1071
10	2.36	0.0929	20	2.76	0.1087

Exhaust valve clearance (Cold) :

0.28 mm (Spec.), 0.20 - 0.36 mm (Limit)

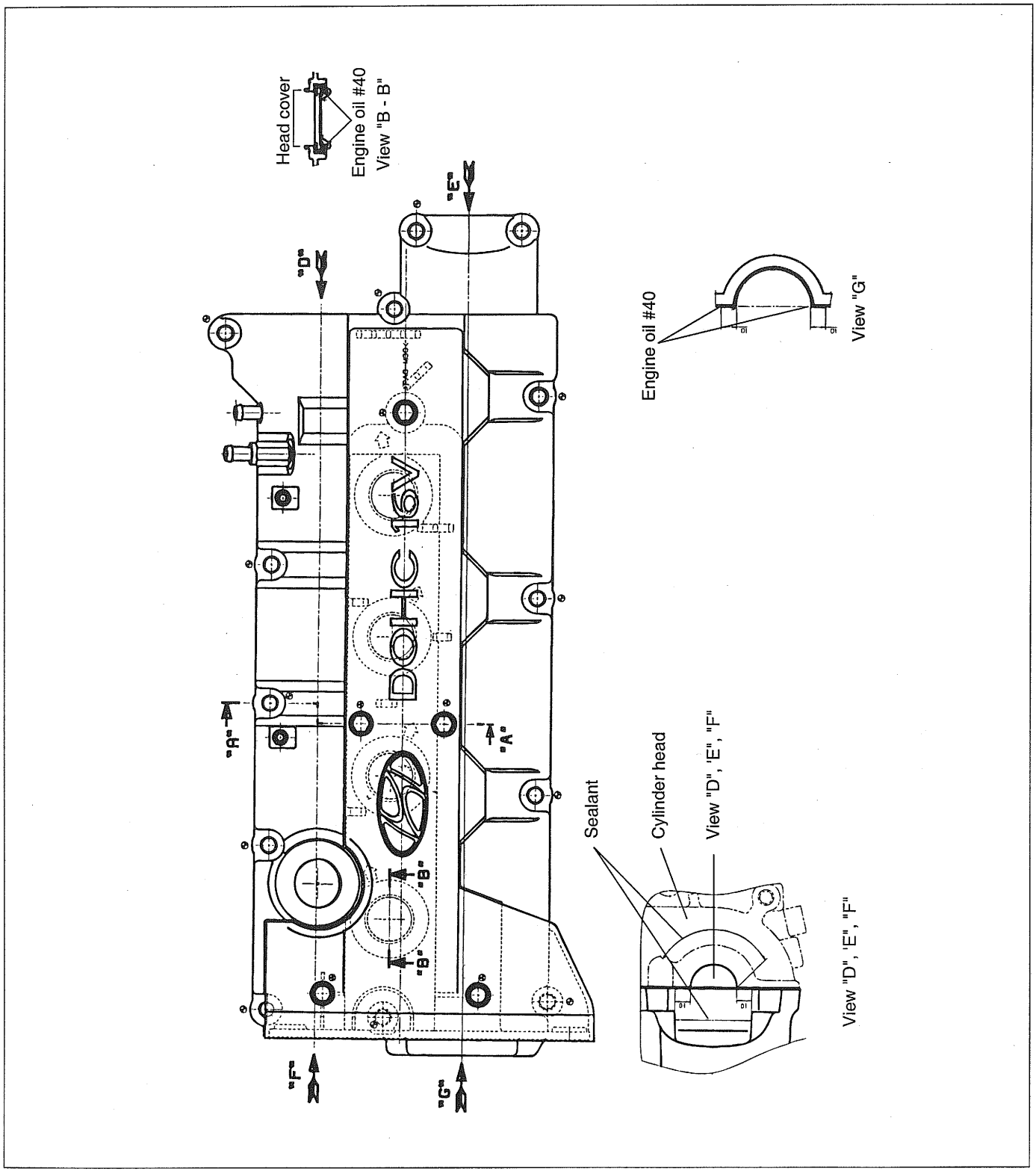
Example : The 2.24 mm shim is installed, and the measured clearance is 0.450 mm. Replace the 2.24 mm shin with a new No. 11 shim.

HINT : New shims have the thickness in millimeters imprinted on the face.

EDKB888E

INSTALLATION ECNC2100

1. Remove any sealant material on the cylinder head and cover.
2. Apply sealant (Loctite NO. 5999) to the cylinder head cover.

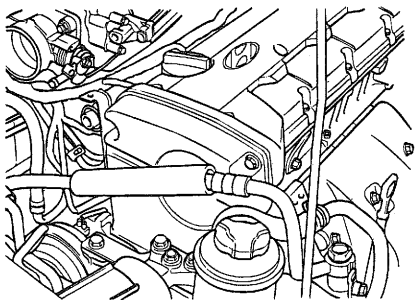


EDKB889E

3. Install the cylinder head cover.

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

4. Connect the accelerater cable.
5. Connect the PCV hose and the breather hose to the cylinder head cover.
6. Connect the spark plug calbes to the spark plugs.
7. Install the upper timing belt cover with the four bolts.

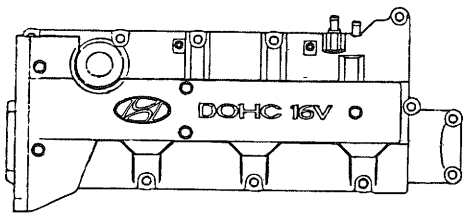


KDNB001C

8. Install the center cover with the five bolts.

Center cover : 2.5 - 3.5 Nm (25 - 35 kg.cm, 2 - 3 lb.ft)

9. Install the oil filler cap.

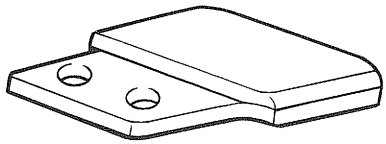


EDKB444C

10. Install the engine cover.

CHAIN GUIDE

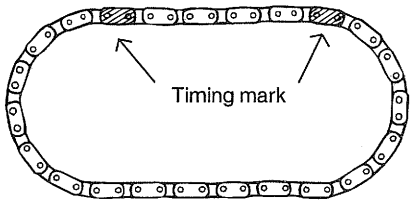
1. Check the chain guide for bend, crack or damage, Replace if necessary.
2. Check the rubber part of chain guide for abnormal wear.
   Replace if necessary.



EDKB888F

TIMING CHAIN

Check the bushing and plate of the timing chain for wear. Replace if it is worn severely.



EDKA030A

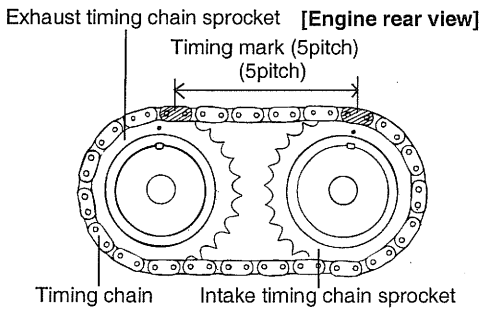
REASSEMBLY ECKB2200

1. Install the mechanical tappets and shims.

   NOTE

   The mechanical tappets and shims must be reinstalled in their original position.

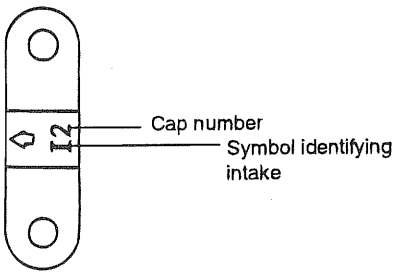
2. Align the camshaft timing chain with the intake timing chain sprocket and exhaust timing chain sprocket as shown.



EDKA030B

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

4. Install the bearing caps. The markings on the caps are for intake/exhaust identification.
   I : Intake camshaft
   E : Exhaust camshaft



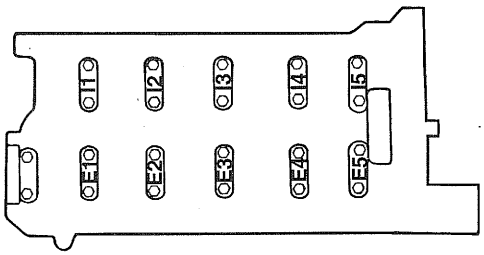
EDDA021C

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

Tightening torque

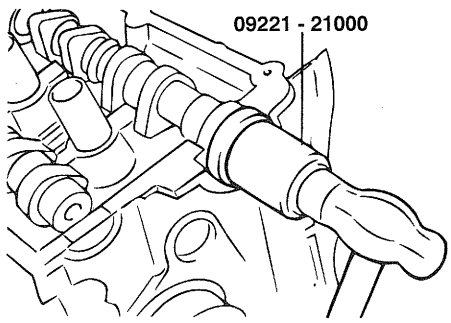
Bearing cap bolt :

14 - 15 Nm (140 - 150 kg.cm, 10 - 11 lb.ft)



EDKB444D

6. Using the special tool, camshaft oil seal installer (09221-21000), press the camshaft oil seal. Be sure to apply engine oil to the oil seal lips. Insert the oil seal along the camshaft front end and install by driving the installer with a hammer to 8.5 mm (0.3346 in.) depth from the front end face of the camshaft.



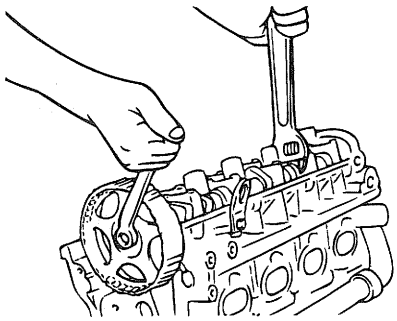
EDDA021E

7. Install the camshaft sprocket to the specified torque.

Tightening torque

Camshaft sprocket bolt :

100 - 120 Nm (1000 - 1200 kg.cm, 74 - 89 lb.ft)



EDDA021F

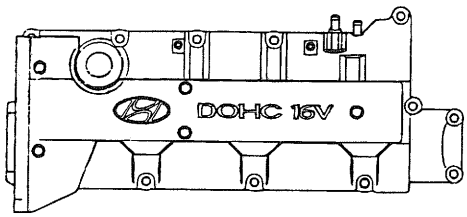
8. Align the camshaft sprocket and crankshaft sprocket timing marks. Place the piston of the NO. 1 cylinder to top dead center on the compression stroke.

9. Install the cylinder head cover.

Tightening torque

Cylinder head cover bolts :

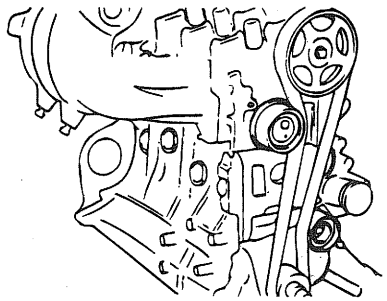
8 - 10 Nm (80 - 100 kg.cm, 6 - 7 lb.ft)



EDKB444C

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 pylley.



KDDA001K

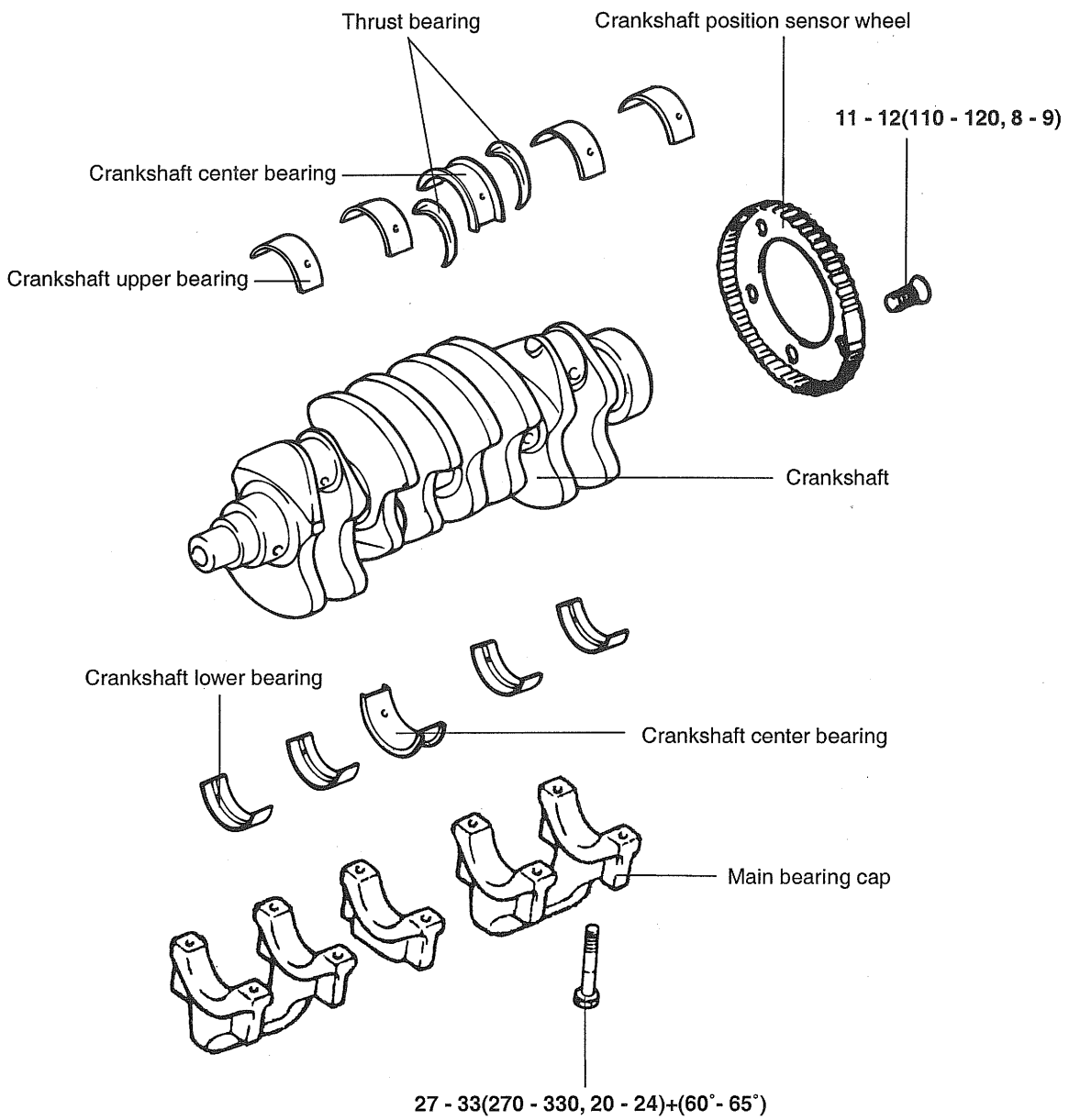
12. Install the timing belt cover.

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

13. Install the coolant pump pulley and crankshaft pulley.

CRANK SHAFT

COMPONENTS ECKB2300



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

EDKB444E

DISASSEMBLY ECKB2400

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.

   NOTE

   Put the main bearing caps in order of their original position and direction for easier reassembly.

4. Remove the main bearing caps and remove crankshaft cramkshaft. Keep the bearings in order by cap number.
5. Remove the crankshaft position sensor wheel.

INSPECTION ECKB2500

CRANKSHAFT

1. Check the crankshaft journals and pins for damage, uneven wear and crack. 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. : 57 mm (2.2440 in.)

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

Crankshaft journal, pin out-of-round and taper
0.01 mm : (0.0004 in.) or less

MAIN BEARINGS AND CONNECTING ROD BEARINGS

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

OIL CLEARANCE MEASUREMENT

1. Measure the diameter of crankshaft journal and pin.
2. Measure the diameter of crankshaft bore and connecting rod bore.
3. Measure the thickness of 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.

Main bearing oil clearance :

0.028 - 0.048 mm (0.0011 - 0.0019 in.)

Connecting rod bearing oil clearance

(To set limits to new parts) :

0.024 - 0.044 mm (0.0009 - 0.0017 in.)

OIL SEAL

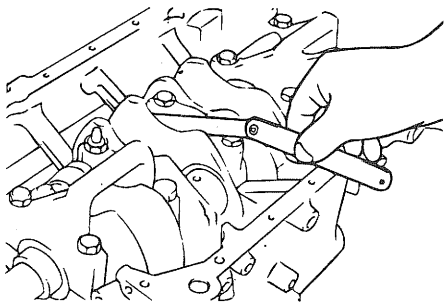
Check front and rear oil seals for damage or worn lips. Replace any defective seal.

BEARING CAPS

After installing the bearing caps, make sure that the crankshaft turns smoothly and the end play is correct. If the end play exceeds the service limit, replace the crankshaft bearing.

Standard value : 0.06 - 0.26 mm (0.0023 - 0.010 in.)

Limit : 0.30 mm (0.0118 in.)



V5EM208A

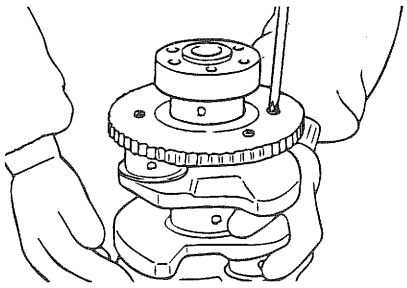
SENSOR WHEEL

1. Remove the crankshaft sensor wheel.
2. Check the crankshaft sensor wheel for damage, crack and wear. Replace if necessary.
3. Check the clearance between crankshaft sensor wheel and crank position sensor with a depth gauge.

Standard value :

Clearance between crankshaft sensor wheel and crank position sensor :

0.5 - 1.1 mm (0.020 - 0.043 in.)



EDDA028C

NOTE

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

REASSEMBLY ECKB2600

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 when disassembling.
2. Install the crankshaft. Apply engine oil to the journals.
3. Install bearing caps and tighten the cap bolts to the specified torque in the sequence of the center, No.2, No.4 front and rear caps. Cap bolts should be tightened evenly in from 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 :

27-33 Nm (270 - 330 kg.cm, 20 - 24lb.ft)+(60° - 65°)

Connecting rod cap bolt :

50-53 Nm (500 - 530 kg.cm, 37 - 39 lb.ft)

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.

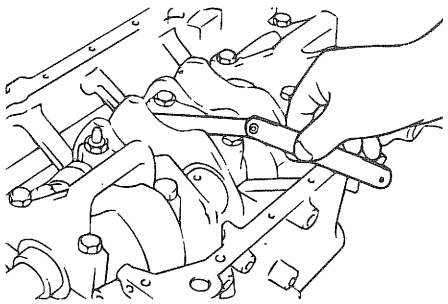
Standard value

Crankshaft end play :

0.06 - 0.260 mm (0.0024 - 0.0102)

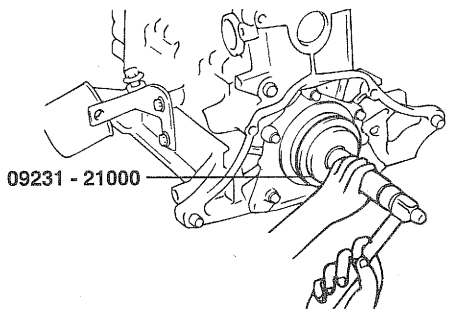
Connecting rod end play :

0.10 - 0.25 m.m (0.0039 - 0.0098 in.)



V5EM208A

5. Using the special tool, crankshaft rear oil seal installer (09231 - 21000) as shown, install the oil seal in the crankshaft rear oil seal case. Press fit the oil seal being careful not to align it wrong.

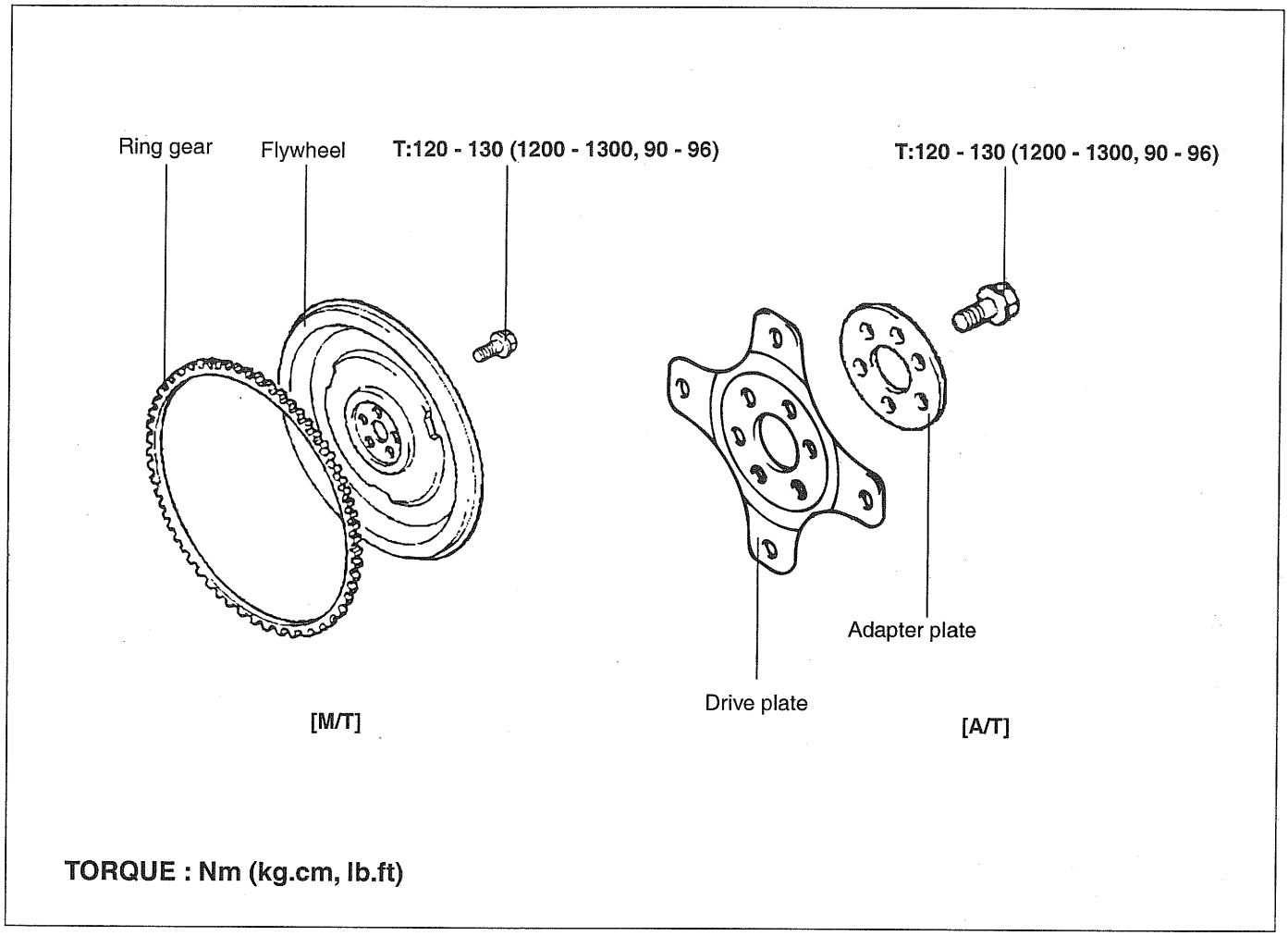


EDDA029B

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 ECKB2700



EDKA999B

M/T : Manual Transmission Vehicles
A/T : Automatic Transmission Vehicles

DISASSEMBLY ECKB2800

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

INSPECTION ECKB2900

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 : 0.1 mm (0.004 in.)

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

REASSEMBLY ECKB3000

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

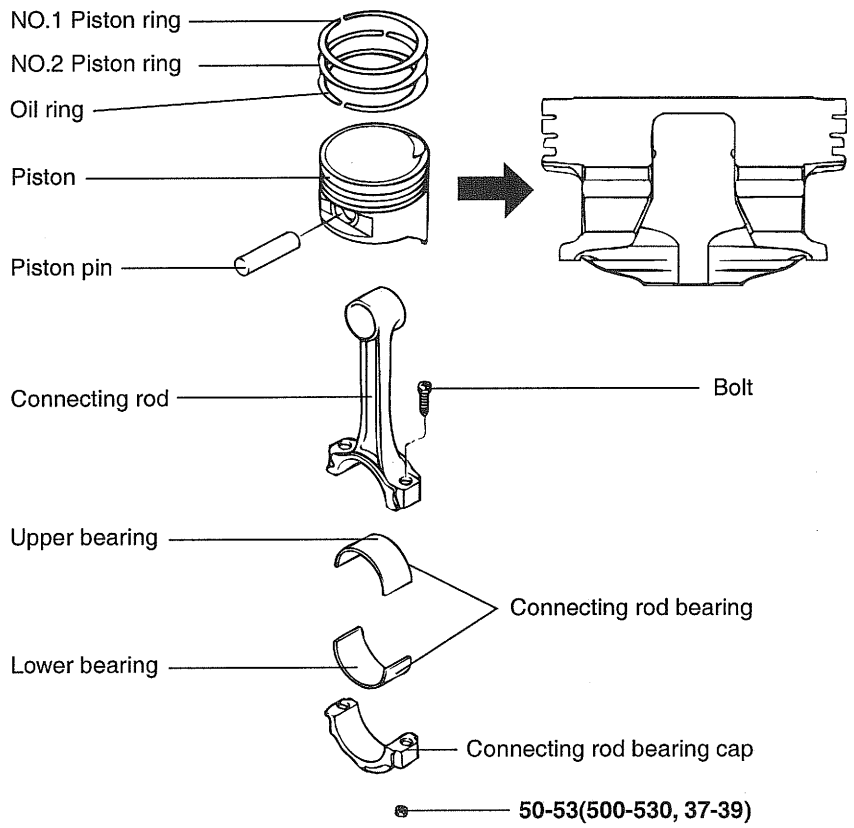
Tightening torque

Flywheel bolt :

120-130 Nm (12000-1300 kg.cm, 90-96 lb.ft)

PISTON

COMPONENTS ECKB3100



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

EDKA999A

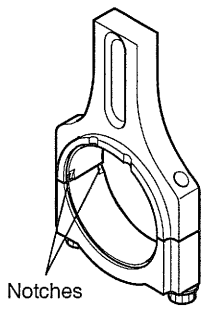
DISASSEMBLY ECKB3200

CONNECTING ROD CAP

⚠ ***CAUTION***

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

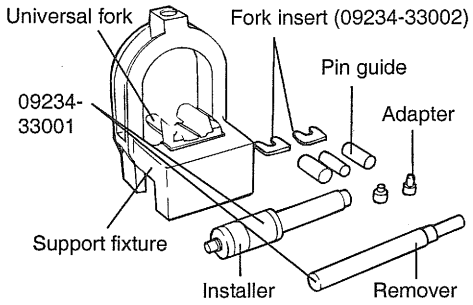
1. Remove the connecting rod cap bolts, then remove the caps and the big end lower bearing.
2. Push each piston connecting rod assembly toward the top of the cylinder.



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.

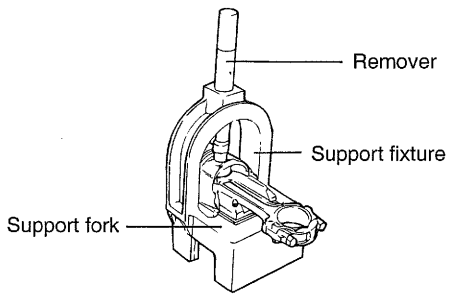


ECA9361A

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.



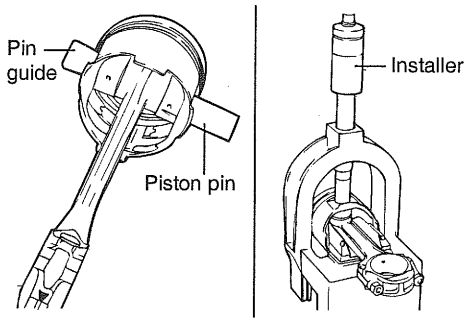
EDA9048A

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.

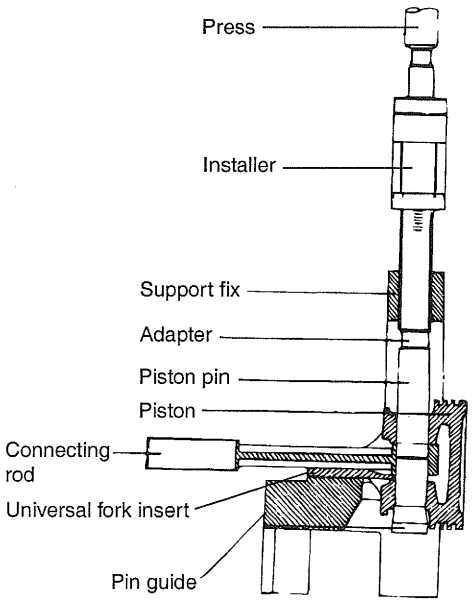


ECA9361C

7. Insert the installer tool through the hole in the arch of the support fixture and use a 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 350 - 1350 kgf of force when the installing tool seats against the top of the arch.



HEW20A55

INSPECTION ECNC3300

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)

PISTONS 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 only the piston rings only.

Piston ring side clearance

No. 1 : 0.04-0.08 mm (0.0016-0.0031 in.)

No. 2 : 0.03-0.07 mm (0.0012-0.0028 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 to the cylinder wall by gently pressing it down with a piston. Measure the gap with a feeler gauge. If the gap exceeds the service limit, replace the piston ring.

Piston ring end gap

[Standard]

No. 1 : 0.23-0.38 mm (0.0091-0.0150 in.)

No. 2 : 0.45-0.60 mm (0.0177 - 0.0236 in.)

Oil ring : 0.20 - 0.60 mm (0.0079 - 0.0236 in.)

[Limit]

No. 1, 2 oil ring : 1.0 mm (0.039 in.)

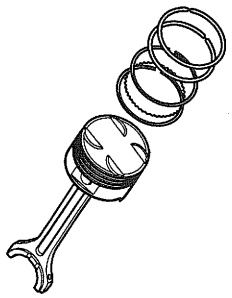
3. When replacing the ring without correcting the cylinder bore, check the gap with the ring situated at the low part of cylinder that is less worn out.

PISTON RING SERVICE SIZE AND MARK

Standard	None
0.25 mm (0.010 in.) O.S.	25
0.25 mm (0.010 in.) O.S.	50
0.75 mm (0.030 in.) O.S.	75
1.00 mm (0.039 in.) O.S.	100

NOTE

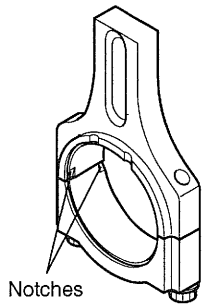
The mark can be found on the upper side of the ring next to the end.



KFW3037C

CONNECTING RODS

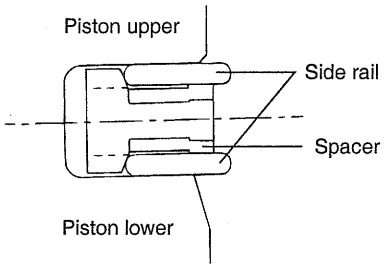
1. When the connecting rod cap is installed, make sure that the cylinder numbers match. (marked on rod end cap at disassembly) When a new connecting rod is installed, make sure that the notches holding the bearing in place are on the same side.
2. Replace the connecting rod if it is damaged at either 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.



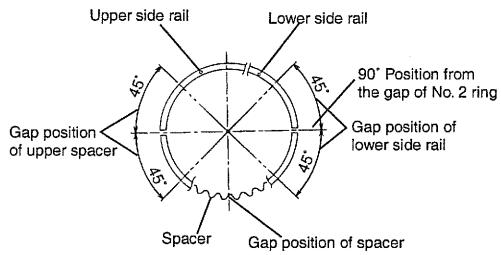
KFW3049A

REASSEMBLY ECNC3400

1. Install the spacer.

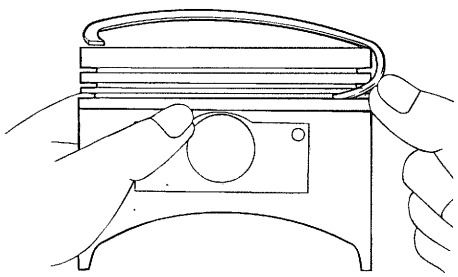


ECA9082A



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).



ECA9380B

⚠ ***CAUTION***

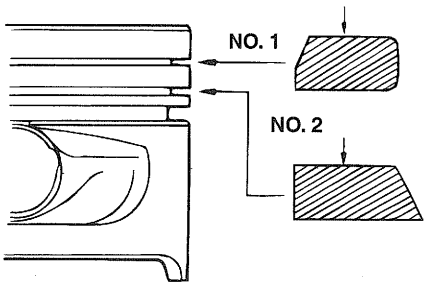
Do not use a piston ring expander when installing side rail.

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

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

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

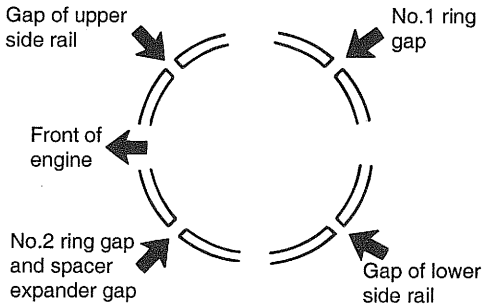
6. Install the No. 1 piston ring.



ECKB340A

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 :

50-53 Nm (500-530 kg.cm, 36-39 lb.ft)

⚠ *CAUTION*

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

14. Check the connecting rod side clearance.

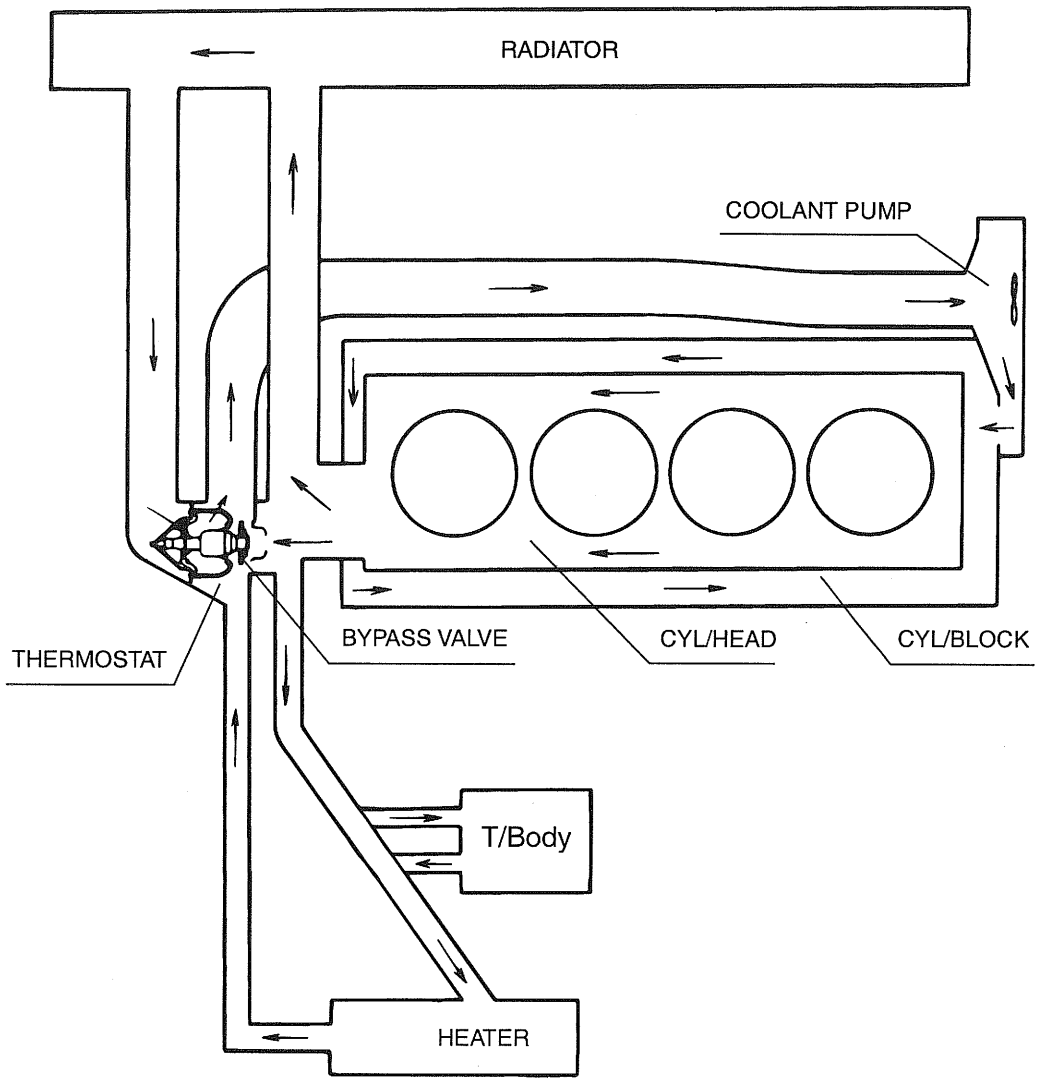
Connecting rod side clearance
Standard : 0.10-0.25 mm (0.0039-0.0098 in.)
Limit : 0.4 mm (0.0157 in.)

15. Install the oil screen.
16. Install the oil pan.
17. Install the cylinder head.

COOLING SYSTEM

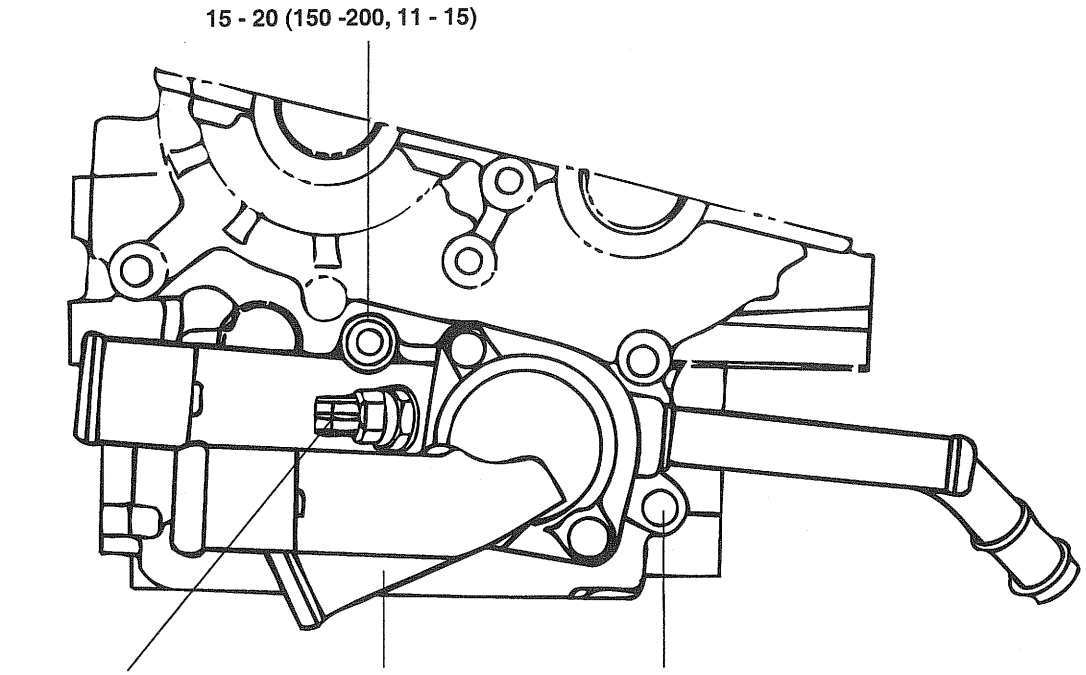
ENGINE COOLANT HOSE/PIPES

COOLING SYSTEM DIAGRAM ECKB3500



EDKB444F

COMPONENTS ECKB3600



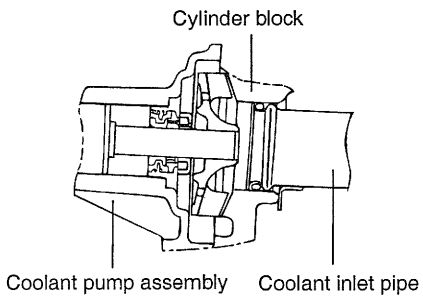
TORQUE : Nm (kg.cm, lb.ft)

EDKA050A

INSPECTION ECKB3700

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

Replace if necessary.



ECKA040A

REASSEMBLY ECKB3800

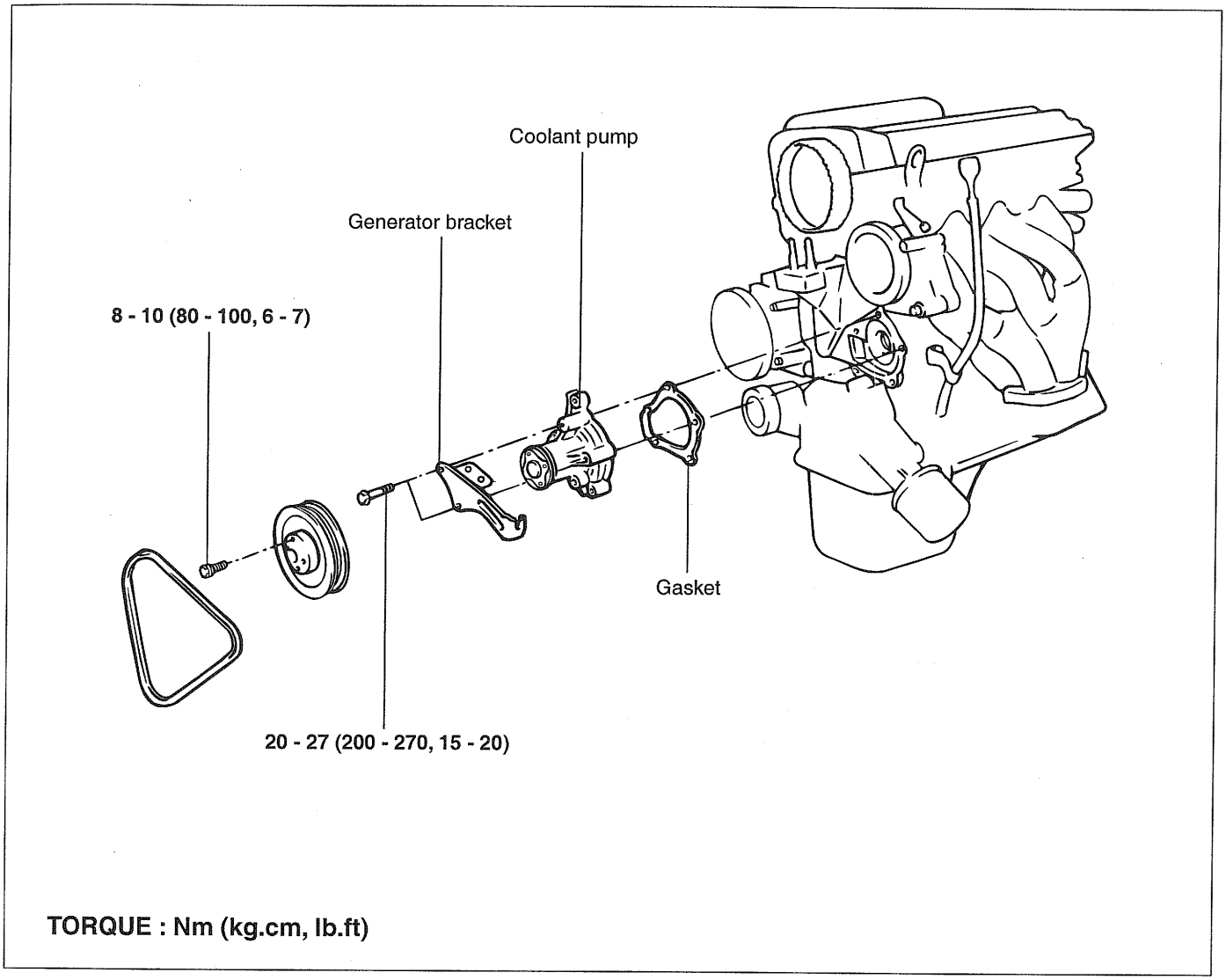
Fit an O - ring in the groove provided at the coolant inlet pipe end, wet the O - ring with coolant and insert the coolant inlet pipe.

NOTE

- *Do not apply oil or grease to the coolant pipe O - ring.*
- *Keep the coolant pipe connections free from sand, dust, etc.*
- *Insert the coolant pipe fully into the coolant pump.*
- *Do not reuse O - ring. Replace it with a new one.*

ENGINE COOLANT PUMP

COMPONENTS ECKB3900



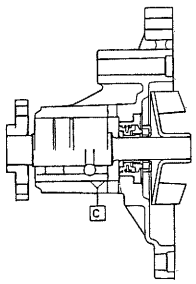
EDKB046A

DISASSEMBLY ECKB4000

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 ECKB4100

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 the seal is defective. Replace the coolant pump assembly.



EDKB051A

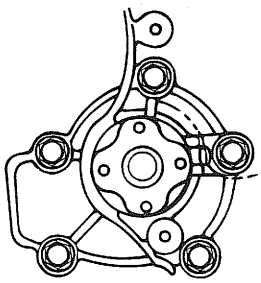
REASSEMBLY ECKB4200

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 :

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

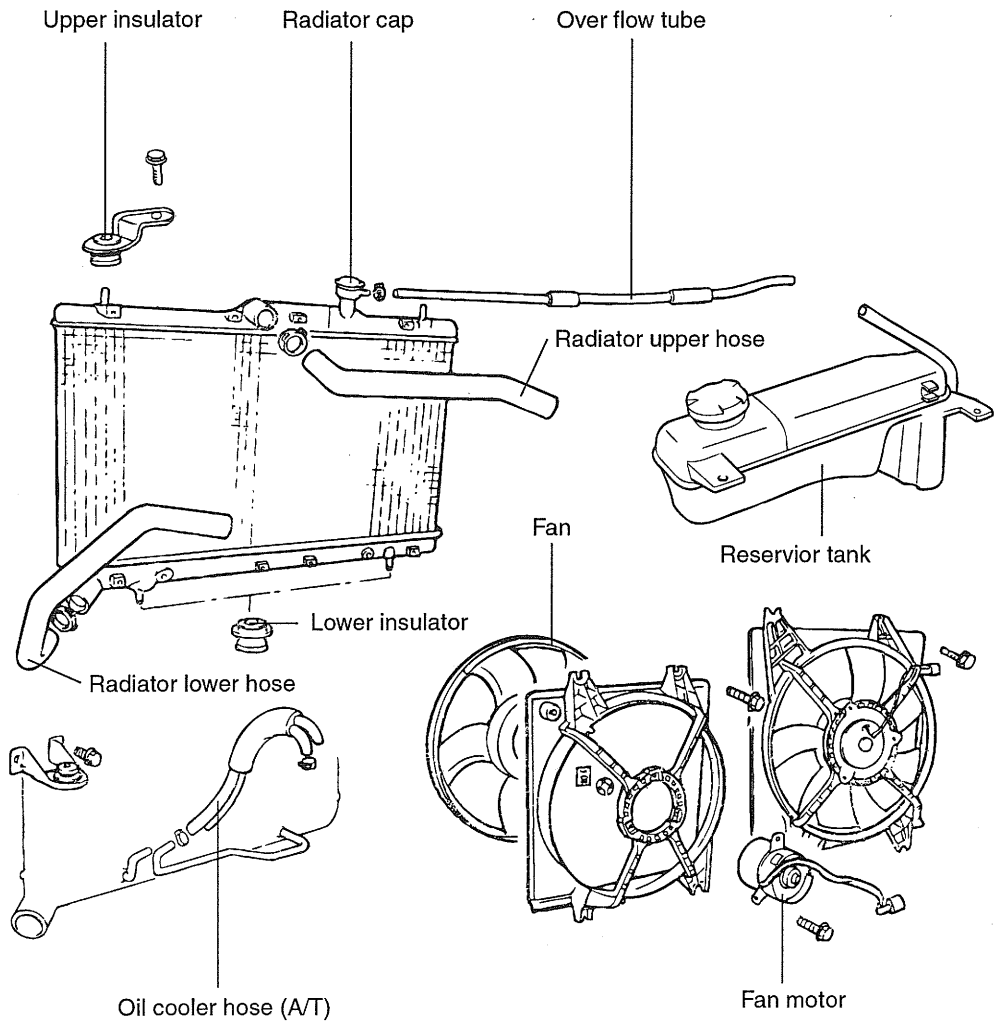


EDKB050B

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

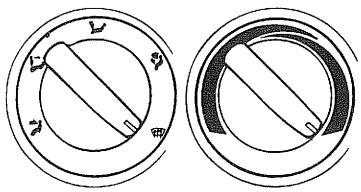
COMPONENTS ECNC4300



EDNB005A

DISASSEMBLY ECKB4400

1. Disconnect the radiator fan motor connector.
2. Set the temperature control switch 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.

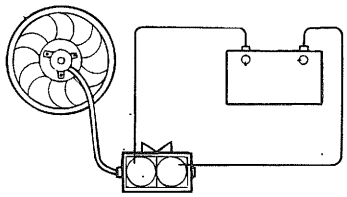
6. Remove the radiator mounting bolts.
7. Remove the radiator and the fan motor together.
8. Remove the fan motor from the radiator.

INSPECTION ECKB4500

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 crack, 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 machine for checking a cooling system.
7. Check the radiator cap seal for crack or damage.

RADIATOR FAN MOTOR

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



ECDA064A

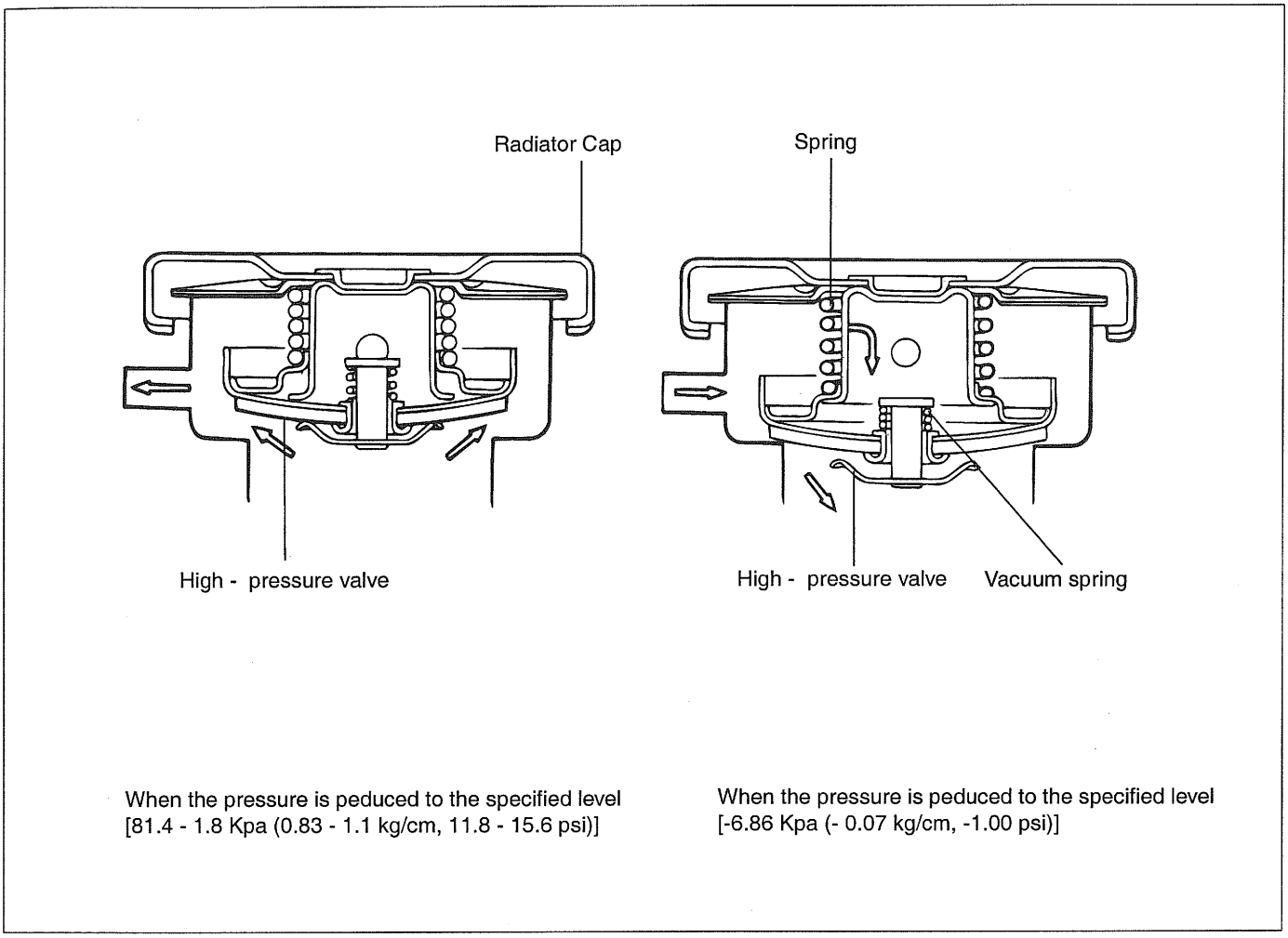
2. Check that abnormal noises are not produced while the motor is turning.

REASSEMBLY ECKB4600

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

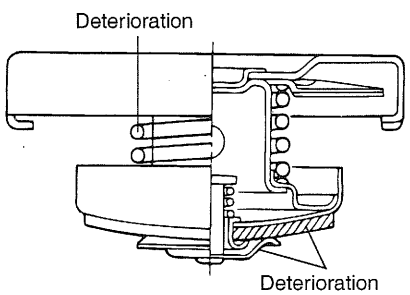
COMPONENTS ECKB4700



ECDA066A

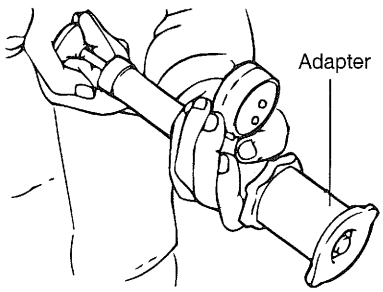
INSPECTION ECKB4800

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



ECDA068A

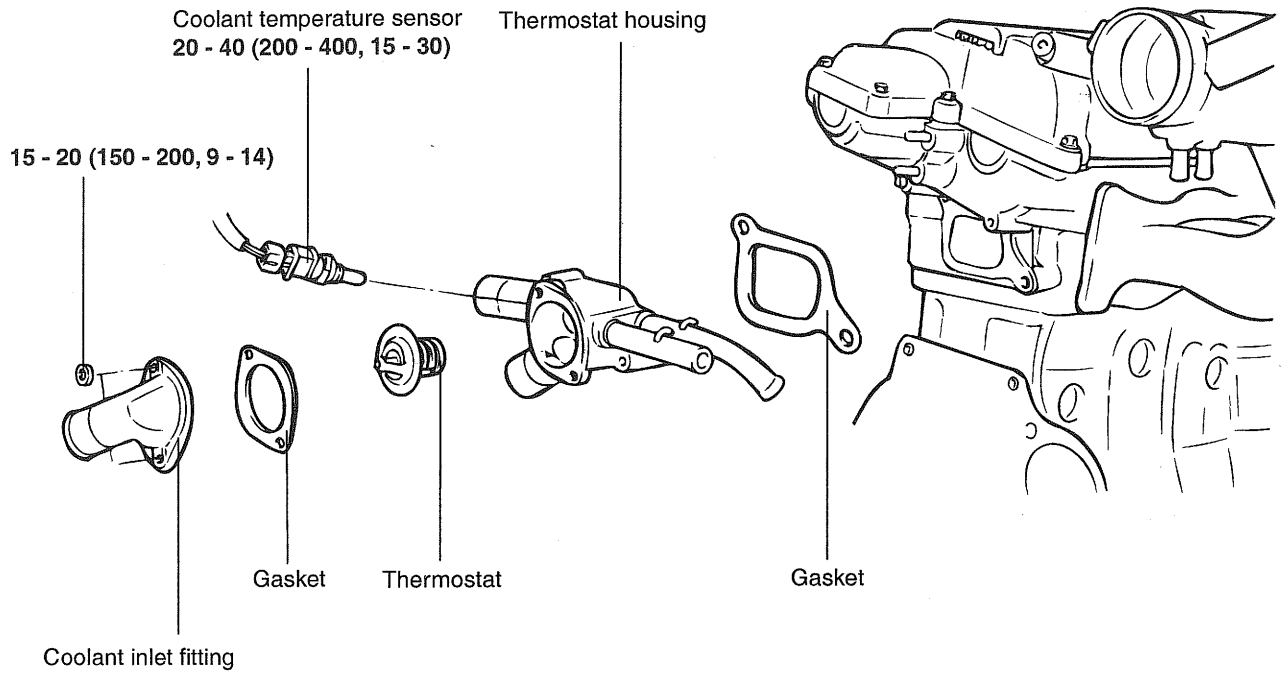
2. Attach a radiator cap tester to the radiator.
3. Pump the tester until the pointer stabilizes.
4. If the pointer stays constant for 10 sec. at a point exceeding the service limit, the radiator cap is good.



ECDA068B

THERMOSTAT

COMPONENTS ECKB4900



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

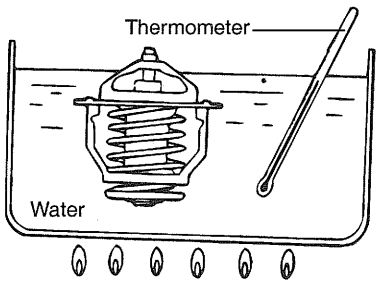
ECKB040D

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

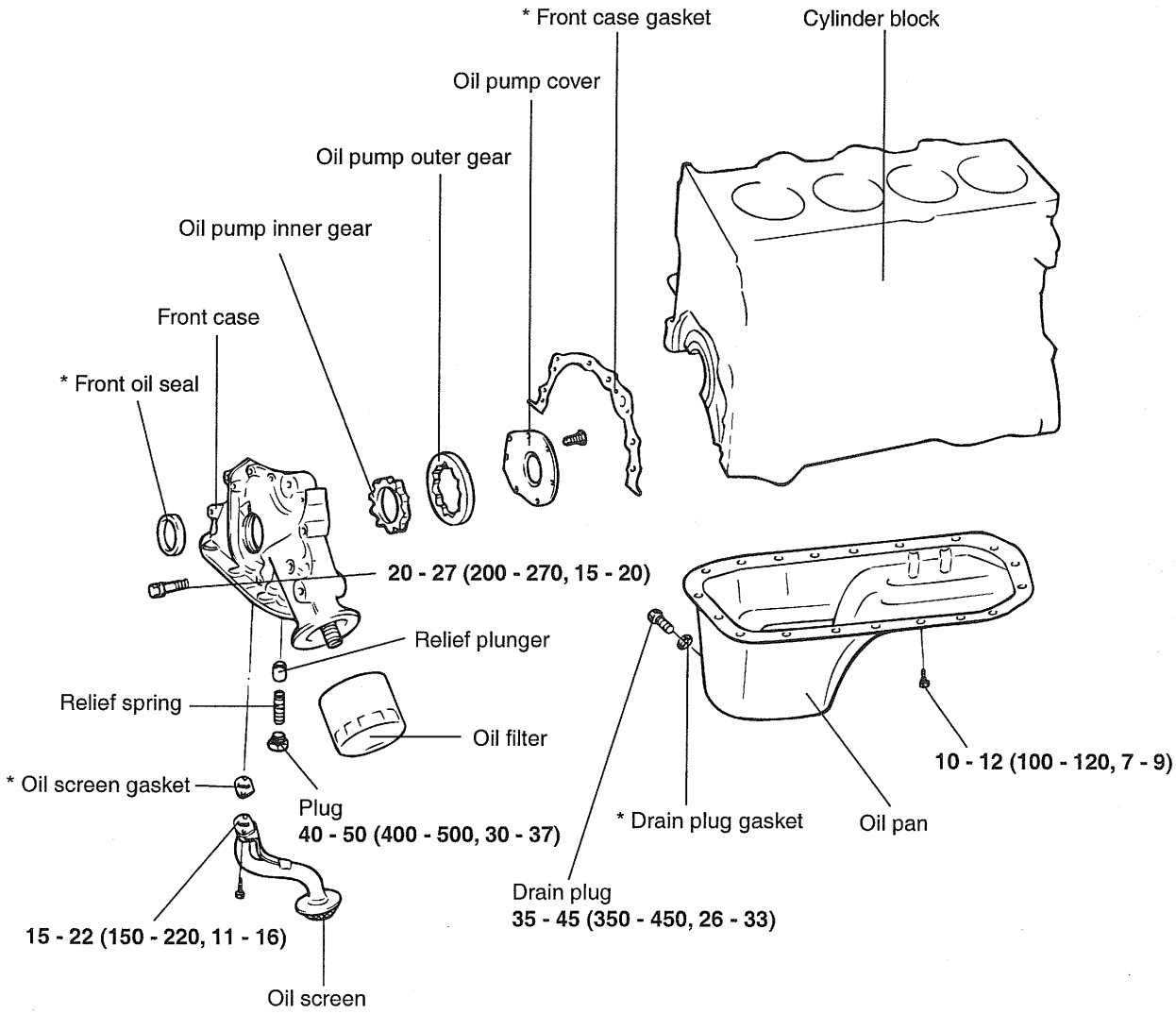
Coolant temperature sensor :

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

LUBRICATION SYSTEM

OIL PUMP

COMPONENTS ECKB5200



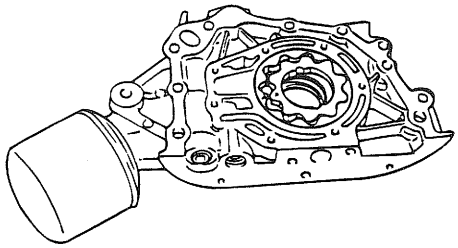
* Replace the gasket and seal with new ones after removal.

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 ECKB5400

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

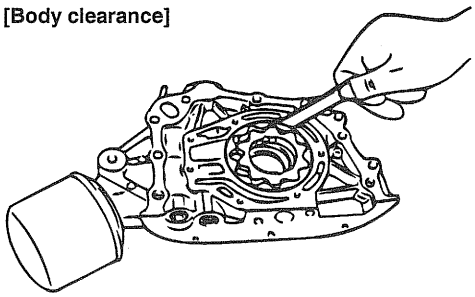
Check the surfaces contacting gears for damage or worn.

OIL PUMP GEARS

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

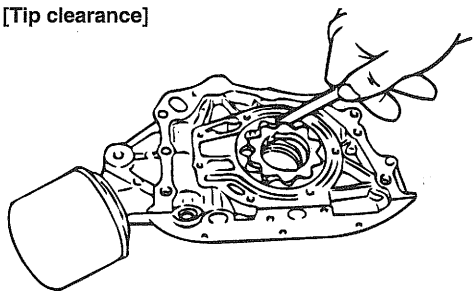
[Body clearance]



EDDA066A

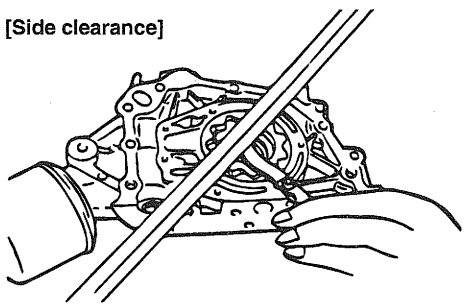
3. Check the tip clearance on the pump roter.

[Tip clearance]

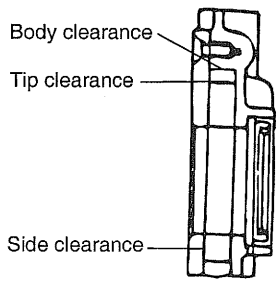


EDDA066B

[Side clearance]



A5EM048C



EDDA066D

RELIEF VALVE AND SPRING

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

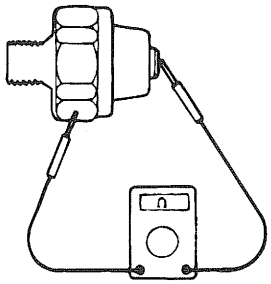
Standard value

Free height : 43.8 mm (1.724 in.)

Load : 3.7 kg/40.1 mm (8.14 lb/1.579 in.)

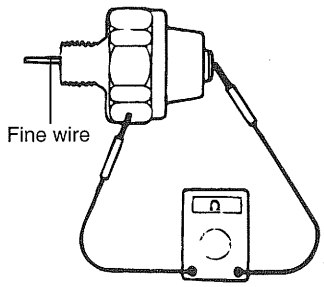
OIL PRESSURE SWITCH

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.



EDDA061B

4. Check for an air leaks, the diaphragm is broken. Replace the switch.

REASSEMBLY ECKB5500

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

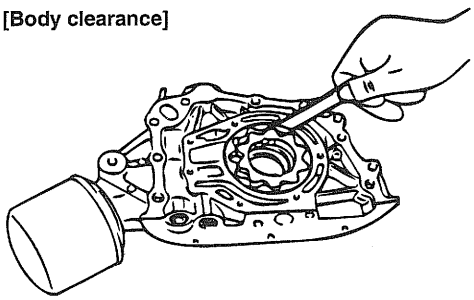
Oil pump cover bolt : 6-9 Nm (60-90 kg.cm, 4-7 lb.ft)

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

Tightening torque

Relief valve plug : 400-500 kg.cm, 30-37 lb.ft

[Body clearance]



EDDA066A

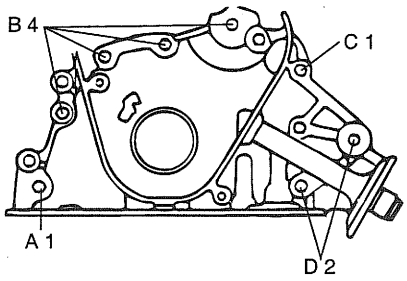
FRONT CASE

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

Tightening torque :

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

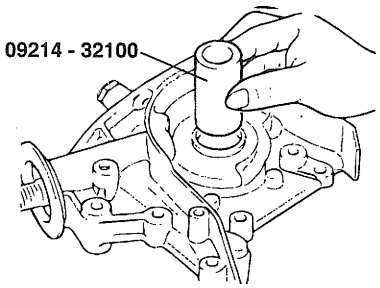
Length
A : 25 mm (0.98 in.)
B : 20 mm (0.79 in.)
C : 45 mm (1.77 in.)
D : 38 mm (1.50 in.)



KDDA001N

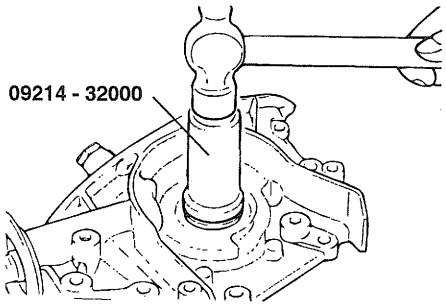
OIL SEAL

1. Using the special tool, Crankshaft oil seal guide (09214 - 32100), install the oil seal.



ECDA018B

2. Using the special tool, Crankshaft front oil seal installer (09214-32000), install the oil seal.

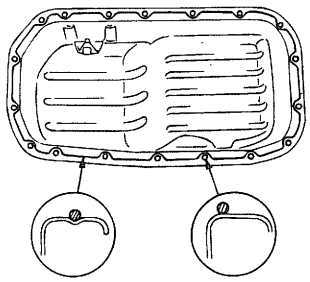


ECDA018C

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.

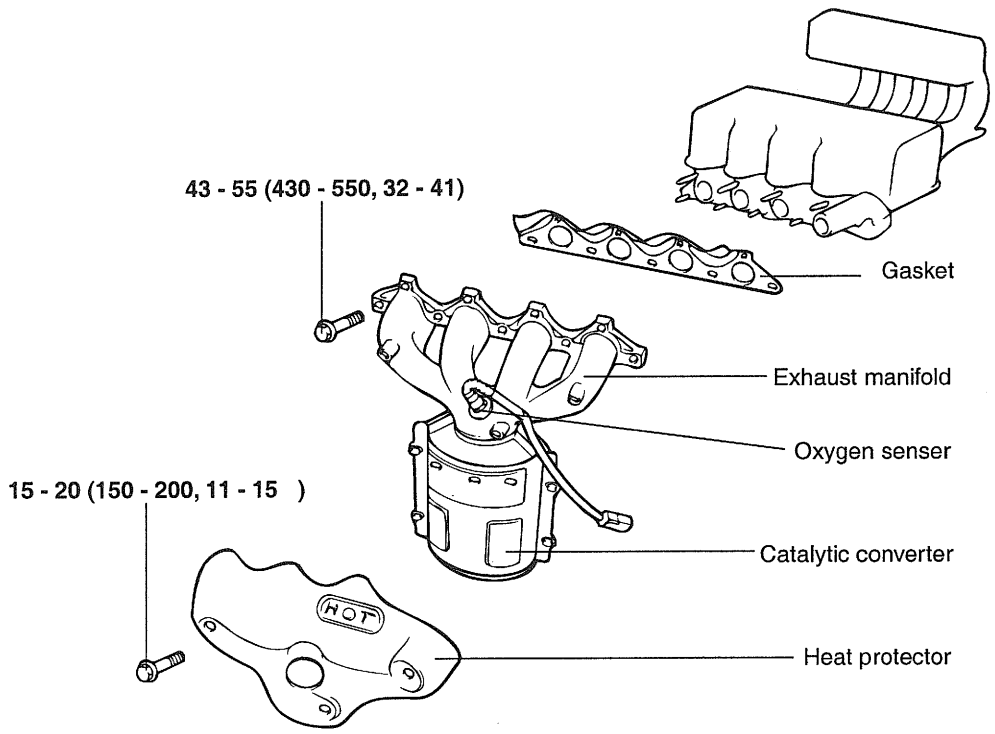
Tightening torque

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

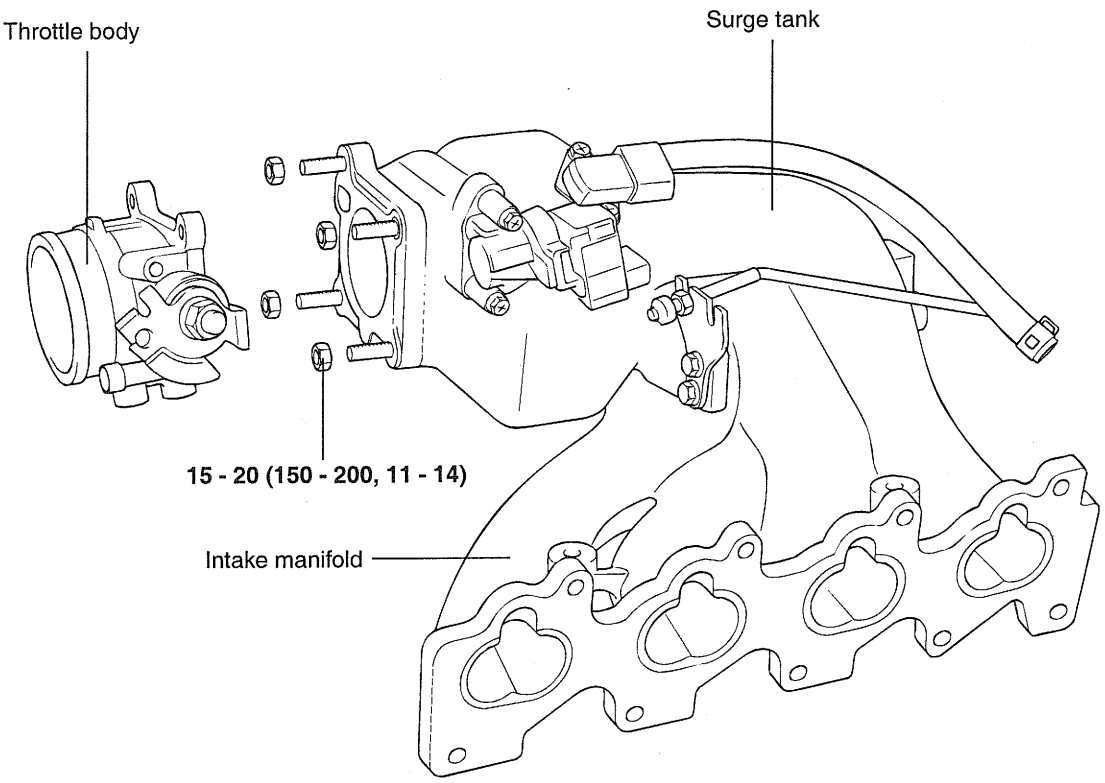
Install the exhaust manifold in the reverse order of removal.

⚠ ***CAUTION***

Replace the exhaust manifold gasket and lock nut when reassembling.

INTAKE MANIFOLD

COMPONENTS ECNC6000

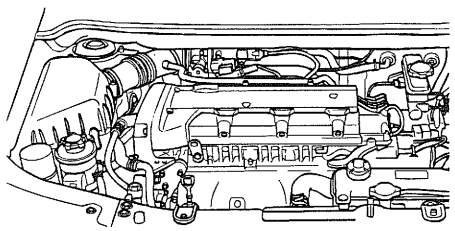


TORQUE : Nm (kg.cm, lb.ft)

EDNB006A

REMOVAL ECNC6100

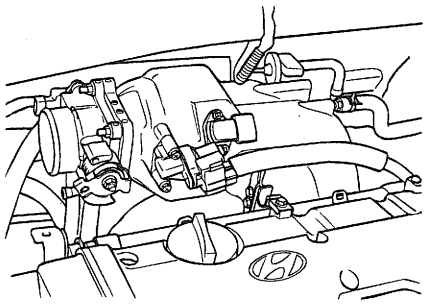
1. Remove the engine cover.



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.

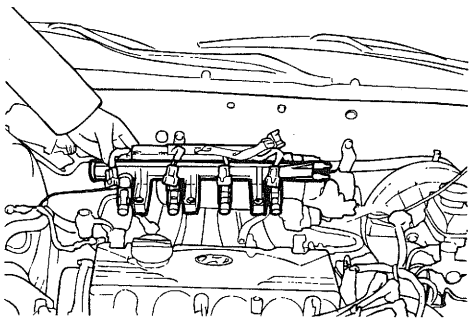


KDNB006B

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

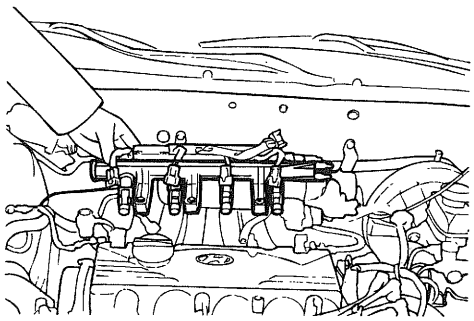
Check for damage or cracking of any part.

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.

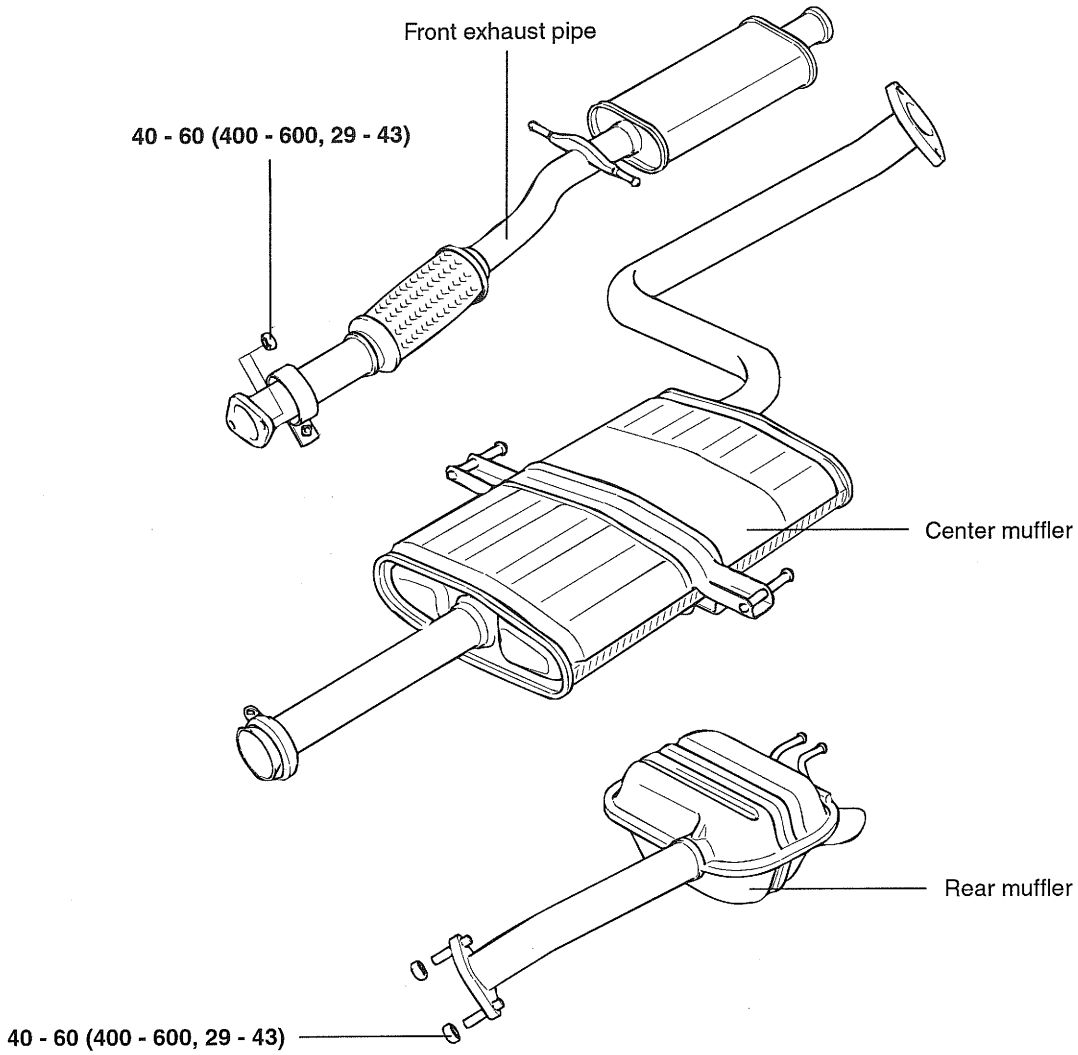


ECDA088B

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

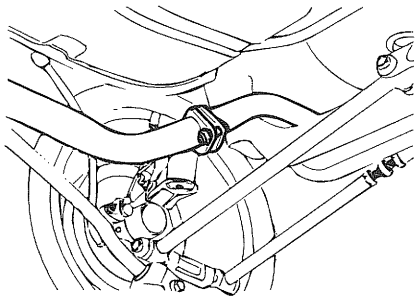
REMOVAL ECNC6500

REAR MUFFLER

⚠ *CAUTION*

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

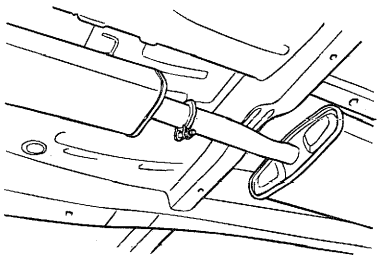
1. Disconnect the rear muffler from the center muffler.
2. Remove the rubber hangers and remove the rear muffler.



KDNB007C

CENTER MUFFLER

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

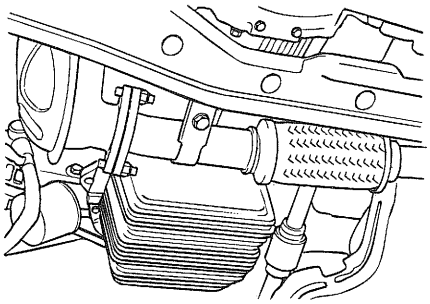


KDNB007B

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.



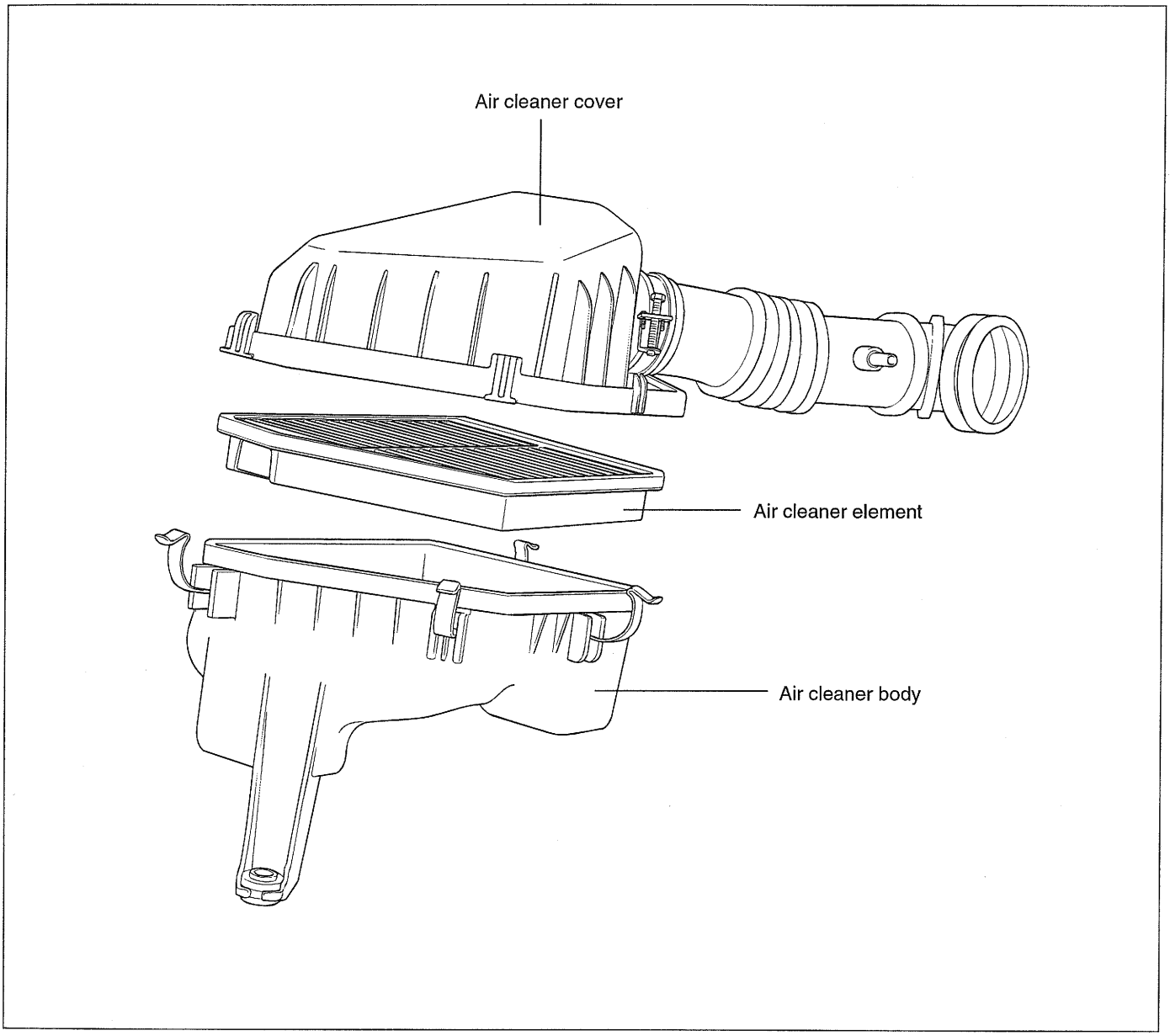
KDNB003B

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)

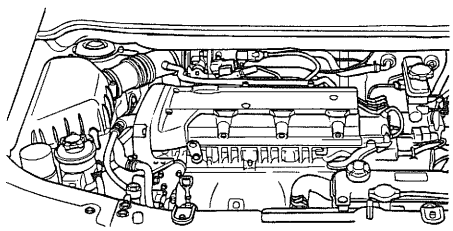
COMPONENTS ECNC6700



EDNB008A

REMOVAL ECNC6800

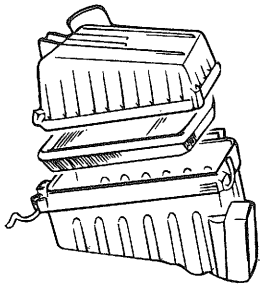
1. Remove the air duct connected to the air cleaner.
2. Remove the air intake hose at the air cleaner side.
3. Remove the air cleaner cover and filter.
4. Remove the air cleaner mounting bolts and remove the air cleaner.



KDNB003C

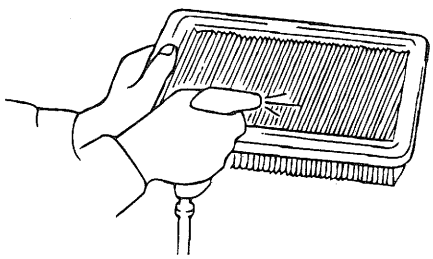
INSPECTION ECKB6900

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.

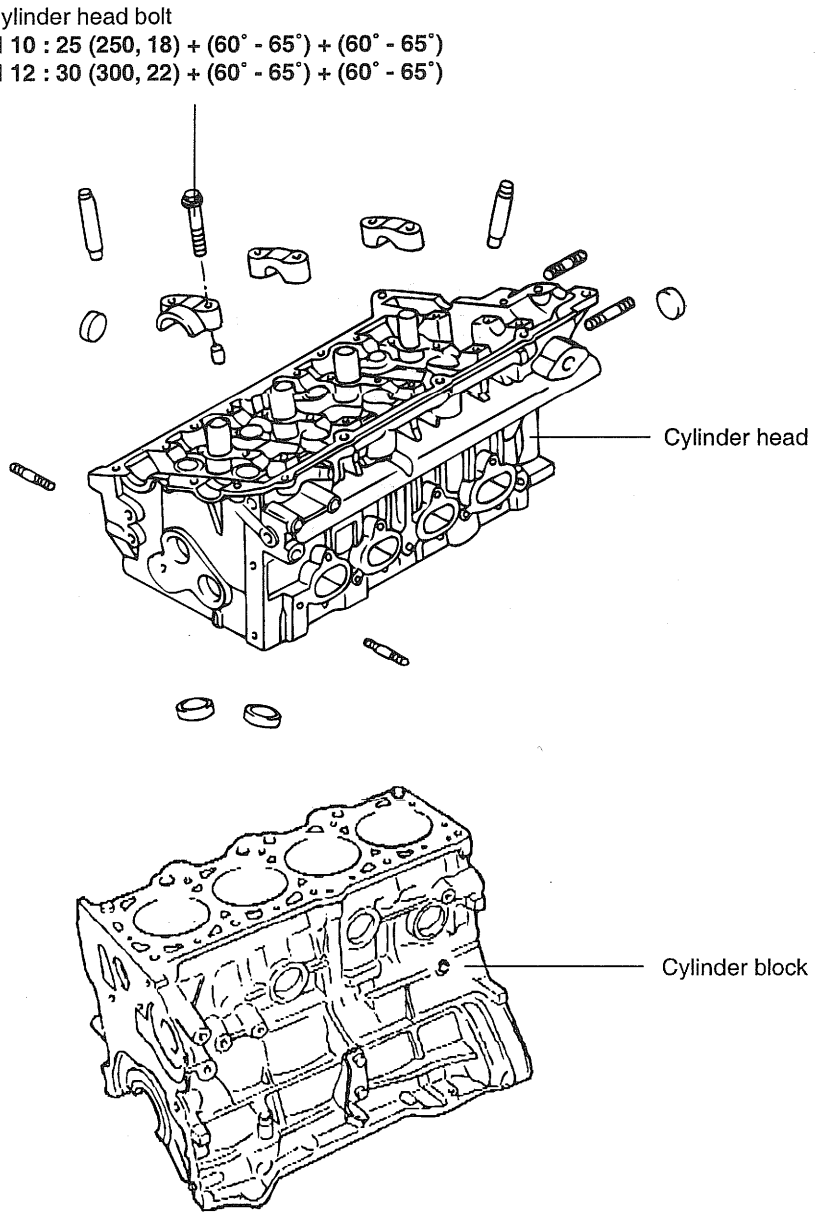
INSTALLATION ECKB7000

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

CYLINDER HEAD ASSEMBLY

CYLINDER HEAD

COMPONENTS ECKB7100

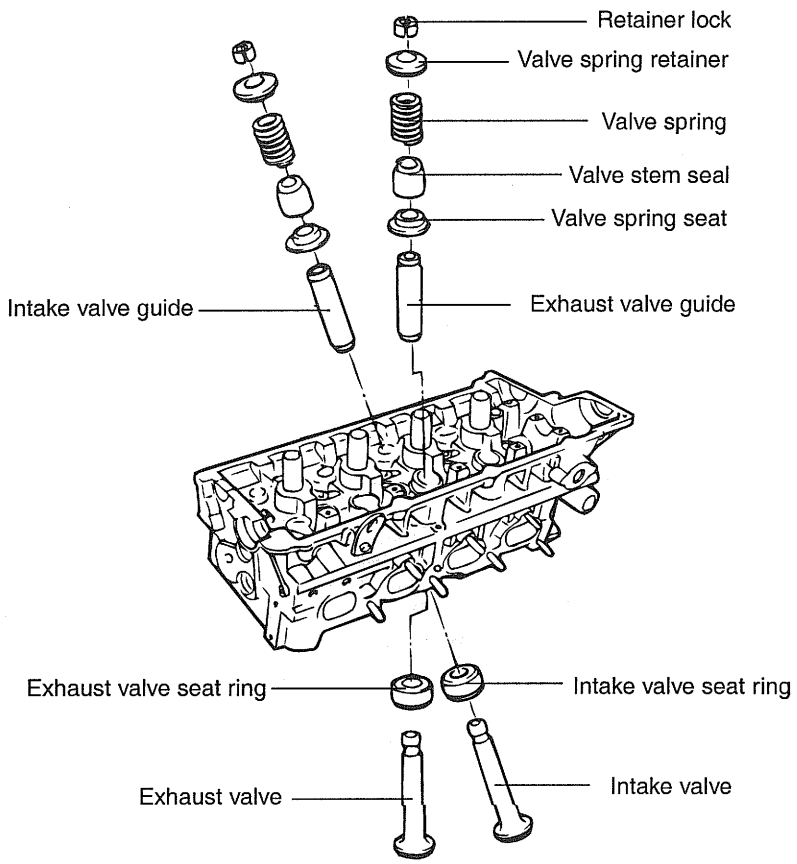


TORQUE : Nm (kg.cm, lb.ft)

EDKB050E

VALVES

COMPONENTS ECKB7200



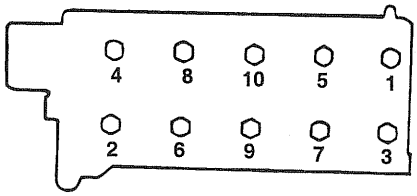
TORQUE : Nm (kg.cm, lb.ft)

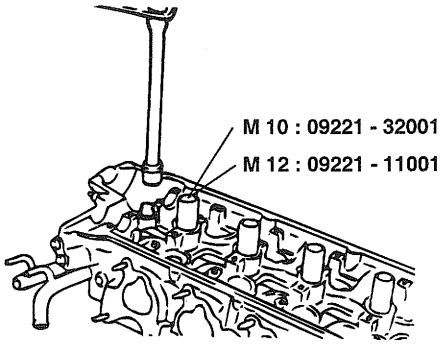
***Replace the seal with new one after removal**

EDKB050D

DISASSEMBLY ECKB7300

1. Using a special tool (09221- 32001, 09221 - 11000), remove the cylinder head bolts in the order shown in the illustration.



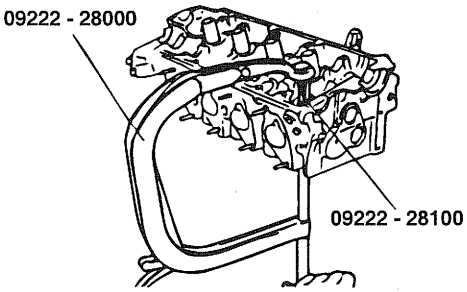


KDDB001L

2. Using the special tool (09222 - 28000, 09222 - 28100), remove the valve spring 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.

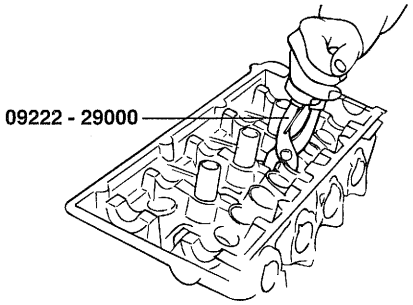


EDKB444G

3. Remove the valve stem seals with pliers (09222 - 29000).

NOTE

Do not reuse the valve stem seals.

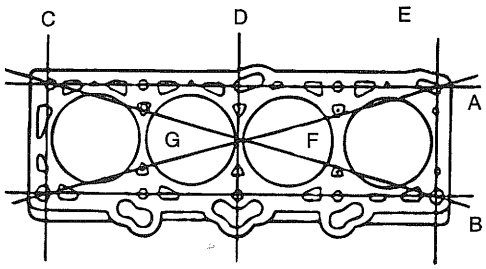


EDDA088B

INSPECTION ECKB7400

1. Check the cylinder head for crack, 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.



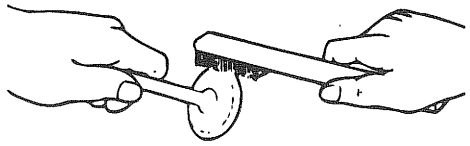
EDKB444H

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 : 0.06 mm (0.0024 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]

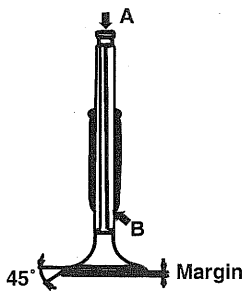
Intake : 1.15 mm(0.0453 in.)

Exhaust : 1.35 mm(0.0531 in.)

[Limit]

Intake : 0.8 mm(0.0315 in.)

Exhaust : 1.0mm(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 : 48.86 mm(1.9236 in.)

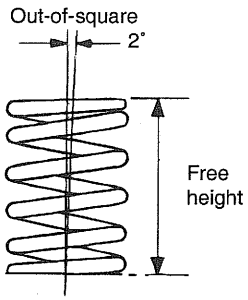
Load : 18.3kg / 39 mm (40.0 kg / 30.5mm)

Out - of - square : 1.5° or less

[Limit]

Free height : - 1.0 mm(- 0.0394 in.)

Out - of - square : 3°



ECA9281C

VALVE GUIDES

Check the valve stem-to-guide clearance. If the clearance exceeds the service limit, replace the valve guide.

Valve stem-to-guide clearance

[Standard]

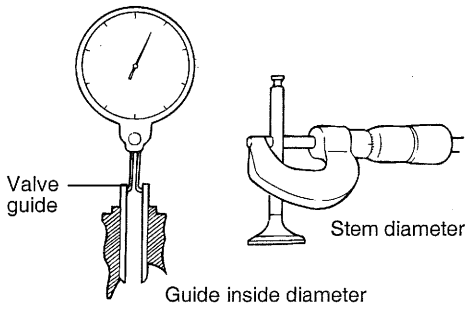
Intake : 0.02-0.05 mm(0.0008-0.0020 in.)

Exhaust : 0.035-0.065mm(0.0014 - 0.0026 in.)

[Limit]

Intake : 0.1 mm (0.0040 in)

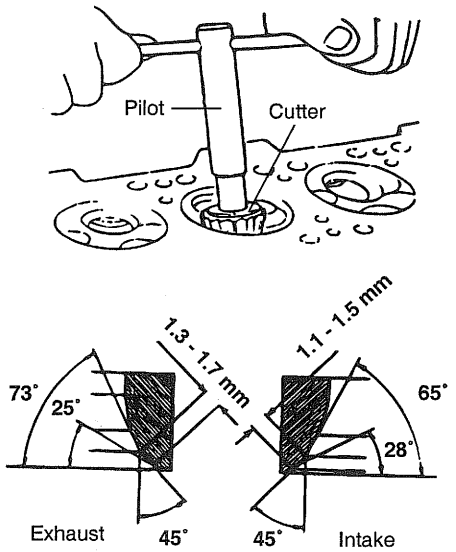
Exhaust : 0.13 mm (0.0051 in.)



ECA9281D

RECONDITIONING VALVE SEAT

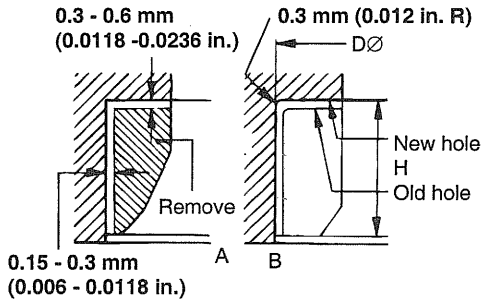
Check the valve seat for overheating and unequal contact with the valve face. Recondition or replace the seat if necessary. Before reconditioning the seat, check the valve guide for wear. If the valve guide is worn, replace it and then recondition the seat. Recondition the valve seat with a valve seat 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.



EDKB444I

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.

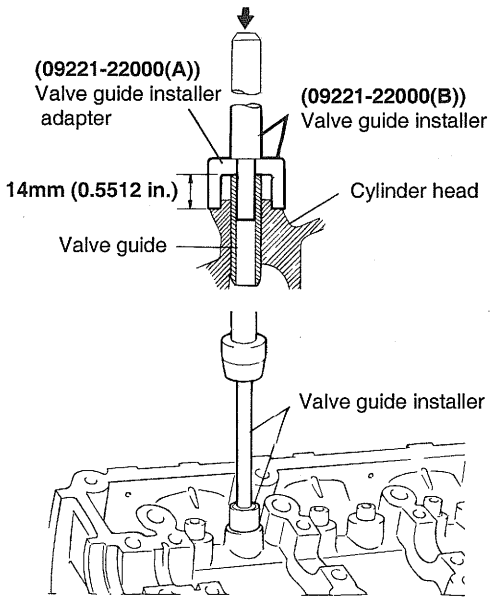
Valve seat contact width
Intake : 1.1 - 1.5 mm (0.0433 - 0.0590 in.)
Exhaust : 1.3 - 1.7 mm (0.0512 - 0.0670 in.)

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 Seat ring	0.3 (0.012) O.S. 0.6 (0.024) O.S.	30 60	7.5-7.7 (0.295-0.303) 7.8-8.0 (0.307-0.315)	33.300-33.325 (1.3110-1.3120) 33.600-33.625 (1.3228-1.3238)
Exhaust valve Seat ring	0.3 (0.012) O.S. 0.6 (0.024) O.S	30 60	7.9-8.1 (0.311-0.319) 8.2-8.4 (0.323-0.331)	28.800-28.821 (1.1339-1.1347) 29.100-29.121 (1.1457-1.1465)

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.

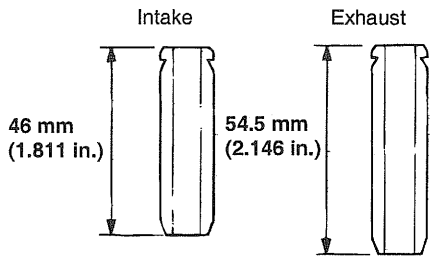


ECDA109C

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. Keep in mind that the intake and exhaust valve guides are different in length.

NOTE

Do not install a valve guide unless it is oversize.



ECA9281H

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

REASSEMBLY ECKB7500

NOTE

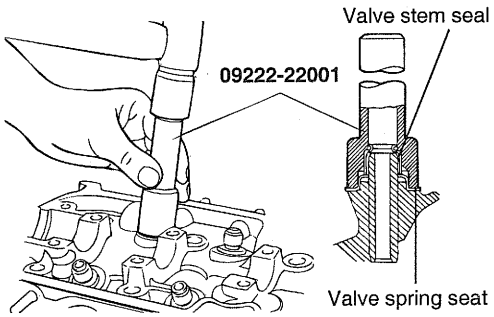
1. *Clean each part before assembly.*
2. *Apply engine oil to the sliding and rotating parts.*

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

NOTE

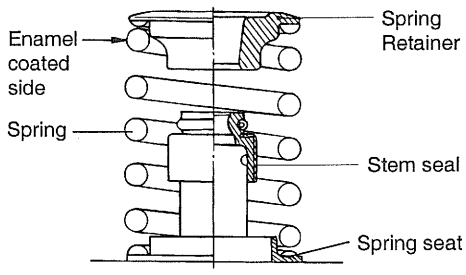
- *Do not reuse old valve stem seals.*
- *Incorrect installation of the seal could result in oil leakage past the valve guides.*

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.



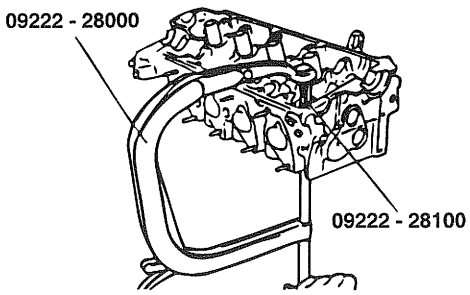
ECHA930A

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.



EDKB444G

NOTE

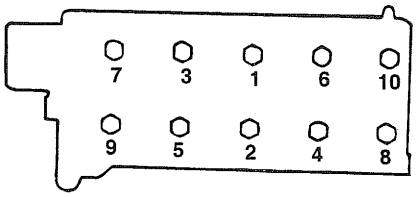
When the spring is compressed, Check that the valve stem seal is not pressed against the bottom of the retainer.

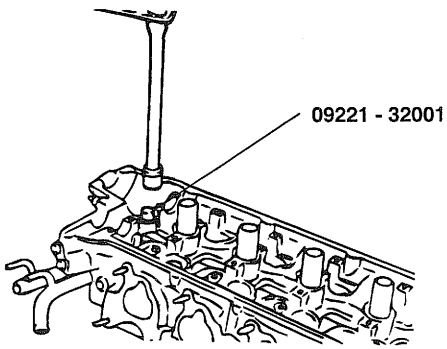
5. Clean both gasket surfaces of the cylinder block and cylinder head.

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 sequence shown below.





KDDA001L

Cylinder head bolt

M10 :

25 Nm (250 kg.cm, 18 lb.ft)+(60°- 65°)+(60°- 65°)

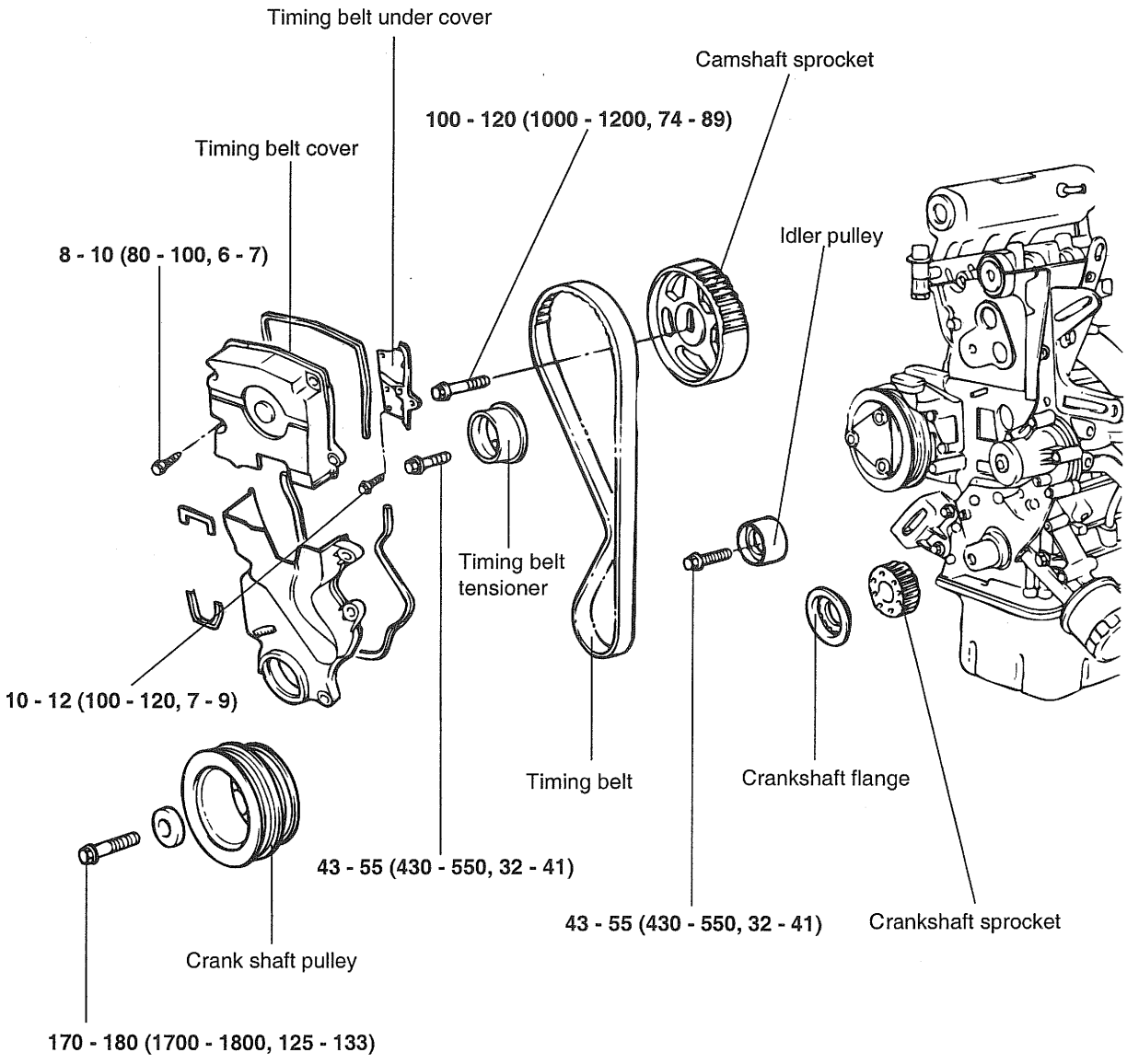
M12 :

30 Nm (300 kg.cm, 22 lb.ft)+(60°- 65°)+(60°- 65°)

TIMING SYSTEM

TIMING BELT

COMPONENTS ECNC7600

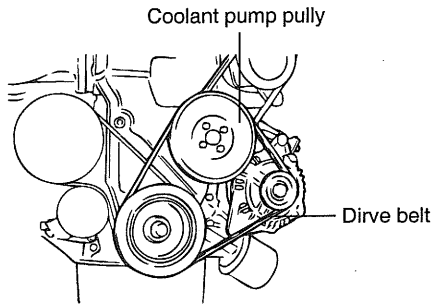


TORQUE : Nm (kg.cm, lb.ft)

B6EM010A

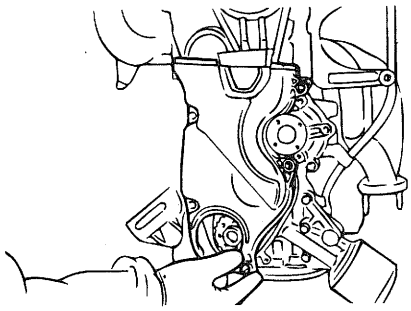
DISASSEMBLY ECKB7700

1. Remove the crankshaft pulley, coolant pump pulley and drive belt.
2. Remove the alternator bolt.
3. Remove the coolant pump pulley and belt.



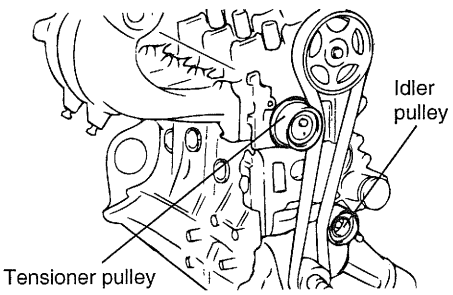
V5EM701A

4. Remove the crankshaft pulley.
5. Remove the timing belt cover.



V5EM701B

6. Remove the timing belt tensioner pulley.

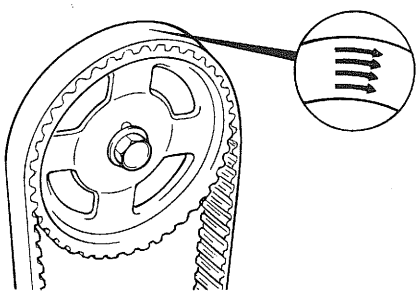


V5EM701C

NOTE

If the timing belt is reused, make an arrow indicating the turning direction (or the front of the engine) to make sure that the belt is reinstalled in the same direction as before.

7. Remove the timing belt.



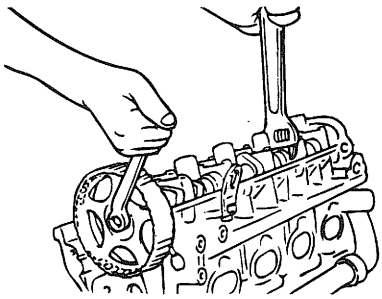
ECDA121B

8. Remove the idler pulley.
9. Remove the camshaft sprocket.

NOTE

Be careful not to damage the cylinder head with the wrench.

10. Remove the crankshaft sprocket from crankshaft.

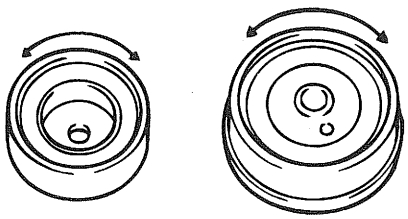


KDDA001C

INSPECTION ECNB7900

SPROCKETS, TENSIONER PULLEY, AND IDLER PULLEY.

1. Check the camshaft sproket, 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.



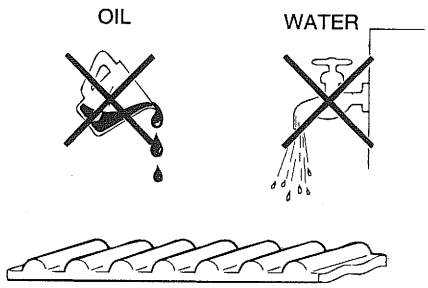
EDDA093A

TIMING BELT

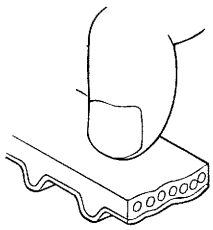
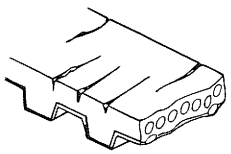
1. Check the belt for oil or dust deposits. Replace, if necessary.
   Small deposits should be wiped away with a dry cloth or paper. Do not clean with solvent.
2. When the engine is overhauled or belt tension adjusted, check the belt carefully. If any of the following flaws are evident, replace the belt.

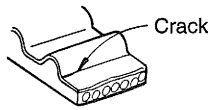
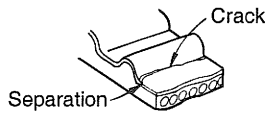
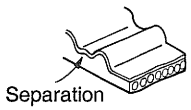
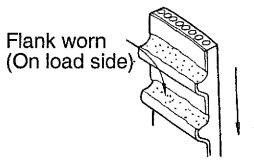
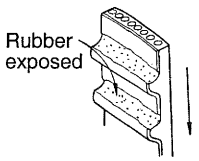
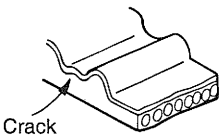
NOTE

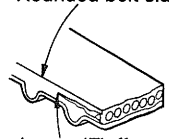
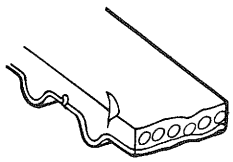
- *Do not bend, twist or turn the timing belt inside out.*
- *Do not allow the timing belt to come into contact with oil, water and steam.*



ECA9200A

Description	Flaw conditions
1. Hardened back surface of rubber	Back surface is glossy, non-elastic and so hard that, when your fingernail is pressed into it, no mark is produced.  ECA9200B
2. Cracked back surface of rubber	 ECA9200Y

Description	Flaw conditions
3. Cracked or separating canvas	 ECA9200I  ECA9200J  ECA9200K
4. Badly worn teeth (initial stage)	Tooth flank shows canvas on the load side (Fluffy canvas fibers, rubber changed into white color and unclear canvas texture)  ECA9200C
5. Badly worn teeth (last stage)	Tooth flank worn and rubber exposed on load side (tooth width reduced)  ECA9200D
6. Cracked tooth bottom	 ECA9200E
7. Missing tooth	 ECA9200F
8. Badly worn side of belt	

Description	Flaw conditions
NOTE *Normal belt should have a precisely cut side as if cut by a sharp knife*	Rounded belt side  Abnormal wear (Fluffy canvas fiber) ECA9200G
9. Cracked side of belt	 ECA9200H

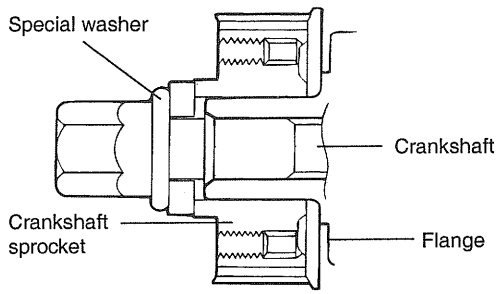
REASSEMBLY ECNC8100

1. Install damper pulley flange and crankshaft sprocket as shown. Pay close attention to their mounting direction.

Tightening Torque

Camshaft sprocket bolt :

170-180 Nm (1700-1800 kg.cm, 125-133 lb.ft)



ECNC094B

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

Tightening torque

Camshaft sprocket bolt :

100-120 Nm (1000-1200 kg.cm, 74-89 lb.ft)

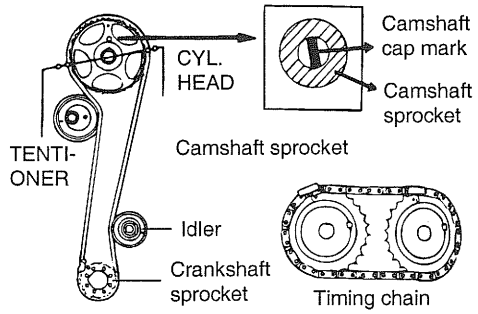
3. Align the timing marks of the camshaft sprocket and crankshaft sprocket with the No. 1 piston placed at top dead center and its compression stroke.

4. Install the timing belt tensioner and idler pulley.

5. Install the timing belt on the camshaft.

NOTE

When the timing belt is installed on the camshaft sprocket, make sure that the tension side is tightened by pushing the timing belt tensioner pulley toward the water pump.



V5EM702B

6. Turn the crankshaft two turns in the operating direction (clockwise) and realign camkshaft sprocket timing mark.

CAUTION

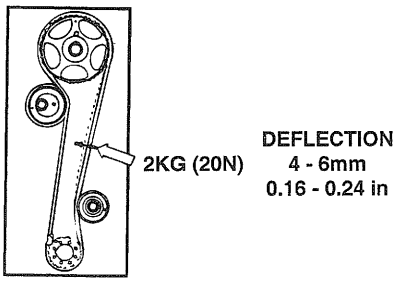
Do not turn the crankshaft in a counterclockwise direction. The crankshaft should be turned smoothly.

Tightening torque

Tensioner and idler pulley installing bolt :

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

7. Recheck the belt tension. When the tension side of timing belt is pushed horizontally with a moderate force [approx. 2kg (20N, 5lb)], the timing belt cog end sags in approx. 4-6 mm (0.16 - 0.24 in.)



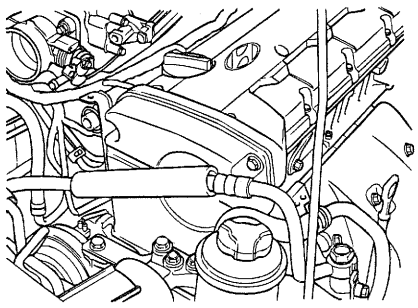
V5EM702E

8. Install the timing belt cover.

Tightening torque

Timing belt cover bolt :

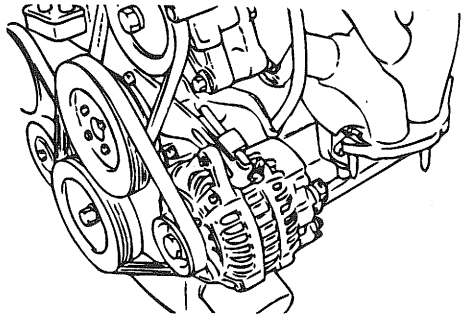
8-10 Nm (80-100 kg.cm, 6-7 lb.ft)



KDNB001C

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

10. Install the coolant pump pulley.



EDDA094G

11. Install the drive belt and adjust the belt tension.