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## SECTION 1B

# SOHC ENGINE MECHANICAL

**CAUTION:** *Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in B unless otherwise noted.*

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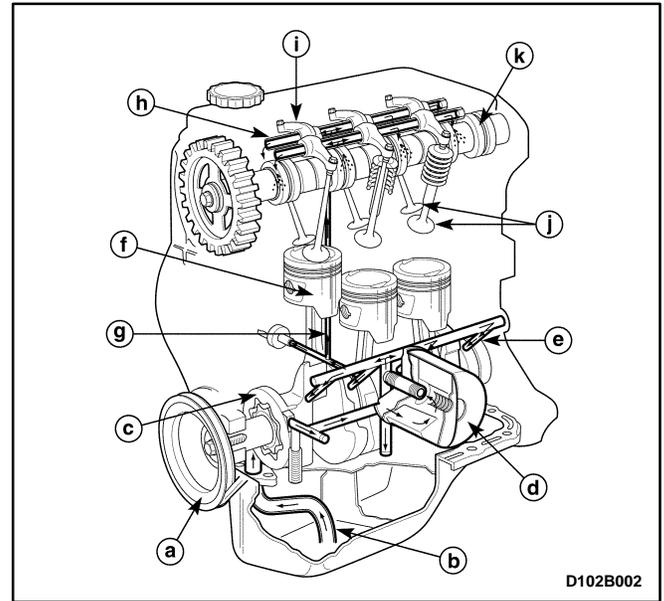
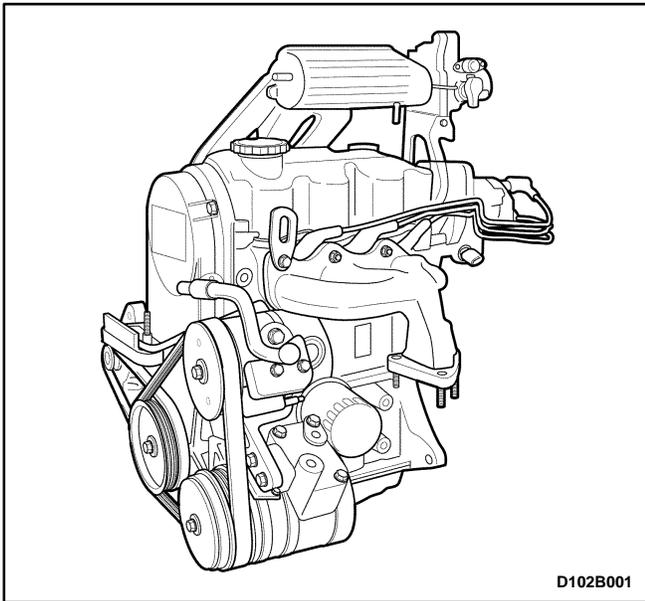
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## DESCRIPTION AND OPERATION

### ENGINE TYPE

The engine is 4-cycle, water-cooled, in-line 3 cylinders with displacement of 796cc (68.5×72.0mm) (2.70×2.83 in.).

Engine model (Specifications)	F8C Type SOHC / 2 Valve (MPI)
Maximum power (kw/rpm)	37.5 / 6,000
Maximum torque (N•m/rpm)	68.6 / 4,600
Compression ratio	9.3 : 1

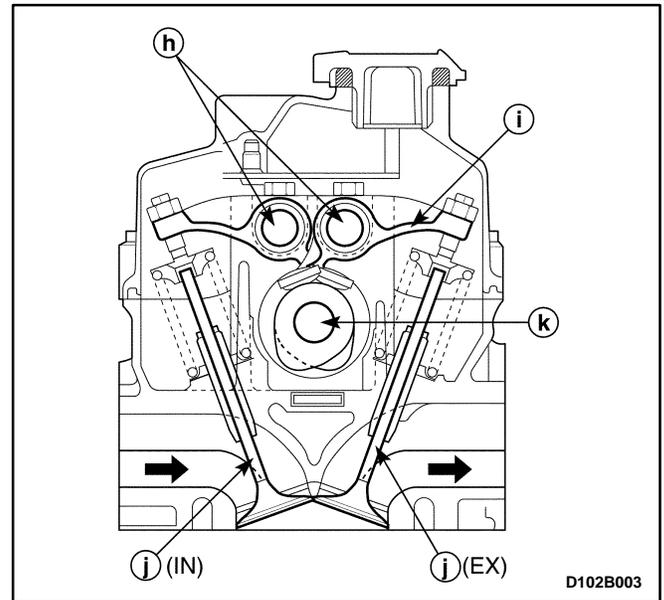


### CYLINDER HEAD AND VALVE TRAIN

The cylinder head is made of cast aluminum alloy for better strength in hardness with lightweight, and camshaft (k) and rocker arm shaft (h) arranged in-line support.

### ENGINE LUBRICATION

The engine lubrication is of the wetsump method to draw up the oil forced by the oil pump. The oil pump is of a trochoid type, and mounted on crankshaft at crankshaft pulley side (a). Oil is drawn up through oil pump pickup tube (b) and passed through pump (c) to oil filter (d). The filtered oil flows into two paths in engine block. In one path (e), oil reaches crankshaft journal bearings. Oil from crankshaft journal bearings is supplied to connecting rod bearings by means of intersecting passages drilled in crankshaft, and then injected from a small hole provided on big end of connecting rod to lubricate piston (f), rings, and cylinder wall. In another path (g), oil goes up to cylinder head and lubricates rocker arm (i), valve (j), camshaft (k), etc. through the oil hole provided on the rocker arm shaft (h).



The combustion chambers are formed into the manifold combustion chambers with increased squish parts for better combustion efficiency and its intake and exhaust

parts are installed in the cross flow arrangement. The rocker arm (i) operates in seesaw motion to close and open the intake and exhaust valves (j) with camshaft by turning the rocker arm shaft of each intake and exhaust part.

## ENGINE BLOCK

As the largest part of the engine components, the block (l) has all the necessary parts attached to outer surface of it.

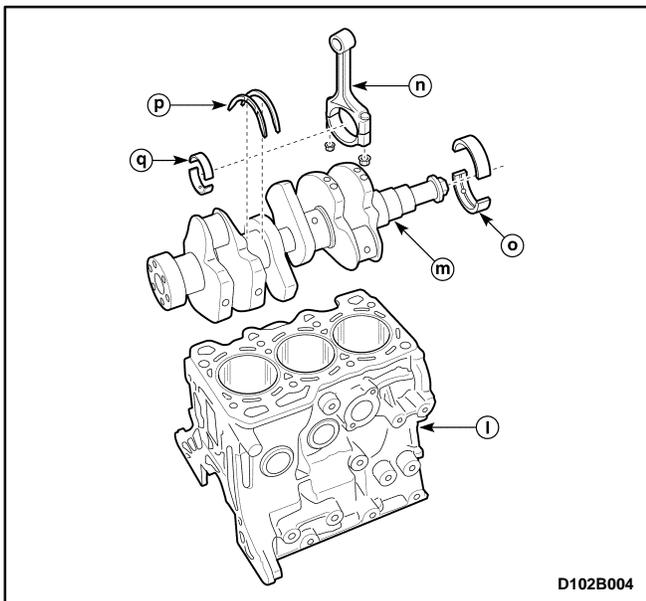
On the inside surface of block, there are bore surfaces by honing, which are cylinders, and on the periphery of the cylinders, there are the passages to prevent the over-heated and to lubricate the engine block.

## CRANKSHAFT

The crankshaft (m) is to convert the rectilinear motion into the rotation motion through the connecting rod (n) which transmits the power generated by combustion.

On the one side of it, oil pump, crankshaft pulley and timing belt pulley are attached, and oil seal housing and flywheel are on the other side.

A special steel of high grade cast iron is used for the material to stand the bending load and distortion. The material of the main bearing (o) is aluminum alloy. The split thrust bearings (p) are inserted in the journal bearing part (No.3).



## CONNECTING ROD

The connecting rods (n) are made of forged steel, and its section is typed "I" with its big end connected to

crankshaft (m) and its small end to piston pin to transmit the power.

The big end is detachable, and its upper and lower parts are fastened by bolting after the metal bearings (q) are inserted.

## PISTON, PISTON RING AND PISTON PIN

### Piston

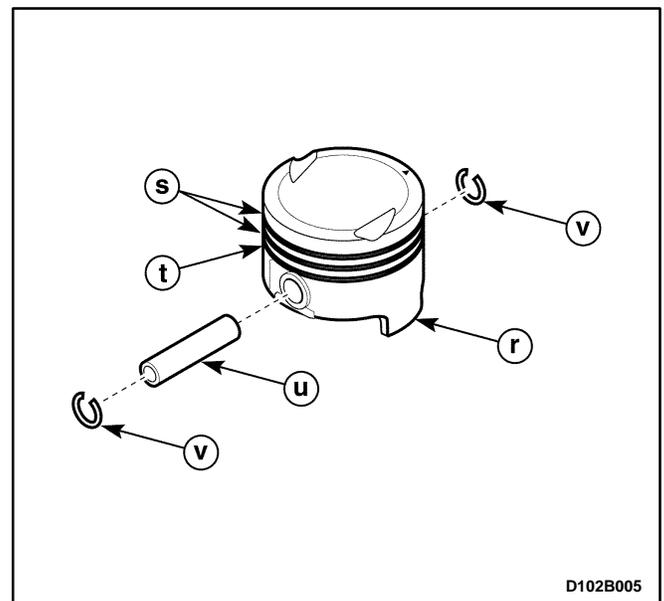
The piston (r) is of the open skirt type and its crown is exposed in the combustion chamber to generate power. Its land and skirt parts are made of coat aluminum alloy which is light and has excellent heat conductivity in order to meet its continuous and high speed reciprocation movement.

### Piston Ring

It is composed of two compression rings (s) and one oil ring (t) and installed between the grooves of the piston to make the high speed reciprocating movement maintaining a remarkable air tightness as well as cylinders. It is a critical parts to affect the compression pressure, oil consumption, compression, blow by pressure and engine performance.

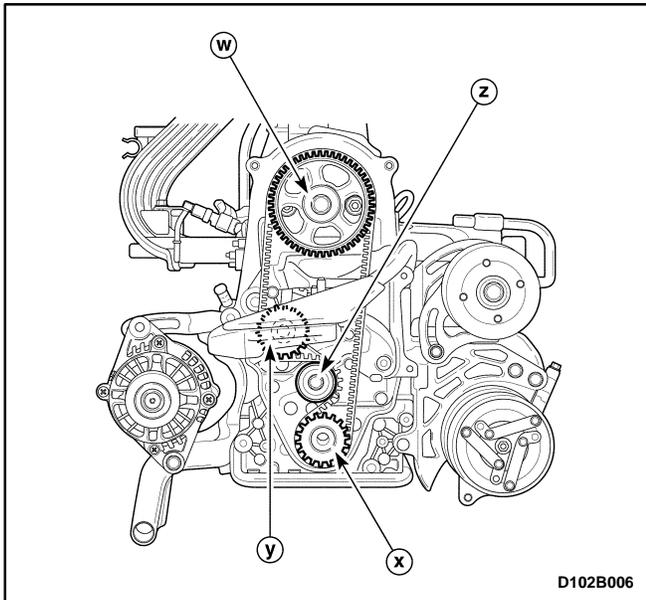
### Piston Pin

The pin (u) is not fixed to the piston or connecting rod and its both ends are assembled by the circlip (v) in the full floating type. The pin is used to transmit the power from the crown part of piston to connecting rod.



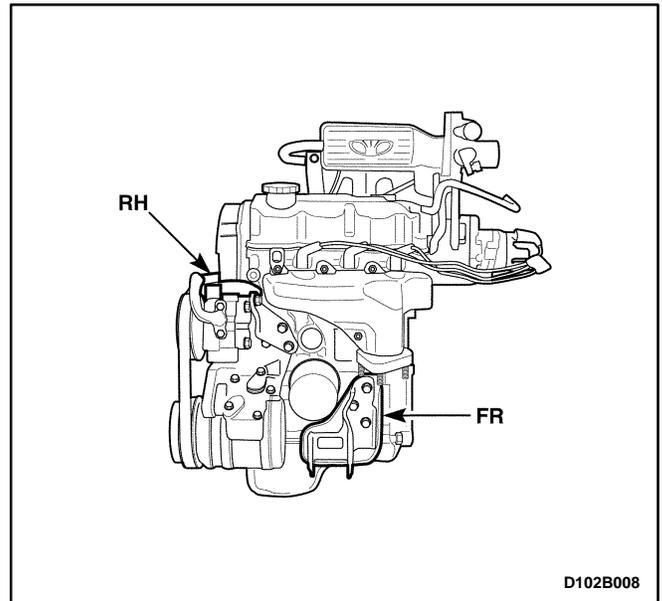
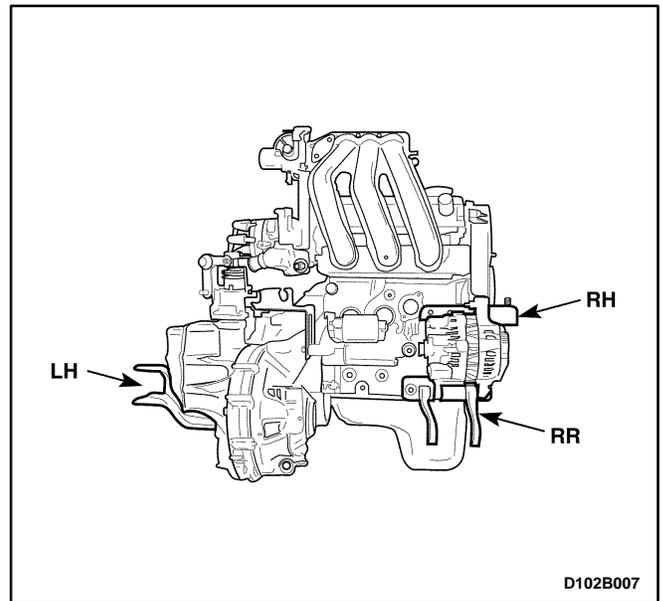
## TIMING BELT AND PULLEY

The timing belt connects the camshaft timing pulley (w) and the crankshaft timing pulley (x). The timing belt coordinates the crankshaft and the camshaft and keeps them synchronized. The timing belt also turns the coolant pump (y). The timing belt and the pulleys are toothed so that there is no slippage between them. There is a tension pulley (z) that maintains the correct timing belt tension. The timing belt is made of a tough reinforced rubber similar to that used on the serpentine drive belt. The timing belt requires no lubrication.



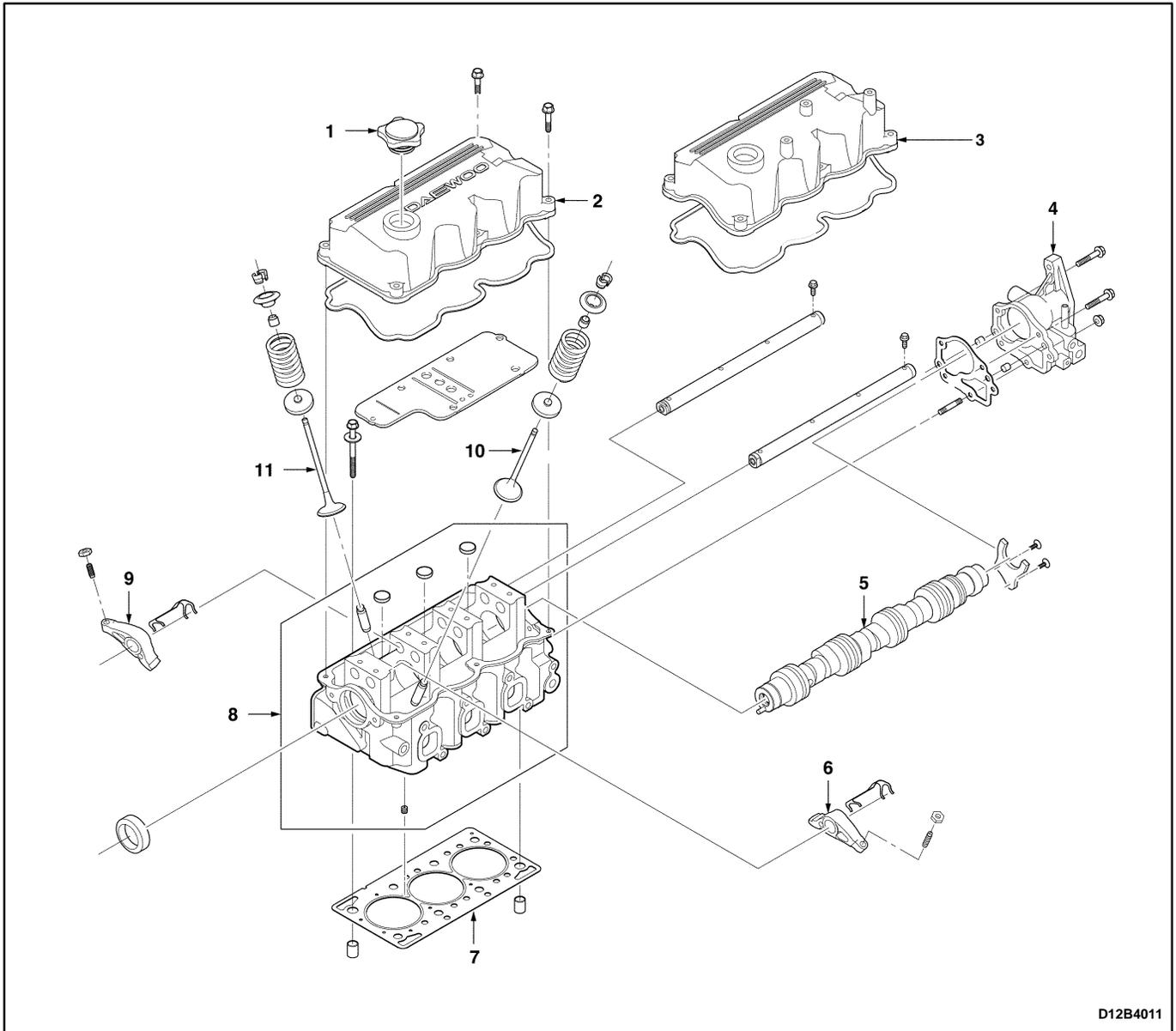
## ENGINE MOUNT

This is to absorb or reduce the engine vibration and impact from the wheeled road. Engine mount is attached to the engine—front side, the engine-right side and the engine-rear side and one transaxle mount is attached to the transaxle side.



# COMPONENT LOCATOR

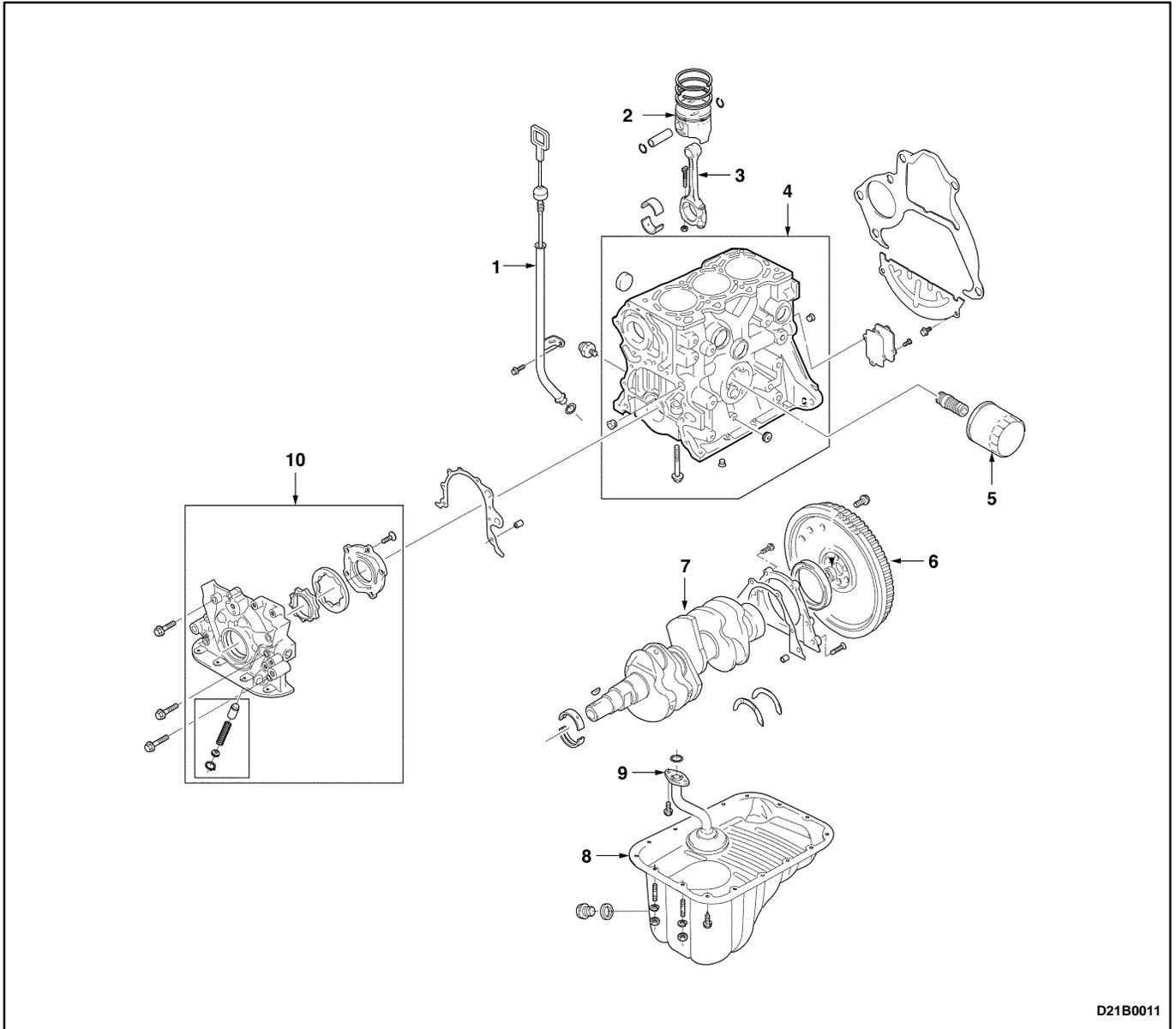
## CYLINDER HEAD



D12B4011

- |                                  |                        |
|----------------------------------|------------------------|
| 1 Oil Filler Cap                 | 7 Cylinder Head Gasket |
| 2 Cylinder Head Cover            | 8 Cylinder Head        |
| 3 Cylinder Head Cover (Euro III) | 9 Intake Rocker Arm    |
| 4 Distributor Case               | 10 Exhaust Valve       |
| 5 Camshaft                       | 11 Intake Valve        |
| 6 Exhaust Rocker Arm             |                        |

# ENGINE BLOCK

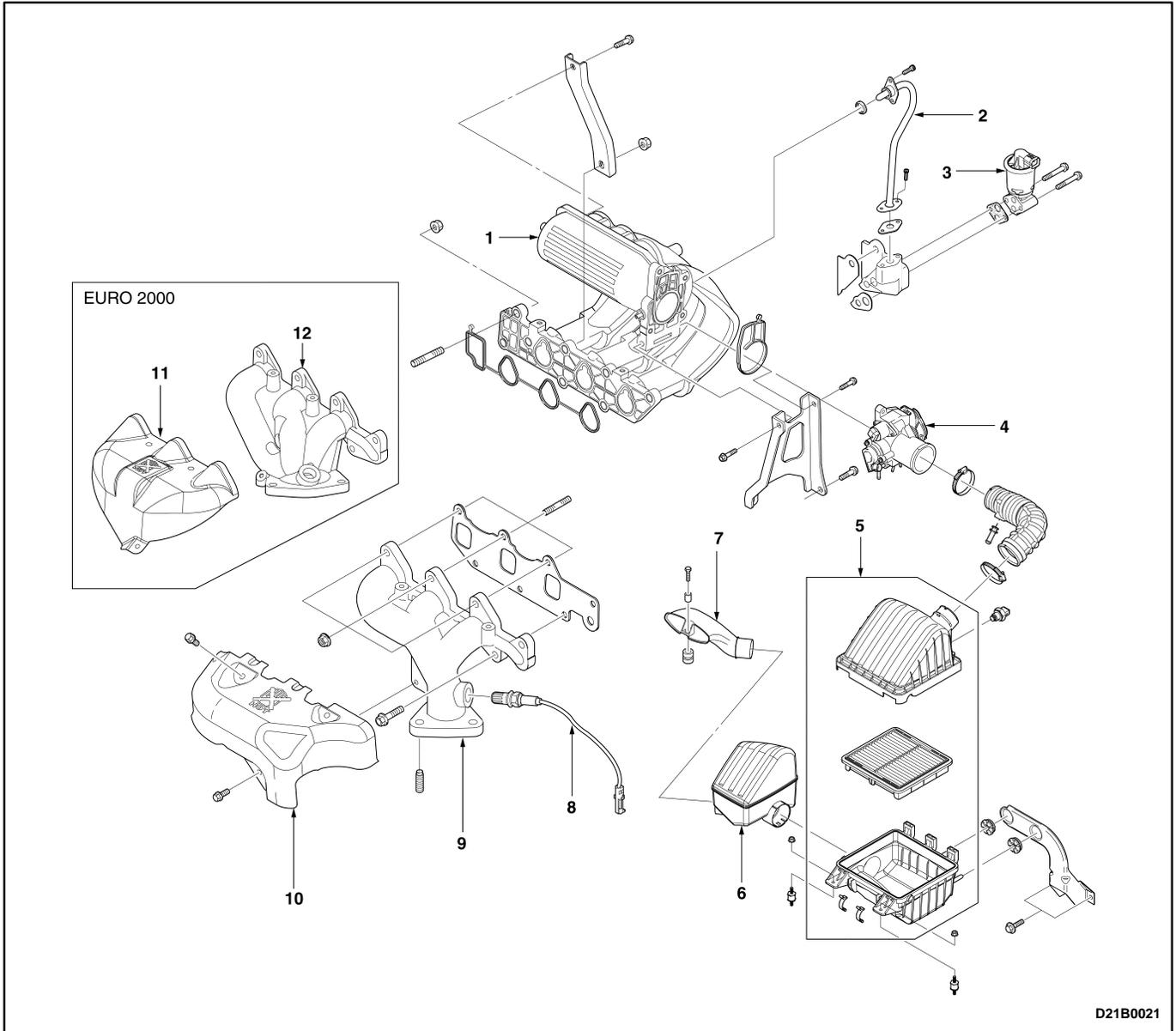


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- 1 Oil Level Gauge Stick
- 2 Piston
- 3 Connecting Rod
- 4 Engine Block
- 5 Oil Filter

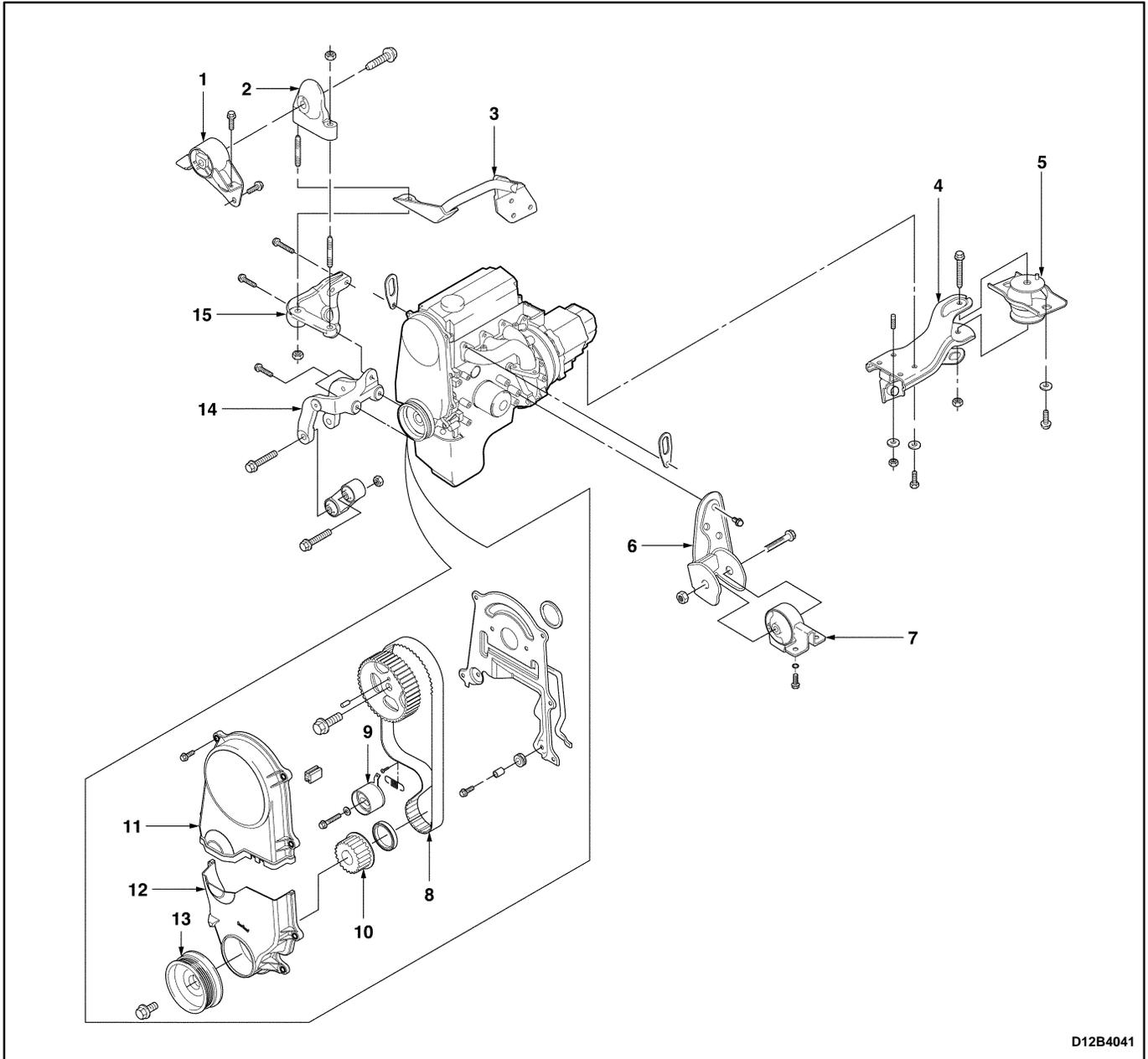
- 6 Flywheel
- 7 Crankshaft
- 8 Oil Pan
- 9 Oil Pump Strainer
- 10 Oil Pump Assembly

## MANIFOLD & AIR FLOW SYSTEM



- |  |  |
|--|--|
| 1 Intake Manifold                                    | 7 Snorkel                                  |
| 2 Exhaust Gas Recirculation (EGR) Pipe               | 8 Oxygen Sensor                            |
| 3 Exhaust Gas Recirculation (EGR) Valve and Solenoid | 9 Exhaust Manifold                         |
| 4 Throttle Body Assembly                             | 10 Exhaust Manifold Heat Shield            |
| 5 Air Filter Assembly                                | 11 Exhaust Manifold Heat Shield (Euro III) |
| 6 Resonator  | 12 Exhaust Manifold (Euro III)             |

## TIMING BELT & ENGINE MOUNT



D12B4041

- |                                     |                                  |
|-------------------------------------|----------------------------------|
| 1 Engine Mount Damping Block        | 9 Timing Belt Tensioner          |
| 2 Engine Mount Intermediate Bracket | 10 Crankshaft Gear               |
| 3 Engine Mount Brace Bracket        | 11 Timing Belt Upper Front Cover |
| 4 Transaxle Mount Bracket           | 12 Timing Belt Lower Front Cover |
| 5 Transaxle Mount Damping Block     | 13 Crankshaft Pulley             |
| 6 Engine Mount Front Bracket        | 14 Engine Mount Lower Bracket    |
| 7 Engine Mount Front Damping Bush   | 15 Engine Mount Upper Bracket    |
| 8 Timing Belt                       |                                  |

## DIAGNOSTIC INFORMATION AND PROCEDURE

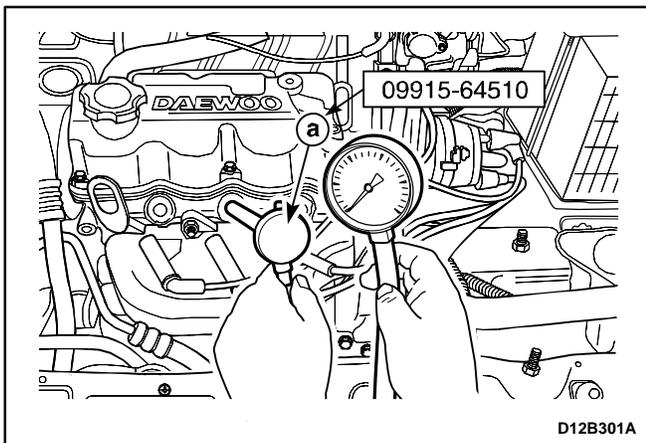
### COMPRESSION PRESSURE CHECK

#### Tools Required

09915-64510 Compression Pressure Gauge

Check the compression pressure in the following procedures:

1. Warm up the engine to the normal operating temperature (Cooling temperature : 80–90°C (176–194°F)).
2. Stop the engine and then remove the high tension cable and the spark plug.
3. Disconnect the distributor optical sensor connector.
4. Install the compression pressure gauge 09915-64510 (a) in the hole of spark plug.



5. Disengage the clutch in Neutral (to lighten starting load on engine upon cranking), and depress the accelerator all the way to make the throttle fully open.
6. Crank the engine with the starting motor, and read the highest pressure on the compression pressure gauge.
  - The difference of measured value between cylinders is 98.06kPa (14.22 psi) and less.
  - On checking, make the connection perfectly airtight between the hole of spark plug and compression pressure gauge.

	Unit	Standard	Limit
Compression Pressure – 400 rpm	kPa(psi)	1,225.75 (177.73)	1,176.72– 1,274.78 (170.62– 184.84)

7. After checking, remove the gauge and install the removed parts.

### OIL PRESSURE CHECK

#### Tools Required

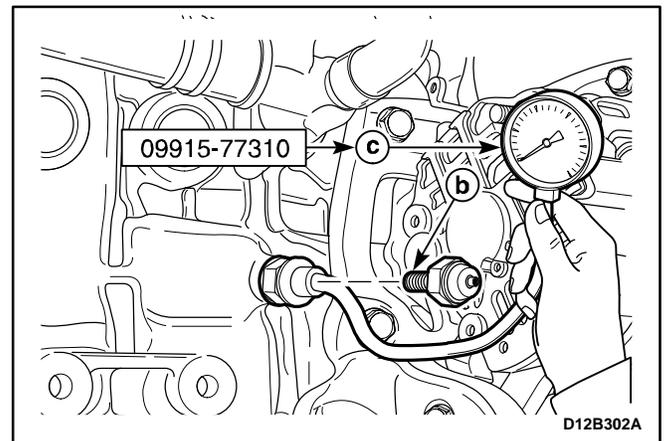
09915-77310 Oil Pressure Gauge

Prior to check oil pressure, check the followings:

- Check oil level and add if required.
- Replace the discolored, deteriorated or diluted oil.
- Check any oil leakage and repair the defective parts.

Check the compression pressure in the following procedures:

1. Remove the oil pressure switch (b) from the cylinder block.
2. Install the oil pressure gauge 09915-77310 (c) to the mounting place of the oil pressure switch.



3. Start the engine and warm up to the normal operating temperature.
4. Raise the engine speed up to 2,000rpm and then read oil pressure.

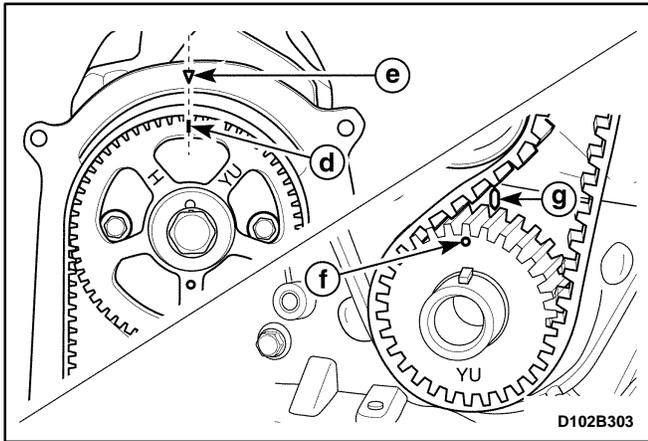
Item	Unit	Standard
Oil Pressure – 2000rpm	kPa (psi)	245.15–294.18 (35.55–42.66)

5. After checking, wrap the threads of oil pressure switch with a seal tape and tighten it to the specified torque 12–16 N•m (106–144 lb-in).
6. Start the engine and check oil pressure switch for oil leakage.

## ADJUSTMENT OF VALVE CLEARANCE

Adjust the valve clearance in the following procedures:

1. Remove the air filter/resonator assembly and the relevant parts installed on the cylinder head cover.
2. Remove the cylinder head cover hexagon bolts and remove the cover.
3. Turn over the crankshaft to make No.1 cylinder matched with the compression top dead center. (When the camshaft sprocket notch (d) is aligned with the timing belt rear cover triangle pointer (e) and the crankshaft sprocket point (f) is aligned with the oil pump housing point (g), the compression top dead center is on the ignition sequence for No. 1 cylinder.)

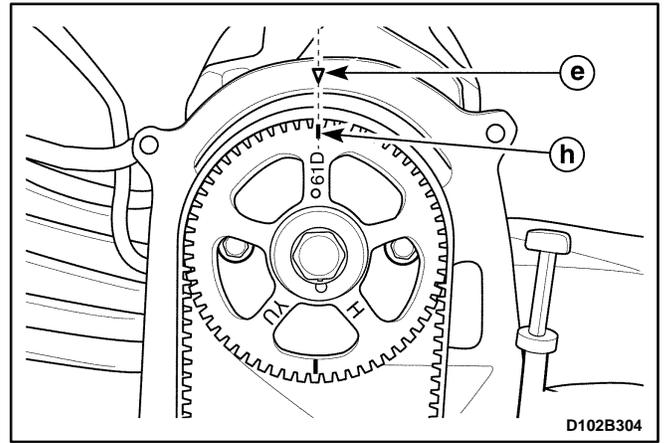


4. Check the valve clearance for No. 1 cylinder compression top dead center.

Condition	Cylinder No.	1	2	3
Compression top dead center of No.1 cylinder	Intake	○	○	
	Exhaust	○		○

\* ○ marks indicates the place where the valve clearance can be checked and adjusted.

5. If the checking for the valve clearance of No.1 cylinder compression top dead center is over, position No.1 cylinder on the exhaust top dead center as rotating the crankshaft in a 360-degree arc. (When the camshaft sprocket point (h) is aligned with the timing belt rear cover triangle pointer (e), the exhaust top dead center is on the ignition sequence for No. 1 cylinder.)

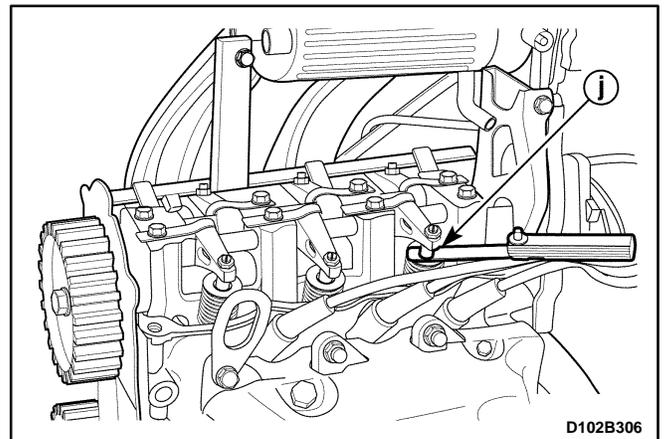
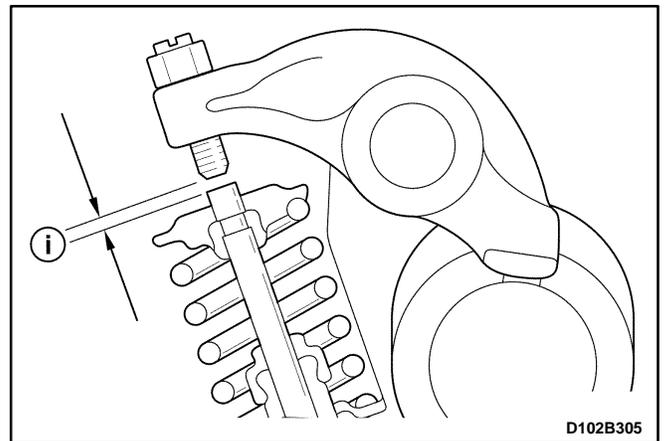


6. Check the valve clearance for the No. 1 cylinder exhaust top dead center.

Condition	Cylinder No.	1	2	3
Exhaust top dead center of No.1 cylinder	Intake			○
	Exhaust		○	

\* ○ marks indicates the place where the valve clearance can be checked and adjusted.

- Check and adjust the valve clearance (i) using thickness gauge (j).



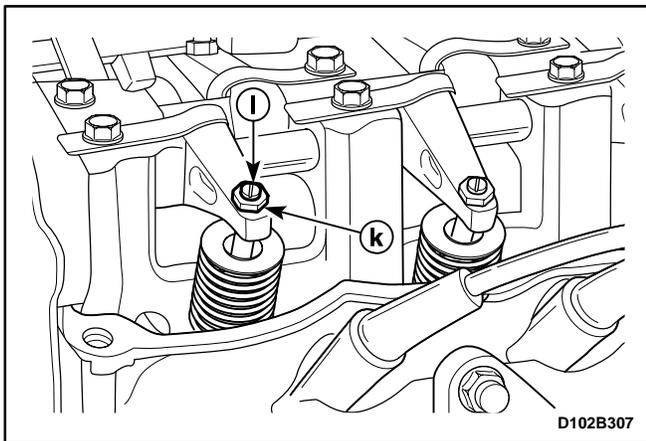
The measured value of valve clearance should meet the specified value. If not, adjust the valve clearance.

**Important:** In case of hot engine, warm up the engine until the electric cooling fan begins to work and stop the engine to adjust the clearance with 20–30 minutes there from.

Unit : mm (in.)

Item			Specified value
Valve Clearance	Cold	Intake	0.15±0.02 (0.0059±0.0008)
		Exhaust	0.32±0.02 (0.0126±0.0008)
	Hot	Intake	0.25±0.02 (0.0098±0.0008)
		Exhaust	0.42±0.02 (0.0165±0.0008)

8. When adjusting the valve clearance, loosen the adjust nut (k) and then tighten or loosen the adjust rod (l) properly.

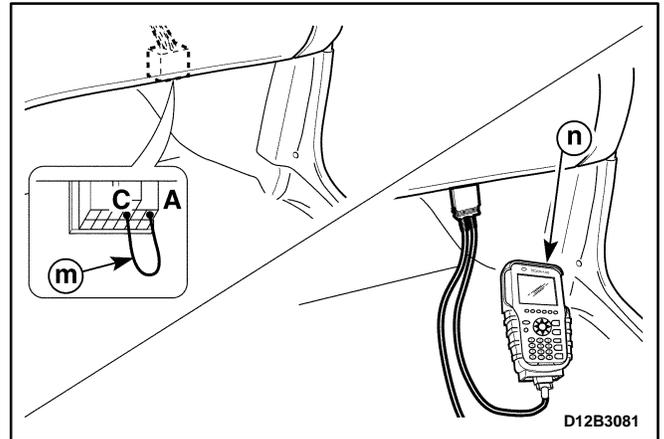


## IGNITION TIMING CHECK AND ADJUSTMENT (TYPICAL)

**Note:** Ignition timing could not be adjusted for Direct Ignition System (Euro Stage III).

Check and adjust the ignition timing in the following procedures:

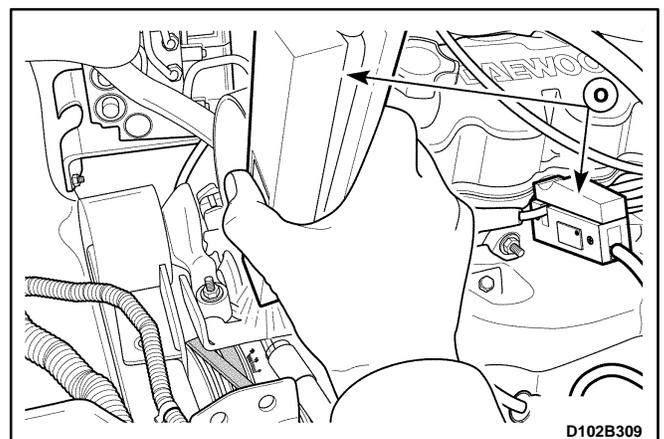
1. Warm up the engine to the normal operating temperature.
2. Turn off the lamp and audio system and shift the shift gear lever in Neutral.

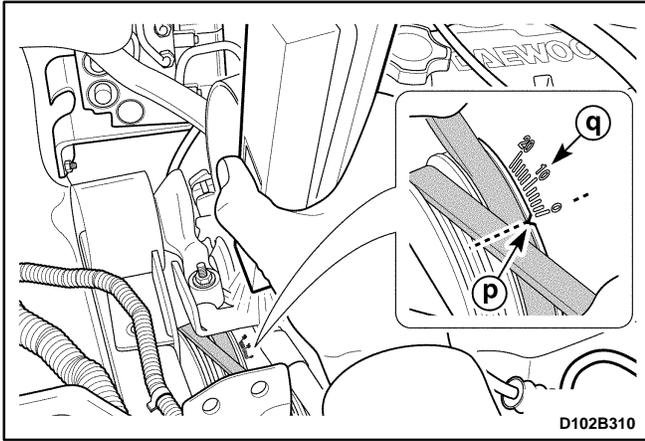


3. Connect terminal A and terminal C of ALDL connector using the wire (m) or connect the scan tool (n) with ALDL connector.
4. Connect the timing light (o) with No. 1 cylinder high tension cable and check the specified value for the ignition timing, flashing notch on the crankshaft pulley.

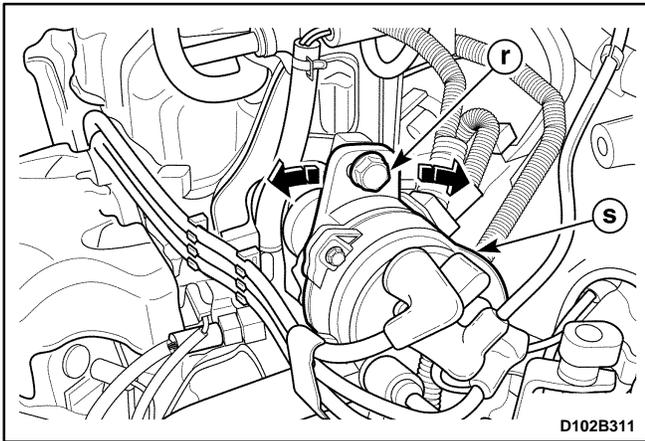
Item	Specified Value
Ignition timing – 950rpm	10° BTDC

**Important:** In flashing the timing light, if crankshaft pulley notch (p) is matched with the mark (10) for timing check, the ignition timing is 10° BTDC.





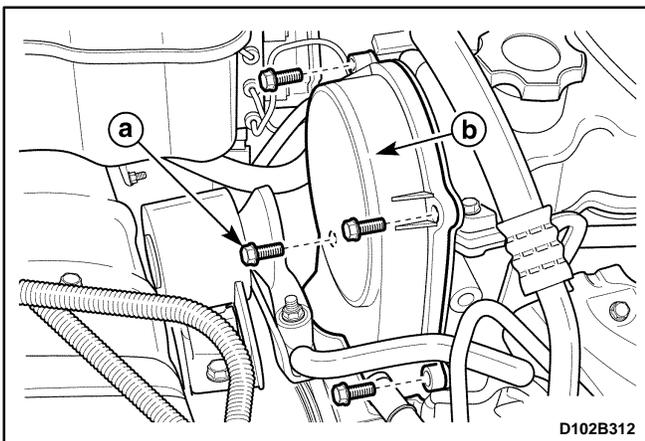
5. If the ignition timing exceeds the specified value, loosen the distributor bolts and adjust it to the specified ignition timing by turning the distributor body (s).



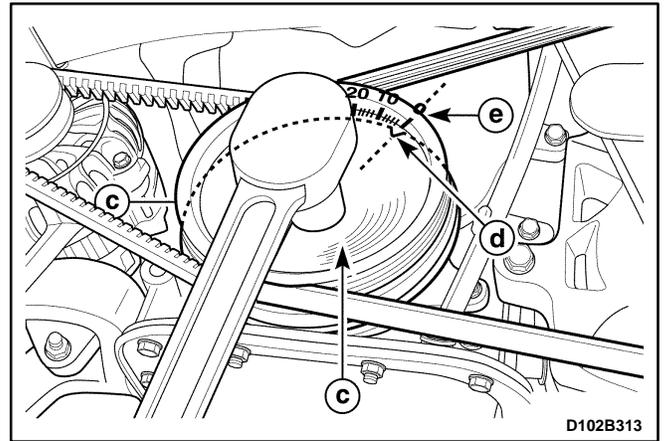
## VALVE TIMING CHECK AND ADJUSTMENT

Check the valve timing in the following procedures:

1. After removing the high headlamp, loosen the bolts (a) and remove the timing belt front upper cover (b).

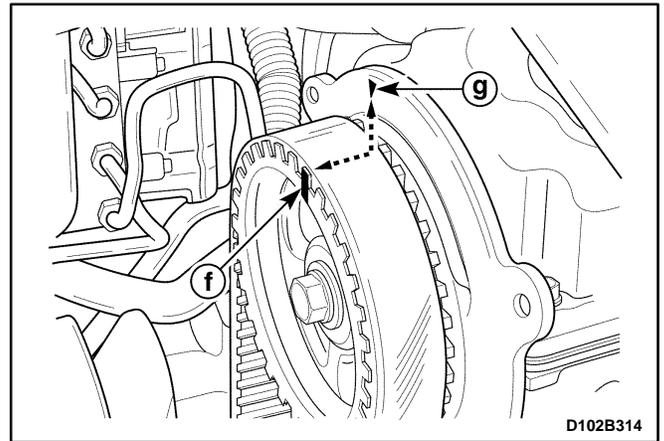


2. Turning the crankshaft clockwise twice, align the notch (d) on the crankshaft pulley (c) with the mark 0 (e) for the timing check on the timing belt front lower cover.



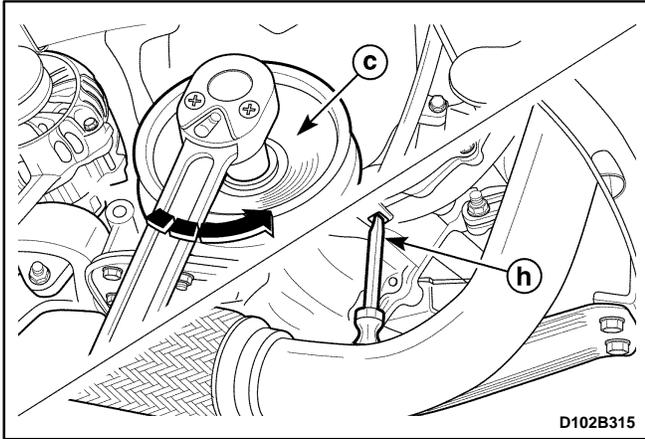
3. Check if the notch (f) on the camshaft sprocket is aligned with the triangle pointer (g) on the timing belt rear cover.

**Important:** Notch (f) should be aligned with pointer (g) to set the valve timing normally.

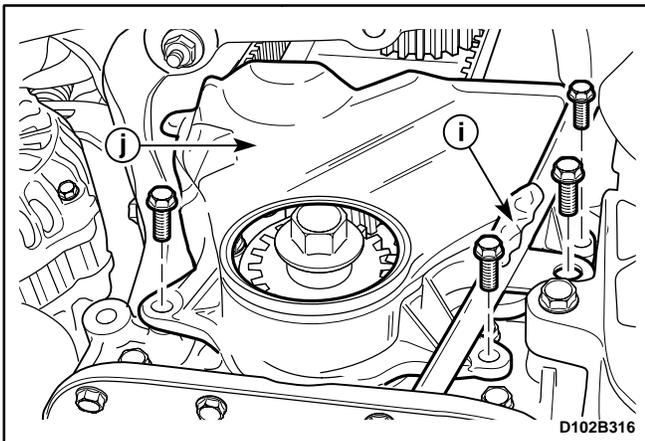


Adjust the valve timing in the following procedures:

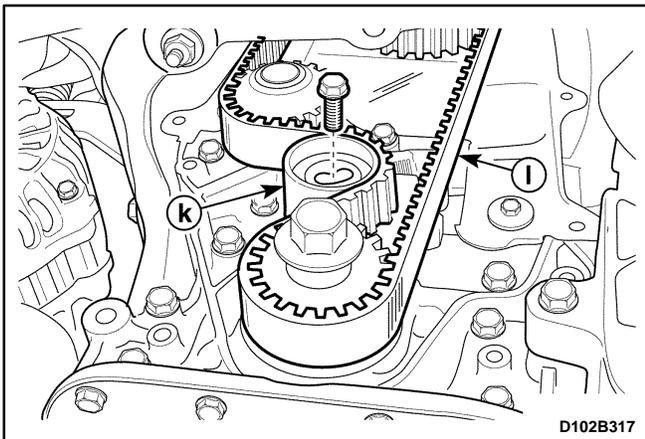
1. Loosen the bolt and remove the timing belt pulley (c). In loosening the bolt, use the driver (h) in the picture shown.



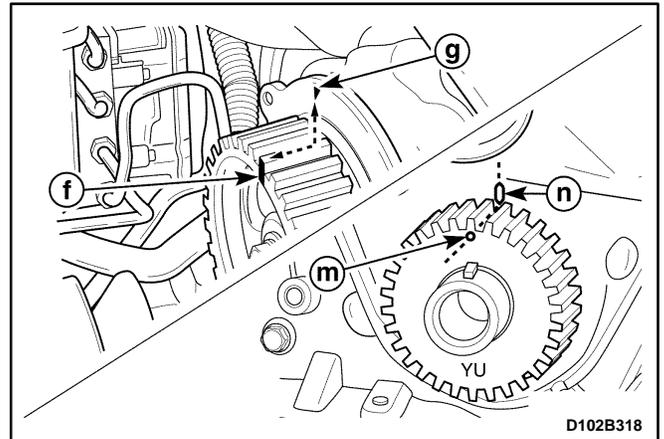
2. Remove the oil level gauge guide tube (i) and the timing belt front lower cover (j).



3. Remove the timing belt tensioner (k) and the timing belt (l).

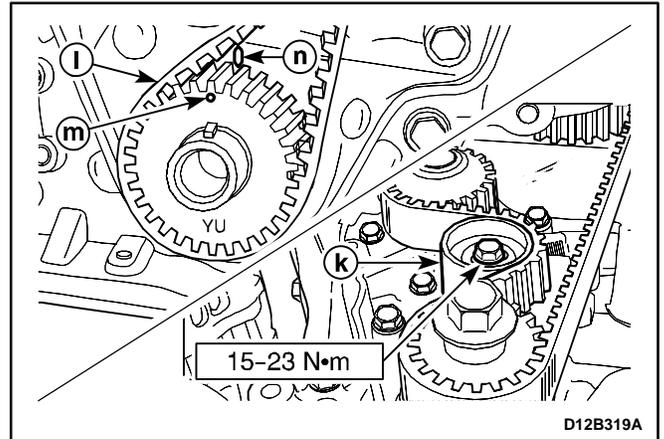


4. Using the bolt, turn the crankshaft clockwise to align the mark (m) on the crankshaft sprocket with the pointer (n) on the oil pump housing. Then, turn the camshaft to align the notch (f) with the pointer (g).



5. Install the timing belt (l) and the tensioner (k). (Do not tighten the tensioner bolt completely.)

Turning the crankshaft clockwise twice, align the mark (m) with the pointer (n) and tighten the tensioner bolt to 15-23 N•m (11-17 lb-ft).



6. Install all removed parts.