

SERVICE MANUAL



SUBARU IMPREZA



ENGINE SECTION

Technical description

• Mechanism and function

ENGINE (DOHC)

2-3b

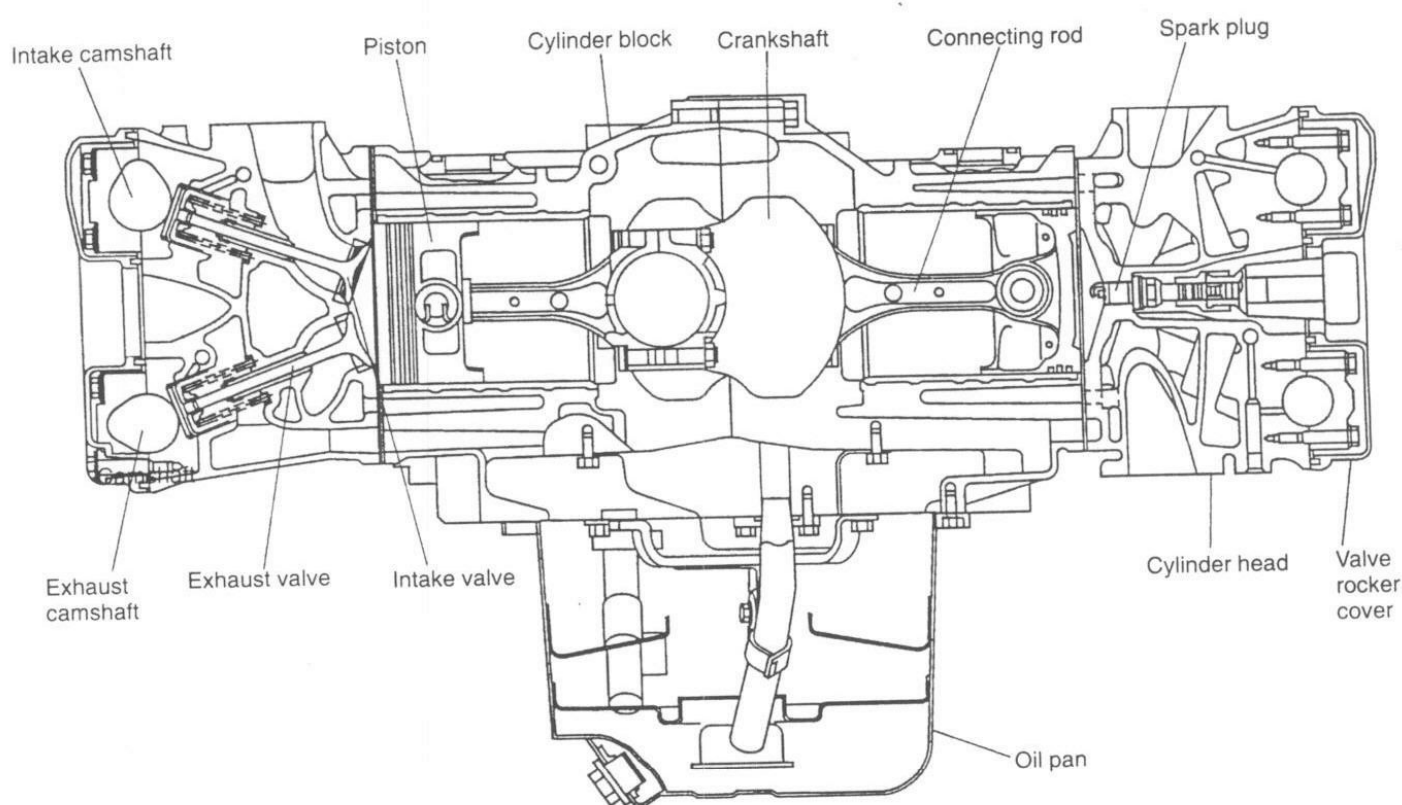
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1. General

The engine is made from aluminum alloy and is horizontally opposed, it is a 4-stroke cycle, water-cooled, DOHC 16-valve, turbocharged engine. The fuel injection system utilizes an MFI design.

A summary of the major construction and function features is as follows:

- The cylinder head is a center-plug type that utilizes pentroof combustion chambers. The four-valve design is provided with two intake valves and two exhaust valves per cylinder. The intake and exhaust ports are arranged in a cross-flow design.
- A single timing belt drives four camshafts on the left and right banks and the water pump on the left bank. Belt tension is automatically adjusted to eliminate maintenance.
- The crankshaft is supported by five bearings to provide high rigidity and strength.
- The cylinder block is made from aluminum diecast which is integrated with cast-iron cylinder liners.



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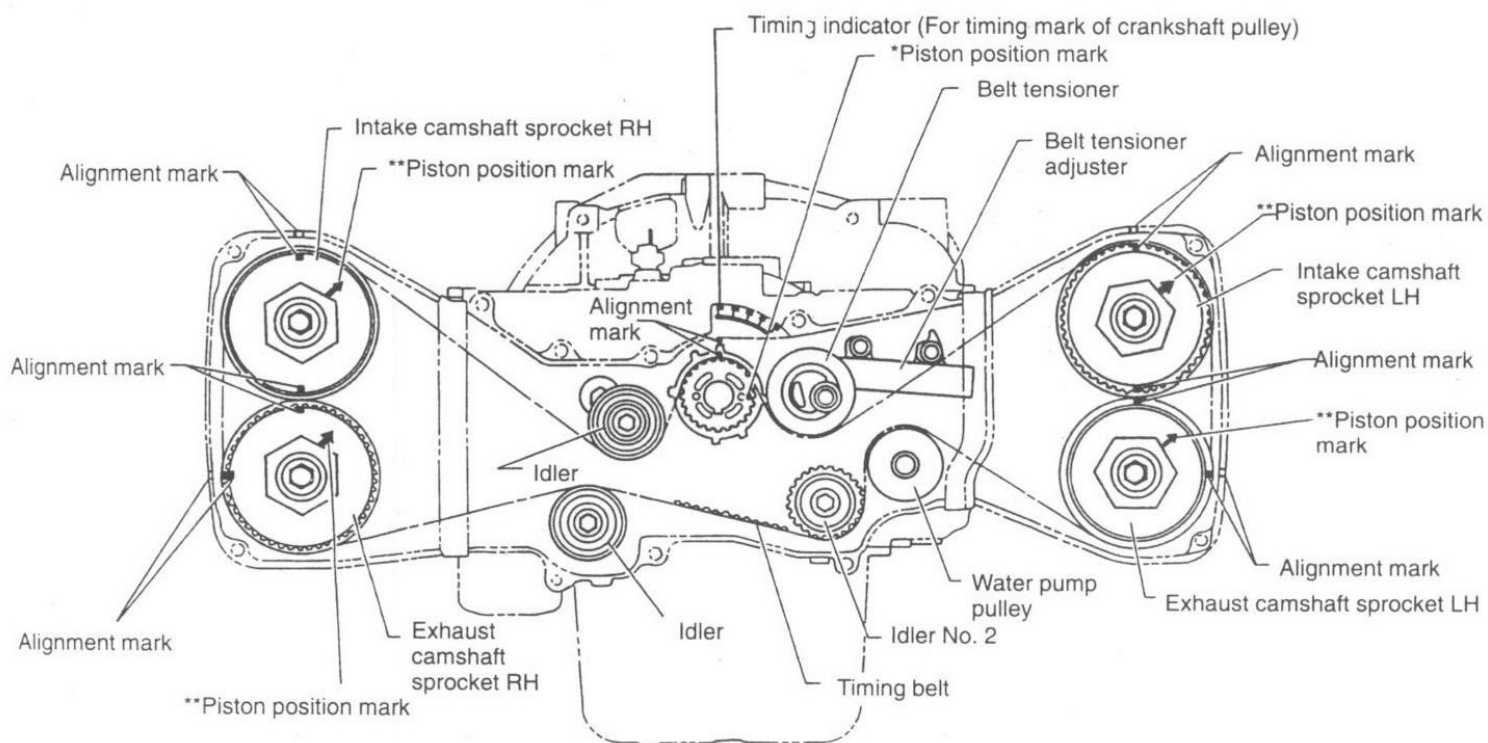
2. Timing Belt

A single timing belt drives four camshafts (intake and exhaust camshafts on each bank). The back of the belt also drives the water pump.

The timing belt teeth have a specially designed round profile to provide quiet operation. The timing belt is composed of a strong and inflexible core wire, a wear-resistant canvas and heat-resistant rubber material.

A hydraulic belt-tensioner adjuster constantly maintains specified belt tension to properly drive the camshafts, as well as to provide a "maintenance-free" advantage.

The camshaft sprocket is made of resin. Compared with the alloy type one, it is lighter in weight.



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NOTE:

*: #1 piston is set at TDC when piston-position mark on crankshaft sprocket is aligned with mark on cylinder block.

**: #1 piston is set at TDC on compression stroke when piston-position mark on camshaft sprocket is facing directly upward.

3. Belt Tensioner Adjuster

The belt tensioner adjuster provides a constant value of tension for the timing belt. Proper belt tension is maintained using an adjuster rod to push the timing belt via tensioner pulley. The location of the tensioner pulley shaft center is offset in relation to the center of the pulley's outside diameter. The adjuster rod provides a rotary movement for the tensioner pulley by both tension of the spring housed in the adjuster.

- Belt tension action

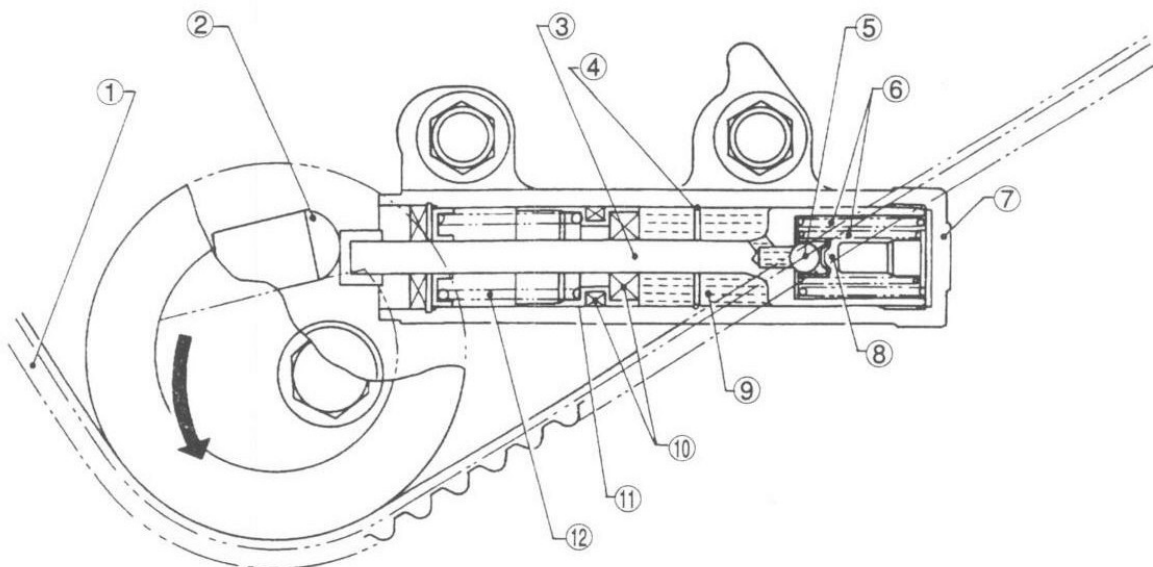
The adjuster rod is moved to the left by the force of the main spring. This causes silicone oil (which is held to constant pressure by compression-spring tension inside the reservoir chamber) to push the check ball so that silicone oil flows into the oil-pressure chamber.

The momentum which forces the adjuster rod out acts upon the tensioner arm so that the pulley is turned counterclockwise. Thus, timing belt tension is properly maintained.

- Balance to belt tension

When the timing belt reaction force is balanced by the main spring tension (to push the adjuster rod), the arm is held stationary to maintain constant belt tension.

When the timing belt reaction force increases to such an extent that the belt will be too tight, a small quantity of oil in the oil-pressure chamber gradually returns to the reservoir chamber via the adjuster body-to-rod clearance. This return of oil continually moves the rod until the reaction force of the timing belt balances with main spring force and oil pressure inside the oil-pressure chamber. Thus, belt tension is constantly maintained.



- ① Timing belt
- ② Tension arm
- ③ Adjuster rod
- ④ Stopper

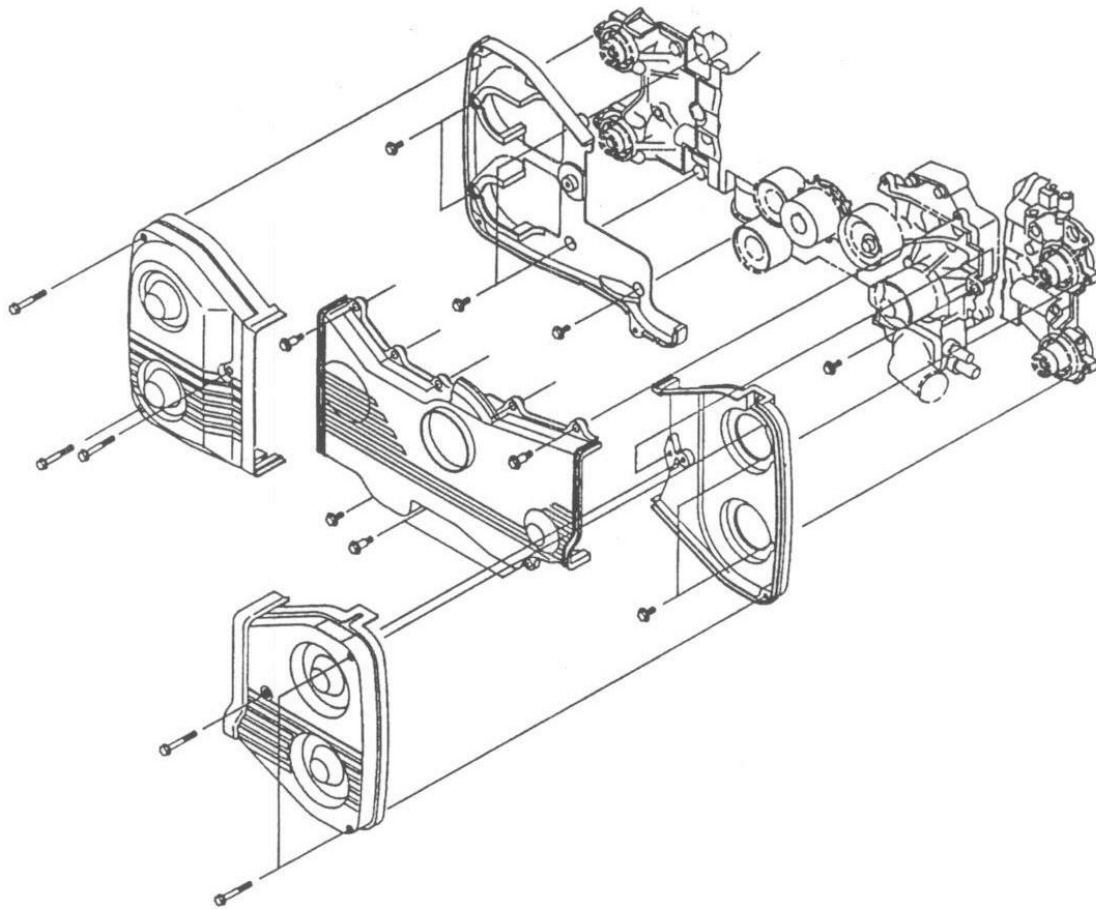
- ⑤ Check ball
- ⑥ Main spring
- ⑦ Adjuster body
- ⑧ Oil pressure chamber

- ⑨ Oil pressure chamber (Silicone oil)
- ⑩ Oil seal
- ⑪ Piston
- ⑫ Compression spring

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4. Belt Cover

- The belt cover is made of synthetic resin molding which is lightweight and heat resistant. It has a totally enclosed design that utilizes rubber packing at the mating surface of the cylinder block. This eliminates the chance of dust and liquid from entering the interior.
- A floating design is utilized by placing rubber mounting between the cylinder block and belt cover to prevent the transmission of noise and vibration.
- The front belt cover has a graduated line for ignition-timing confirmation.



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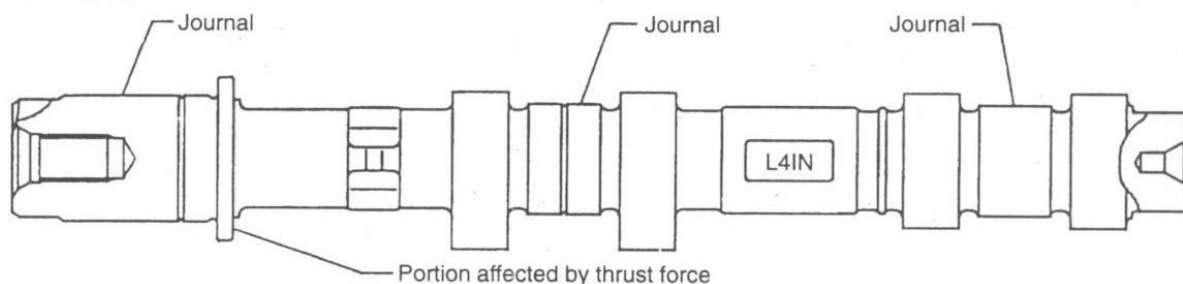
5. Camshaft

The DOHC engine uses four camshafts in all; intake and exhaust camshafts on the RH bank and intake and exhaust camshafts on the LH bank.

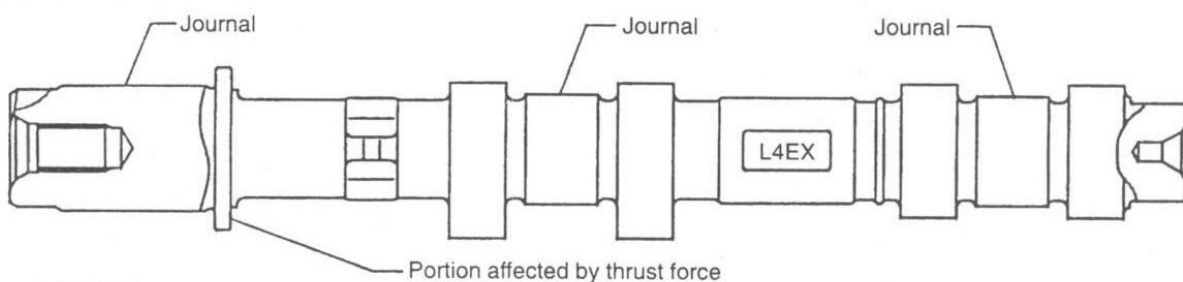
The cam nose part is finished with "chill" treatment to increase wear resistance and anti-scuffing properties.

Each camshaft is supported by three journals with three camshaft caps. Each camshaft flange is supported by a groove provided in the cylinder head to receive thrust force.

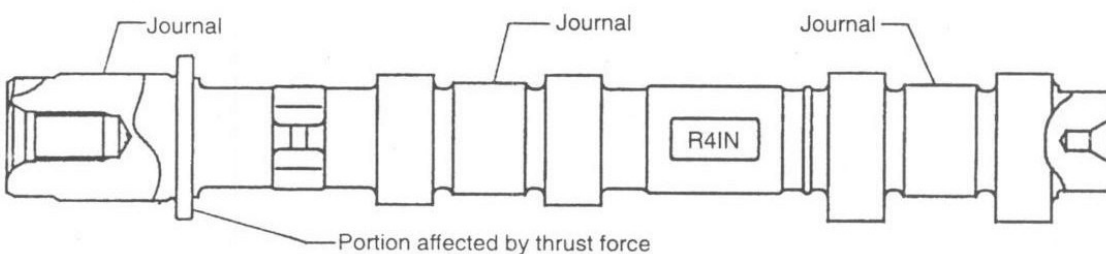
Intake camshaft (LH)



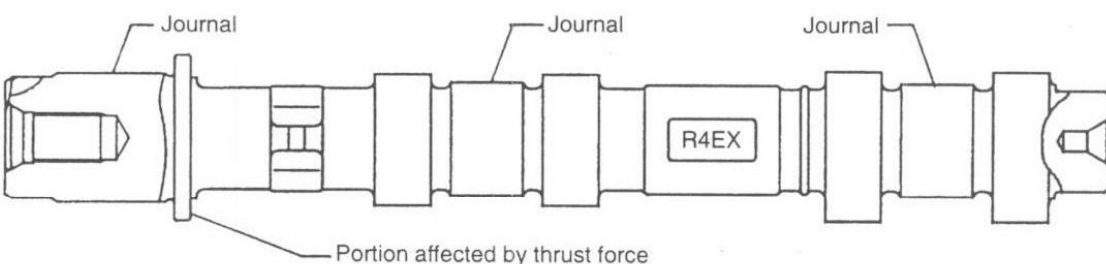
Exhaust camshaft (LH)



Intake camshaft (RH)



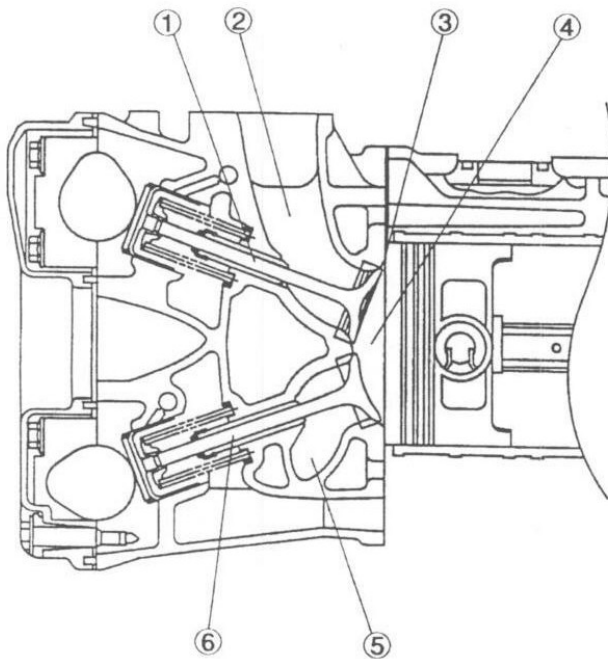
Exhaust camshaft (RH)



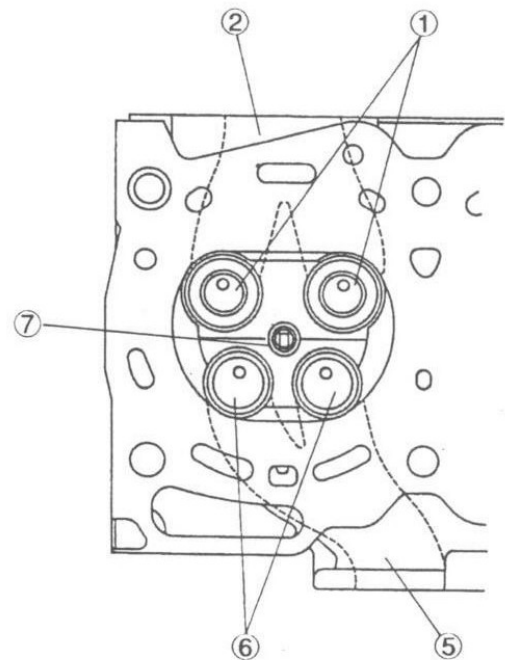
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6. Cylinder Head

- The cylinder head is made from aluminium die casting.
- Combustion chamber in the cylinder head is a compact, pentroof design and spark plug is located at the center of combustion chamber which feature a wide "squish" area for increased combustion efficiency.
- Four valves (two intake and two exhaust), which are arranged in a cross-flow design, are used per cylinder.
- The cylinder head gasket is a metallic one consisting of three layers of the stainless steel sheets. It has better heat resistance and gas sealability and higher reliability.



- ① Intake valve
- ② Intake port
- ③ Squish area
- ④ Combustion chamber



- ⑤ Exhaust port
- ⑥ Exhaust valve
- ⑦ Spark plug

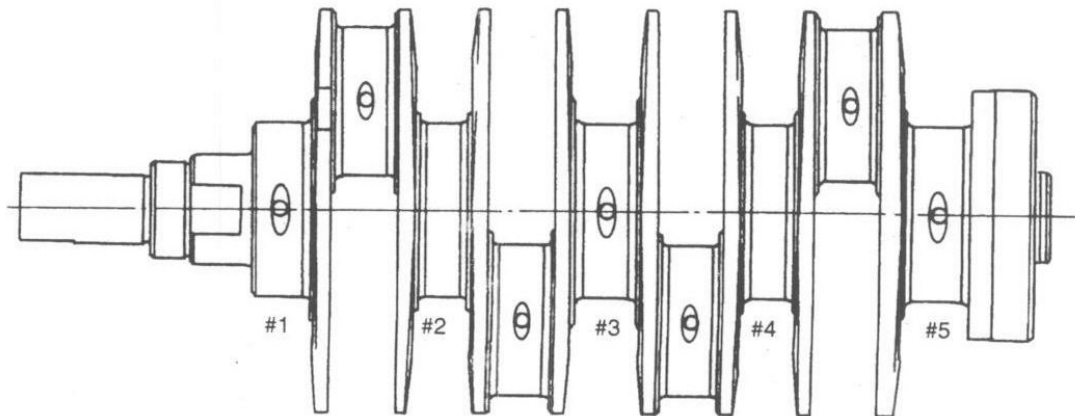
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7. Cylinder Block

- The cylinder block is made from aluminum die casting. The cylinder perimeter has an open-deck design which is lightweight, highly rigid and has superb cooling efficiency.
- The cylinder liners are made from cast iron and are dry types which are totally cast with aluminum cylinder block. Five main journal block designs are employed to increase stiffness and quiet operation.
- The oil pump is located in the front center of the cylinder block and the engine coolant pump is located at the front of the right-cylinder bank. At the rear of the right-cylinder block is a separator which eliminates oil mist contained in the blow-by gas.

8. Crankshaft

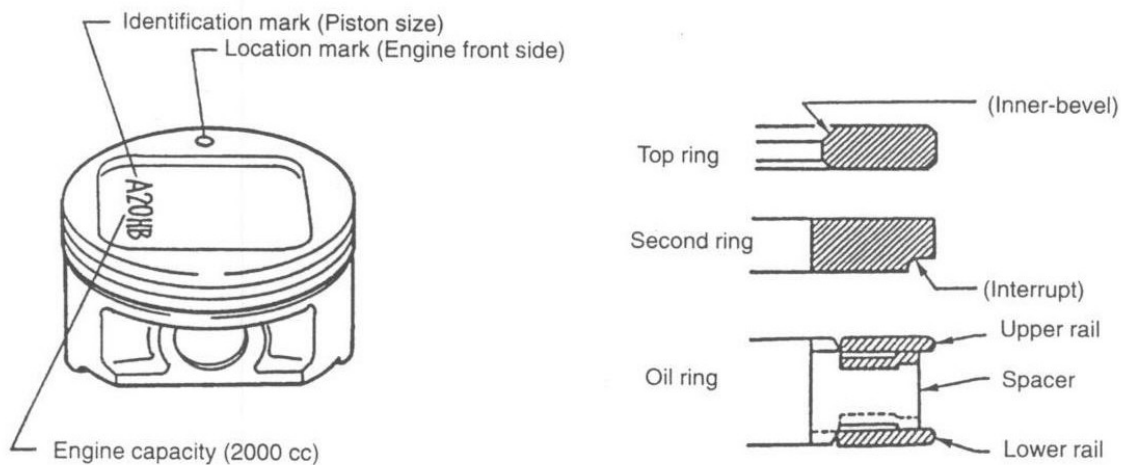
The crankshaft is supported by five bearings to provide high rigidity and strength. The corners of the crankshaft journals and webs, as well as the crank pins and webs, are finished with fillet-roll work to increase stiffness. The five crankshaft bearings are made from aluminum alloy and the No. 3 bearing is provided with a flanged metal to receive thrust force.



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9. Piston

- The piston skirt has a “slipper” design to reduce weight and sliding. The oil control ring groove utilizes a slit design.
- The piston pin is located in an offset position. The Nos. 1 and 3 pistons are offset in the lower direction while the Nos. 2 and 4 pistons are offset in the upper direction.
- The piston head is recessed for both the intake and exhaust valves. It also has symbols used to identify the location and the direction of installation.
- Three piston rings are used for each piston—two compression rings and one oil ring. The top piston ring has an inner-bevel design and the second piston ring has an interrupt design to reduce oil consumption.



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