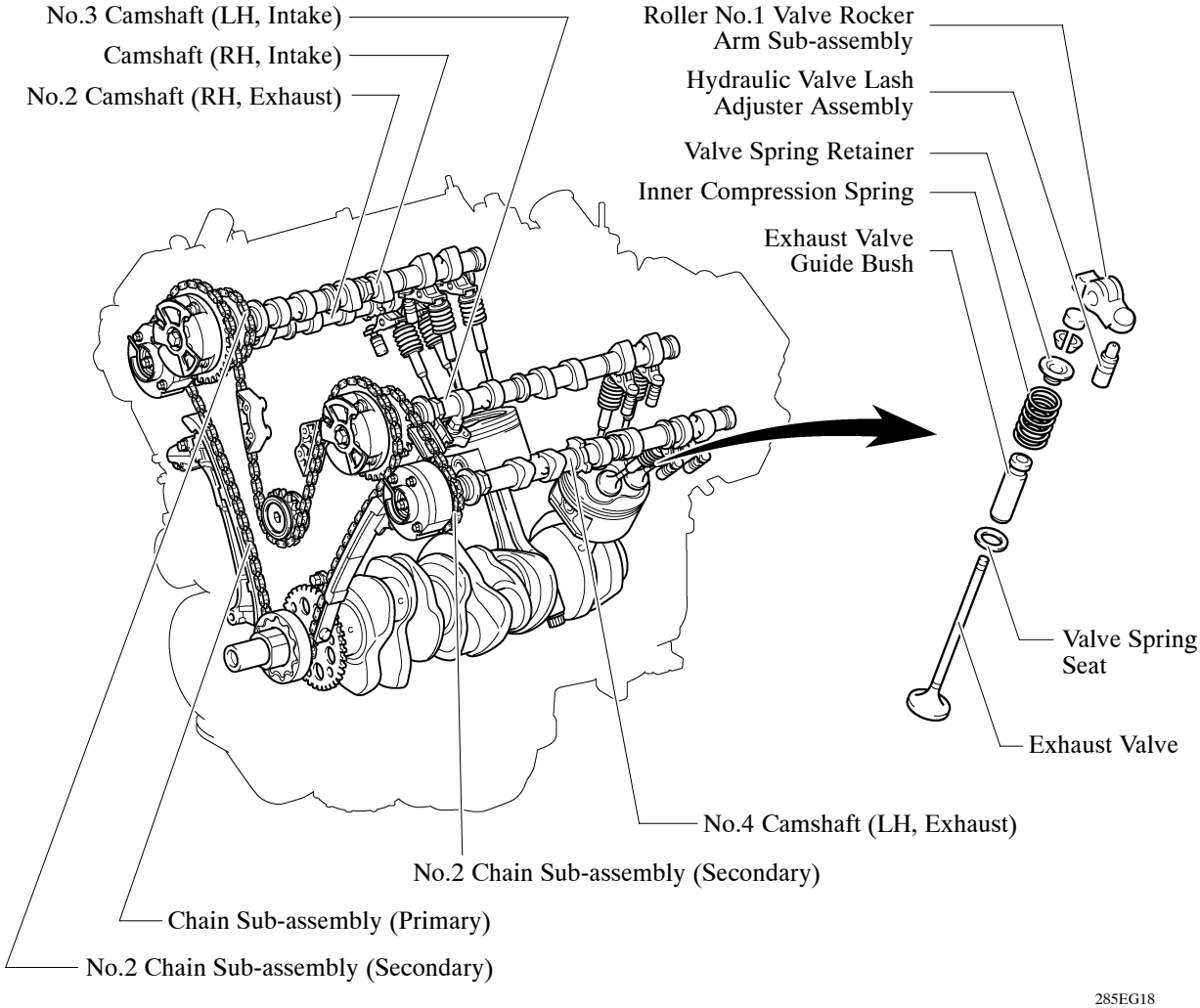
■VALVE MECHANISM

1. General

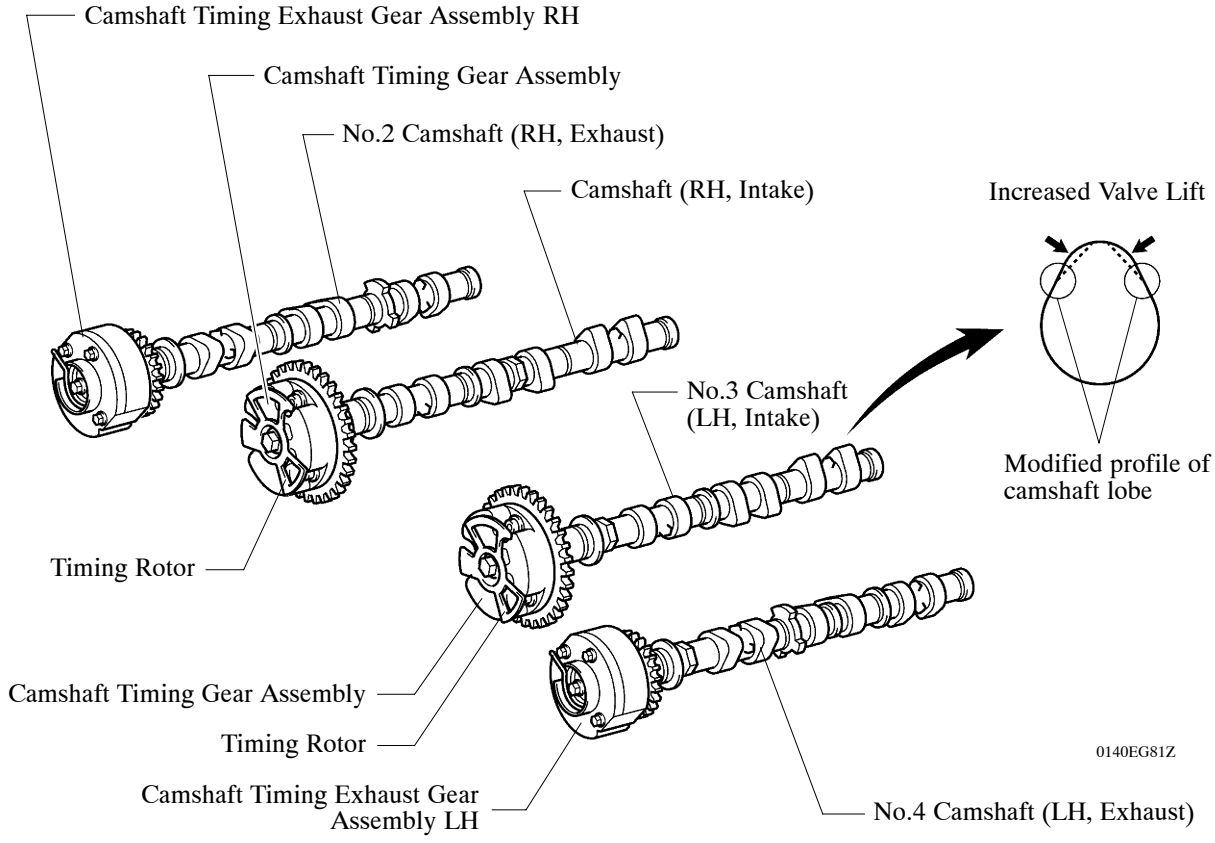
- Each cylinder of this engine has 2 intake valves and 2 exhaust valves. Intake and exhaust efficiency is increased due to the larger total port areas.
- This engine uses roller No.1 valve rocker arm sub-assemblies with built-in needle bearings. This reduces the friction that occurs between the cams and the roller No.1 valve rocker arm sub-assemblies that push the valves down, thus improving fuel economy.
- Hydraulic valve lash adjuster assemblies, which maintain a constant zero valve clearance through the use of oil pressure and spring force, are used.
- The camshaft (RH, intake) and No.3 camshaft (LH, intake) are driven by the crankshaft via the chain sub-assembly (primary). The No.2 camshaft (RH, exhaust) or No.4 camshaft (LH, exhaust) is driven by the camshaft (RH, intake) or No.3 camshaft (LH, intake) of their respective bank via No.2 chain sub-assemblies (secondary).
- This engine has a Dual VVT-i (Variable Valve Timing-intelligent) system which controls the intake camshafts and exhaust camshafts to provide optimal valve timing according to driving conditions. With this adoption, lower fuel consumption, higher engine performance, and fewer exhaust emissions have been achieved. For details of Dual VVT-i control, refer to page EG-67.



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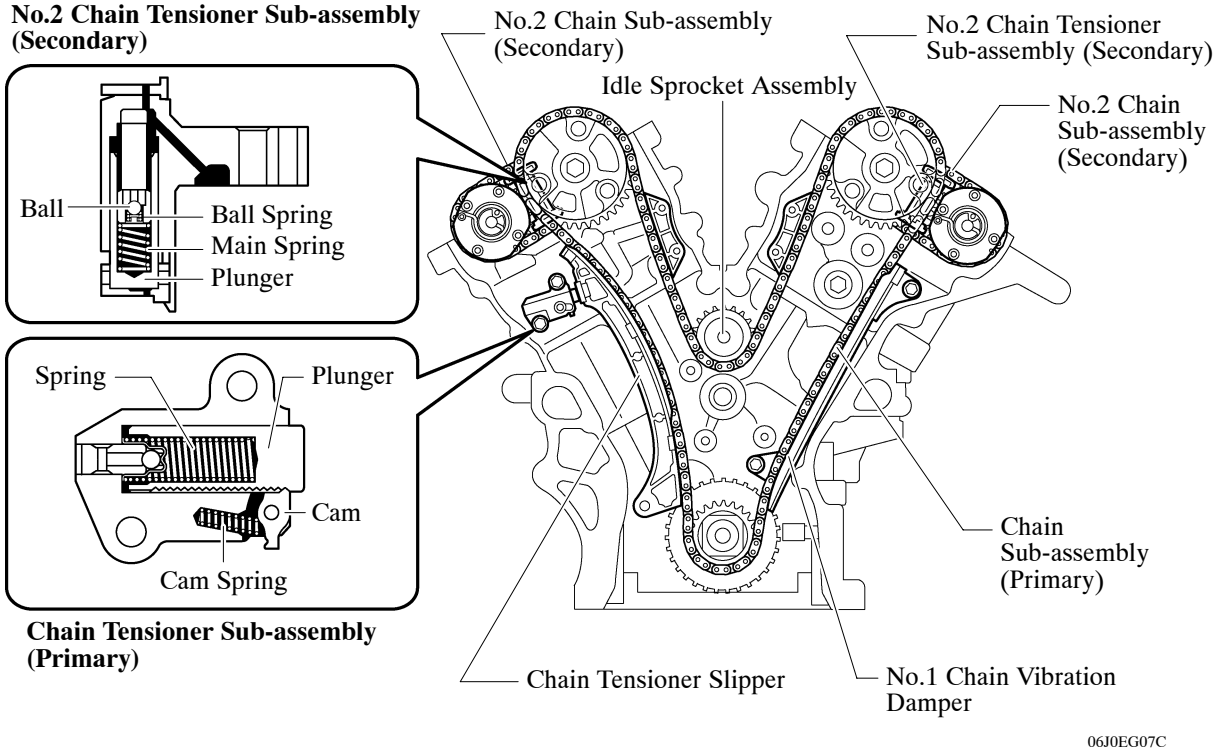
2. Camshaft

- The camshafts are made of cast iron alloy.
- Oil passages are provided on the intake and exhaust camshafts in order to supply engine oil to the VVT-i system.
- Camshaft timing gear assemblies (LH and RH) and camshaft timing exhaust gear assemblies (LH and RH) are installed on the front of the camshafts (intake) and camshafts (exhaust) to vary the timing of the intake and exhaust valves.
- Together with the use of the roller No.1 valve rocker arm sub-assemblies, the cam profile has been modified. This results in increased valve lift when the valve begins to open and as it finishes closing, helping to achieve enhanced output performance.



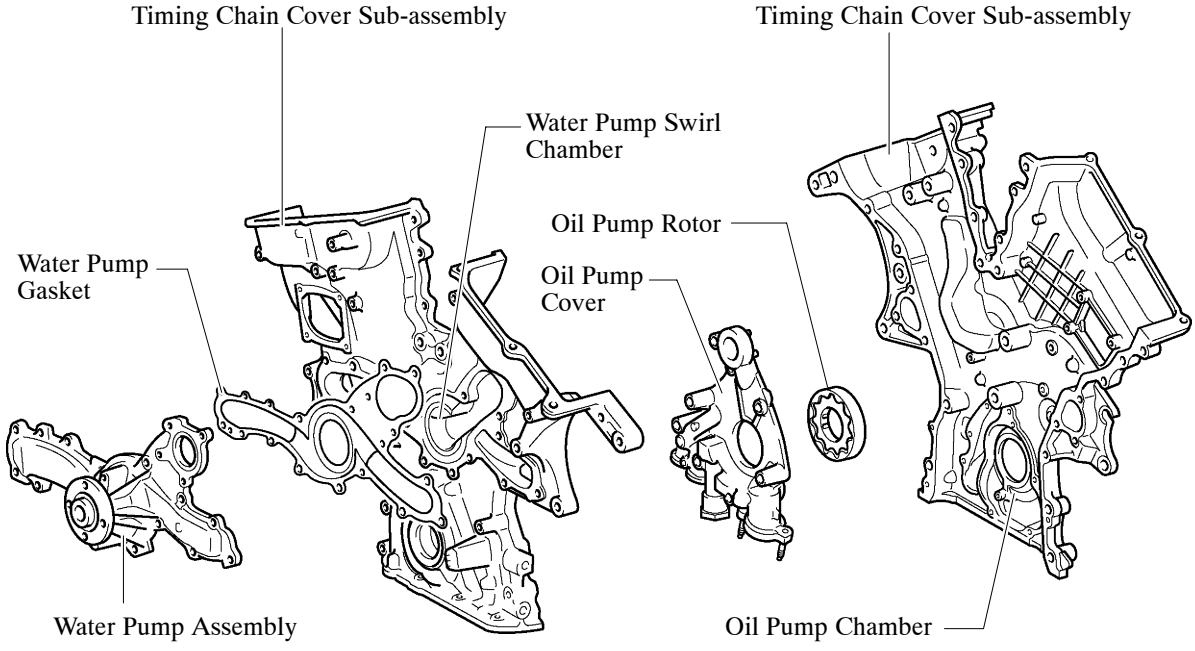
3. Chain Sub-assemblies and Chain Tensioner Sub-assemblies

- Each a chain sub-assembly (primary) and two No.2 chain sub-assemblies (secondary) use roller chains with a pitch of 9.525 mm (0.375 in.).
- All chain sub-assemblies are lubricated by an oil jet.
- The chain sub-assembly (primary) uses one chain tensioner sub-assembly (primary) and each of the No.2 chain sub-assemblies (secondary) for the right and left banks uses one No.2 chain tensioner sub-assembly (secondary).
- Both the chain tensioner sub-assembly (primary) and No.2 chain tensioner sub-assembly (secondary) use a spring and oil pressure to maintain proper chain tension at all times. They suppress noise generated by the chain sub-assemblies.
- The chain tensioner sub-assembly (primary) is a ratchet type with a non-return mechanism.



4. Timing Chain Cover Sub-assembly

The timing chain cover sub-assembly has an integrated construction consisting of the cooling system (water pump assembly and water passage) and the lubrication system (oil pump and oil passage). Thus, the number of parts is reduced to reduce weight.

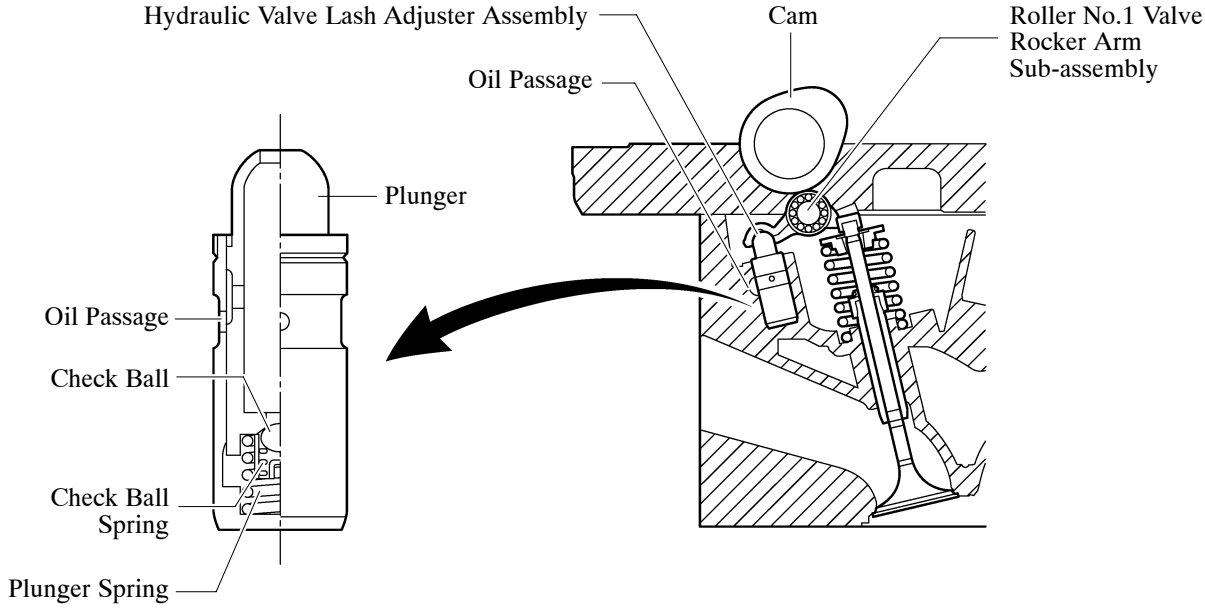


View from Front Side **View from Back Side**

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5. Hydraulic Valve Lash Adjuster Assembly

- The hydraulic valve lash adjuster assemblies, which are located at the fulcrum (pivot point) of the roller No.1 valve rocker arm sub-assemblies, each consist primarily of a plunger, plunger spring, check ball, and check ball spring.
- Both the engine oil that is supplied by the cylinder head sub-assembly and the built-in spring actuate the hydraulic valve lash adjuster assembly. The oil pressure and the spring force that act on the plunger push the roller No.1 valve rocker arm sub-assembly against the cam, in order to adjust the clearance between the valve stem and the roller No.1 valve rocker arm sub-assembly. This prevents the generation of noise during the opening and closing of the valves. As a result, engine noise is reduced.



Service Tip

Valve clearance adjustment is not necessary because hydraulic valve lash adjuster assemblies are used.