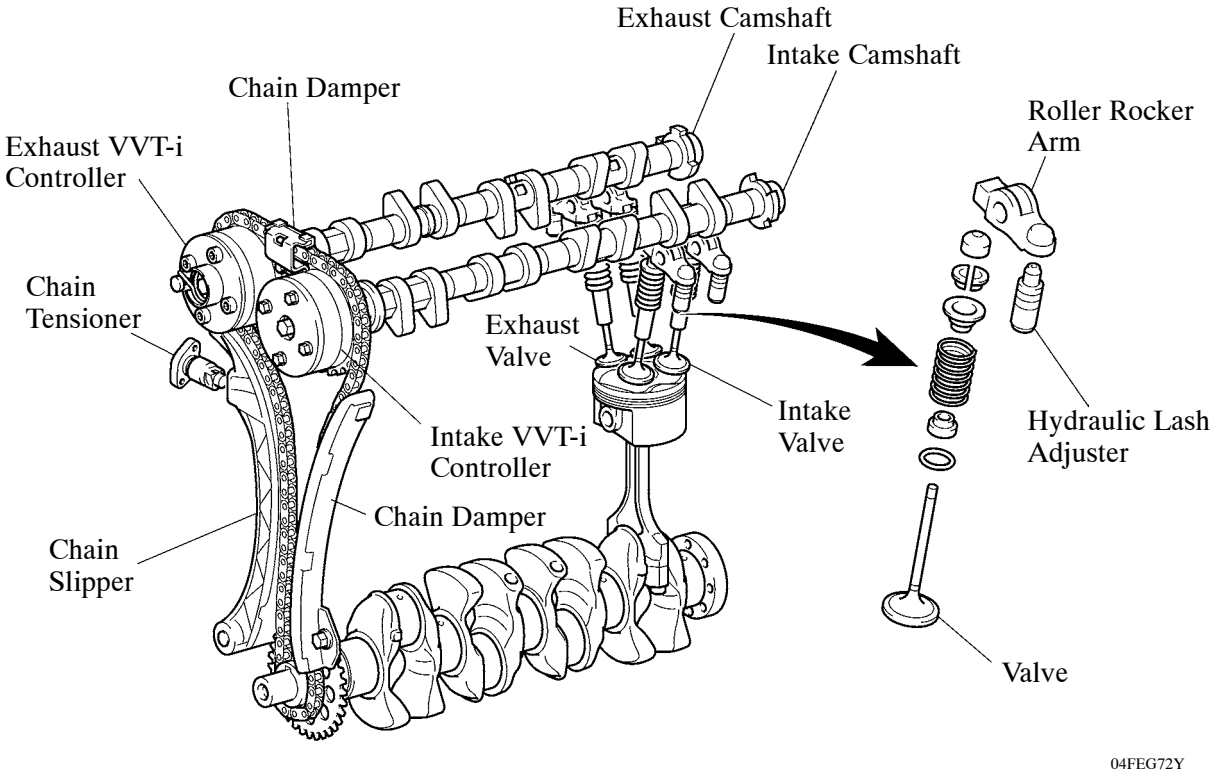
■ VALVE MECHANISM

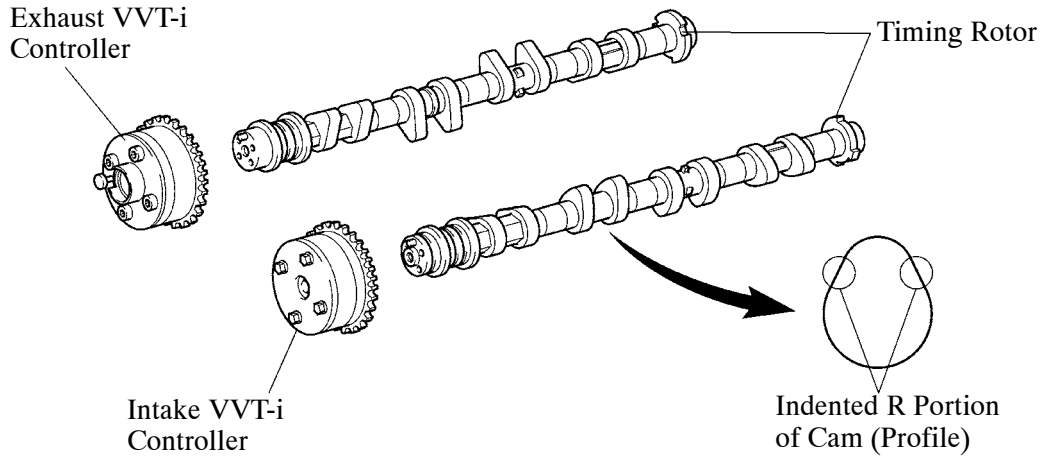
1. General

- Intake and exhaust efficiency has been increased due to the larger total port areas.
- The 2ZR-FE engine uses roller rocker arms with built-in needle bearings. This reduces the friction that occurs between the cams and the areas (roller rocker arms) that push the valves down, thus improving fuel economy.
- The hydraulic lash adjusters, which maintain a constant zero valve clearance through the use of oil pressure and spring force, are used.
- The intake and exhaust camshafts are driven by a timing chain.
- The 2ZR-FE engine uses a Dual VVT-i (Variable Valve Timing-intelligent) system which controls the intake and exhaust camshafts to provide optimal valve timing according to driving conditions. With this, lower fuel consumption, higher engine performance, and fewer exhaust emissions have been achieved. For details of Dual VVT-i control, see page 65.



2. Camshaft

- The intake and exhaust camshafts are made of cast iron alloy.
- An oil passage is provided in the intake and exhaust camshafts in order to supply engine oil to the VVT-i system.
- A VVT-i controller has been installed on each front of the intake and exhaust camshafts to vary the timing of the intake and exhaust valves.
- Together with the use of the roller rocker arm, the cam profile has been designed with an indented R (radius). This results in increased valve lift when the valve begins to open and finishes closing, helping to achieve enhanced output performance.
- A timing rotor for the camshaft position sensor is provided at each back end of the intake and exhaust camshafts.

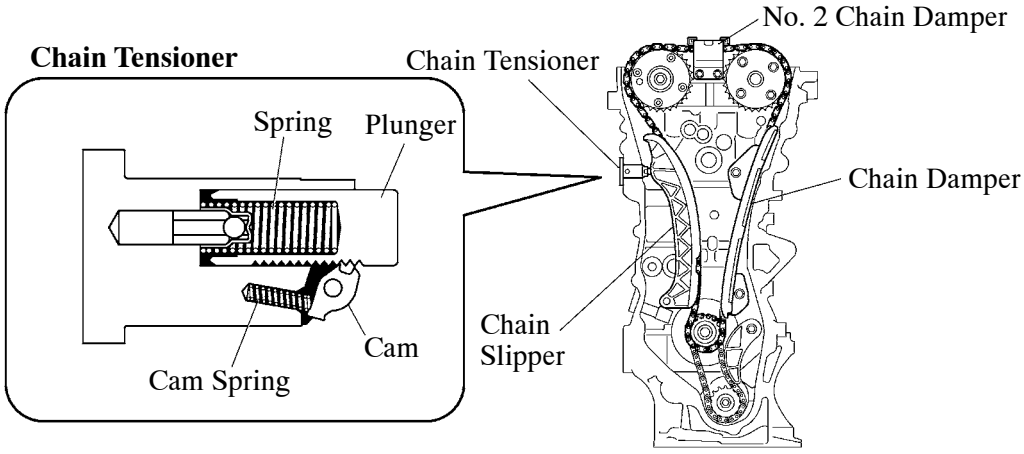


Cam with indented R

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3. Timing Chain and Chain Tensioner

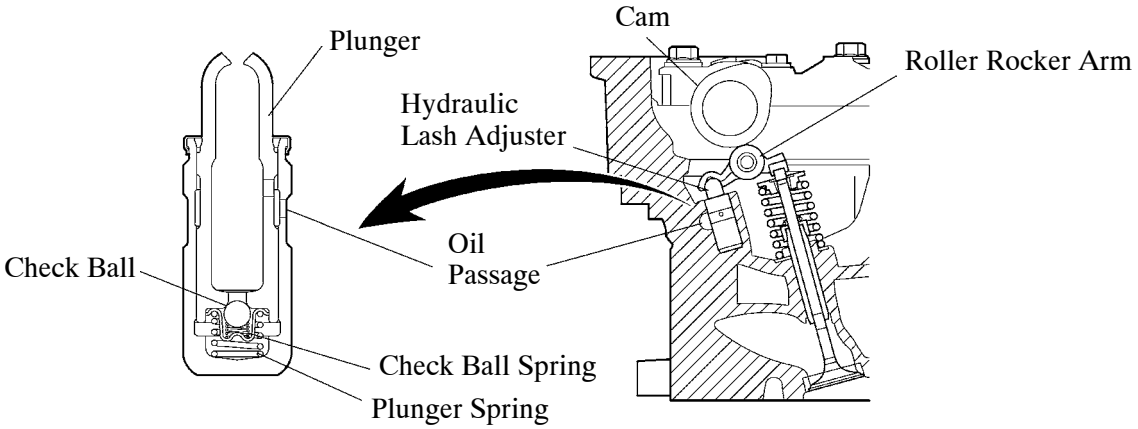
- A roller chain with an 8 mm pitch is used to make the engine more compact.
- The timing chain is lubricated by a timing chain oil jet. See page 28 for the location of the timing chain oil jet.
- The chain tensioner uses a spring and oil pressure to maintain proper chain tension at all times. The chain tensioner suppresses noise generated by the timing chain.
- The chain tensioner is ratchet type with a non-return mechanism.
- To achieve excellent serviceability, the chain tensioner is constructed so that it can be removed and installed from the outside of the timing chain cover.



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4. Hydraulic Lash Adjuster

- The hydraulic lash adjuster, which is located at the fulcrum of the roller rocker arm, consists primarily of a plunger, plunger spring, check ball, and check ball spring.
- The engine oil that is supplied by the cylinder head and the built-in spring actuates the hydraulic lash adjuster. The oil pressure and the spring force that act on the plunger push the roller rocker arm against the cam, in order to adjust the valve clearance that is created during the opening and closing of the valve. As a result, engine noise is reduced.



Service Tip

Valve clearance adjustment is not necessary because a hydraulic lash adjuster is used.

5. Timing Chain Cover

- An aluminum die-cast timing chain cover is used.
- The timing chain cover has an integrated construction consisting of the cooling system (water pump and water passage). Thus, the number of parts has been reduced for weight reduction.
- The oil passage is provided on the timing chain cover to simplify the oil passage.
- The timing chain oil jet is provided in the timing chain cover.
- A drive belt tension gauge is provided on the timing chain cover.

