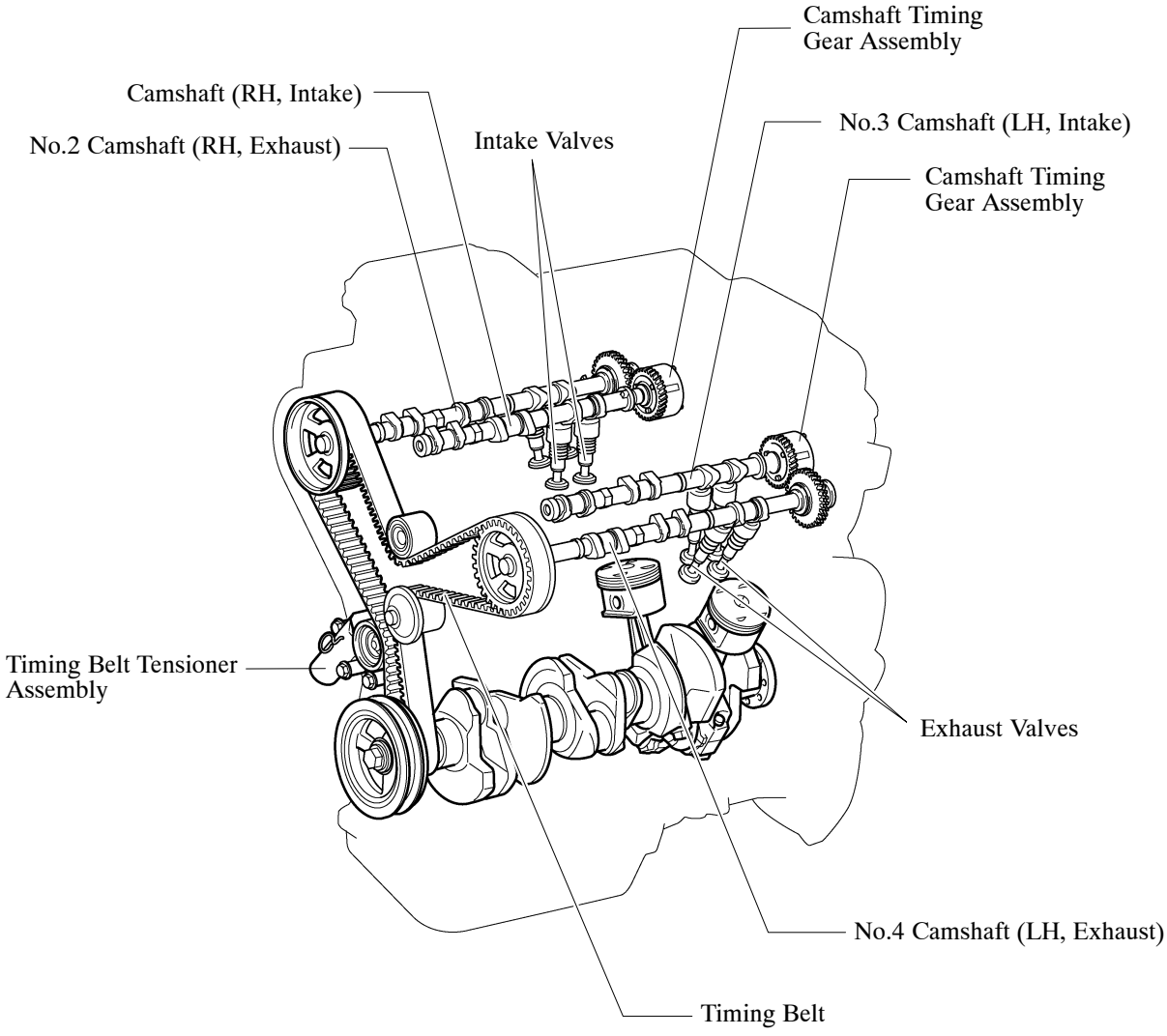
■VALVE MECHANISM

1. General

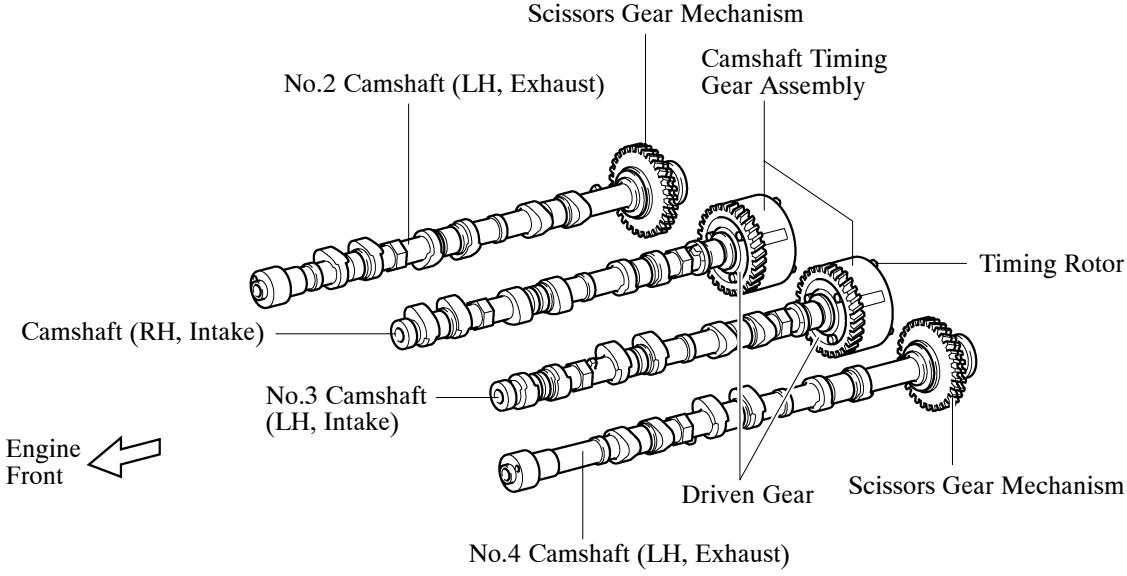
- The intake and exhaust valves are directly opened and closed by 4 camshafts.
- The exhaust camshafts are driven by a timing belt, while the intake camshafts are driven by gears from the exhaust camshafts.
- The valve mechanism uses the VVT-i (Variable Valve Timing-intelligent) system to achieve lower fuel consumption and higher engine performance, and to reduce exhaust emissions. For details of VVT-i control, refer to page EG-49.



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2. Camshaft

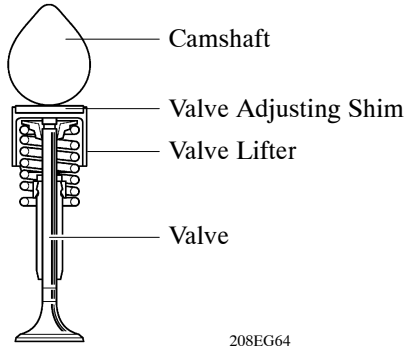
- The camshafts are made of cast iron alloy.
- Oil passages are provided in the intake camshafts in order to supply engine oil to the VVT-i system.
- Camshaft timing gear assemblies are installed on the rear of the intake camshafts to vary the timing of the intake valves.
- The intake camshafts are driven by gears on the exhaust camshafts. A scissors gear mechanism is used on drive gear exhaust camshafts to control backlash and suppress gear noise.
- To detect the intake camshaft position, a timing rotor is provided at the camshaft timing gear assembly. This timing rotor, which is secured to the intake camshaft, is used by the camshaft position sensor to detect the actual position of the camshaft.



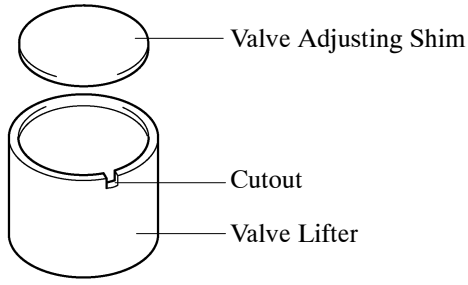
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3. Intake and Exhaust Valve and Valve Lifter

- Narrow valve stems are used to reduce the intake and exhaust resistance and for weight reduction.
- The valve adjusting shim has been located directly above the valve lifter. This construction allows the valve adjusting shim to be replaced without removing the camshaft, which improves the serviceability during valve clearance adjustment.
- A cutout is provided in the valve lifter to improve the serviceability of removing the valve adjusting shims.



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Service Tip

The adjustment of the valve clearance is accomplished by selecting and replacing the appropriate valve adjusting shims.
A total of 32 valve adjusting shims are available in 0.025 mm (0.001 in.) increments, from 2.525 mm (0.099 in.) to 3.30 mm (0.130 in.). For details, refer to the 2008 HIGHLANDER HYBRID VEHICLE Repair Manual (Pub. No. RM07V0U).

4. Timing Belt and Timing Belt Tensioner Assembly

- The timing belt tooth configuration has been designed to help to reduce noise and enable the belt to transmit power under high load factors.
- The timing belt tensioner assembly uses a spring and silicone oil damper, and maintains proper timing belt tension at all times. The timing belt tensioner assembly suppresses noise generated by the timing belt.

