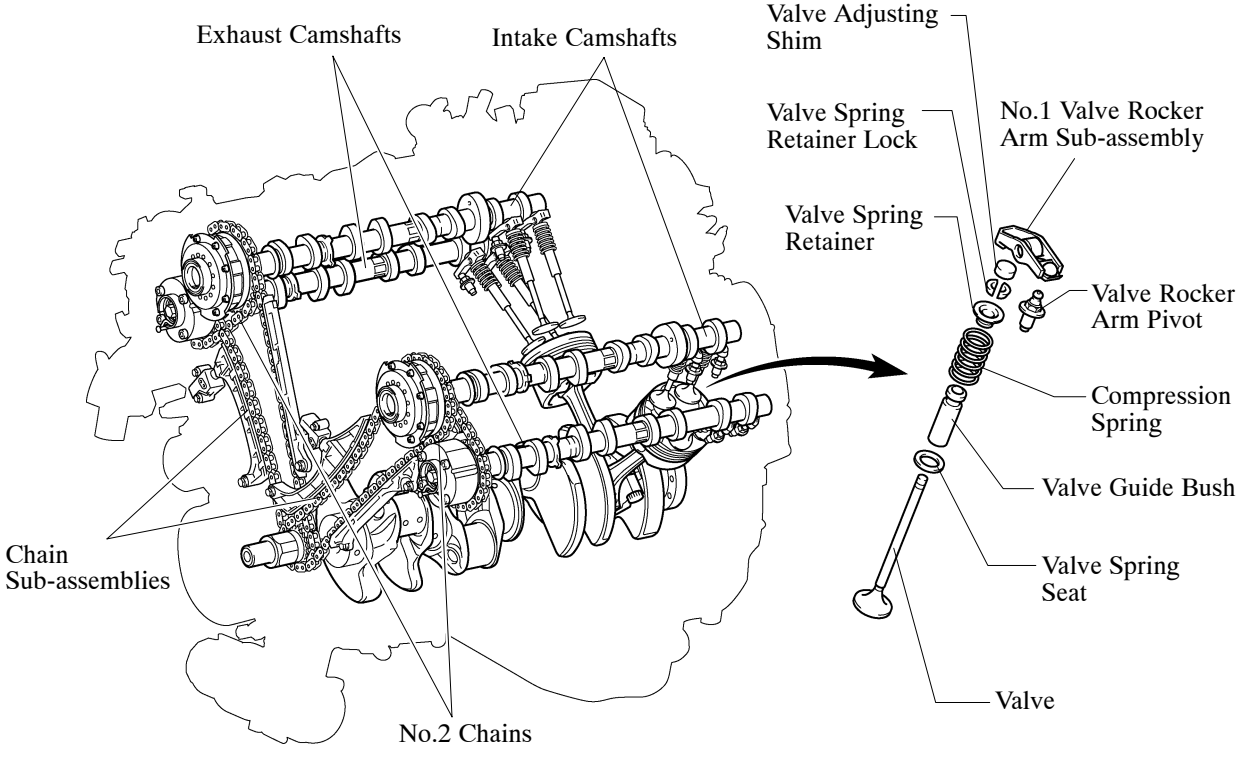
■VALVE MECHANISM

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 No.1 valve rocker arm sub-assemblies with built-in needle bearings. This reduces the friction that occurs between the cams and the rocker arms that push the valves down, thus improving fuel economy.
- Fixed valve rocker arm pivots and No.1 valve rocker arm sub-assemblies are adopted to support the increased maximum engine speed.
- Shims mounted on the ends of the valve stems are used for adjustment of valve clearance.
- As a result of adopting titanium intake valves, high valve lift and increased engine speed are assured, improving output performance.
- As a result of the adoption of a high nickel content heat resistant steel alloy for the umbrella portion of the exhaust valves, high temperature durability is improved.
- To ensure highly accurate valve timing, separate chain sub-assemblies are driven by the crankshaft in order to rotate the intake camshafts of the left and right banks. The exhaust camshafts are driven by the intake camshaft of the respective bank via a No.2 chain.
- Net-shape sintered composite camshafts are used.
- This engine has 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 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-91.



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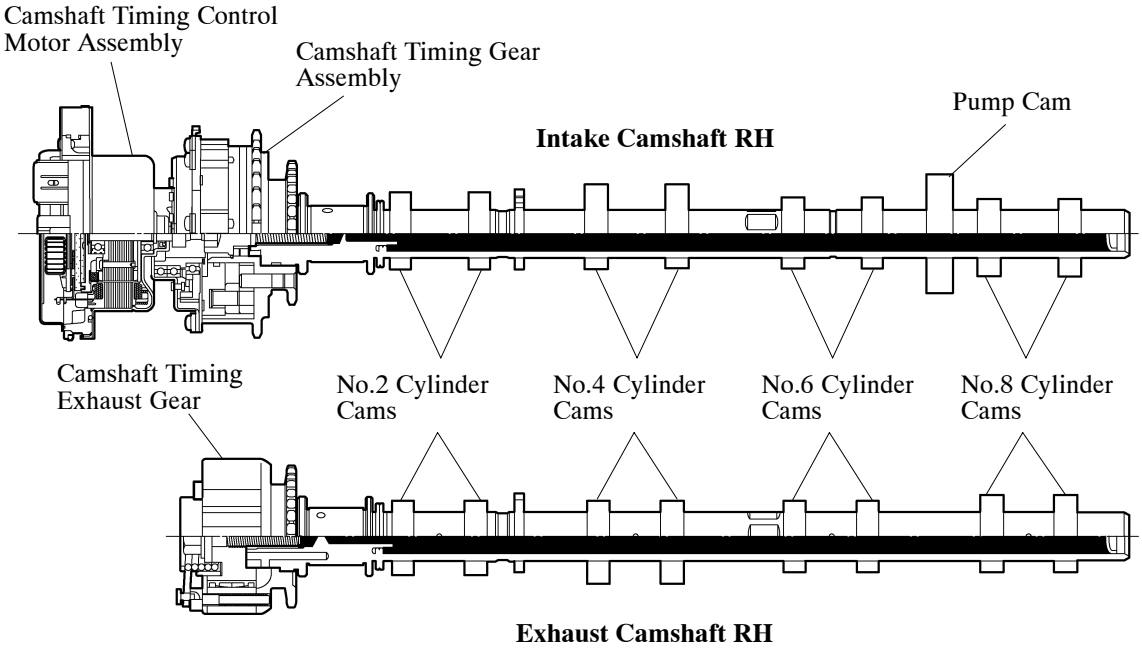
2. Camshaft

- A composite camshaft made of net-shape sintered cam pieces and a hollow shaft is used for weight reduction.
- The net-shape sintering of the cam pieces has optimized the cam profile, thus improving power output and fuel economy.
- The materials of the cam pieces have been optimized in accordance with their applications, which are to drive the valves, and to drive the pump. This results in improved durability of the camshaft.
- An oil passage is provided in the intake and exhaust camshafts. The intake side is for lubricating the camshaft timing gear assembly and the exhaust side is for controlling the camshaft timing exhaust gear.
- Together with the use of the 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 finishes closing, helping to achieve enhanced output performance.



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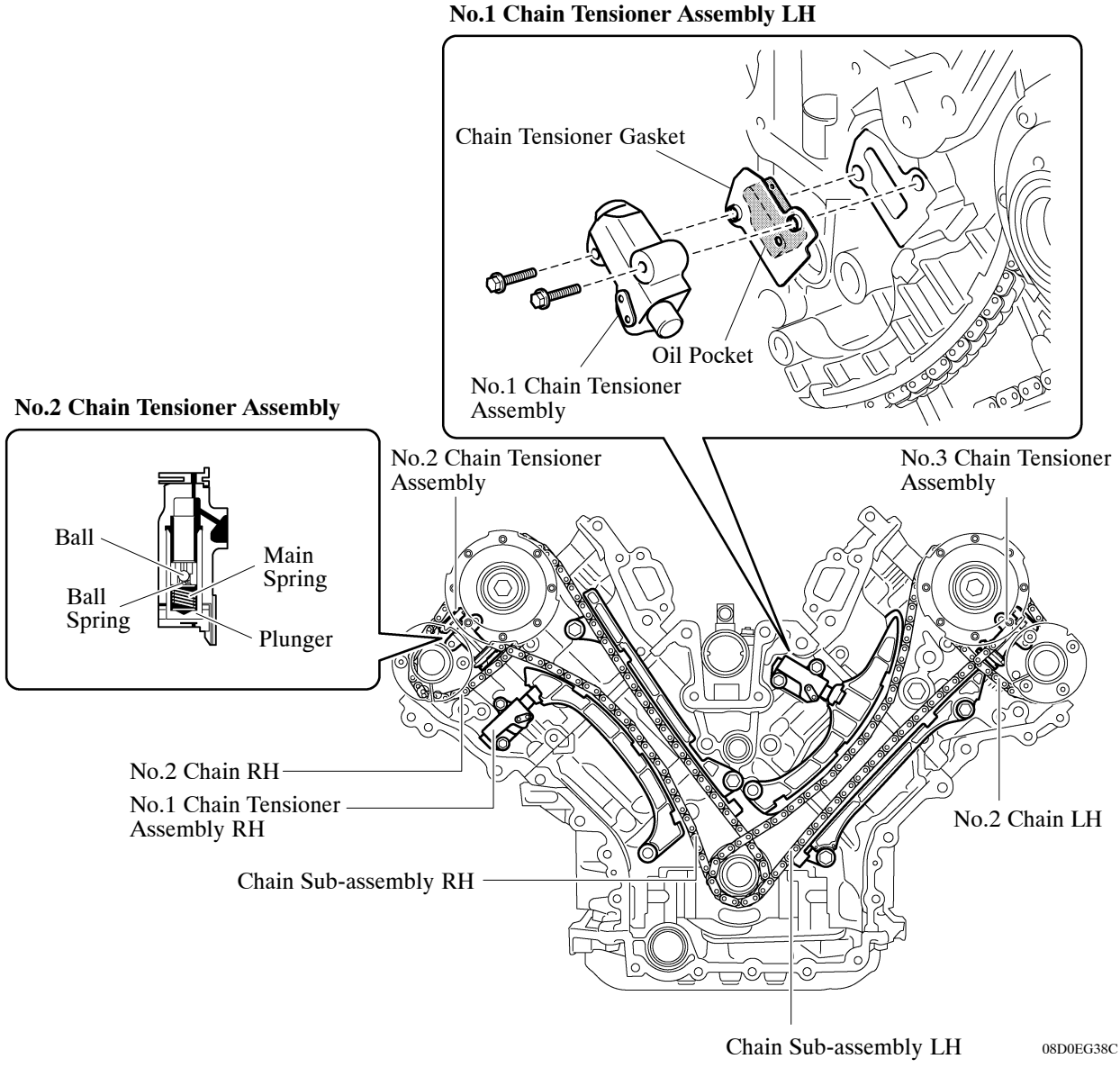
— REFERENCE —

Net-shape Sintering:

Net-shape sintering is a shaping method that can create precision formed products by stamping them with dies, without requiring grind finishing.

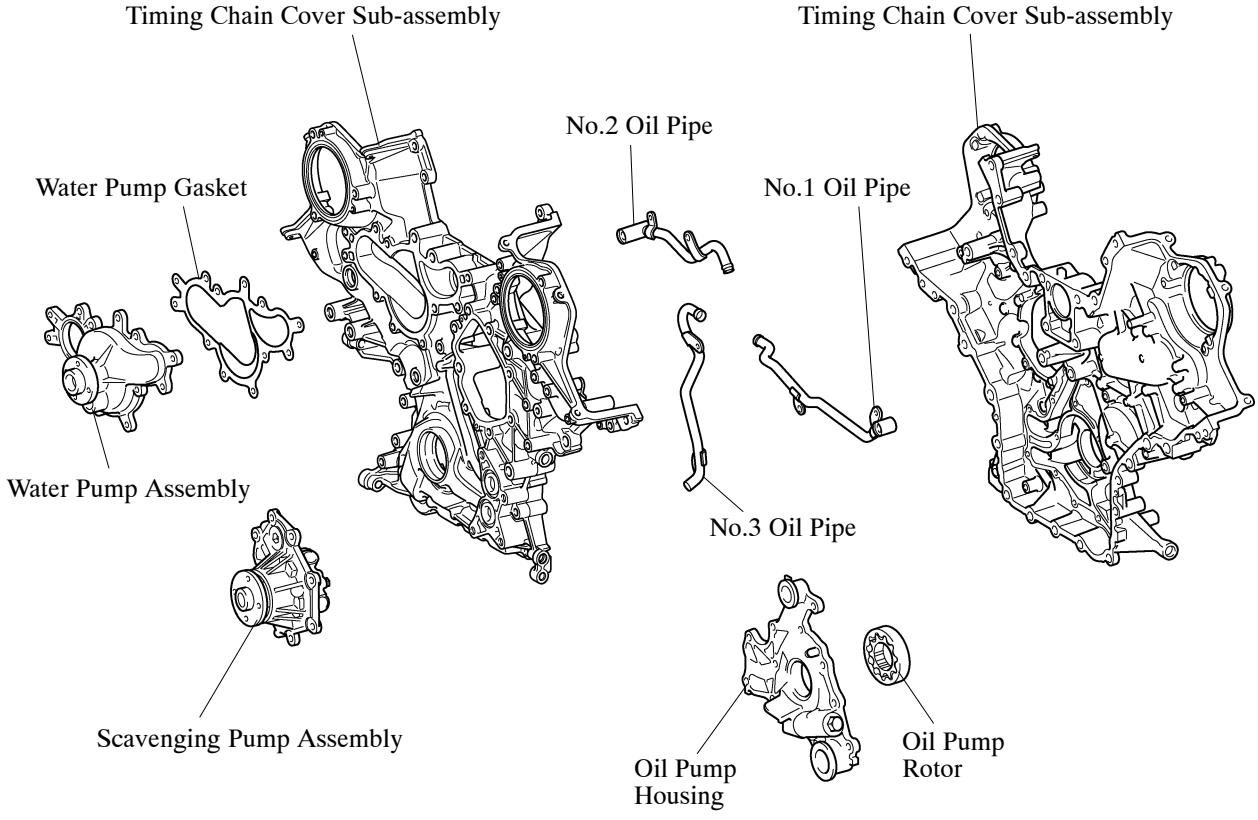
3. Timing Chains and Chain Tensioners

- Both the chain sub-assembly and No.2 chain use roller chains with a pitch of 9.525 mm (0.375 in.).
- A timing chain tensioner is provided for each chain sub-assembly and No.2 chain on each bank.
- The No.1, No.2 and No.3 chain tensioner assemblies use a spring and oil pressure to maintain proper chain tension at all times. The tensioners suppress noise generated by the timing chains.
- The No.1 chain tensioner assembly is a ratchet type with a non-return mechanism. Furthermore, the chain tensioner gasket is provided with an oil pocket. The pocket reduces the time it takes for oil pressure to build up in the No.1 chain tensioner assembly when the engine is started. This prevents the timing chain from flapping and reduces noise.



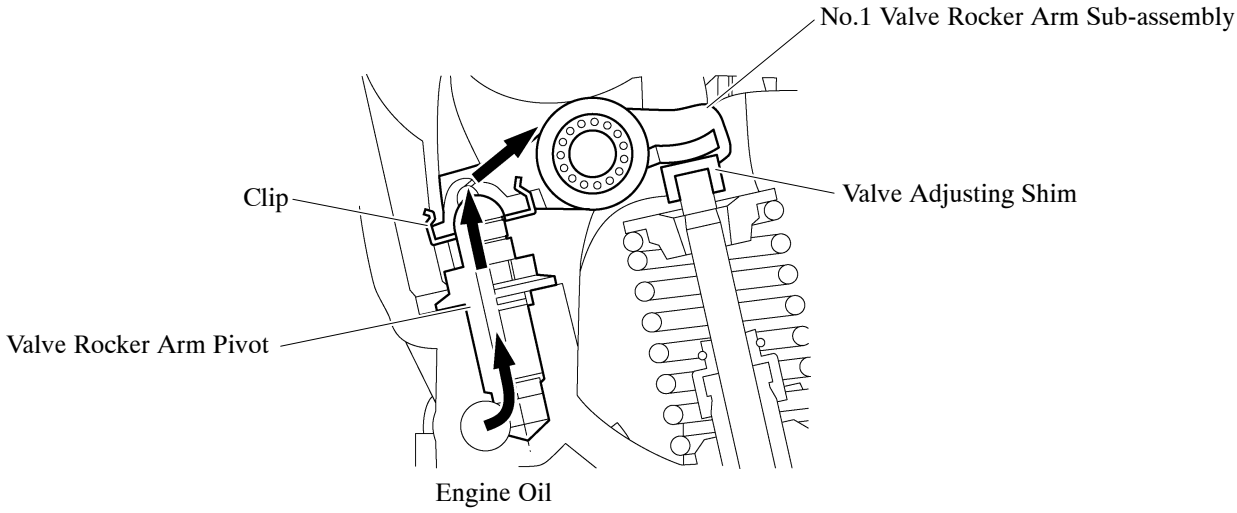
4. Timing Chain Cover

- 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, scavenging pump assembly and oil passage). Thus, the number of parts has been reduced to reduce weight.
- An oil jet is provided in the oil pump housing to lubricate the timing chain.



5. No.1 Valve Rocker Arm Sub-assembly and Valve Rocker Arm Pivot

- A mounting clip is adopted for the connection between the No.1 valve rocker arm sub-assemblies and the fixed pivots to prevent the rocker arms from falling off when the valve clearance is adjusted.
- Lubrication for the sliding parts of the No.1 valve rocker arm sub-assemblies is provided from the fixed pivot oil passage via the valve rocker arm pivot.



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Service Tip

The adjustment of the valve clearance is accomplished by selecting and replacing the appropriate valve adjusting shims. Valve adjusting shims are available in 41 increments of 0.020 mm (0.0008 in.), from 2.00 mm (0.0787 in.) to 2.80 mm (0.1102 in.).
For details, refer to the LEXUS IS F Repair Manual (Pub. No. RM08E0E).