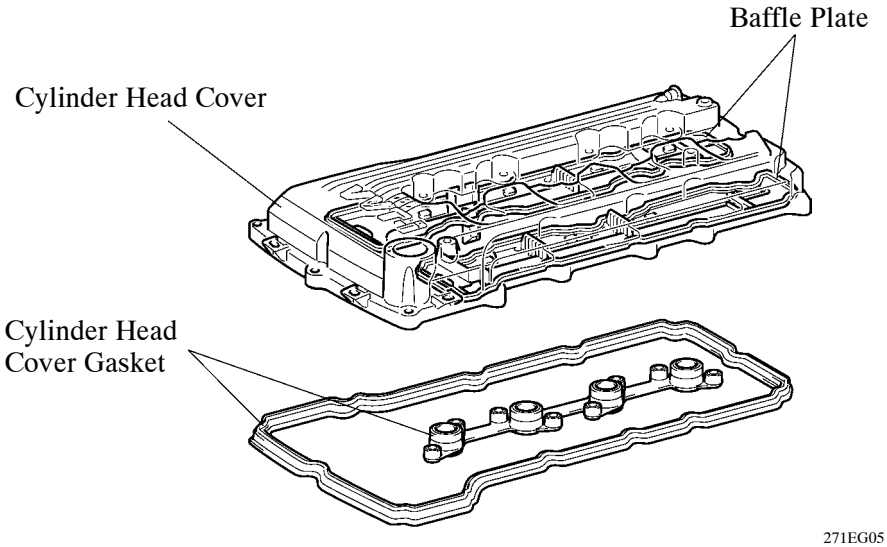
■ ENGINE PROPER

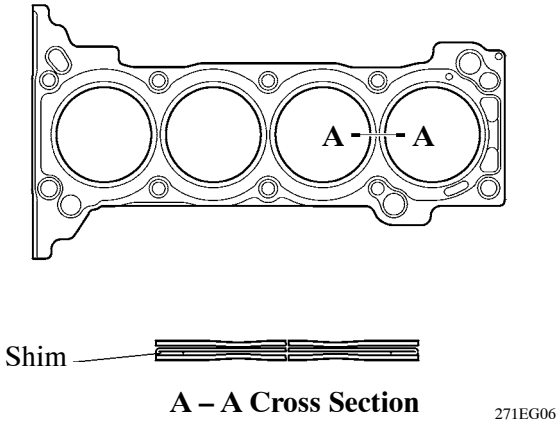
1. Cylinder Head Cover

- The cylinder head cover is made of plastic to reduce weight and noise.
- Acrylic rubber, which excels in heat resistance and reliability, is used for the cylinder head cover gasket.
- Baffle plates made of plastic are provided inside the cylinder head cover to reduce the consumption of engine oil through blow-by gas. The baffle plates are welded onto the cylinder head cover, and cannot be removed.



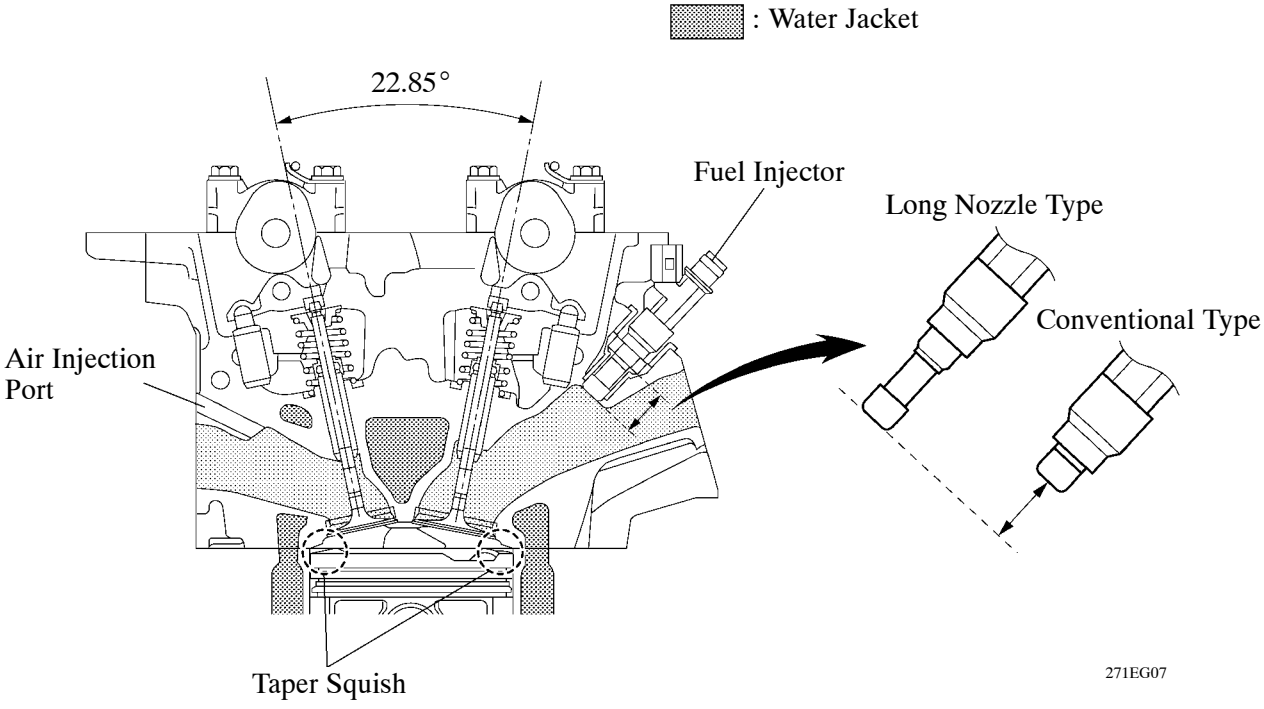
2. Cylinder Head Gasket

- A steel-laminate type cylinder head gasket is used.
- A shim is provided around the cylinder bore to increase the sealing surface, thus improving the sealing performance and durability.



3. Cylinder Head

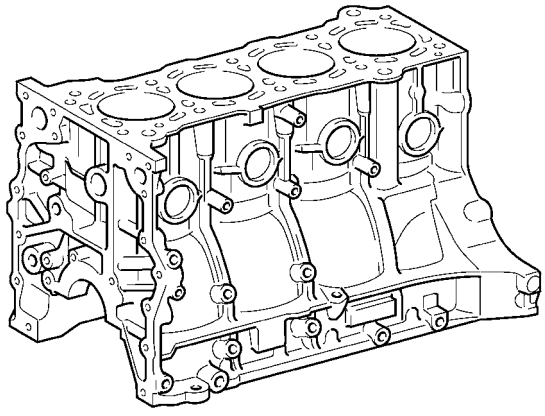
- The cylinder head, which is made of aluminum alloy, contains a pentroof type combustion chamber. The spark plug has been located in the center of the combustion chamber in order to improve the engine's anti-knocking performance.
- The angle between the intake and exhaust valves is narrowed and set at 22.85° to permit a compact cylinder head.
- A cross-flow intake and exhaust layout is used to improve intake and exhaust efficiency.
- A taper squish combustion chamber is used to improve anti-knocking performance and intake efficiency. In addition, engine performance and fuel economy have been improved.
- The cylinder head bolt employs plastic region tightening bolts.
- Long nozzle type fuel injectors are installed in the cylinder head to reduce the distance from fuel injector to intake valve, thus preventing the fuel from adhering to the intake port walls, and reducing exhaust emissions.
- The routing of the water jacket in the cylinder head is optimized to achieve higher cooling performance.
- An air injection port, which directs the air from the air pump to the exhaust port of each cylinder, has been provided on top of the exhaust port on the models with the air injection system.



4. Cylinder Block

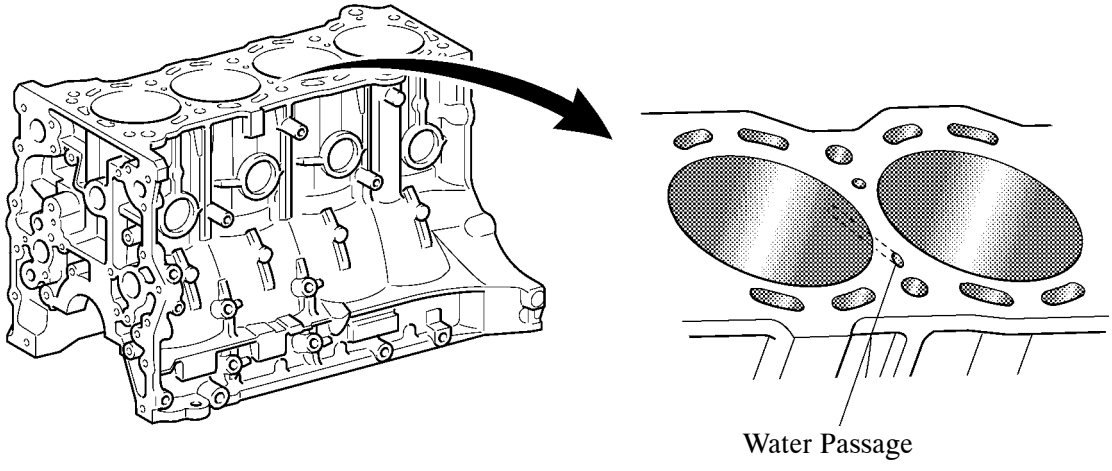
- The cylinder block is made of cast iron, and the rib shape of each part has been optimized to increase rigidity while reducing vibration and noise.
- Water passages have been provided between the cylinder bores of the 2TR-FE engine. By allowing the engine coolant to flow between the cylinder bores, this construction enables the temperature of the cylinder walls to be kept uniform.

▶ 1TR-FE Engine ◀



271EG08

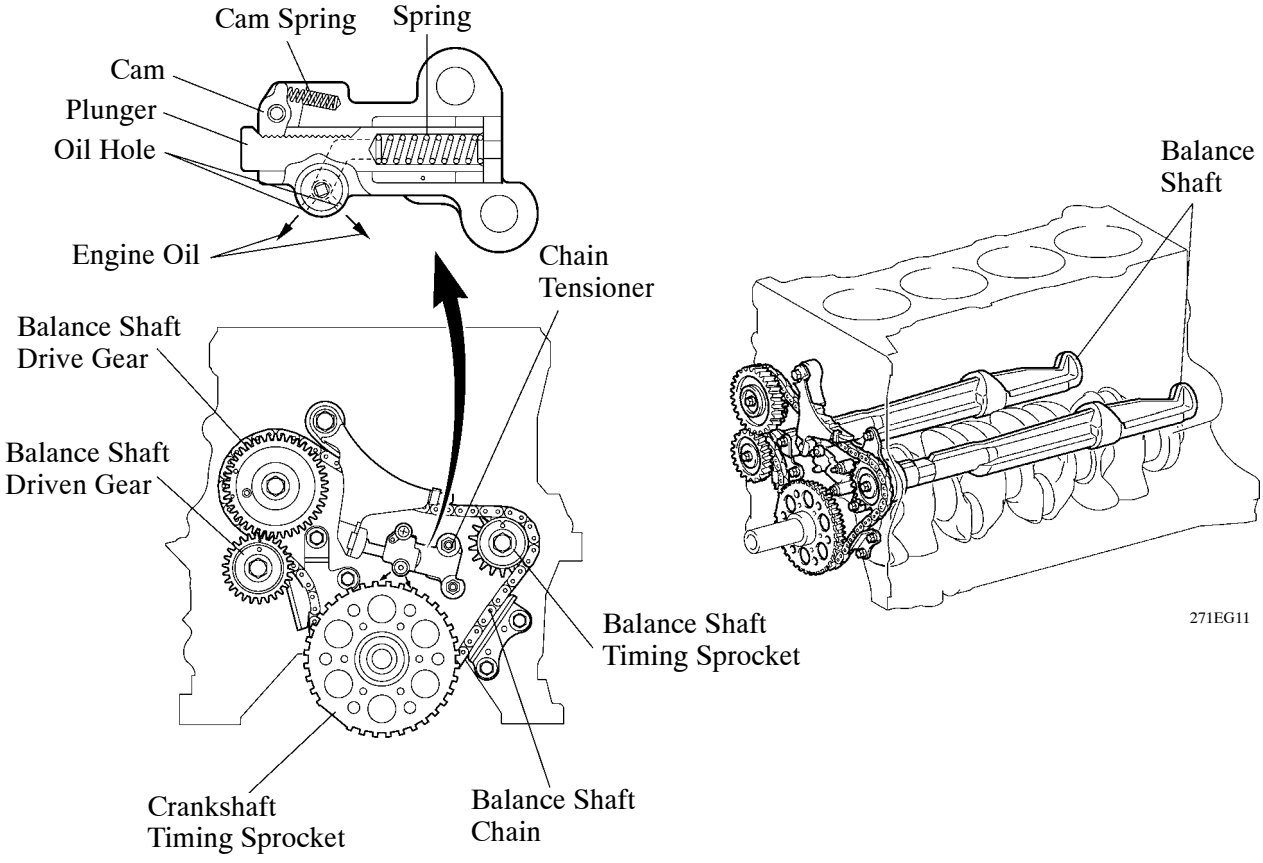
▶ 2TR-FE Engine ◀



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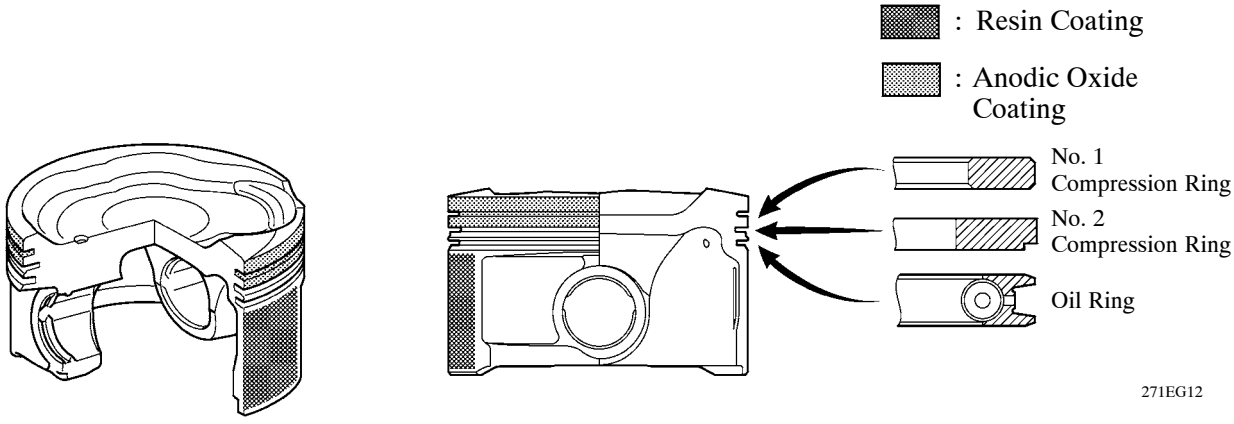
5. Balance Shaft (for 2TR-FE Engine)

- For in-line 4-cylinder engines, the main cause of vibration is imbalanced inertial force of reciprocating parts such as the pistons and connecting rods. The 2TR-FE engine vibration has been reduced by using 2 balance shafts to cancel the imbalanced inertial force, thereby reducing engine noise (booming noise).
- The 2 balance shafts are built into the cylinder block. Using a chain and idler gear, both balance shafts rotate at twice the speed of the crankshaft with each balance shaft rotating in the opposite direction of the other.
- The chain tensioner uses a spring and oil pressure to maintain proper chain tension at all times. A ratchet type non-return mechanism is also included.
- The chain tensioner has two oil holes that spray engine oil for lubricating the balance shaft chain. Furthermore, they lubricate the timing chain that drives the camshaft.



6. Piston

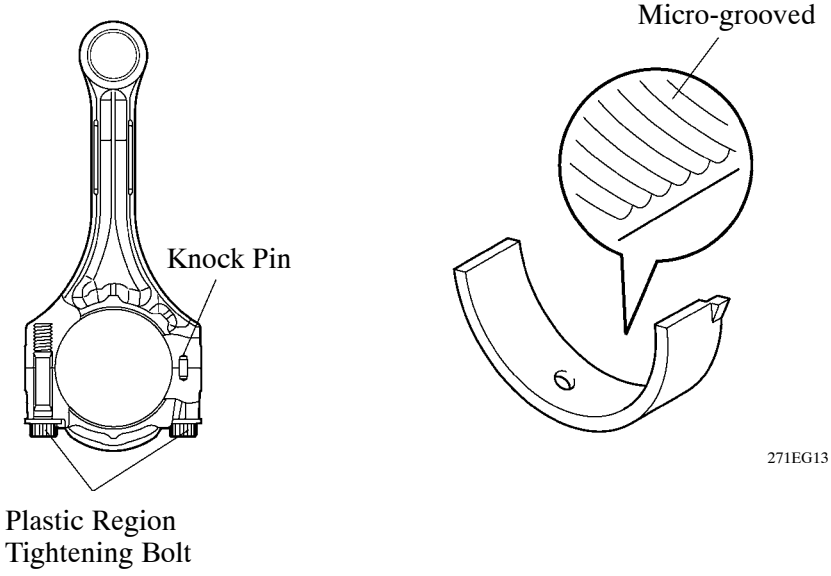
- The piston is made of aluminum alloy.
- The piston head portion uses a taper squish shape to accomplish fuel combustion efficiency.
- The piston skirt has been coated with resin to reduce the friction loss.
- The groove of the top ring has been coated with anodic oxide to improve wear resistance and rust resistance.
- On models with the leaded gasoline engine, a PVD (Physical Vapor Deposition) coating has been applied on the surface of the No. 1 compression ring and oil ring, and the surface of the No. 2 compression ring has been chrome-plated.



2TR-FE Engine (for Unleaded Gasoline Engine)

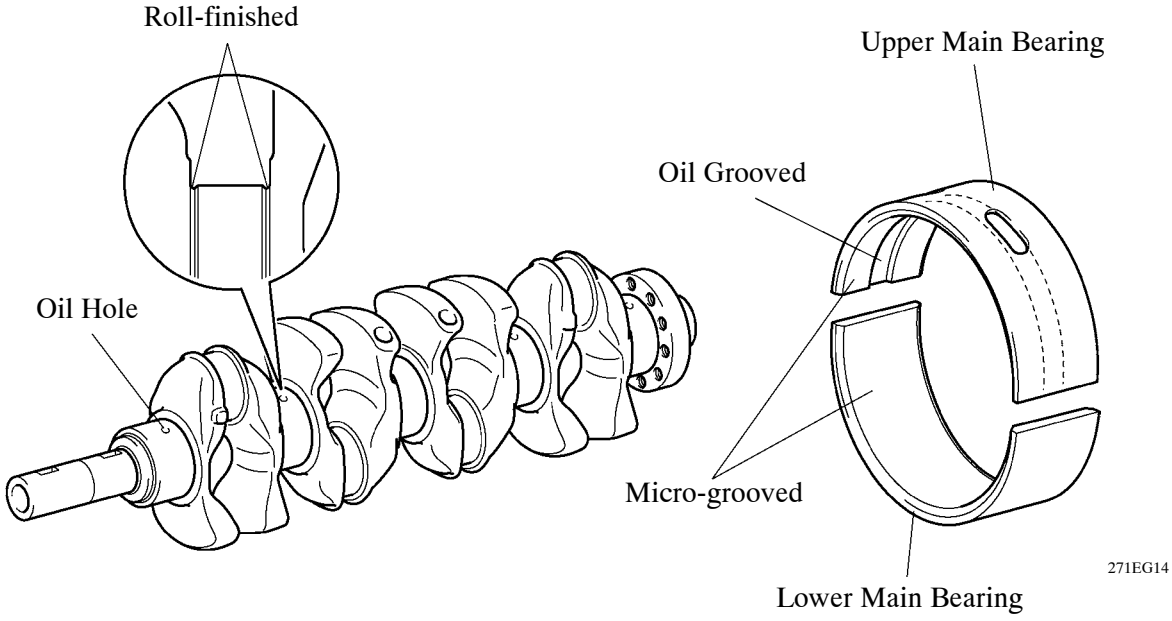
7. Connecting Rod and Connecting Rod Bearing

- Connecting rods that have been forged for high strength are used for weight reduction.
- Knock pins are used at the mating surfaces of the bearing caps of the connecting rod to minimize the shifting of the bearing caps during assembly.
- Plastic region tightening bolts are used.
- The lining surface of the connecting rod bearing has been micro-grooved to achieve an optimal amount of oil clearance. As a result, cold-engine cranking performance has been improved and engine vibrations have been reduced.



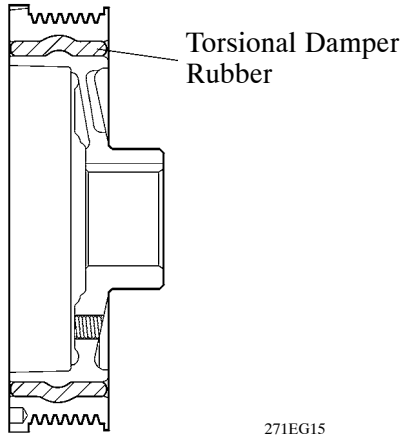
8. Crankshaft and Crankshaft Bearing

- The crankshaft has 5 journals and 8 balance weights.
- All pin and journal fillets are roll-finished to maintain adequate strength.
- The crankshaft bearing is made of aluminum alloy.
- The crankshaft bearing caps are tightened using 2 plastic region tightening bolts for each journal.
- Similar to the connecting rod bearings, the lining surface of the crankshaft bearings has been micro-grooved to achieve an optimal amount of oil clearance. As a result, cold-engine cranking performance has been improved and engine vibrations have been reduced.
- The upper main bearing has an oil groove around its inside circumference.



9. Crankshaft Pulley

The rigidity of the torsional damper rubber has been optimized to reduce noise.



10. Oil Pan

- Oil pan No. 1 is made of aluminum alloy.
- Oil pan No. 2 is made of steel.
- Oil pan No. 1 is secured to the cylinder block and the transmission in order to increase rigidity.

