GENERAL DESCRIPTION AND SYSTEM OPERATION

CYLINDER HEAD AND GASKET

The cylinder head is made of an aluminum alloy. The cylinder head uses crossflow intake and exhaust ports. A spark plug is located in the center of each combustion chamber. The cylinder head houses the dual camshafts.

CRANKSHAFT

The crankshaft has eight integral weights which are cast with it for balancing. Oil holes run through the center of the crankshaft to supply oil to the connecting rods, the bearings, the pistons, and the other components. The end thrust load is taken by the thrust washers installed at the center journal.

TIMING BELT

The timing belt coordinates the crankshaft and the dual overhead camshafts and keeps them synchronized. The timing belt also turns the coolant pump. The timing belt and the pulleys are toothed so that there is no slippage between them. There are two idler pulleys. An automatic tensioner pulley maintains the timing belt's correct tension. The timing belt is made of a tough reinforced rubber similar to that used on the serpentine accessory drive belt. The timing belt requires no lubrication.

OIL PUMP

The oil pump draws engine oil from the oil pan and feeds it under pressure to the various parts of the engine. An oil strainer is mounted before the inlet of the oil pump to emove impurities which could clog or damage the oil pump or other engine components. When the crankshaft rotates, the oil pump driven gear rotates. This causes the space between the gears to open and narrow continually, pulling oil in from the oil pan when the space opens, and pumping the oil out to the engine as the space narrows.

At high engine speeds, the oil pump supplies a much higher amount of oil than required for lubrication of the engine. The oil pressure regulator prevents too much oil from entering the engine lubrication passages. During normal oil supply, a coil spring and a valve keep the bypass closed, directing all of the pumped oil to the engine. When the amount of oil being pumped increases, the pressure becomes high enough to overcome the force of the spring. This opens the valve of the oil pressure regulator, allowing the excess oil to flow through the valve and drain back to the oil pan.

OIL PAN

The engine oil pan is mounted to the bottom of the cylinder block. The engine oil pan houses the crankcase and is made of cast aluminum.

Engine oil is pumped from the oil pan by the oil pump. After it passes through the oil filter, it is fed through two paths to lubricate the cylinder block and the cylinder head. In one path, the oil is pumped through the oil passages in the crankshaft to the connecting rods, then to the pistons and the cylinders. It then drains back to the oil pan. In the second path, the oil is pumped through the oil passages to the camshaft. The oil passes through the internal passageways in the camshafts to lubricate the valve assemblies before draining back to the oil pan.

EXHAUST MANIFOLD

A single four–port, rear–takedown manifold is used with this engine. The manifold is designed to direct escaping exhaust gases out of the combustion chambers with a minimum of back pressure. The oxygen sensor is mounted to the exhaust manifold.

INTAKE MANIFOLD

The intake manifold has four independent long ports and uses inertial supercharging to improve engine torque at low and moderate speeds.

CAMSHAFTS

This engine is a dual overhead camshaft (DOHC) type, which means there are two camshafts. One camshaft operates the intake valves, and the other camshaft operates the exhaust valves. The camshafts sit in journals in the cylinder head on the top of the engine. They are held in place by camshaft caps. The camshaft journals of the cylinder head are drilled for oil passages. Engine oil travels to the camshafts under pressure where it lubricates each camshaft journal. The oil returns to the oil pan through drain holes in the cylinder head. The camshaft lobes are machined into the solid camshaft to open and close the intake and the exhaust valves the precisely correct amount at the precisely correct time. The camshaft lobes are oiled by the splash action from pressurized oil escaping from the camshaft journals.

EXHAUST GAS RECIRCULATION VALVE

The exhaust gas recirculation (EGR) system is used to lower oxides of nitrogen (NOX) emission levels caused by high combustion temperatures. The main element of the system is the EGR valve which is operated electronically.

The EGR valve feeds small amounts of exhaust gas into the intake manifold to decrease the combustion emperature. The amount of exhaust gas recirculated is controlled by the engine control module (ECM) in response to variations in engine load. If too much exhaust gas enters, combustion will not take place. For this reason, very little exhaust gas is allowed to pass through the valve, especially at idle.

The EGR valve is usually open under the following onditions:

- Warm engine operation.

- Above idle speed.

ON–BOARD REFUELING VAPOR RECOVERY SYSTEM

The On–Board Refueling Vapor Recovery (ORVR) system has been developed to meet enhanced evaporative emission control requirements during vehicle moving, parking, and refueling at gas stations.

Collected vapor is consurmed by the engine through the intake manfold during vehicle operation. The mechanism of the ORVR requirement, so called ”Liquied Trap” or ”Liquied Real” is to create suction inside filler neck by the aid of fuel flow through a reduced diameter section in the filler pipe.

The ORVR system provides nozzle compatibility with conventional and stage II vapor recovery nozzles. No special refueling procedures are required.