

Variable Valve Timing Unit

The VVT unit transmits a fixed drive via the secondary chain to the exhaust camshaft. The inlet camshaft is driven from the body of the unit via internal helical splines: when commanded from the EMS this mechanism rotates the inlet camshaft relative to the body/sprocket assembly to advance or retard the valve timing.

The VVT unit has three main parts: the body/sprocket assembly, an inner sleeve bolted axially to the nose of the camshaft and a drive ring/piston assembly located between the body and inner sleeve and coupled to both via helical splines.

The basic operation is similar to that of the two position unit: oil pressure applied in the advance chamber forces the drive ring/piston assembly to move inwards along its axis while rotating clockwise on the helical body splines. Since the drive ring is also helically geared to the inner sleeve but with opposite angled splines, the inner sleeve is made to rotate in the same direction, turning the camshaft. The use of opposing helical

gears (the angle is more acute than in the two position unit) produces a relatively large angular rotation for a small axial movement, thus keeping the VVT unit to a compact size. Note that the inner sleeve does not move axially.

To move back to a retard position, oil pressure is switched to the retard chamber and the piston and rotational movements are reversed. The use of oil pressure to move the piston in both directions eliminates the need for a return spring for VVT operation (as in the two position system). However, a lighter pressure spring is fitted in the retard chamber to assist the piston assembly to revert to the fully retarded position with the engine stopped. Note that rotating the engine backwards from the stopped position will cause the VVT unit body to move relative to the camshaft, advancing the timing. To avoid the possibility of incorrect timing being set after any associated service work, reference must be made to JTIS 5 for the correct procedures.

Due to the use of bi-directional oil pressure actuation and light spring pressure, a much lower

