The Mitsubishi Innovative Valve Timing Electronic Control System Explained

The AERA Technical Committee offers the following information on explanation of the Mitsubishi Innovative Valve timing Electronic Control system.

MIVEC (Mitsubishi Innovative Valve timing Electronic Control system) is the general name for all engines equipped with the variable valve timing mechanism developed by Mitsubishi Motors.

Mitsubishi has been focusing for a long time on technologies to control valve timing and amount of lift with the aim of achieving high power output, low fuel consumption, and low exhaust emissions. The MIVEC engine was first used in 1992 in the Mirage, and since then Mitsubishi Motors has been adding a number of enhancements to produce an even better performance. In the Outlander launched in 2005, the Delica D5 and the Galant Fortis launched in 2007, Mitsubishi Motors adopted a mechanism that continuously and optimally controls the intake and exhaust valve timing.

Now, the all-new MIVEC engine controls both intake valve timing and amount of valve lift at the same time, all the time. The all-new MIVEC engine with a simple SOHC structure is used for the Japanese-market GALANT FORTIS and GALANT FORTIS SPORTBACK from 2011, OUTLANDER from 2012.

While MIVEC controlled engines cover a broad range of platforms, below is an explanation for the 4G69 4G64 engines.

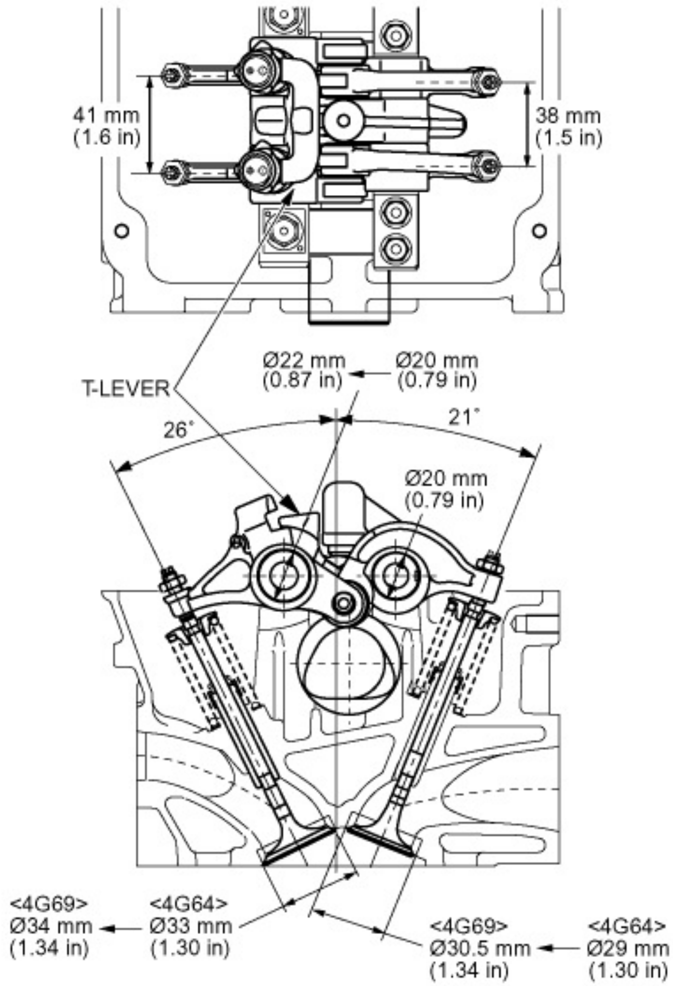


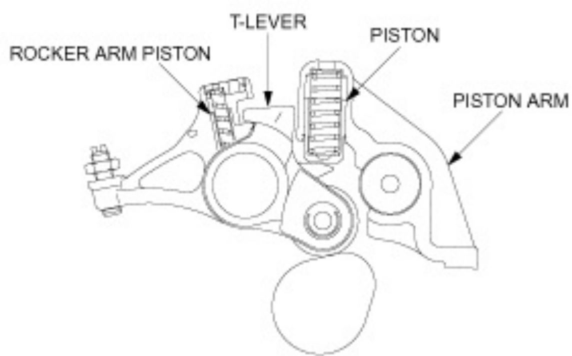
Figure 1. MIVEC Detail

This MIVEC adopts the additional switching system on the two intake valves in the conventional SOHC 4 valve engine. This switching system has the two cams that are for the low mode having the difference between the valve lifts and for the high mode keeping the both valve lifts high. In the range of the low engine speed, the flow within the valve is enhanced by the difference between the valve lifts. Also the stabilization of the combustion is designed to realize the low fuel economy, low exhaust gas and high torque. In the range of the high engine speed, the high output due to the increment in the intake air amount is reached by increasing the open valve period and the lift.

The structure has the T-lever that moves following the high lift cam and is arranged between the high lift cam and the lift cams of low & middle, in addition to the low & middle lift cams and the rocker arm that drive the two intake valves each. In the range of the low engine speed, then each valve drives alone at the low lift cam and the middle lift cam respectively because the wing of T-lever does not reach the piston. In the range of the high engine speed, the oil pressure moves the piston within the rocker arm. T-lever pushes the rocker arm forward and then the high lift cam drives the both valves.

The cam switching is carried out when the torque to be produced in the low speed mode and the high speed mode respectively is crossing each other at the engine speed of 3500 rpm. An accumulator is mounted to ensure the oil pressure at the instant of switching and to prevent the switching mistakes.

The oil passage is divided into two in just front of the Oil Control Valve (OCV) and lubrication oil is always supplied to the exhaust rocker shaft. Supplying the lubrication oil to the intake rocker shaft is controlled by ON/OFF of the OCV and carries out the switching for the low, middle and high lift cams.



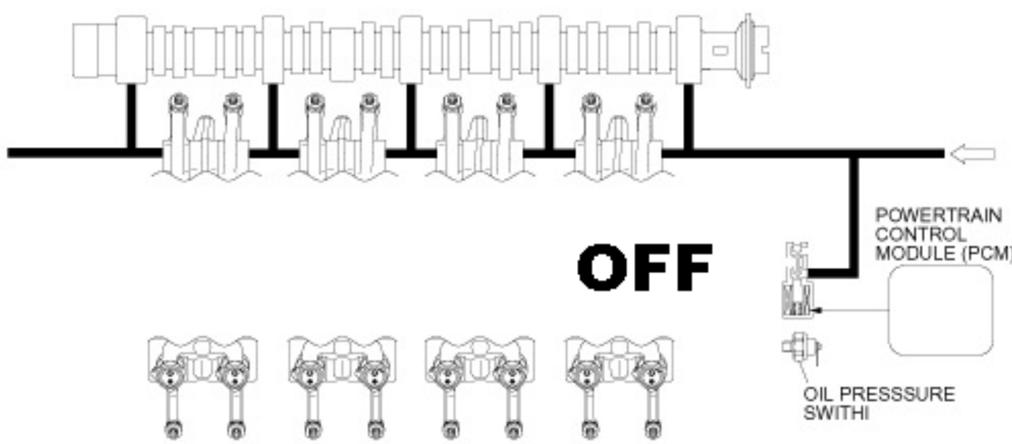
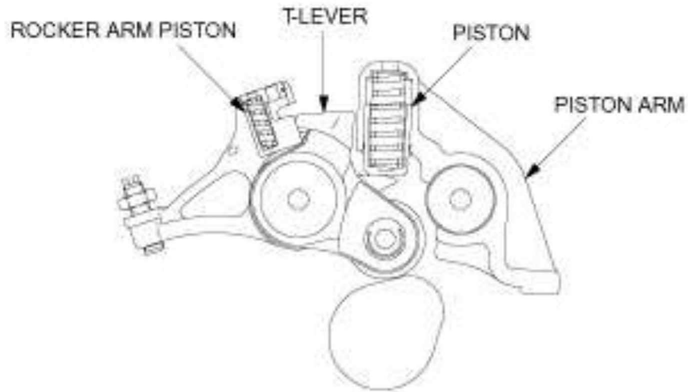


Figure 2. Off Position

Under the OCV is in “OFF” position, the switching piston does not operate because the switching oil pressure within the intake rocker shaft is below the specified pressure, and so the wing of the high speed rocker arm does not reach the switching piston. Accordingly, the intake valve is driven by the low speed rocker arm.



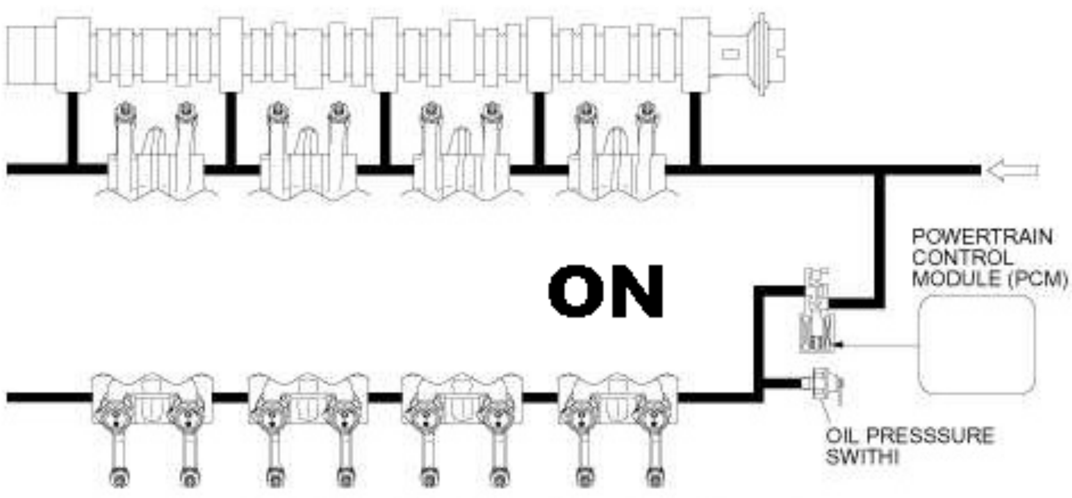


Figure 3. ON Position

Under the OCV is in “ON” position, the switching piston is increased by the oil pressure because the switching oil pressure within the intake rocker shaft is above the specified pressure, and so the wing of the high speed rocker arm reaches the switching piston. Accordingly, the intake valve is driven by the high speed rocker arm.