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| **Title:** 2AR-FE ENGINE CONTROL: SFI SYSTEM: TUMBLE CONTROL; 2013 MY RAV4 [12/2012 - ] | | |

# TUMBLE CONTROL

## 1. OPERATION

(a) Engine Running Cold

(1) To improve combustion, the ECM operates the actuator to fully close the tumble control valve, in order to create a strong tumble current in the combustion chamber. This enables the engine to operate at a lean air-fuel ratio immediately after a cold start.

(2) Based on the signals from various sensors, the ECM retards the ignition timing in order to reduce the amount of unburned gas and promote the warming up of the TWC. In addition, the ECM optimizes the fuel injection volume.

(3) The vacuum pressure created downstream of the valve promotes the atomization of the fuel and prevents the fuel from adhering to the ports.

(4) These measures help reduce exhaust gas emissions while the engine is running cold.

(b) Engine Warmed Up

(1) The ECM operates the actuator to fully open the tumble control valve. When the valve is fully open, the passage has minimal intake resistance in order to improve engine performance.