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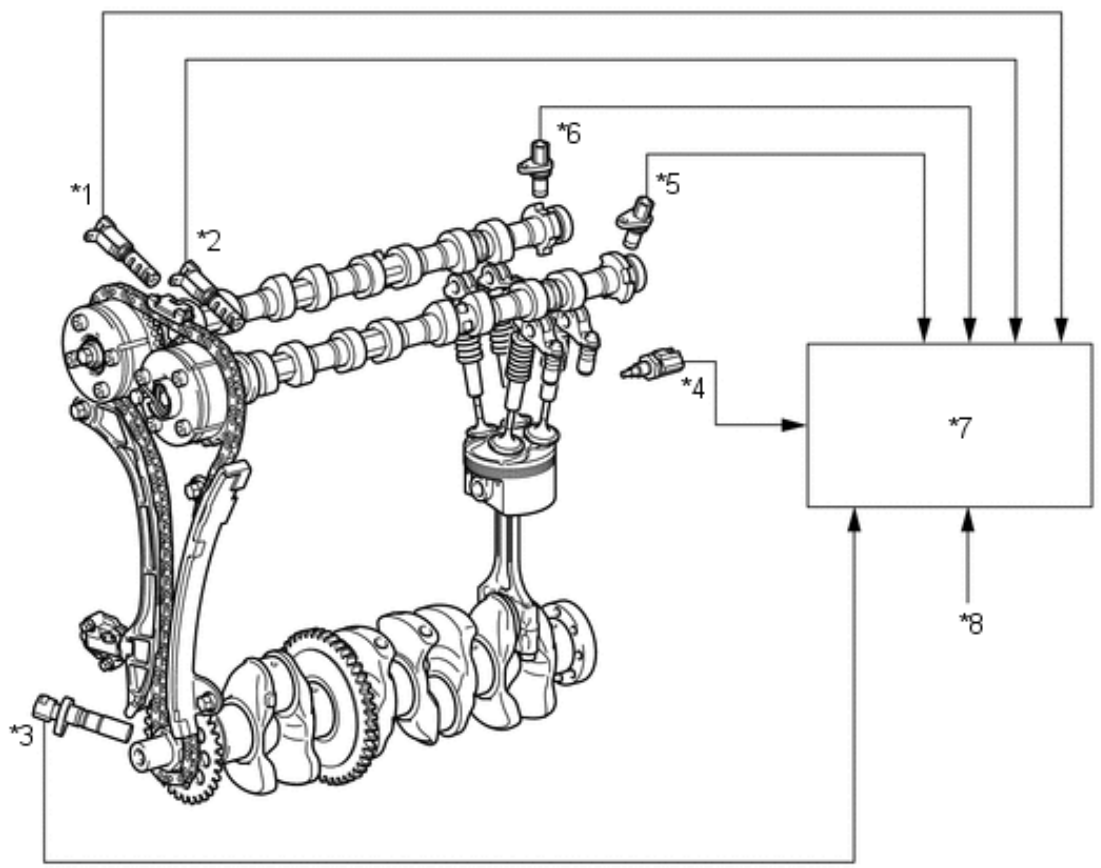
|---|---|---|
| **Last Modified:** 03-12-2013 | 6.4 F | **Doc ID:** NM1000000004HBQ |
| **Model Year:** 2013 | **Model:** RAV4 | **Prod Date Range:** [12/2012 - ] |
| **Title:** 2AR-FE ENGINE CONTROL: SFI SYSTEM: DUAL VVT-i CONTROL; 2013 MY RAV4 [12/2012 - ] | | |

# DUAL VVT-i CONTROL

## 1. FUNCTION

(a) The Dual VVT-i system is designed to control the intake and exhaust camshafts within a range of 40° respectively (of Crankshaft Angle) to provide valve timing optimally suited to the engine condition. This improves torque in all the speed ranges as well as increasing fuel economy and reducing exhaust emissions.

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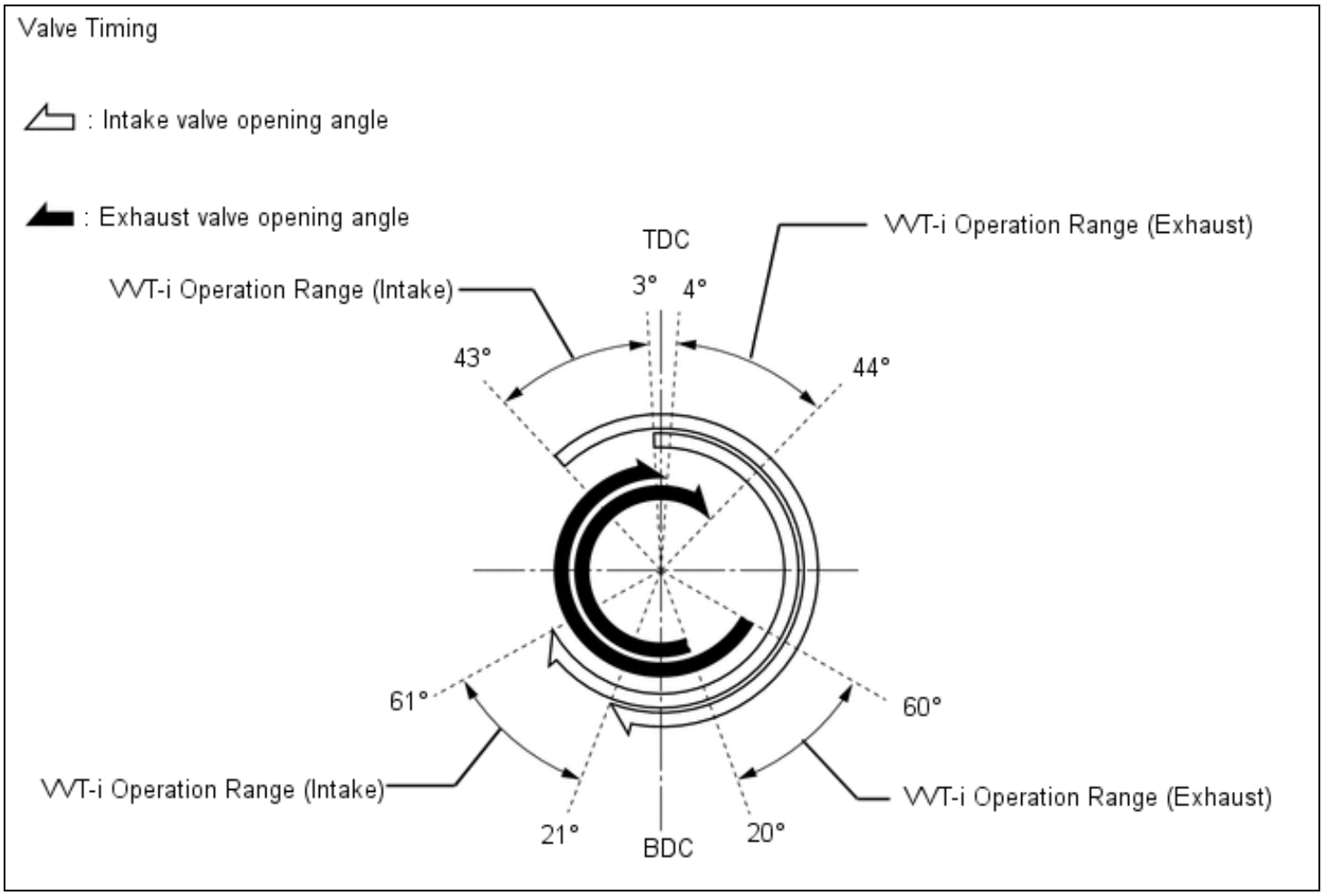
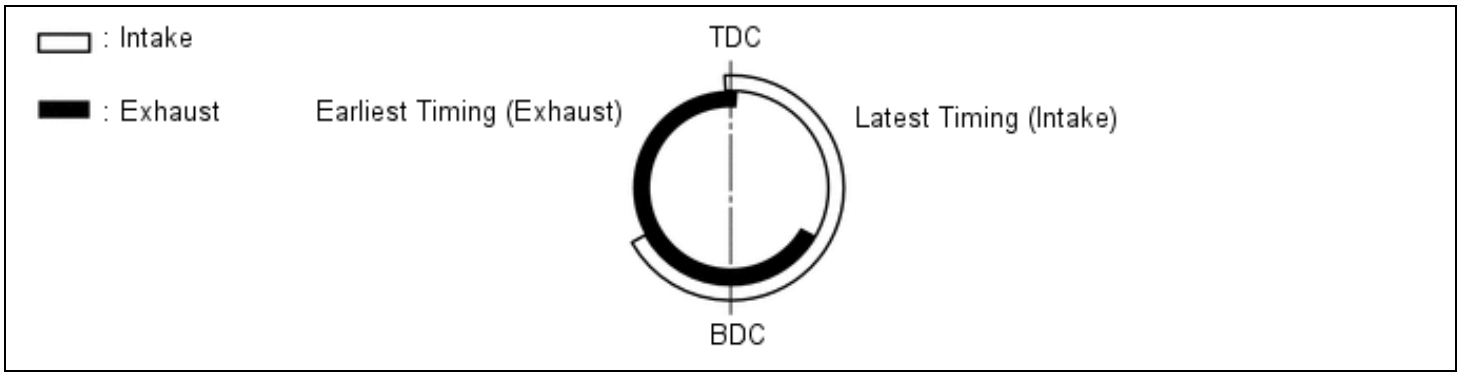
|---|---|---|---|
| *1 | Camshaft Timing Oil Control Valve Assembly (Intake) | *2 | Camshaft Timing Oil Control Valve Assembly (Exhaust) |
| *3 | Crank Position Sensor | *4 | Engine Coolant Temperature Sensor |
| *5 | Camshaft Position Sensor (Exhaust) | *6 | Camshaft Position Sensor (Intake) |
| *7 | ECM | *8 | • Intake Mass Air Flow Meter Sub-assembly<br>• Throttle Position Sensor |



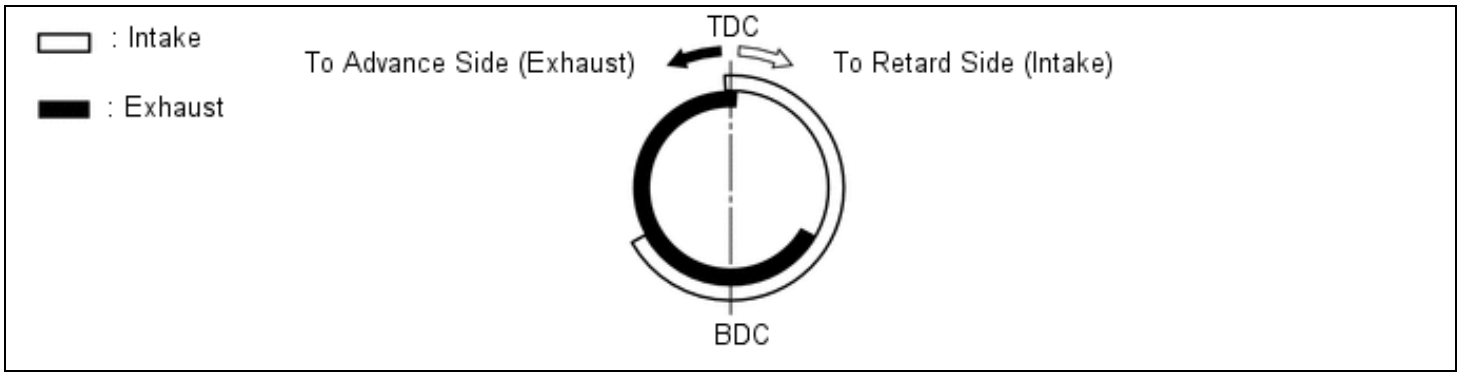

(b) The VVT-i system delivers excellent benefits in the different operating conditions as follows:

(1) During Idling



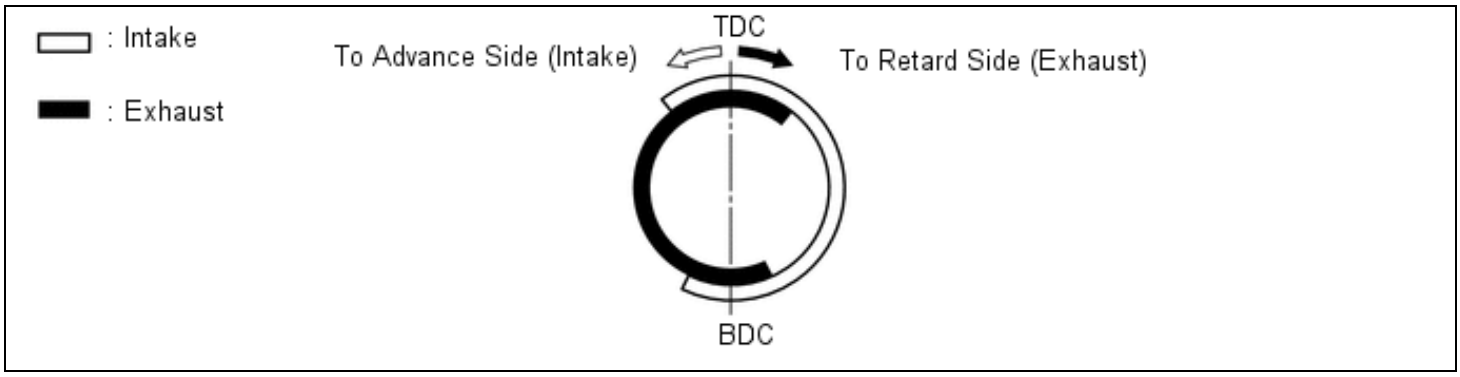

| OBJECTIVE | EFFECT |
|---|---|
| Reducing overlap to reduce blow back to the intake side | • Stabilized idling speed<br>• Better fuel economy |

(2) At Light Load



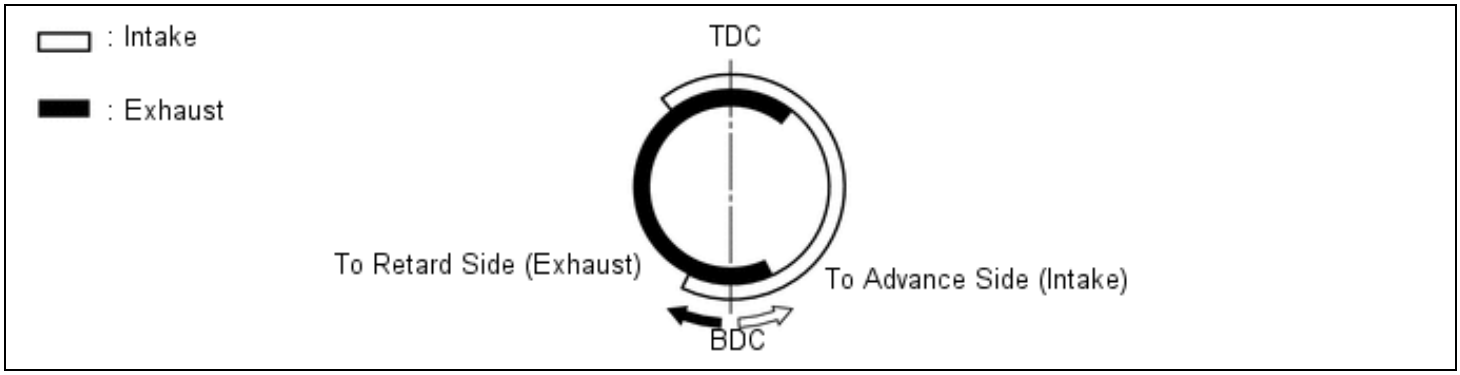

| OBJECTIVE | EFFECT |
|---|---|
| Reducing overlap to reduce blow back to the intake side | Ensured engine stability |

(3) At Medium Load



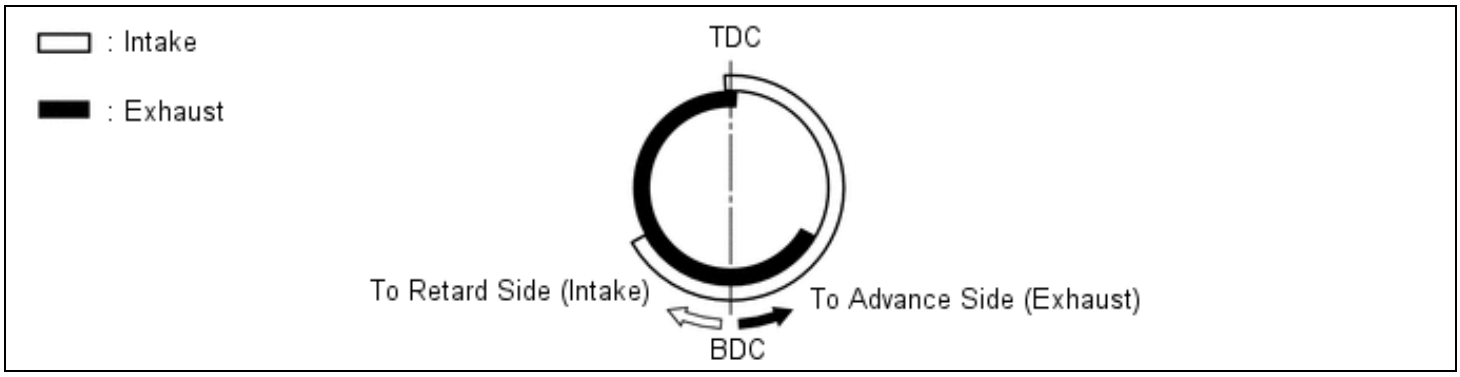

| OBJECTIVE | EFFECT |
|---|---|
| Increasing overlap to increase internal EGR to reduce pumping loss | • Better fuel economy<br>• Improved emission control |

(4) In Low to Medium Speed Range with Heavy Load



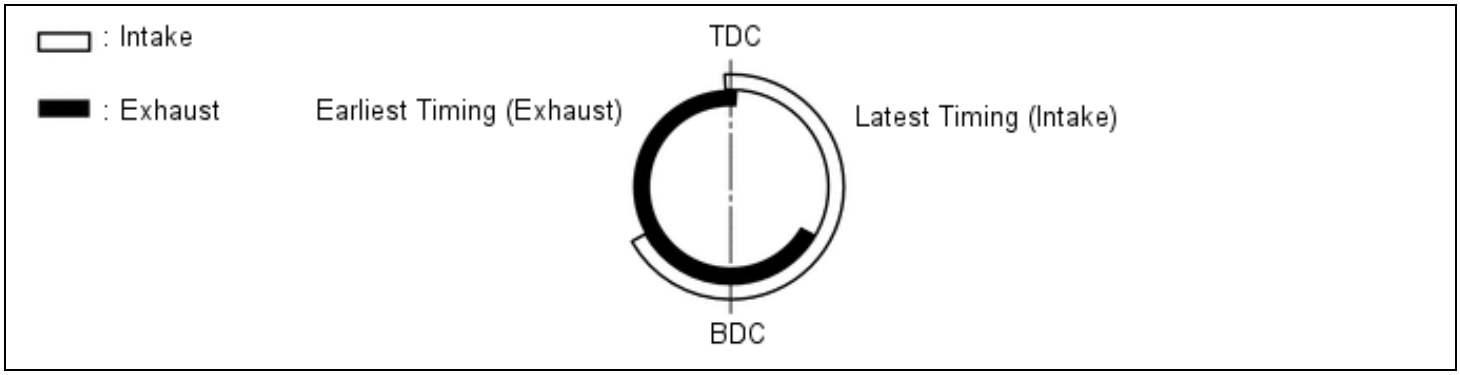

| OBJECTIVE | EFFECT |
|---|---|
| Advancing the intake valve close timing for volumetric efficiency improvement | Improved torque in low to medium speed range |

(5) In High Speed Range with Heavy Load



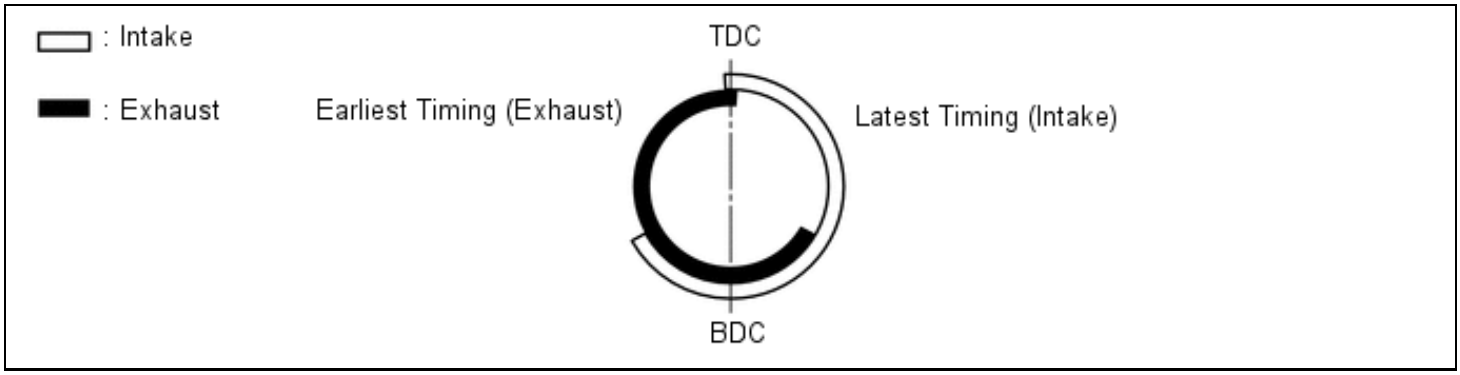

| OBJECTIVE | EFFECT |
|---|---|
| Retarding the intake valve close timing for volumetric efficiency improvement | Improved output |

(6) At Low Temperatures




| OBJECTIVE | EFFECT |
|---|---|
| Reducing overlap to reduce blow back to the intake side leads to the lean burning condition, and stabilizes the idling speed at fast idle | • Stabilized fast idle speed<br>• Better fuel economy |

(7) Starting Engine and Stopping Engine

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|---|---|

| OBJECTIVE | EFFECT |
| --- | --- |
| Reducing overlap to minimize blow back to the intake side | Improved startability |