Components - Engine Outputs

Idle Speed Control System

ISC (Idle Speed Control) System

MONITOR DESCRIPTION

The idle speeds are determined depending on the volume of air that passes through the ISC valve. When the volume is large, the idle speed is higher. When the volume is small, the idle speed is lower. The ISC valve controls the volume of air that bypasses the throttle valve. The engine control module (ECM) sends duty signals to the ISC valve and drives the ISC valve stepper motor to determine the volume of air that bypasses the throttle valve.
If the actual idle speed does not reach the target speed, the ECM interprets this as a malfunction of the ISC valve and sets a DTC.
If the rate of duty signal input to the ISC valve is 0 or 100 %, the ECM interprets this as an open/short circuit in the ISC valve and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0505	• ISC system malfunction • ISC valve circuit is open/shorted
Required sensors/Components	Main	ETCS, ISC valve and Crankshaft position sensor
	Sub	ECT sensor and vehicle speed sensor
Frequency of operation	Continuous	
Duration	Within 20 min.	ISC system malfunction
	10 sec.	ISC valve circuit is open/shorted
MIL operation	2 driving cycles	ISC system malfunction
	Immediate	ISC valve circuit is open/shorted
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present	See page In–4	
Case 1: ISC system malfunction		
Battery voltage	11 V	–
ECT	75°C (167°F)	–
Vehicle speed	–	3 km/h (2 mph)
Engine RPM	Idle speed	–
Case 2: ISC valve circuit is open/shorted		
Battery voltage	10 V	–

TYPICAL MALFUNCTION THRESHOLDS

When both of the following conditions are detected 5 to 11 times, the ISC system is judged to be malfunctioning.

Detection Criteria	Threshold
Case 1: ISC system malfunction	
Deviation of idle speed (Shift position N)	• 100 rpm or less than target idle speed • 200 rpm or more than target idle speed
Deviation of idle speed (Shift position D)	• 100 rpm or less than target idle speed • 150 rpm or more than target idle speed
Case 2: ISC valve circuit is open/shorted	
Output duty signal	0 or 100 %

Igniter

Ignitor

MONITOR DESCRIPTION

Using the ignition (IGt) signal, the engine control module (ECM) turns on and off the power transistor inside the igniter and switches on and off the current to the primary igniter coil. When the current flow to the primary coil is cut off, high−voltage is generated in the secondary coil and this voltage is applied to the spark plugs to spark inside the cylinders. As the ECM cuts the current to the primary coil, the igniter sends back the ignition confirmation (IGf) signal for each cylinder ignition to the ECM.
If the ECM does not receive the ignition confirmation signal (IGf) after sending the ignition signal (IGt) it interprets this as a fault in the igniter and sets a DTC.

MONITOR STRATEGY

Related DTCs	P1300 (Cylinder No. 1)	IGf signal does not return from ignitor
	P1305 (Cylinder No. 2)	
	P1310 (Cylinder No. 3)	
	P1315 (Cylinder No. 4)	
Required sensors/Components	Main	Ignition coil with ignitor
	Sub	Crankshaft position sensor
Frequency of operation	Continuous	
Duration	Within 5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present	See page In−4	
Engine RPM	1,500 rpm	−

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
IGf signal	No signal

VVT System

Valve Timing Advance/Retard

MONITOR DESCRIPTION

The engine control module (ECM) optimizes the valve timing using the VVT system to control the intake valve camshaft. The VVT system includes the ECM, the oil control valve (OCV) and the VVT controller (actuator). The ECM sends “duty−cycle” control signals to the OCV. This electrical control signal, applied to the OCV, regulates the oil pressure supplied to the VVT controller (actuator).
The ECM compares the target valve timing with the actual valve timing calculated by using the signals from both the VVT sensor and the crankshaft position sensor. If a difference occurs between them, the ECM interprets it as a malfunction and sets a DTC.

MONITOR STRATEGY

Related DTCs	P1349	Intake valve timing advance/retard
Required sensors/Components	Main	Camshaft position sensor, Crankshaft position sensor and VVT sensor
	Sub	ECT sensor
Frequency of operation	Once per driving cycle	
Duration	Within 10 sec.	
MIL operation	Immediate	• Intake valve timing advance/retard • Intake valve timing advance
	2 driving cycles	Intake valve timing retard
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present	See page In−4	
Battery voltage	11 V	−
Engine RPM	500 rpm	4,000 rpm
ECT	75°C (167°F)	100°C (212°F)

TYPICAL MALFUNCTION THRESHOLDS

°CA indicates crankshaft angle.

Detection Criteria	Threshold
Case 1: Intake valve timing advance/retard (2000 to 2002 models)	
Difference between target valve timing and detected valve timing	More than 5°CA for 5 sec.
Case 2: Intake valve timing advance (2003 models)	
Change amount of valve timing when OCV for VVT operating when valve timing advances than 67°CA	Less than 5°CA for 5 sec. (when advanced valve timing)
Case 3: Intake valve timing retard (2003 models)	
Change amount of valve timing when OCV for VVT operating when valve timing retards than 67°CA	Less than 5°CA for 5 sec. (when retarded valve timing)

Variable Valve Timing (VVT) System Malfunction

MONITOR DESCRIPTION

The engine control module (ECM) optimizes the valve timing using the VVT system to control the intake valve camshaft. The VVT system includes the OCV for VVT and the VVT controller. The ECM sends a duty signal to the OCV. This signal, applied to the OCV, regulates the oil pressure supplied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft. The ECM calibrates the valve timing of the VVT system by setting the camshaft to the maximum retard angle at idle. The ECM closes the OCV to retard the cam.

The ECM monitors actual valve timing at idle. If this valve timing is outside the normal range, the ECM interprets this as a malfunction and sets a DTC.

MONITOR STRATEGY

Related DTCs	P1346	VVT system malfunction
Required sensors/Components	Main	VVT sensor and Crankshaft position sensor
	Sub	OCV for VVT and ECT sensor
Frequency of operation	Once per driving cycle	
Duration	Within 60 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present	See page In–4	
VVT status	Feedback (for 8 sec. or more)	
Engine RPM	Idle speed	
ECT	75°C (167°F)	100°C (212°F)
Difference between target valve timing and detected valve timing	–	5°CA* within 15 sec.
Valve timing change is small (Valve timing change is 1.875°CA for 360°CA)		

* °CA indicates crankshaft angle.

TYPICAL MALFUNCTION THRESHOLDS

Engine Family	Detection Criteria	Threshold
1ZZ–FE	Valve timing at idle (valve timing is retarded to maximum)	Less than 24°CA
		More than 46°CA
2ZZ–GE	Valve timing at idle (valve timing is retarded to maximum)	Less than 19°CA
		More than 41°CA

OCV (Oil Control Valve) for VVT (Variable Valve Timing)

MONITOR DESCRIPTION

The VVT system includes the ECM, the OCV and the VVT controller (actuator). The ECM sends “duty−cycle” control signals to the OCV. This electrical control signal, applied to the OCV, regulates the oil pressure supplied to the VVT controller (actuator).
The ECM monitors electrical resistances of the OCV, duty ratio to the OCV or electrical current of the OCV individually (depending on the vehicle model). If these values are outside the normal range, the ECM interprets it as a malfunction and sets a DTC.

MONITOR STRATEGY

Related DTCs	P1656	OCV for VVT circuit is open/shorted
Required sensors/Components	Main	OCV for VVT
	Sub	None
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page In−4

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Output duty ratio (when target duty ratio is 80 % or less)	100 %
Output duty ratio	3 % or less

COMPONENT OPERATING RANGE

Parameter	Standard Value
OCV current	Between 0.33 and 2.7 A

VVTL System

OCV (Oil Control Valve) for VVTL (Variable Valve Timing and Lift)

MONITOR DESCRIPTION

When the engine RPM is high, the VVTL actuator advances shims under the high–lift cam followers using engine oil pressure. Switching to the high–lift cam increases the valve lift as well as the intake air volume and exhaust capacity. These changes increase the engine's power output.
When the engine RPM is 6,200 rpm or more, the ECM increases the OCV control signal duty–rate and it opens the oil passage to the VVTL actuator. The engine oil pressure powered actuator advances the cam follower shims and the valves begin using the high–lift cam.
The ECM senses the current flow to the OCV to determine the "actual" duty–rate of the control signal. If the duty–rate is outside the normal range, the ECM interprets this as a malfunction in the OCV. The ECM will illuminate the MIL and a DTC is set.

MONITOR STRATEGY

Related DTCs	P1690	OCV for VVTL circuit is open/shorted
Required sensors/Components	Main	OCV for VVTL
	Sub	None
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present	See page In–4	
Battery voltage	11 V	–
Starter	Not operating	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
"actual" duty–rate of OCV (when target duty ratio is less than 70 – 80 %)	100 %
"actual" duty–rate of OCV (when power is being applied to OCV)	3 % or less

VVTL (Variable Valve Timing and Lift) System Malfunction

MONITOR DESCRIPTION

When the engine RPM is high, the VVTL actuator advances shims under the high−lift cam followers using engine oil pressure. Switching to the high−lift cam increases the valve lift as well as the intake air volume and exhaust capacity. These changes increase the engine's power output.
When the engine RPM is 6,200 rpm or more, the ECM increases the OCV control signal duty−rate and it opens the oil passage to the VVTL actuator. The engine oil pressure powered actuator advances the cam follower shims and the valves begin using the high−lift cam.
The VVTL oil pressure switch senses the engine oil pressure applied to the VVTL system and the ECM judges which cam (conventional cam or high−lift cam) is used based on the switch output. If the engine oil pressure applied to the VVTL system is high when the conventional cam is required by the ECM or if the pressure is low when the high−lift cam is required, the ECM will determine that there is a malfunction and set a DTC.

MONITOR STRATEGY

Related DTCs	P1692	Cam does not change to conventional cam
	P1693	Cam does not change to high−lift cam
Required sensors/Components	Main	Oil pressure switch for VVTL
	Sub	Vehicle speed sensor, ECT sensor, Crankshaft position sensor
Frequency of operation	Continuous	
Duration	Within 5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present	See page In−4	
High−lift cam condition:		
ECT	60°C (140°F)	−
Vehicle speed	10 km/h (6 mph)	−
Time after engine start	10 sec.	−
Engine RPM	6,200 rpm	−
Conventional cam condition:		
Except high−lift cam condition (Engine RPM is less than 6,000 rpm)		

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1: Cam does not change to conventional cam	
Oil pressure switch for VVTL when conventional cam condition	ON (Oil pressure applied to VVTL system) for 5 sec. or more
Case 2: Cam does not change to high−lift cam	
Oil pressure switch for VVTL when high−lift cam condition	OFF (Oil pressure not applied to VVTL system) for 1 sec. or more

COMPONENT OPERATING RANGE

Parameter	Standard Value
Oil pressure switch for VVTL when conventional cam condition	OFF
Oil pressure switch for VVTL when high−lift cam condition	ON