Components - Engine Inputs

MAF Sensor

Mass Airflow (MAF) Sensor

MONITOR DESCRIPTION

The MAF sensor monitors the amount of air flowing through the throttle valve. The engine control module (ECM) uses this information to determine the fuel injection time and provide a proper air/fuel ratio. Inside the MAF sensor, there is a heated platinum wire exposed to the flow of intake air. By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, changing their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF sensor. The voltage level is proportional to the airflow through the sensor and the ECM interprets this voltage as the intake air amount. If there is a defect in the sensor or an open or short circuit, the voltage level will deviate outside the normal operating range. The ECM interprets this deviation as a defect in the MAF sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0100	MAF sensor is open/shorted
Required sensors/Components	Main	MAF sensor
	Sub	Crankshaft position sensor
Frequency of operation	Continuous	
Duration	Within 10 sec.	
MIL operation	Immediate	Engine RPM is less than 4,000 rpm
	2 driving cycles	Engine RPM is 4,000 rpm or more
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
MAF sensor voltage	Less than 0.2 V
	More than 4.9 V

COMPONENT OPERATING RANGE

Parameter	Standard Value
MAF sensor voltage	Between 0.5 V and 4.5 V

Mass Airflow (MAF) Sensor Range/Performance Problem

MONITOR DESCRIPTION

The MAF sensor measures the amount of air flowing through the throttle valve. The engine control module (ECM) uses this information to determine the fuel injection time and provide a proper air/fuel ratio. Inside the MAF sensor, there is a heated platinum wire exposed to the flow of intake air. By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, changing their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF sensor. The voltage level is proportional to the airflow through the sensor and the ECM interprets this voltage as the intake air amount.

In order to confirm that the output voltage of MAF sensor corresponds to the actual intake air amount, the ECM checks the output voltage of the MAF sensor under the following conditions:

- During idle (small intake air volume)
- While driving under a high load condition (large intake air volume)

If the ECM detects that the output voltage of the MAF sensor is high while the engine is idling or the output voltage is low while driving under a high load condition, the ECM interprets this as a malfunction in the MAF sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0101	MAF sensor malfunction
Required sensors/Components	Main	MAF sensor
	Sub	Crankshaft position sensor, Throttle position sensor and ECT sensor
Frequency of operation	Continuous	
Duration	Within 10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page In–4
Included in the Typical Malfunction Thresholds	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold	Typical Enabling Condition
MAF sensor voltage	More than 2.2 V	• Idling • ECT is 70˚C (158˚F) or more
	Less than 1.0 V	• Engine RPM is 2000 rpm or more • Throttle valve open

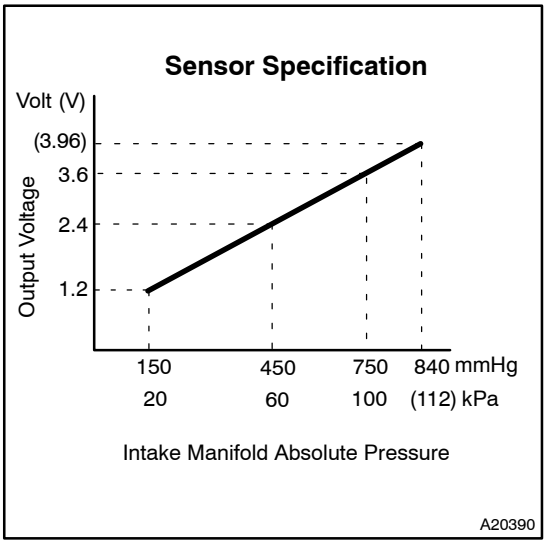
COMPONENT OPERATING RANGE

Parameter	Standard Value
MAF sensor voltage	Between 0.5 V and 4.5 V

MAP Sensor

Manifold Air Pressure (MAP) Sensor

MONITOR DESCRIPTION



The MAP sensor detects the air pressure in the intake manifold. The ECM uses this sensor to calculate the engine load. Engine load is one of the factors the ECM uses to determine the fuel injector ON time, i.e. the fuel injection quantity. The sensor always indicates a “pressure” in the intake manifold as a complete vacuum is interpreted as “zero” pressure. Manifold pressures vary from a low values during idle or deceleration conditions to “atmospheric” pressure at wide–open throttle. Supercharged or turbocharged engines will achieve pressure above atmospheric pressure.

The ECM supplies a regulated 5 V reference–voltage to the MAP sensor. The MAP sensor varies its outputs signal voltage between 1.2 V and 3.96 V in response to the pressure variations in the intake manifold. When the pressure in the intake manifold is low, the output voltage of the MAP sensor is low. When the pressure is high, the output voltage is high.

If the ECM detects a MAP sensor output voltage that is out of the specified range, the ECM interprets this as a malfunction in the MAP sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0105	MAP sensor circuit is open/shorted
Required sensors/Components	Main	MAP sensor
	Sub	None
Frequency of operation	Continuous	
Duration	Within 10 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

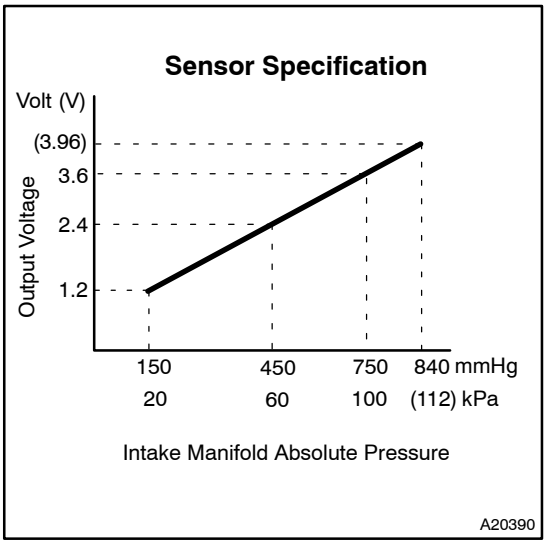
Detection Criteria	Threshold
MAP sensor voltage	Less than 0.5 V or more than 4.5 V

COMPONENT OPERATING RANGE

Parameter	Standard Value
MAP sensor voltage	Between 1.2 V (at –80 kPa) and 3.96 V (at 12 kPa)

Manifold Air Pressure (MAP) Sensor Range/Performance Problem

MONITOR DESCRIPTION



The MAP sensor detects the air pressure (vacuum) in the intake manifold. The ECM uses this sensor to calculate the engine load. Engine load is one of the factors the ECM uses to determine the fuel injector ON time, i.e. the fuel injection quantity. The sensor always indicates a “pressure” in the intake manifold as a complete vacuum is interpreted as “zero” pressure. Manifold pressures vary from a low value during idle or a deceleration condition to higher value at wide−open throttle (atmospheric pressure level). Supercharged or turbocharged engines will achieve pressure above atmospheric pressures.

The ECM supplies a regulated 5V reference−voltage to the MAP sensor. The MAP sensor varies its outputs signal voltage between 1.2 V and 3.96 V in response to the pressure variations in the intake manifold. When the pressure in the intake manifold is low, the output voltage of the MAP sensor is low. When the pressure is high, the output voltage is high.

To confirm that the output voltage of the MAP sensor corresponds to the actual pressure in the intake manifold, the ECM checks the MAP sensor output voltage in the following conditions:

- While idling (low intake manifold pressure)
- While the engine is in a high−load condition (high intake manifold pressure)

If the ECM detects a high output voltage from the MAP sensor while the engine is idling or a low output voltage when the engine is highly loaded, the ECM interprets this as a malfunction in the MAP sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0106	MAP sensor malfunction
Required sensors/Components	Main	MAP sensor
	Sub	Crankshaft position sensor, Throttle position sensor and ECT sensor
Frequency of operation	Continuous	
Duration	Within 10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page In−4
Included in the Typical Malfunction Thresholds	−

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold	Typical Enabling Condition
MAP sensor voltage	More than 3.0 V	• Idling • ECT is 70˚C (158˚F) or more
	Less than 1.0 V	• Engine RPM is less than 2,500 rpm • Throttle valve open

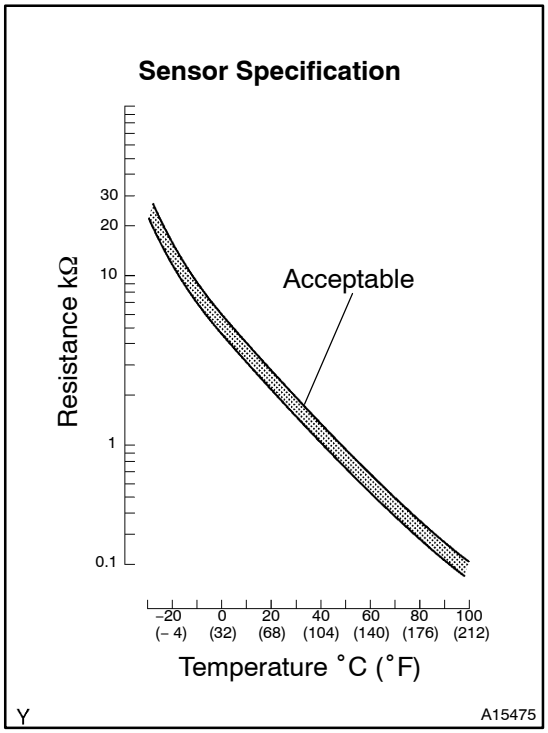
COMPONENT OPERATING RANGE

Parameter	Standard Value
MAP sensor voltage	Between 1.2 V (at 20 kPa) and 3.96 V (at 112 kPa)

IAT Sensor

Intake Air Temperature (IAT) Sensor

MONITOR DESCRIPTION



The IAT sensor mounted on the mass airflow (MAF) sensor*, monitors temperature of the intake air. The IAT sensor has a thermistor that varies its resistance depending on the temperature of the intake air. When the air temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected in the voltage output from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the intake air temperature.

When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a malfunction in the IAT sensor and sets a DTC.

* When the engine uses a manifold air pressure (MAP) sensor instead of a MAF sensor, the IAT sensor is mounted on the air cleaner box.

MONITOR STRATEGY

Related DTCs	P0110	IAT sensor circuit is open/shorted
Required sensors/Components	Main	IAT sensor
	Sub	None
Frequency of operation	Continuous	
Duration	Within 10 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
IAT sensor circuit is shorted:	
IAT sensor resistance (temperature of intake air)	Less than 98.5 Ω (more than 140°C [284°F])
IAT sensor circuit is open:	
IAT sensor resistance (temperature of intake air)	More than 156 kΩ (less than –40°C [–40°F])

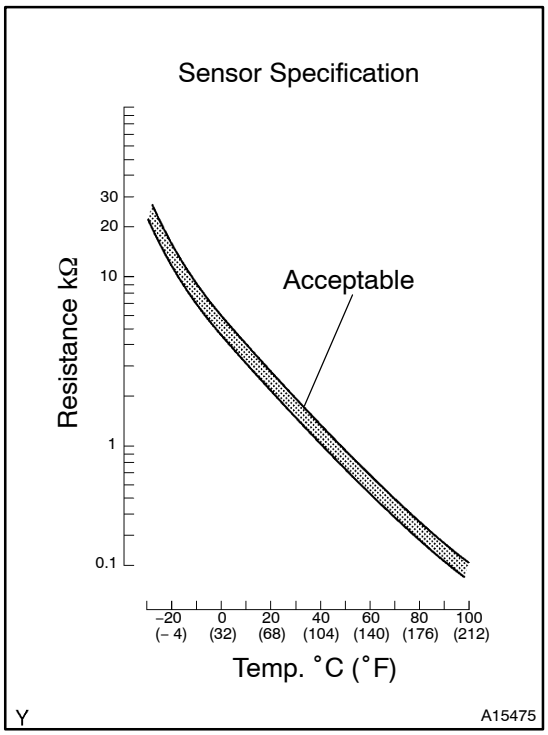
COMPONENT OPERATING RANGE

Parameter	Standard Value
IAT sensor resistance	Between 2.0 kΩ and 3.0 kΩ at 20˚C (68˚F)
	Between 0.3 kΩ and 0.4 kΩ at 80˚C (176˚F)

ECT Sensor

Engine Coolant Temperature (ECT) Sensor

MONITOR DESCRIPTION



The ECT sensor is used to monitor temperature of engine coolant. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the temperature is low the resistance in the thermistor increases. When the temperature is high the resistance drops.
The variations in resistance are reflected in the voltage output from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature.
If the ECM detects that the resistance of the ECT sensor is out of the normal range, the ECM interprets this as a malfunction in the ECT sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0115	ECT sensor circuit is open/short
Required sensors/Components	Main	ECT sensor
	Sub	None
Frequency of operation	Continuous	
Duration	Within 10 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
ECT sensor resistance (temperature of engine coolant)	Less than 79 Ω (more than 140°C [284°F])
	More than 156 kΩ (less than −40°C [−40°F])

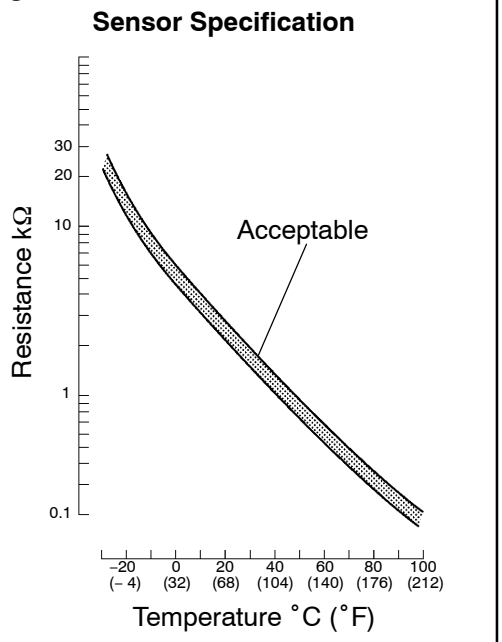
COMPONENT OPERATING RANGE

Parameter	Standard Value
ECT sensor resistance	Between 2.0 kΩ and 3.0 kΩ at 20˚C (68˚F)
	Between 0.2 kΩ and 0.4 kΩ at 80˚C (176˚F)

Engine Coolant Temperature (ECT) Sensor Range/Performance

MONITOR DESCRIPTION

Fig. 1



The ECT sensor is used to monitor temperature of engine coolant. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the temperature is low the resistance in the thermistor increases. When the temperature is high the resistance drops.

The variations in resistance are reflected in the voltage output from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature.

- When the sensor output voltage is outside the normal operating range, the ECM interprets this as a malfunction of the ECT sensor and a DTC is set.
- If the ECT is too low to permit “Closed Loop” operation even through enough time has elapsed for the engine to partially warm up, the ECM interprets this as a malfunction of the ECT sensor or cooling system and a DTC is set.
- If the ECT output does not vary even though the vehicle is repeatedly accelerated and slowed, the ECM interprets this as a malfunction of the ECT sensor or cooling system and a DTC is set.

MONITOR STRATEGY

Related DTCs	P0116	• ECT sensor malfunction • Insufficient ECT for Closed Loop
Required sensors/Components	Main	ECT sensor
	Sub	IAT sensor, MAF sensor (or MAP sensor), Radiator fan, Thermostat and Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	250 sec. or more	ECT sensor malfunction
	Within 1,200 sec.	Insufficient ECT for Closed Loop
MIL operation	6 driving cycles	ECT sensor malfunction when ECT is fixed at 60˚C (140˚F) or more
	2 driving cycles	Others
Sequence of operation	None	

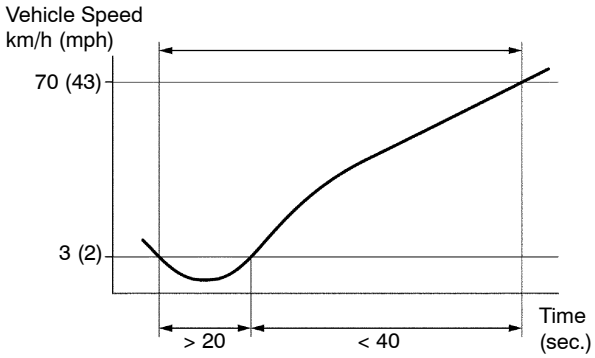
TYPICAL ENABLING CONDITION

Item	Specification	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present	See page In–4	
Case 1–1: ECT sensor malfunction (ECT is fixed at less than 60˚C/140˚F)		
ECT at engine start	35˚C (95˚F)	60˚C (140˚F)
IAT at engine start	–6.7˚C (20˚F)	–
Vehicle speed change by 30 km/h (19 mph) or more	10 times	–
Case 1–2: ECT sensor malfunction (ECT is fixed at 60˚C/140˚F or more)		
ECT at engine start	60˚C (140˚F)	104.4˚C (220˚F)
IAT at engine start	–6.7˚C (20˚F)	–
“Stop and Go”* condition (refer to the following chart)	Once	
“Steady Run and Stop”* condition (refer to the following chart)	Once	
Case 2: Insufficient ECT for Closed Loop		
Throttle valve	Open (idle OFF)	
Intake air amount	0.1 g/sec.	–
Fuel cut	Not operating	

* ”Stop and Go” and ”Steady Run and Stop” condition:

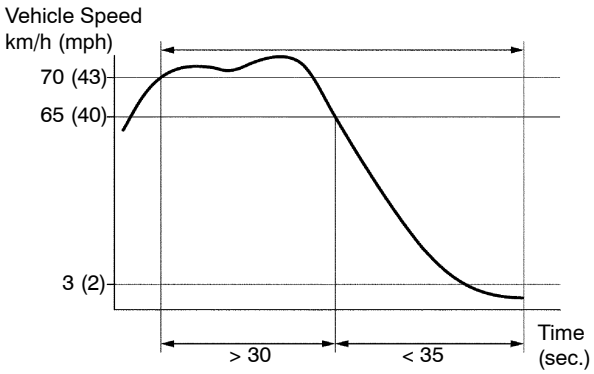
”Stop and Go” condition

Vehicle stops for 20 sec. or more and accelerates to more than 70 km/h (43 mph) within 40 sec.



“Steady Run and Stop” condition

Vehicle runs between 65 km/h (40 mph) and 70 km/h (43 mph) or more for more than 30 sec. and stops within 35 sec.



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TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1–1: ECT sensor malfunction (ECT is fixed at less than 60˚C/140˚F)	
Change value of ECT	Less than 3˚C (5.4˚F)
Case 1–2: ECT sensor malfunction (ECT is fixed at 60˚C/140˚F or more)	
Change value of ECT	1˚C (1.8˚F) or less
Case 2: Insufficient ECT for Closed Loop	
Time until ECT reaches Closed Loop temperature* (ECT at engine start is less than –6.7˚C/20˚F)	1,200 sec.
Time until ECT reaches Closed Loop temperature* (ECT at engine start is between –6.7˚C/20˚F and 10˚C/50˚F)	300 sec.
Time until ECT reaches Closed Loop temperature* (ECT at engine start is 10˚C/50˚F or more)	120 sec.

COMPONENT OPERATING RANGE

Refer to Fig. 1.

Throttle Position Sensor

Throttle Position Sensor

MONITOR DESCRIPTION

The throttle position sensor varies its resistance with the angle of the throttle valve. The ECM applies a regulated reference voltage to the throttle position sensor "+" terminal and calculates the angle of the throttle valve based on the voltage present at the throttle position sensor "signal" terminal.
When the throttle valve is near the fully closed position, the output voltage of the throttle position sensor is low. When it is near the fully open position, the output voltage is high.
If the ECM detects that the output voltage of the throttle position sensor is out of the normal range, the ECM interprets this as a malfunction of the throttle position sensor. The ECM illuminates the MIL and a DTC is set.

MONITOR STRATEGY

Related DTCs	P0120	Throttle position sensor circuit is open/shorted
Required sensors/Components	Main	Throttle position sensor
	Sub	None
Frequency of operation	Continuous	
Duration	Within 10 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
Throttle position sensor voltage	Less than 0.1 V (Throttle valve open)
	More than 4.9 V

COMPONENT OPERATING RANGE

Parameter	Standard Value
Throttle position sensor voltage	Between 0.5 V and 4.5 V

Throttle Position Sensor Range/Performance Problem

MONITOR DESCRIPTION

The throttle position sensor varies its resistance with the angle of the throttle valve. The ECM applies a regulated reference voltage to the throttle position sensor "+" terminal and calculates the angle of the throttle valve based on the voltage present at the throttle position sensor "signal" terminal.
When the throttle valve is near the fully closed position, the output voltage of the throttle position sensor is low. When it is near the fully open position, the output voltage is high.
The ECM checks the indicated angle of the throttle valve during "stop and go" conditions. If the indicated angle (or voltage) in the "closed throttle" position is out of the specified range, the ECM interprets this as a malfunction in the throttle position sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0121	Throttle position sensor malfunction
Required sensors/Components	Main	Throttle position sensor
	Sub	Idle switch
Frequency of operation	Continuous	
Duration	Within 10 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	
Throttle position	Closed throttle position (idle switch ON)	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Throttle angle at closed throttle position	22° or more
	Less than 5°

COMPONENT OPERATING RANGE

Parameter	Standard Value
Throttle angle at closed throttle position	Between 7.5° and 21°

Knock Sensor

Knock Sensor

MONITOR DESCRIPTION

The knock sensor, located on the cylinder block, detects spark knock. When spark knock occurs, the sensor picks–up vibrates in a specific frequency range. When the ECM detects voltage in this frequency range, it retards the ignition timing to suppress the spark knock.
The ECM also senses background engine noise with the knock sensor and uses this noise to check for faults in the sensor. If the knock sensor signal level is too low for more than 10 seconds, the ECM interprets this as a fault in the knock sensor and sets a DTC.
When the flat type knock sensor is used, the ECM supplies 5 V to the knock sensor and measures this voltage to monitor if knock sensor circuit is open or shorted. If this voltage is out of the specified range, the ECM interprets this as a fault in the knock sensor and sets a DTC.

Engines that flat type knock sensor equipped: 2003 1ZZ–FE (2WD) and 2003 2ZZ–GE

MONITOR STRATEGY

Related DTCs	P0325	• Knock sensor signal level is too low • Knock sensor circuit is open/shorted (Flat type knock sensor only)
Required sensors/Components	Main	Knock sensor
	Sub	Crankshaft position sensor, ECT sensor and MAF sensor (or MAP sensor)
Frequency of operation	Continuous	
Duration	10 sec.	Knock sensor signal level is too low
	1 sec.	Knock sensor circuit is open/shorted
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	
Case 1: Knock sensor signal level is too low		
Battery voltage	10 V	
ECT	60°C (140°F)	–
Engine RPM (4A–FE and 7A–FE engine)	1,600	–
Engine RPM (1ZZ–FE and 2ZZ–GE engine)	2,000	5,500
Throttle valve	Open (Idle switch OFF)	
Intake air amount	0.3 g/rev.	–
Time after engine start	5 sec.	–
Case 2: Knock sensor circuit is open/shorted (Knock sensor voltage is low/high)		
Battery voltage	10.5 V	–
Time after engine start	5 sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1: Knock sensor signal level is too low	
Knock sensor signal	Signal level is too low
Case 2: Knock sensor circuit is open/shorted	
Knock sensor voltage	Less than 0.5 V
	More than 4.5 V

Camshaft Position Sensor

Camshaft Position Sensor

MONITOR DESCRIPTION

The camshaft position sensor consists of a magnet, an iron core and a pick–up coil. This sensor monitors a timing rotor located on the camshaft and is used by the engine control module (ECM) to detect the camshaft angle. The camshaft rotation synchronizes with the crankshaft rotation, and this sensor communicates the rotation of the camshaft timing rotor as a pulse signal to the ECM. Based on the signal, the ECM controls fuel injection time and ignition timing.
If there is no signal from the camshaft position sensor even though the engine is turning or the rotation of the camshaft and the crankshaft is not synchronized, the ECM interprets this as a malfunction in the sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0340	• No camshaft position signal • Camshaft and crankshaft position signal misalignment • Camshaft signal is abnormal
Required sensors/Components	Main	Camshaft position sensor
	Sub	Crankshaft position sensor
Frequency of operation	Continuous	
Duration	Within 10 sec.	
MIL operation	2 driving cycles	No camshaft position signal when starter operates
	Immediate	• No camshaft position signal • Camshaft and crankshaft position signal misalignment • Camshaft signal is abnormal
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
Case 1: No camshaft position signal	
Camshaft position signal when starter operates	No signal
Camshaft position signal when engine RPM is 600 rpm or more	No signal
Case 2: Camshaft and crankshaft position signal misalignment	
Camshaft and crankshaft position signal alignment	Misaligned
Case 3: Camshaft signal is abnormal	
Camshaft position signal per 2 revolutions crankshaft	12 or more signals

COMPONENT OPERATING RANGE

Parameter	Standard Value
Camshaft position sensor signal	• Crankshaft position sensor voltage fluctuates when intake camshaft rotates • 3 signals per 2 revolutions crankshaft

Crankshaft Position Sensor

Crankshaft Position Sensor

MONITOR DESCRIPTION

The ECM detects engine RPM with the crankshaft position sensor. The crankshaft position sensor consists of a magnet and a pickup coil. Also, a plate with teeth is installed in the crankshaft. Whenever the teeth on the revolving crankshaft pass the magnet in the crankshaft position sensor, a voltage is generated in the pickup coil. The crankshaft position sensor detects the number of revolutions of the crankshaft based on the voltage generated in the pickup coil and then transmits a signal to the ECM.
If there is no signal from the crankshaft position sensor even though the engine turning, the ECM interprets this as a malfunction in the sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0335	No crankshaft position signal
Required sensors/Components	Main	Crankshaft position sensor
	Sub	Camshaft position sensor
Frequency of operation	Continuous	
Duration	4.7 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page In–4
Included in the Typical Malfunction Thresholds	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold	Typical Enabling Condition
Crankshaft position signal	No signal for 4.7 sec. or more	Starter operating
	No signal for 0.5 sec. or more	• Engine RPM is 600 rpm or more • 3 sec. or more after starter switched to OFF

COMPONENT OPERATING RANGE

Parameter	Standard Value
Crankshaft position signal	• Crankshaft position sensor voltage fluctuates when engine rotates • 34 signals per 1 revolution crankshaft

Vehicle Speed Sensor

Vehicle Speed Sensor

MONITOR DESCRIPTION

The engine control module (ECM) detects vehicle speeds as pulse signals using a vehicle speed sensor. There are 2 detection methods and the signal travels to the ECM differently depending on the vehicle model.

(a) A vehicle speed sensor built into each wheel detects vehicle speed signals (pulse signals). These signals are sent to the ECM via the skid control ECU and the combination meter.

(b) The transmission output shaft speed (NC) sensor built into the transmission detects vehicle speed signals (pulse signals). These signals are sent to the ECM via the combination meter.

If the ECM does not detect any vehicle speed signals while vehicle is being driven, the ECM interprets it as a malfunction in the vehicle speed sensor circuit and set a DTC.

MONITOR STRATEGY

Related DTCs	P0500	Vehicle speed sensor circuit malfunction
Required sensors/Components	Main	Vehicle speed sensor (or NC sensor), Skid control ECU and Combination meter
	Sub	Crankshaft position sensor, MAF sensor (or MAP sensor), PNP switch
Frequency of operation	Continuous	
Duration	Within 10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification
The monitor will run whenever the following DTCs are not present	See page In–4
Vehicle running	• M/T models: Determined by the volume of intake air and engine RPM after the engine warmed up • A/T models: Determined by the throttle angle, PNP switch, engine RPM

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Vehicle speed sensor signal while vehicle is underway:	No signal

ECM

Power Supply for ECM

MONITOR DESCRIPTION

The battery supplies electricity to the engine control module (ECM) even when the ignition switch is OFF. This electricity allows the ECM store data such as DTC history, freeze−frame data, fuel trim values, and other data. If the battery voltage falls below a minimum level, the ECM will conclude that there is a fault in the power supply circuit. At the next engine start, the ECM will turn on the MIL and a DTC will be set.

MONITOR STRATEGY

Related DTCs	P1600	Battery voltage to ECM is low
Required sensors/Components	Main	ECM
	Sub	None
Frequency of operation	Continuous	
Duration	3 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
Battery voltage to ECM	Less than 3.5 V