DTC	P0300	Random / Multiple Cylinder Misfire Detected
DTC	P0301	Cylinder 1 Misfire Detected
DTC	P0302	Cylinder 2 Misfire Detected
DTC	P0303	Cylinder 3 Misfire Detected
DTC	P0304	Cylinder 4 Misfire Detected

## DESCRIPTION



When the engine misfires, high concentrations of hydrocarbons (HC) enter the exhaust gas. Extremely high HC concentration levels can cause increases in exhaust emission levels. High concentrations of HC can also cause increases in the Three-Way Catalytic Converter (TWC) temperature, which may cause damage to the TWC. To prevent these increases in emissions and to limit the possibility of thermal damage, the ECM monitors the misfire rate. When the temperature of the TWC reaches the point of thermal degradation, the ECM blinks the MIL. To monitor misfires, the ECM uses both the Camshaft Position (CMP) sensor and the Crankshaft Position (CKP) sensor. The CMP sensor is used to identify any misfiring cylinders and the CKP sensor is used to measure variations in the crankshaft rotation speed. Misfires are counted as when the crankshaft rotation speed variations exceed predetermined thresholds. If the misfire rate exceeds the threshold level, and could cause emission deterioration, the ECM illuminates the MIL and sets a DTC.

DTC No.	DTC Detection Conditions	Trouble Areas
P0300	Simultaneous misfiring of several cylinders detected (2 trip detection logic)	<ul><li> Open or short in engine wire harness</li><li> Connector connection</li></ul>
P0301 P0302 P0303 P0304	Misfiring of specific cylinder detected (2 trip detection logic)	<ul> <li>Vacuum hose connections</li> <li>Ignition system</li> <li>Injector</li> <li>Fuel pressure</li> <li>Mass Air Flow (MAF) meter</li> <li>Engine Coolant Temperature (ECT) sensor</li> <li>Compression pressure</li> <li>Valve clearance</li> <li>Valve timing</li> <li>PCV valve and hose</li> <li>PCV hose connections</li> <li>Air induction system</li> <li>ECM</li> </ul>

When DTCs for misfiring cylinders are randomly set, but DTC P0300 is not set, it indicates that misfires have been detected in different cylinders at different times. DTC P0300 is only set when several misfiring cylinders are detected at the same time.

## MONITOR DESCRIPTION

The ECM illuminates the MIL and sets a DTC when either of the following conditions, which could cause emission deterioration, is detected (2 trip detection logic).

- Within the first 1,000 crankshaft revolutions of the engine starting, an excessive misfiring rate (approximately 20 to 50 misfires per 1,000 crankshaft revolutions) occurs once.
- After the first 1,000 crankshaft revolutions, an excessive misfiring rate (approximately 20 to 50 misfires per 1,000 crankshaft revolutions) occurs 4 times in sequential crankshaft revolutions.

The ECM flashes the MIL and sets a DTC when either of the following conditions, which could cause Three-Way Catalytic Converter (TWC) damage, is detected (2 trip detection logic).

- In every 200 crankshaft revolutions at a high engine rpm, the threshold misfiring percentage is recorded once.
- In every 200 crankshaft revolutions at a normal engine rpm, the threshold misfiring percentage is recorded 3 times.

Related DTCs	P0300: Multiple cylinder misfire P0301: Cylinder 1 misfire P0302: Cylinder 2 misfire P0303: Cylinder 3 misfire P0304: Cylinder 4 misfire
Required Sensors/Components (Main)	Crankshaft position sensor and Camshaft position sensor
Required Sensors/Components (Related)	Engine coolant temperature and intake air temperature sensors and Mass air flow meter
Frequency of Operation	Continuous
Duration	1,000 to 4,000 crankshaft revolutions: Emission related misfire 200 to 600 crankshaft revolutions: Catalyst damaged misfire
MIL Operation	2 driving cycles: Emission related misfire MIL flashes immediately: Catalyst damaged misfire
Sequence of Operation	None

## **MONITOR STRATEGY**

## TYPICAL ENABLING CONDITIONS

Misfire:

Monitor runs whenever following DTCs not present	P0100 - P0103 (MAF meter) P0110 - P0113 (IAT sensor) P0115 - P0118 (ECT sensor) P0120 - P0223, P2135 (TP sensor) P0125 (Insufficient ECT for Closed Loop) P0327, P0328 (Knock sensor) P0335 (CKP sensor) P0340 (CMP sensor) P0500 (VSS)
Battery voltage	8 V or more
VVT system	Not operated by scan tool
Engine RPM	400 to 6,400 rpm
Either of following conditions (a) or (b) met	-
(a) ECT at engine start	More than -7°C (19°F)
(b) ECT	More than 20°C (68°F)
Fuel cut	OFF

#### Monitor period of emission-related-misfire:

First 1,000 revolutions after engine start, or Check Mode	Crankshaft 1,000 revolutions
Except above	Crankshaft 1,000 revolutions x 4

#### Monitor period of catalyst-damaged-misfire (MIL blinks):

All of following conditions 1, 2 and 3 met	Crankshaft 200 revolutions x 3
1. Driving cycles	1st

2. Check mode	OFF
3. Engine RPM	Less than 2,300 rpm
Except above	Crankshaft 200 revolutions

## **TYPICAL MALFUNCTION THRESHOLDS**

### Monitor period of emission-related-misfire:

Misfire rate 1.3 % or more			
Monitor period of catalyst-damaged-misfire (MIL blinks):			
Number of misfire per 200 revolutions	118 or more (varies with intake air amount and RPM)		

## **MONITOR RESULT**

Refer to CHECKING MONITOR STATUS (see page ES-17).

## WIRING DIAGRAM

Wiring diagram of the ignition system.



Wiring diagram of the injector circuit.

![](_page_4_Figure_1.jpeg)

## **CONFIRMATION DRIVING PATTERN**

- 1. Connect the intelligent tester to the DLC3.
- 2. Turn the ignition switch ON.
- 3. Turn the tester ON.
- 4. Record the DTC(s) and freeze frame data.
- 5. Using the tester, switch the ECM from normal mode to check mode (see page ES-38).
- 6. Read the misfire counts of each cylinder (CYL #1 to #4) with the engine in an idling condition. If any misfire count is displayed, skip the following confirmation driving pattern.
- Drive the vehicle several times with the conditions, such as engine rpm and engine load, shown in MISFIRE RPM and MISFIRE LOAD in the DATA LIST. HINT:

In order to store misfire DTCs, it is necessary to drive the vehicle for the period of time shown in the table below, with the MISFIRE RPM and MISFIRE LOAD in the DATA LIST.

Engine RPM	Duration
Idling	3.5 minutes or more
1,000	3 minutes or more
2,000	1.5 minutes or more
3,000	1 minute or more

8. Check whether misfires have occurred by checking DTCs and freeze frame data. HINT:

Do not turn the ignition switch OFF until the stored DTC(s) and freeze frame data have been recorded. When the ECM returns to normal mode (default), the stored DTC(s), freeze frame data and other data will be erased.

9. Record the DTC(s), freeze frame data and misfire counts.

10.Turn the ignition switch OFF and wait for at least 5 seconds.

## **INSPECTION PROCEDURE**

HINT:

- If any DTCs other than misfire DTCs are output, troubleshoot those DTCs first.
- Read freeze frame data using the intelligent tester. Freeze frame data records the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- If the misfire does not recur when the vehicle is brought to the workshop, reproduce the conditions stored in the freeze frame data.
- If the misfire still cannot be reproduced even though the conditions stored in the freeze frame data have been duplicated, one of the following factors is considered to be a possible cause of the problem:

   (a) The fuel level is low.

(b) Improper fuel is used.

(c) The spark plugs are dirty.

- (d) The problem is complex due to multiple factors.
- After finishing repairs, check that no misfires occur in each cylinder (CYL #1, #2, #3 and #4).
- Be sure to confirm that no misfiring cylinder DTCs are set again by conducting the confirmation driving pattern, after the repairs.
- For 6 and 8 cylinder engines, the ECM intentionally does not set the specific misfiring cylinder DTCs at high engine RPM. If misfires only occur during high engine RPM driving, only DTC P0300 is set. In the event of DTC P0300 being present, perform the following operations:

(a)Clear the DTC (see page ES-35).

- (b) Start the engine and conduct the confirmation driving pattern.
- (c) Read the misfiring rates of each cylinder or DTC(s) using the tester.
- (d)Repair the cylinder(s) that has a high misfiring rate or is indicated by the DTC.
- (e)After finishing repairs, conduct the confirmation driving pattern again, in order to verify that DTC P0300 is not set.
- When either SHORT FT #1 or LONG FT #1 in the freeze frame data is outside the range of +-20 %, the air-fuel ratio may be rich (-20 % or less) or lean (+20 % or more).
- When the COOLANT TEMP in the freeze frame data is less than 75°C (167°F), the misfires occurred only while warming up the engine.

1	CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO MISFIRE DTC	;S)
---	---	-----

- (a) Connect the intelligent tester to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Turn the tester ON.
- (d) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (e) Read DTCs.

#### Result

Display (DTC Output)	Proceed To
P0300, P0301, P0302, P0303 and/or P0304	A
P0300, P0301, P0302, P0303 and/or P0304 and other DTCs	В

ES

![](_page_6_Figure_2.jpeg)

Result

#### (i) Read the CYL #1 to #4 or DTCs displayed on the tester.

Misfire Count	Proceed To
Most misfires occur in only 1 or 2 cylinders	A
3 cylinders or more have equal misfire counts	В

#### HINT:

- If it is difficult to reproduce misfires for each cylinder, check the DATA LIST item called MISFIRE MARGIN. Try to find vehicle driving conditions that lower the MISFIRE MARGIN value. Values above 30 % are considered normal.
- If the freeze frame data's record of the ECT is below 75°C (167°F), the misfire may be detected only when the engine is cold.
- If the freeze frame data's record of the ENGINE RUN TIME is below 120 seconds, the misfire may be detected immediately after the engine is started.

![](_page_7_Picture_8.jpeg)

### PERFORM ACTIVE TEST USING INTELLIGENT TESTER (FUEL CUT #1 TO #4)

- (a) Allow the engine to idle.
- (b) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / FUEL CUT#1 (to #4).
- (c) If a cylinder has a high misfire count, cut fuel to that cylinder. Compare the misfire count of the cylinder before fuel cut and after fuel cut.

#### Result

Misfire Count in Each Cylinder	Proceed To
Misfire count of cylinder before fuel cut and after fuel cut roughly same	Α
Misfire count of cylinder before fuel cut lower than after fuel cut	В

#### NOTICE:

# This ACTIVE TEST cannot be performed while the vehicle is being driven.

HINT:

If the misfire count of the cylinder before and after the fuel cut are roughly the same, the cylinder is misfiring. If the misfire count of the cylinder before the fuel cut is lower than after the fuel cut, the cylinder misfires sometimes.

![](_page_7_Figure_20.jpeg)

A 5

6 CHECK SPARK PLUG			
Electrode Gap	<ul> <li>(a) Remove the ignition coil ar misfiring cylinder.</li> <li>(b) Measure the spark plug ele Standard gap:         <ol> <li>1.0 to 1.1 mm (0.039 to</li> <li>(c) Check the electrode for ca Recommended spark plu</li> <li>Manufacturers</li> <li>DENSO</li> </ol> </li> </ul>	nd the spark plug of the ectrode gap. 0.043 in.) rbon deposits. Ig: Products SK20R11	
A74353 A088861E01 NGK IFR6A11 NOTICE: If the electrode gap is larger than standard, replace the spark plug. Do not adjust the electrode gap.			
		( PLUG	
OK			
7 CHECK FOR SPARKS AND IGN	NITION		
	<ul> <li>(a) Remove the ignition coil from the ignition spark plug onto</li> <li>(b) Install the spark plug onto</li> <li>(c) Connect the intelligent test</li> <li>(d) Turn the ignition switch ON</li> <li>(e) Select the following menu</li> <li>ENHANCED OBD II / ACT</li> <li>(f) Attach the spark plug asse</li> <li>(g) Perform the FUEL CUT ALL or LEFT button to change</li> <li>NOTICE:</li> <li>When FUEL CUT ALL is cranked, fuel injection w</li> <li>(h) Crank the engine for less to spark.</li> <li>OK:</li> <li>Sparks jump across election</li> <li>(i) Install the ignition coil.</li> </ul>	om the cylinder head. the ignition coil. ter to the DLC3. N and turn the tester ON. items: DIAGNOSIS / IVE TEST / FUEL CUT ALL. ombly to the cylinder head. L operation (press the RIGHT the ON). OFF and the engine is ill occur. han 2 seconds and check the ectrode gap.	
		09	
		p 9	
ОК		р э	
OK 8 CHECK CYLINDER COMPRESS	SION PRESSURE OF MISFIRING	р 9 G CYLINDER	
OK 8 CHECK CYLINDER COMPRESS	SION PRESSURE OF MISFIRING (a) Measure the cylinder comp misfiring cylinder.	<b>G CYLINDER</b>	

NG

#### CHECK ENGINE TO DETERMINE CAUSE OF LOW COMPRESSION

	9	CHANGE NORMAL SPARK PLUG AND CHECK SPARK OF MISFIRING CYLINDER		
L		(a) Change the installed spark plug to a spark plug that		
		(b) Perform a spark test		
		CAUTION:		
5		Always disconnect all injector connectors. NOTICE:		
		<ul> <li>Do not crank the engine for more than 2 seconds.</li> <li>(1) Install the spark plug to the ignition coil and connect the ignition coil connector.</li> <li>(2) Disconnect the injector connector.</li> <li>(3) Ground the spark plug.</li> <li>(4) Check if sparks occur while the engine is being cranked.</li> <li>OK:</li> <li>Sparks jump across electrode gap.</li> </ul>		
		NG REPLACE IGNITION COIL ASSEMBLY THEN CONFIRM THAT THERE IS NO MISFIRE		
[	ОК			
Г				

**REPLACE SPARK PLUG** 

**10** INSPECT ECM TERMINAL OF MISFIRING CYLINDER (#10, #20, #30, AND /OR #40 VOLTAGE)

connector.

![](_page_9_Figure_7.jpeg)

Standard voltage		
Tester Connections	Specified Conditions	
B30-108 (#10) - B30-45 (E01)	9 to 14 V	
B30-107 (#20) - B30-45 (E01)	9 to 14 V	
B30-106 (#30) - B30-45 (E01)	9 to 14 V	
B30-105 (#40) - B30-45 (E01)	9 to 14 V	

(c) Measure the voltage between the terminals of the ECM

(a) Disconnect the B30 ECM connector.

(b) Turn the ignition switch ON.

![](_page_9_Figure_9.jpeg)

NG

#### ES-173

#### 11 **CHECK HARNESS AND CONNECTOR (INJECTOR - ECM)** Disconnect the injector connector (of the misfiring (a) Wire Harness Side: cylinder). (b) Disconnect the B30 ECM connector. Injector Connector Turn the ignition switch ON. (C) (d) Measure the resistance and voltage between the injector (B13)(B14) and the ECM connector terminals. B15B16 Standard voltage Cylinder **Tester Connections Specified Conditions** Front View No. 1 B16-1 - Ground 9 to 14 V No. 2 B15-1 - Ground 9 to 14 V No. 3 B14-1 - Ground 9 to 14 V (B30) ECM Connector No. 4 B13-1 - Ground 9 to 14 V Standard resistance Cylinder **Tester Connections Specified Conditions** 10 k $\Omega$ or higher B16-2 - Ground No. 1 ۰ B16-2 - B30-108 (#10) Below 1 Ω B15-2 - Ground 10 k $\Omega$ or higher No. 2 #40 #30 B15-2 - B30-107 (#20) Below 1 Ω #20 #10 Front View B14-2 - Ground 10 kΩ or higher A106388E05 No. 3 B14-2 - B30-106 (#30) Below 1 $\Omega$ B13-2 - Ground 10 k $\Omega$ or higher No. 4 B13-2 - B30-105 (#40) Below 1 Ω Reconnect the injector connector. (e) Reconnect the ECM connector. (f) **REPAIR OR REPLACE HARNESS OR** NG CONNECTOR OK 12 CHECK FUEL INJECTOR OF MISFIRING CYLINDER (a) Check the injector injection (whether fuel volume is high or low, and whether injection pattern is poor). NG **REPLACE FUEL INJECTOR ASSEMBLY** OK 13 CHECK VALVE CLEARANCE OF MISFIRING CYLINDER NG ADJUST VALVE CLEARANCE

OK

![](_page_11_Figure_2.jpeg)