

2012 - Mazda6 - Engine

DTC P0171:00 [MZR 2.5]

DTC P0171:00	Fuel trim system too lean
DETECTION CONDITION	• The PCM monitors short term fuel trim (SHRTFT) and long term fuel trim (LONGFT) values when closed loop fuel control. If the LONGFT and the sum total of these fuel trims exceed preprogrammed criteria, the PCM determines that the fuel system is too lean. Diagnostic support note • This is a continuous monitor (fuel system). • The MIL illuminates if PCM detects the above malfunctioning condition in two consecutive drive cycles or in one drive cycle while the DTC for the same malfunction has been stored in the PCM. • PENDING CODE is available if PCM detects the above malfunction conditions during first drive cycle. • FREEZE FRAME DATA (Mode 2)/Snapshot data is available. • The DTC is stored in the PCM memory.
	• Misfire • Erratic signal to PCM ▪ APP sensor signal malfunction ▪ ECT sensor signal malfunction ▪ MAF sensor signal malfunction ▪ TP sensor signal malfunction ▪ VSS signal malfunction • A/F sensor heater malfunction • A/F sensor malfunction ▪ A/F sensor loose ▪ Exhaust system leakage ▪ A/F sensor deterioration • Air suction in intake air system

POSSIBLE CAUSE	• MAF sensor malfunction • Improper operation of purge control system • Improper operation of variable valve timing control system • Fuel supply system malfunction ▪ Pressure regulator malfunction ▪ Fuel pump malfunction ▪ Fuel leakage on fuel line from fuel distributor and fuel pump ▪ Fuel filter clogged or restricted ▪ Fuel return hose clogged • Ignition system malfunction ▪ Ignition coil related wiring harness malfunction ▪ Spark plug malfunction ▪ Ignition coil malfunction • Insufficient engine compression • Improper operation of fuel injector • PCM malfunction
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Diagnostic procedure

STEP	INSPECTION	ACTION
1	IDENTIFY TRIGGER DTC FOR FREEZE FRAME DATA (MODE 2) • Is the DTC P0171:00 on FREEZE FRAME DATA (Mode 2)?	Yes Go to the next step.
		No Go to troubleshooting procedures for DTC on FREEZE FRAME DATA (Mode 2). (See DTC TABLE [MZR 2.5] .)
2	VERIFY FREEZE FRAME DATA (MODE 2)/ SNAPSHOT DATA HAS BEEN RECORDED • Has the FREEZE FRAME DATA (Mode 2)/snapshot data been recorded?	Yes Go to the next step.
		No Record the FREEZE FRAME DATA (Mode 2)/snapshot data on the repair order, then go to the next step.
3	VERIFY RELATED REPAIR INFORMATION AVAILABILITY • Verify related Service Bulletins and/or on-line repair information availability. • Is any related repair	Yes Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No Go to the next step.

	information available?		
4	VERIFY RELATED PENDING CODE AND STORED DTC - Switch the ignition to off, then to ON (engine off). - Verify the related PENDING CODE or stored DTCs using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [MZR 2.5].) - Are any other DTCs present?	Yes If misfire DTC is present: - Go to Step 11. If other DTC is present: - Go to the applicable DTC inspection. (See DTC TABLE [MZR 2.5].)	
		No If drive ability concern is present: - Go to Step 11. If drive ability concern is not present: - Go to the next step.	
5	VERIFY CURRENT INPUT SIGNAL STATUS - Access the following PIDs using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [MZR 2.5].) - APP1 - APP2 - ECT - MAF - TP REL - VSS - Is there any signal that is far out of specification when the ignition is switched to ON and the engine runs? (See PCM INSPECTION [MZR 2.5].)	Yes Inspect the suspected sensor and related wiring harness. Repair or replace the malfunctioning part according to the inspection results, then go to Step 20.	
		No Go to the next step.	
6	VERIFY CURRENT INPUT SIGNAL STATUS UNDER FREEZE FRAME DATA (MODE 2) CONDITION CAUTION: While performing this step, always operate the vehicle in a safe and lawful manner.	Yes Inspect the suspected sensor and related wiring harness. Repair or replace the malfunctioning part according to the inspection results, then go to Step 20.	
		No Go to the next step.	

	- When the M-MDS is used to observe monitor system status while driving, be sure to have another technician with you, or record the data in the M-MDS using the PID/DATA MONITOR AND RECORD capturing function and inspect later. - Access the following PIDs using the M-MDS under the FREEZE FRAME DATA (Mode 2) condition. (See ON-BOARD DIAGNOSTIC TEST [MZR 2.5].) - APP1 - APP2 - ECT - MAF - TP REL - VSS - Is there any signal which causes drastic changes?		
7	INSPECT A/ F SENSOR HEATER - Inspect the A/F sensor heater. (See AIR FUEL RATIO (A/ F) SENSOR INSPECTION [MZR 2.5].) - Is there any malfunction?	Yes Replace the A/F sensor, then go to Step 20. (See AIR FUEL RATIO (A/ F) SENSOR REMOVAL/ INSTALLATION [MZR 2.5] .)	
		No Go to the next step.	
8	VERIFY CURRENT INPUT SIGNAL STATUS OF A/ F SENSOR - Reconnect the A/F sensor connector. - Inspect the A/F sensor. (See AIR FUEL RATIO (A/ F) SENSOR INSPECTION [MZR 2.5].) - Is there any malfunction?	Yes Go to the next step.	
		No Go to Step 11.	
9	INSPECT INSTALLATION OF A/ F SENSOR	Yes Go to the next step.	

	- Inspect if the A/F sensor is loosely installed. - Is the A/F sensor installed securely?	No	Retighten the A/F sensor, then go to Step 20. (See AIR FUEL RATIO (A/ F) SENSOR REMOVAL/ INSTALLATION [MZR 2.5] .)
10	INSPECT EXHAUST GAS LEAKAGE - Visually inspect for the exhaust gas leakage between the exhaust manifold and A/F sensor. - Is there any leakage?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 20.
		No	Replace the A/F sensor, then go to Step 20. (See AIR FUEL RATIO (A/ F) SENSOR REMOVAL/ INSTALLATION [MZR 2.5] .)
11	VERIFY CURRENT INPUT SIGNAL STATUS OF MAF SENSOR - Start the engine. - Access the MAF PID using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [MZR 2.5].) - Verify that the MAF PID changes quickly according to the engine RPM. - Is the MAF PID value normal? (See PCM INSPECTION [MZR 2.5].)	Yes	Go to Step 13.
		No	Go to the next step.
12	INSPECT FOR EXCESSIVE AIR SUCTION OF INTAKE AIR SYSTEM - Visually inspect for loosen, cracks or damages hoses on intake air system. NOTE: - Engine speed may change when rust penetrating agent is sprayed on the air suction area. - Is there any malfunction?	Yes	Repair or replace the source of air suction, then go to Step 20.
		No	Replace the MAF/IAT sensor, then go to Step 20. (See INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [MZR 2.5] .)
13	INSPECT PURGE CONTROL SYSTEM OPERATION Perform the Purge Control System Inspection. (See ENGINE CONTROL SYSTEM OPERATION INSPECTION [MZR 2.5].)	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 20.
		No	Go to the next step.

	Is there any malfunction?		
14	INSPECT VARIABLE VALVE TIMING CONTROL SYSTEM OPERATION - Perform the Variable Valve Timing Control System Operation Inspection. (See ENGINE CONTROL SYSTEM OPERATION INSPECTION [MZR 2.5].) - Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 20.
		No	Go to the next step.
15	INSPECT FUEL LINE PRESSURE - Switch the ignition to off. NOTE: - If the engine will not start, inspect the fuel line pressure with ignition is switched to ON. - Inspect the fuel line pressure while the engine running. (See FUEL LINE PRESSURE INSPECTION [MZR 2.5].) - Is there any malfunction?	Yes	If fuel pressure is too high: - Replace the fuel pump unit, then go to Step 20. (See FUEL PUMP UNIT REMOVAL/ INSTALLATION [MZR 2.5].) If fuel pressure is low: - Go to the next step.
		No	Go to Step 17.
16	INSPECT FUEL LINE - Visually inspect the fuel line from fuel pump to fuel distributor. - Is there any leakage?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 20.
		No	Inspect the low-pressure side fuel filter for foreign materials or stain inside fuel filter. - If foreign materials or stain is found inside fuel filter (low-pressure side): - Clean of fuel tank and filter. - If foreign materials or stain is not found: - Replace the fuel pump unit. (See FUEL PUMP UNIT REMOVAL/ INSTALLATION [MZR 2.5].) Go to Step 20.
17	INSPECT IGNITION SYSTEM OPERATION	Yes	Go to the next step.

	- Perform the Spark Test. (See ENGINE CONTROL SYSTEM OPERATION INSPECTION [MZR 2.5].) - Is strong blue spark visible at each cylinder?	No	Repair or replace the malfunctioning part according to the inspection results, then go to Step 20.
18	INSPECT ENGINE COMPRESSION - Inspect the engine compression. (See COMPRESSION INSPECTION [MZR 2.5].) - Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 20.
		No	Go to the next step.
19	INSPECT FUEL INJECTOR OPERATION - Perform the Fuel Injector Operation Inspection. (See ENGINE CONTROL SYSTEM OPERATION INSPECTION [MZR 2.5].) - Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to the next step.
		No	Go to the next step.
20	VERIFY DTC TROUBLESHOOTING COMPLETED - Make sure to reconnect all disconnected connectors. - Clear the DTC from the PCM memory using the M-MDS. (See AFTER REPAIR PROCEDURE [MZR 2.5].) - Perform the Drive Mode 03 (EGR System, A/F sensor heater, HO2S heater, A/F sensor, HO2S and TWC Repair Verification Drive Mode). (See OBD-II DRIVE MODE [MZR 2.5].) - Stop the vehicle and access the ON BOARD READINESS TEST to inspect Drive Mode completion status. - Verify the FUEL_EVAL PID changes to yes. - If not, perform	Yes	Repeat the inspection from Step 1. If the malfunction recurs, replace the PCM. (See PCM REMOVAL/ INSTALLATION [MZR 2.5].) Go to the next step.
		No	Go to the next step.

	the Drive Mode 03 (EGR System, A/F sensor heater, HO2S heater, A/F sensor, HO2S and TWC Repair Verification Drive Mode). (See OBD-II DRIVE MODE [MZR 2.5].) - Perform the KOER self test. (See KOEO/ KOER SELF TEST [MZR 2.5].) - Is the PENDING CODE for this DTC present?		
21	VERIFY AFTER REPAIR PROCEDURE - Perform the "AFTER REPAIR PROCEDURE". (See AFTER REPAIR PROCEDURE [MZR 2.5].) - Are any DTCs present?	YesGo to the applicable DTC inspection. (See DTC TABLE [MZR 2.5].)	No DTC troubleshooting completed.

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DETECTION CONDITION	• The PCM monitors short term fuel trim (SHRTFT) and long term fuel trim (LONGFT) values when closed loop fuel control. If the LONGFT and the sum total of these fuel trims exceed preprogrammed criteria, the PCM determines that the fuel system is too lean. Diagnostic support note • This is a continuous monitor (fuel system). • The MIL illuminates if PCM detects the above malfunctioning condition in two consecutive drive cycles or in one drive cycle while the DTC for the same malfunction has been stored in the PCM. • PENDING CODE is available if PCM detects the above malfunction conditions during first drive cycle. • FREEZE FRAME DATA (Mode 2)/Snapshot data is available. • The DTC is stored in the PCM memory.
	• Misfire • Erratic signal to PCM ▪ APP sensor signal malfunction ▪ ECT sensor signal malfunction ▪ MAF sensor signal malfunction ▪ TP sensor signal malfunction ▪ VSS signal malfunction • A/F sensor heater malfunction • A/F sensor malfunction ▪ A/F sensor loose ▪ Exhaust system leakage ▪ A/F sensor deterioration • Air suction in intake air system

POSSIBLE CAUSE	• MAF sensor malfunction • Improper operation of purge control system • Improper operation of variable valve timing control system • Fuel supply system malfunction ▪ Pressure regulator malfunction ▪ Fuel pump malfunction ▪ Fuel leakage on fuel line from fuel distributor and fuel pump ▪ Fuel filter clogged or restricted ▪ Fuel return hose clogged • Ignition system malfunction ▪ Ignition coil related wiring harness malfunction ▪ Spark plug malfunction ▪ Ignition coil malfunction • Insufficient engine compression • Improper operation of fuel injector • PCM malfunction
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Diagnostic procedure

STEP	INSPECTION	ACTION
1	IDENTIFY TRIGGER DTC FOR FREEZE FRAME DATA (MODE 2) • Is the DTC P0171:00 on FREEZE FRAME DATA (Mode 2)?	Yes Go to the next step.
		No Go to troubleshooting procedures for DTC on FREEZE FRAME DATA (Mode 2). (See DTC TABLE [MZR 2.5] .)
2	VERIFY FREEZE FRAME DATA (MODE 2)/ SNAPSHOT DATA HAS BEEN RECORDED • Has the FREEZE FRAME DATA (Mode 2)/snapshot data been recorded?	Yes Go to the next step.
		No Record the FREEZE FRAME DATA (Mode 2)/snapshot data on the repair order, then go to the next step.
3	VERIFY RELATED REPAIR INFORMATION AVAILABILITY • Verify related Service Bulletins and/or on-line repair information availability. • Is any related repair	Yes Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No Go to the next step.

	information available?		
4	VERIFY RELATED PENDING CODE AND STORED DTC - Switch the ignition to off, then to ON (engine off). - Verify the related PENDING CODE or stored DTCs using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [MZR 2.5].) - Are any other DTCs present?	Yes	If misfire DTC is present: - Go to Step 11. If other DTC is present: - Go to the applicable DTC inspection. (See DTC TABLE [MZR 2.5].)
		No	If drive ability concern is present: - Go to Step 11. If drive ability concern is not present: - Go to the next step.
5	VERIFY CURRENT INPUT SIGNAL STATUS - Access the following PIDs using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [MZR 2.5].) - APP1 - APP2 - ECT - MAF - TP REL - VSS - Is there any signal that is far out of specification when the ignition is switched to ON and the engine runs? (See PCM INSPECTION [MZR 2.5].)	Yes	Inspect the suspected sensor and related wiring harness. Repair or replace the malfunctioning part according to the inspection results, then go to Step 20.
		No	Go to the next step.
6	VERIFY CURRENT INPUT SIGNAL STATUS UNDER FREEZE FRAME DATA (MODE 2) CONDITION CAUTION: While performing this step, always operate the vehicle in a safe and lawful manner.	Yes	Inspect the suspected sensor and related wiring harness. Repair or replace the malfunctioning part according to the inspection results, then go to Step 20.
		No	Go to the next step.

	- When the M-MDS is used to observe monitor system status while driving, be sure to have another technician with you, or record the data in the M-MDS using the PID/DATA MONITOR AND RECORD capturing function and inspect later. - Access the following PIDs using the M-MDS under the FREEZE FRAME DATA (Mode 2) condition. (See ON-BOARD DIAGNOSTIC TEST [MZR 2.5].) - APP1 - APP2 - ECT - MAF - TP REL - VSS - Is there any signal which causes drastic changes?		
7	INSPECT A/ F SENSOR HEATER - Inspect the A/F sensor heater. (See AIR FUEL RATIO (A/ F) SENSOR INSPECTION [MZR 2.5].) - Is there any malfunction?	Yes	Replace the A/F sensor, then go to Step 20. (See AIR FUEL RATIO (A/ F) SENSOR REMOVAL/ INSTALLATION [MZR 2.5] .)
		No	Go to the next step.
8	VERIFY CURRENT INPUT SIGNAL STATUS OF A/ F SENSOR - Reconnect the A/F sensor connector. - Inspect the A/F sensor. (See AIR FUEL RATIO (A/ F) SENSOR INSPECTION [MZR 2.5].) - Is there any malfunction?	Yes	Go to the next step.
		No	Go to Step 11.
9	INSPECT INSTALLATION OF A/ F SENSOR	Yes	Go to the next step.

	- Inspect if the A/F sensor is loosely installed. - Is the A/F sensor installed securely?	No	Retighten the A/F sensor, then go to Step 20. (See AIR FUEL RATIO (A/ F) SENSOR REMOVAL/ INSTALLATION [MZR 2.5] .)
10	INSPECT EXHAUST GAS LEAKAGE - Visually inspect for the exhaust gas leakage between the exhaust manifold and A/F sensor. - Is there any leakage?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 20.
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11	VERIFY CURRENT INPUT SIGNAL STATUS OF MAF SENSOR - Start the engine. - Access the MAF PID using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [MZR 2.5].) - Verify that the MAF PID changes quickly according to the engine RPM. - Is the MAF PID value normal? (See PCM INSPECTION [MZR 2.5].)	Yes	Go to Step 13.
		No	Go to the next step.
12	INSPECT FOR EXCESSIVE AIR SUCTION OF INTAKE AIR SYSTEM - Visually inspect for loosen, cracks or damages hoses on intake air system. NOTE: - Engine speed may change when rust penetrating agent is sprayed on the air suction area. - Is there any malfunction?	Yes	Repair or replace the source of air suction, then go to Step 20.
		No	Replace the MAF/IAT sensor, then go to Step 20. (See INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [MZR 2.5] .)
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		No	Go to the next step.

	Is there any malfunction?		
14	INSPECT VARIABLE VALVE TIMING CONTROL SYSTEM OPERATION - Perform the Variable Valve Timing Control System Operation Inspection. (See ENGINE CONTROL SYSTEM OPERATION INSPECTION [MZR 2.5].) - Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 20.
		No	Go to the next step.
15	INSPECT FUEL LINE PRESSURE - Switch the ignition to off. NOTE: - If the engine will not start, inspect the fuel line pressure with ignition is switched to ON. - Inspect the fuel line pressure while the engine running. (See FUEL LINE PRESSURE INSPECTION [MZR 2.5].) - Is there any malfunction?	Yes	If fuel pressure is too high: - Replace the fuel pump unit, then go to Step 20. (See FUEL PUMP UNIT REMOVAL/ INSTALLATION [MZR 2.5].) If fuel pressure is low: - Go to the next step.
		No	Go to Step 17.
16	INSPECT FUEL LINE - Visually inspect the fuel line from fuel pump to fuel distributor. - Is there any leakage?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 20.
		No	Inspect the low-pressure side fuel filter for foreign materials or stain inside fuel filter. - If foreign materials or stain is found inside fuel filter (low-pressure side): - Clean of fuel tank and filter. - If foreign materials or stain is not found: - Replace the fuel pump unit. (See FUEL PUMP UNIT REMOVAL/ INSTALLATION [MZR 2.5].) Go to Step 20.
17	INSPECT IGNITION SYSTEM OPERATION	Yes	Go to the next step.

	- Perform the Spark Test. (See ENGINE CONTROL SYSTEM OPERATION INSPECTION [MZR 2.5].) - Is strong blue spark visible at each cylinder?	No	Repair or replace the malfunctioning part according to the inspection results, then go to Step 20.
18	INSPECT ENGINE COMPRESSION - Inspect the engine compression. (See COMPRESSION INSPECTION [MZR 2.5].) - Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 20.
		No	Go to the next step.
19	INSPECT FUEL INJECTOR OPERATION - Perform the Fuel Injector Operation Inspection. (See ENGINE CONTROL SYSTEM OPERATION INSPECTION [MZR 2.5].) - Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to the next step.
		No	Go to the next step.
20	VERIFY DTC TROUBLESHOOTING COMPLETED - Make sure to reconnect all disconnected connectors. - Clear the DTC from the PCM memory using the M-MDS. (See AFTER REPAIR PROCEDURE [MZR 2.5].) - Perform the Drive Mode 03 (EGR System, A/F sensor heater, HO2S heater, A/F sensor, HO2S and TWC Repair Verification Drive Mode). (See OBD-II DRIVE MODE [MZR 2.5].) - Stop the vehicle and access the ON BOARD READINESS TEST to inspect Drive Mode completion status. - Verify the FUEL_EVAL PID changes to yes. - If not, perform	Yes	Repeat the inspection from Step 1. If the malfunction recurs, replace the PCM. (See PCM REMOVAL/ INSTALLATION [MZR 2.5].) Go to the next step.
		No	Go to the next step.

	the Drive Mode 03 (EGR System, A/F sensor heater, HO2S heater, A/F sensor, HO2S and TWC Repair Verification Drive Mode). (See OBD-II DRIVE MODE [MZR 2.5].) - Perform the KOER self test. (See KOEO/ KOER SELF TEST [MZR 2.5].) - Is the PENDING CODE for this DTC present?		
21	VERIFY AFTER REPAIR PROCEDURE - Perform the "AFTER REPAIR PROCEDURE". (See AFTER REPAIR PROCEDURE [MZR 2.5].) - Are any DTCs present?	Yes Go to the applicable DTC inspection. (See DTC TABLE [MZR 2.5].)	
		No DTC troubleshooting completed.	